UTM
UNIVERSITI TEKNOLOGI MALAYSIA
Faculty of Social Sciences and Humanities

Our Partners:

AL BUKHARY INTERNATIONAL UNIVERSITY

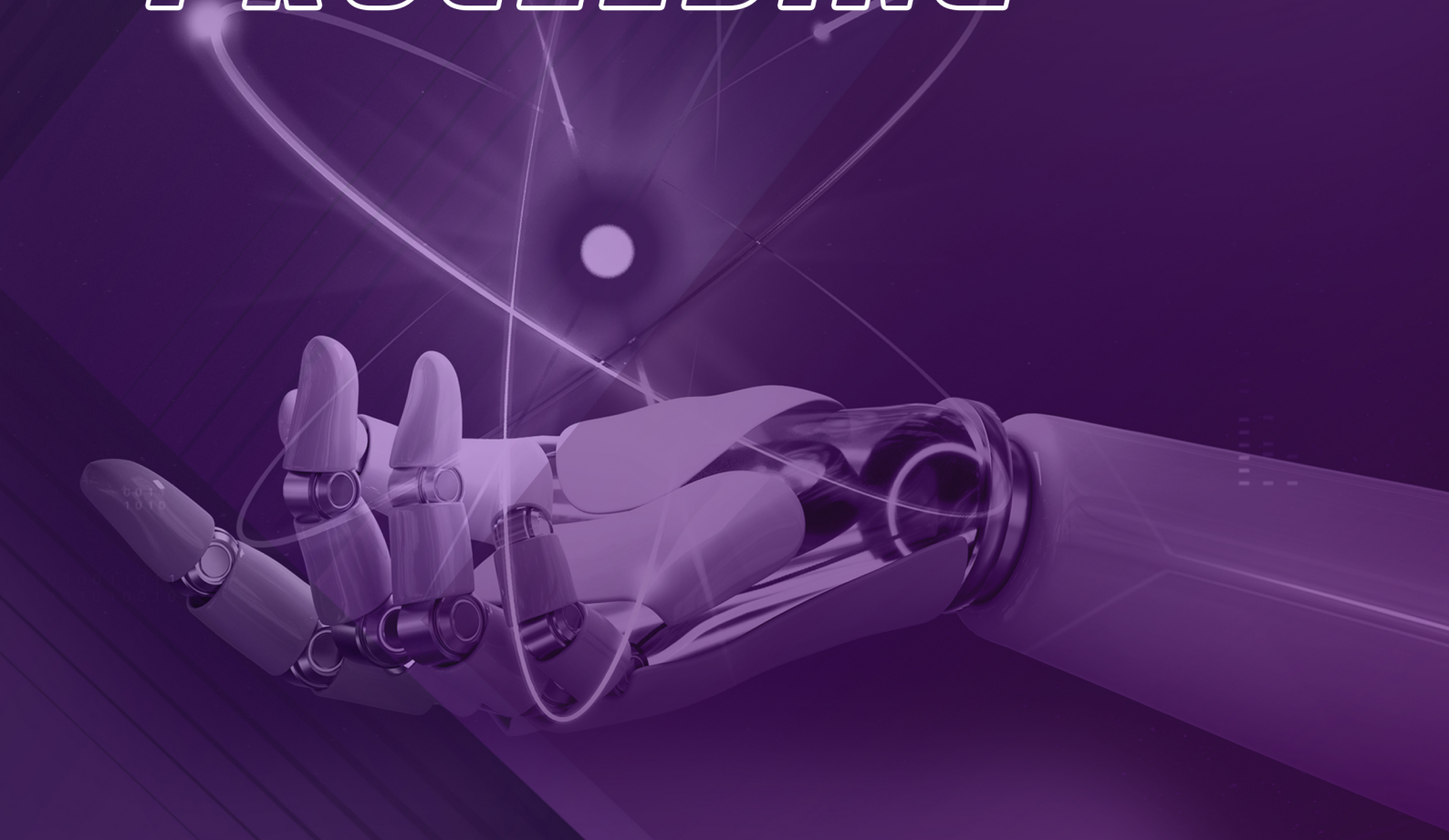
IICE 2023

International Innovation Competition in Education

" STEAM Education for an Innovative Society "

26 SEPT 2023

PROCEEDING



PROCEEDING OF

INTERNATIONAL INNOVATION COMPETITION IN EDUCATION (IICE)

2023

Persatuan Pendidikan Sains dan Matematik Johor

in collaboration with

School of Education

Faculty of Social Sciences and Humanities

UNIVERSITI TEKNOLOGI MALAYSIA

First printing/cetakan pertama

Disember 2023

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

ISBN:

Editor: Norulhuda Ismail, Abdul Halim Abdullah

Cover Design: Siti Noraini Md Zali

Published in Malaysia by:

Persatuan Pendidikan Sains dan Matematik Johor
D/A Sekolah Pendidikan
Fakulti Sains Sosial dan Kemanusiaan
Universiti Teknologi Malaysia
81310 UTM, Johor Bahru, Johor, Malaysia
www.ppsmj.com.my/v3

FOREWORD FROM DIRECTOR OF IICE 2023

Assalamualaikum wbt

It is with gratitude that I pen this foreword for the proceeding of the International Innovation Competition in Education 2023. This competition which was held on the 26th of September 2023 offers opportunities for educators and students to showcase their inventive approaches to teaching and learning, offering insights into contemporary trends across all levels of education. Moreover, it serves as an avenue for researchers to explore ideas aimed at enhancing the educational experience for both adults and young learners.

The theme of this competition is STEAM education for a sustainable future. STEAM education is a powerful tool that can help us tackle the challenges facing our planet, from climate change and resource depletion to social inequality and technological disruption. Artistic expression can help convey scientific and technological concepts to a broader audience, making critical issues more accessible and engaging. As we move forward, let us recognize the immense value of STEAM education and invest in its promotion and development.

The accomplishments of this competition are a testament to the unwavering dedication and concerted efforts of the program's team members. The meticulous contributions of individuals within the organizing committee, including the jury, moderator, and medal committee, have not gone unnoticed. Furthermore, the success of this program would not have been possible without the invaluable support of our partner universities: Albukhary International University, Universitas Negeri Jakarta, Universitas Pendidikan Indonesia, Universitas Negeri Makassar, Universitas Negeri Malang, and Universitas Ahmad Dahalan.

I would like to present to you the extended abstract by the participants of this competition. In addition, I also want to convey my deepest gratitude to the team of editors and contributors who made this proceeding.

NORULHUDA ISMAIL
Director
IICE 2023

TABLE OF CONTENTS

Exploring AI-Generated Illustrations in Students' Retelling of Southeast Asian Folktales

Alia Hanim Zainal Abidin, Norazly Nordin
Albukhary International University, Alor Setar, Kedah, Malaysia
Email address alia.zainal@aiu.edu.my, norazly.nordin@aiu.edu.my

Highlights: This paper explores the use of generative AI in producing accompanying illustrations for students' retelling of Southeast Asian folktales, focusing on their alignment with narrative content. Rubric and content analysis are employed to analyze AI illustrations and narrative elements, assessing themes like characters, settings, and cultural aspects. Findings are varied, with some students achieving criteria for narrative alignment, and enhancing storytelling, while discrepancies were also observed in others, leading to potential misrepresentations. The paper emphasizes the importance of understanding narrative elements and cultural context when using AI-generated visuals. It also highlights the need for using the right and well-crafted prompts to ensure accurate representation in AI-generated illustrations.

Key words: artificial intelligence; content analysis; literature; south-east asian literature; folktales

Introduction

The role of artificial intelligence (AI) in education is undoubtedly one of the most debated and discussed topics these days. The discourse in and around artificial intelligence for education (AIEd) has been ongoing and is non-exhaustive since its inception more than three decades ago, detailing and expanding on different paradigms, methods, and ethics (Ouyang & Jiao, 2021; Vincent-Lancrin & van der Vlies, 2020). One aspect that is taking the existing discourse by storm is the use of generative AI applications built on large language models (LLMs), which has been garnering mixed responses and reactions with studies and calls on more research on its implementation, impacts, ethical implications and possible future outcomes coming from every corner of the field (Lodge, et al, 2023; Rios-Campos, et al, 2023). These LLMs are the backbone of various applications such as ChatGPT, Bard, DALL-E and Imagine, to name a few among many, which can generate various content consisting of texts, images and audio, which means anything from a well composed essay, stories with accompanying illustrations and deepfake videos (Lawton, 2023; McKinsey & Company, 2023).

Although this has been a cause for alarm and concern for many content and art creators (Thorpe, 2023; The Japan Times, 2023), it also opens new opportunities and avenues for others (Bensinger, 2023; Ionita, 2022). While both sides of the discourse struggle to find balance and adapt to the new playing field, in the area of teaching literature, it can be used to create a way to support students' learning. Since understanding narrative and context is crucial in learning literature (Cadden, 2022), generative AI can be used to demonstrate student's understanding of narrative elements in a story and the context in which it takes place. In studying folklore in children's literature for example, this could translate into integrating the use of generative artificial intelligence to produce accompanying illustrations that show suitable narrative alignment in the retelling of South-East Asian folktales by students.

Product Description

As part of the coursework for Children's Literature course in the Elementary Education programme at the School of Education and Social Sciences, Albukhary International University, a group of 43 undergraduate students were asked to work on a retelling of a South-East Asian folktale of their choice. They worked in groups of 2-3 members, and altogether reproduced 21 folktales. The task assigned to them is divided into four phases:

Table 1: Phases of task

Phase	Name	Activity description
1	Selecting the story	Students research and choose a specific South-East Asian folktale based on its authenticity and cultural significance.
2	Analyzing the story	Students analyze the plot, setting, characters and themes contained in the folktale, complete a summary of the story consisting of said elements, and identify values and/or messages meant to be conveyed through the folktale.
3	Retelling the story	Students work on a retelling of the folktale, complete with illustration and are given the creative freedom to use any medium of their choice.
4	Reflecting on the task	Students reflect on the process of retelling the folktale, and propose a possible use of their retelling of the folktale in a classroom.

The need to produce suitable accompanying illustration for a folktale is intrinsic in the characteristics of the folklore genre itself. Due to its brevity, archetypal or symbolic characterization and strong moral message that is commonly attached to its cultural origin, accompanying illustrations usually function to emphasize or enforce certain images and meanings to its often young audience (Mitts-Smith, 2022). What this means is that students need to show understanding of narrative elements of the folktale in order to produce a suitably aligned set of illustrations. The completed retelling of the folktale is evaluated using the following criteria:

Table 2: Criteria for evaluating retelling of folktale

Criteria	Description
Authenticity	• Represents the chosen country's culture and traditions. • Reflects the beliefs/values of the people from the region.
Storytelling	• Maintains coherence and logical progression of events. • Effectively utilizes paragraphs and dialogue where appropriate.
Length and Structure	• Appropriate length for the intended audience. • Has a clear and engaging narrative structure (introduction, rising action, climax, falling action, conclusion).
Illustrations	• Shows creativity, attention to detail, and alignment with the narrative. • Enhances the storytelling experience and complements the text.
Accuracy and Research	• Demonstrates an understanding of the story's plot, setting and characters. • Avoids misrepresentation of its people/place/culture.

In order to fulfill the criteria for illustration, students need to produce accompanying illustration which is suitably aligned with the folktale narrative and enhances the storytelling, and this can be done only if they understood the narrative elements of the folktale, and its cultural context. Out of the 21 folktale retellings, 7 of them utilized generative AI to produce accompanying illustrations. The generative AI application of choice among the students is Imagine, which is available free for use on the web (imagine.art/) as well as an application on Android and iOS, well-known for its ease of use for beginners. The students have no prior knowledge or experience in using generative AI to produce illustrations, and their prior use of LLMs is commonly limited to the use of ChatGPT 3.5, which is free and does not come with image capabilities. Hence, the process that they went through to produce accompanying illustration for their retelling of the folktale is purely exploratory in nature, and worth documenting.

Results & Discussion

As stated in Table 1, students would have cultivated the understanding of the narrative elements and cultural context involved in their folktale retelling in Phase 1 and 2 of the task. In Phase 3, they would need to demonstrate their understanding of the South-East Asian folktale of their choice through drafting its retelling in text as well as producing accompanying illustration. For the seven groups of students that decided to use generative AI to produce their accompanying illustration, this process would also involve the use of prompts, which is the key to the use of generative AI applications run on language models.

There is a whole science built on the art of prompting, as it determines the accuracy and quality of output that is generated (Harvard University Information Technology, 2023; Google for Developers, 2023). In the case of this process, a general prompt of 'a forest with a stream' will produce an illustration based on the most-used datasets to train the generative AI models, which is based on Western-style art and its canon (Hakopian, 2023). However, repeated attempts at prompting, each time adding more detailed or specific description or characteristics required for the intended generated art, would produce better results with higher accuracy. The following collection of images are taken from the front cover of each of the folktale retellings, with varying degree of success in narrative alignment and cultural context.

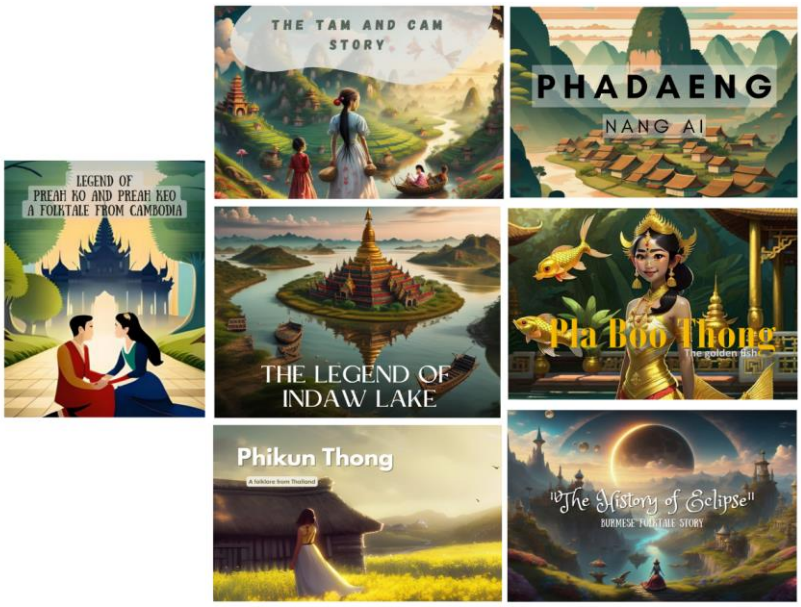


Image 1: A collage of AI-generated illustrations used as the front cover of each folktale retelling.

From the collage, we can see for example that 'Legend of Preah Ko and Preah Keo: A Folktale from Cambodia', 'Pla Boo Thong', which is a folktale from Thailand, and 'The Legend of Indaw Lake' from Myanmar, show the most likely achievement in narrative alignment and cultural context understanding by the students. On the other

hand, 'Phikun Thong', a Thai folktale, and 'The History of Eclipse', from Myanmar, show less detailed cultural representation, although it still shows relative narrative alignment in the way the former presents a young woman in a simple dress, signifying her lower status in society, which is understood as the principal character and namesake for the folktale, 'Phikun Thong'. Meanwhile, 'The History of Eclipse shows a fantastical eclipse which matches with the overall imaginary feel of the entire illustration, but lacks the Burmese cultural representation in the art.

However, despite the fact that the collage in Image 1 shows the initial achievement, in varying degrees, of each illustration for the front cover, it does not, however, guarantee consistency in narrative alignment or cultural representation in enhancing the rest of each folktale's storytelling. One example of this can be seen from 'Pla Boo Thong', which initially showed high achievement in narrative alignment and cultural representation on the front cover.

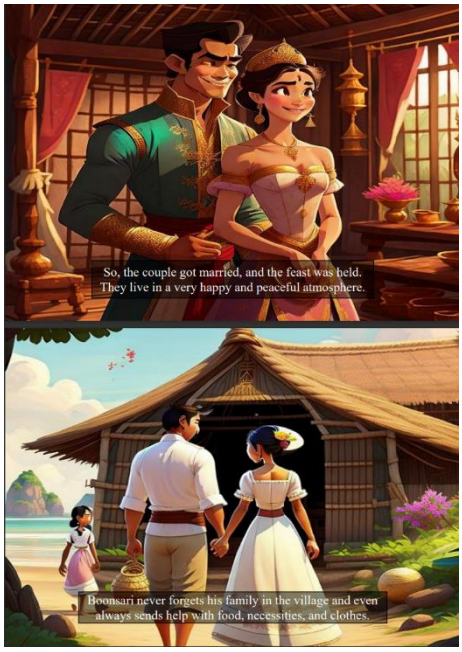


Image 2: Two successive illustrated pages from 'Pla Boo Thong'

Despite the fact that they belong to the same story, the second illustration lacks the consistency in character appearance and setting from the previous page. This affects the narrative alignment and interferes with the storytelling experience. These instances would occur again in the same story, as well as other folktales in the list. This is due to the fact that generative AI models, especially the one that is free for use, generates a single illustration for each prompt, and may or may not recognize the need for a unified overall look for illustrations generated to support narrative alignment and specific cultural representations. Another factor could also be the weakness in prompting skill on the students' part, taking into consideration their lack of prior knowledge and experience.

Two groups of students, however, managed to come up with strategies to attempt at keeping the narrative alignment as well as appropriate cultural representation in their AI-generated illustration. The students who worked on the retelling of 'Legend of Preah Ko and Preah Keo' from Cambodia decided to take out illustrations that do not align correctly with the narrative or represent the cultural context properly from their story. Instead, they opted for incorporating more text. On the other hand, the students who worked on 'The Tam and Cam Story' from Vietnam opted for editing and cropping a number of illustrations in their set that might potentially cause misalignment in narrative and inaccurate cultural representation.

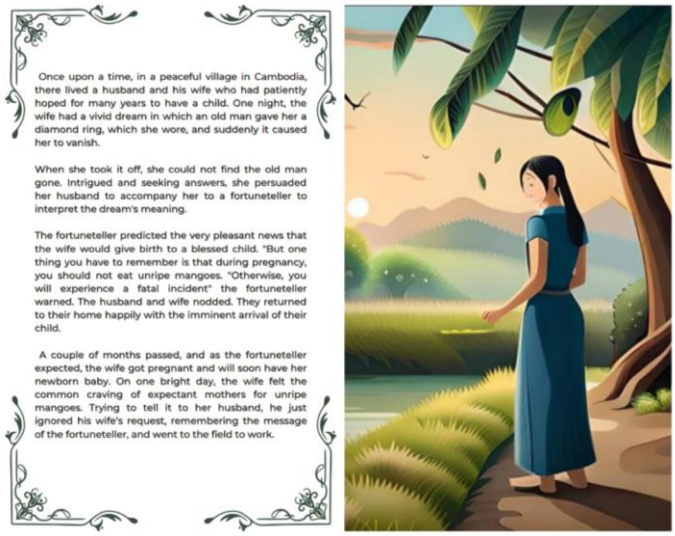


Image 3: Using more text than illustration in 'Legend of Preah Ko and Preah Keo'

Conclusion

As this is a first-time exploration of using generative AI to produce accompanying illustration for South-East Asian folktale done by students in order to demonstrate their understanding of the narrative elements and cultural context of the stories, a number of things have been learned in carrying out this activity as part of a literature class. While understanding of narrative elements and cultural context certainly plays an important role in producing accompanying illustration for folktales using AI generative models, the knowledge and ability to produce accurate prompts is also as equally important, alongside creative problem-solving skills when faced with issues in producing AI-generated images that is intended to align with a specific narrative. Future recommendation to improve the utilisation of generative AI in producing illustration with narrative alignment and specific cultural representation is to further develop prompting skills as well. Other than that, as generative AI models grow in numbers and trained with varied multilingual, multicultural datasets, the possibility of generative AI producing more accurate illustrations that are cultural-specific will also increase. This will provide for a more exciting avenue to explore in teaching and learning literature, a field of study that, at times, deemed 'too classical' or outdated in our recent times.

References

Bensinger, G. (2023). Focus: ChatGPT launches boom in AI-written e-books on Amazon. Reuters. https://www.reuters.com/technology/chatgpt-launches-boom-ai-written-e-books-amazon-2023-02-21/

Cadden, M. (2022). Narrative Theory and Children's Literature. A Companion to Children's Literature, 1st Ed. Blackwell.

Google for Developers, 2023. "Prompt Engineering for Generative AI". https://developers.google.com/machine-learning/resources/prompt-eng

Hakopian M. F., (2023). Art histories from nowhere: on the coloniality of experiments in art and artificial intelligence. AI & Society. DOI:10.1007/s00146-023-01768-0

Harvard University Information Technology, 2023. "Getting started with prompts for text-based Generative AI tools". https://huit.harvard.edu/news/ai-prompts

Ionita, A. 11 October 2022. "Artists Think AI Will Enhance Human Creativity. Here's Why". https://therecursive.com/is-ai-a-muse-or-a-foe-see-how-artists-feel-about-it/

Lawton, G. (n.d.) "What is generative AI? Everything you need to know". TechTarget. https://www.techtarget.com/searchenterpriseai/definition/generative-AI

Lodge, J., Thompson, K. & Corrin, L. (2023). Mapping out a research agenda for generative artificial intelligence in tertiary education. *Australasian Journal of Educational Technology*. 39. 1-8. 10.14742/ajet.8695.

McKinsey & Company, 19 January 2023. "What is Generative AI?" https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-generative-ai

Mitts-Smith, D. (2022). Folklore in Children's Literature. *A Companion to Children's Literature*, 1st Ed. Blackwell.

Ouyang F. & Jiao P. (2021). Artificial intelligence in education: The three paradigms. *Computers and Education: Artificial Intelligence*, Vol 2, 2021. https://doi.org/10.1016/jcaeai.2021.100020

Rios-Campos, C., Cánova, E., Zaquinaula, I., Zaquinaula, H., Castro V., et al, (2023). Artificial Intelligence and Education. *South Florida Journal of Development*. 4. 641-655. 10.46932/sfjdv4n2-001.

Thorpe, V. 18 March 2023. "ChatGPT said I did not exist: how artists and writers are fighting back against AI". The Guardian. https://www.theguardian.com/technology/2023/mar/18/chatgpt-said-i-did-not-exist-how-artists-and-writers-are-fighting-back-against-ai#:~:text=ChatGPT%20is%20just%20one%20of,a%20sense%20of%20%E2%80%9Cviolation%E2%80%9D.

The Japan Times, 10 June, 2023. "58% of Japan's illustrators and writers fearful of losing their jobs to AI" https://www.japantimes.co.jp/life/2023/06/10/digital/ai-japan-illustrators-concern/#:~:text=The%20online%20survey%2C%20which%20was,concerned%20about%20losing%20their%20jobs.

Vincent-Lacrin, S. & van der Vlies, R. (2020). Trustworthy artificial intelligence in education. OECD Education Working Papers, No. 218. https://doi.org/10.1787/a6c90fa9-en

ALEBB: Alternative Energy Concept of Bridge Building Educational Kit Based PjBL-STEAM to Train Scientific Literacy for SDGs in the 5.0 Era.

Shinta Permata Sari1, Rahmatin Ilmiatunnisa'2, Savina Tunazjah3
Universitas Negeri Malang, Malang, Indonesia[1,2,3]
shinta.permata.2103516@students.um.ac.id, rahmatin..ilmiatunnisa.2103516@students.um.ac.id ,
savina.tunazjah.2103516@students.um.ac.id

Highlights: The improvement students' literacy in Indonesia is urgently needed in the era of society 5.0. One effort is to develop learning media. The aim of this research is to develop a valid and practical Alternative Energy Concept of Bridge Building Educational Kit Based PjBL- STEAM (ALEBB) to train scientific literacy. The method was carried out by the R&D with the ADDIE model. The result showed the developed learning media was valid and practical. In conclusion, the ALEBB is expected to support the SDGs program to improve the quality of education which is still low in Indonesia especially in scientific literacy.

Key words: alternative energy; educational kit; PjBL-STEAM; scientific literacy; SDGs

Introduction

In this era of society 5.0, the implementation of quality education is a challenge for several countries in the world including Indonesia (Safitri et al., 2022). This is also in line with the fourth point of the Sustainable Development Goals (SDGs) program, namely quality education. Meanwhile, from the results of the 2018 PISA survey, Indonesian students' literacy skills scored below average. One of them in the field of scientific literacy is ranked 71^{st} out of 80 countries with a decreased score from the results of the 2018 PISA survey, which was 403 to 389 (OECD, 2019). The low quality of education will produce less quality human resources which can have a negative impact on national development and Indonesia's global competitiveness (Alfaien et al., 2023).

In improving the quality of education, effective learning is needed which is easy and fun for students. One important component that is very influential in improving the quality of education is the media (Noorozi et al., 2021). The use of creative and innovative learning media is an appropriate step to increase students' interests and abilities (Fuadi et al., 2020; Huang et al., 2023). However, its use is still not optimal in Indonesian schools, based on the results of observations made at three lower secondary schools in Malang, the media used was dominated by textbooks and student worksheets. The results of Rahayu's (2021) observations in one lower secondary school in Lampung were still implementing teacher centered learning so that there was not enough to training scientific literacy.

Educational kits are a creative and innovative learning media that can be developed into 3D works so that they are more interesting and fun (Anasta et al., 2022). Educational kits can provide experience in assembling and thinking about solutions to problems that are integrated with technology according to the demands of the society 5.0 era. The educational kit itself can show the elements of engineering and arts so that it can improve students' skills in applying concepts through action and in accordance with the STEAM approach. The STEAM approach (Science, Technology, Engineering, Arts, Mathematics) directs students to express ideas, apply learning outcomes through action, and is in line with education in the era of society 5.0 which demands technology-based learning (Azizah et al., 2019). Given the important contribution of scientific literacy in improving the quality of education, STEAM is a necessary approach to train skills in learning science (Nuraini et al., 2023; Yang et al., 2018).

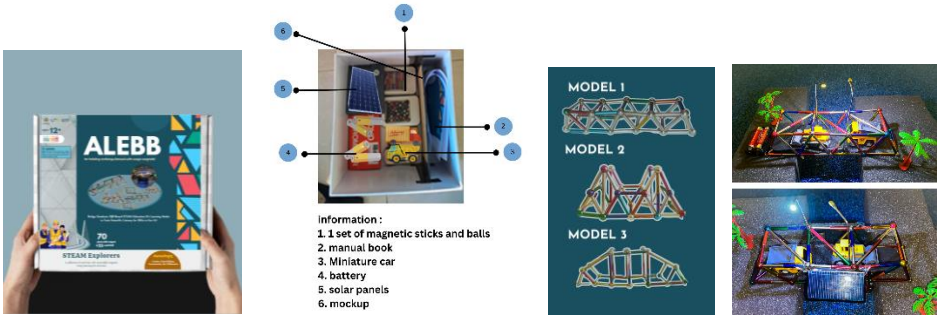
One of the science materials for lower secondary school level in the form of theory and memorization which is considered difficult to understand, uninteresting and boring is material on renewable energy sources (Caron et al., 2023). Renewable energy learning should ideally be practicum-based through learning media that can illustrate the application of renewable energy in everyday life. However, based on the observations of Sanjaya et al (2016), several senior high schools in Jakarta do not yet have suitable learning media with the concept of renewable energy. Meanwhile, material on renewable energy sources is very important for students to understand because it is a real problem that will be faced in the future (Miroah et al., 2015). Besides that, the learning must be in line with the demands of education in the 5.0 era of society, namely students have the ability to solve problems, think critically, and be creative (Harun, 2021). The Project Based Learning (PjBL) learning model is able to meet these demands and at the same time can be used to train scientific literacy (Brown et al., 2023; Fatmawati, 2022). The combination of PjBL and STEM models can not only train scientific literacy but can also train problem solving skills needed in learning in the 21st century (Nuraini et al, 2023).

The previous researches related to the development learning media have been carried out such as math handouts learning media by Ramdani (2020), it has been based on STEAM, but has not implemented the PjBL model and aimed at practicing numeracy literacy. Meanwhile, Afriana (2022), used PjBL-STEM digital media to train scientific literacy but did not include elements of art. However, in those research it was not supported by educational kits that could provide direct practical experience to students and have not practiced the ability to solve problems related to real life. Therefore, it needs learning media that combines kit, STEAM, and PjBL not only train students' scientific literacy but also problem-solving skills. The problem that will be overcome in real life is the increase in energy consumption along with the increase in population in Indonesia. Apart from being a learning media reference for teachers, this product also provides students with new learning experiences to practice scientific literacy through educational kits. Therefore, ALEBB: PjBL-Based STEAM Education Kit Learning Media with Alternative Energy Concept to Train Scientific Literacy for SDGs in the 5.0 Era can be one of the solutions to overcome the low quality of education in Indonesia especially in training scientific literacy.

Product Description

ALEBB Edukit is a learning media with a STEAM learning approach which can be a solution to this problem. ALEBB Edukit has a packaging size of 20 x 20 x 16 cm. Where the packaging material is made of cardboard. The learning media elements used are magnetic sticks, mats, mini solar panels, LED lights, balls, cables and batteries. Then in the education box there is a Manual Book measuring 12 x 8 cm.

Figure1: (a). Edukit packaging form. Figure (b). fill inside, (c) An example of a bridge models (d) An example of bridge with battery and solar panels.



(a) (b) (c) (d)

The learning media product "ALEBB" Edukit is specifically designed to support science learning at lower secondary school Based on the results of PISA 2018 where the level of scientific literacy in Indonesia is still low, so learning media is needed that can overcome these problems. ALEBB Edukit is a Project Based Learning-based learning where later students are given a problem in the real world and students answer these problems by assembling the appropriate bridge shape so that the results are expected to be able to practice the concept of scientific literacy. Which carries the theme of learning about alternative energy found on bridges by utilizing solar panels. This edukit is supported by a Manual Book to provide an overview and procedures for using edukit and Worksheets which contain practice questions that must be completed by students which can be accessed in the form of a QR Code. The design of the learning approach in this education uses STEAM. Students use ALEBB learning media to increase scientific literacy of student components and activities.

Table 1: Design of the ALEBB Edukit Approach with Sintaks PjBL-STEAM

NO	PjBL-STEAM Syntax	Science Literacy	Activity	STEAM
1	Fundamental questions and project determination	- Explain scientific phenomena - use effective literature searches - Identify questions from the reading material provided	- Students can observe and understand problems through the reading material contained in the "Let's Read" on the Worksheet and get basic questions on reading material	- Science: Concepts or materials regarding the problem of energy use. - Technology: Using QR codes to read news articles about the increasing use of non-renewable energy in more detail. As well as the design results of the bridge model and the installation of solar panels which are then realized through the assembly process.
2	Designing project completion steps.	- Use effective literature searches - Evaluate the use of scientific information - Understand the elements of research design and the impact of scientific discovery	On the Worksheet in the "let's design" and "let's design" sections, students discuss the description, tools and materials and the rules for completing the project.	Science: Student activities interpret and conclude information/problems and relate them to the concept of renewable energy in bridge lighting.
3	Preparation of project implementatio	- Use effective literature searches - Evaluate the use of scientific information - Understand the elements of research	Students make a schedule or steps that students will take to solve the problem given. From	- Science: The concept of renewable energy that is used by students in the energy source of bridge lighting, which can use solar panels. - Art: Design a bridge model aesthetically so that it is as similar as possible to the original

	n schedul e.	design and how they influence scientific discover - Solve problems using quantitative skills	designing to finished form.	
4	Comple tion of projects with teacher facilitati on and monitori ng	- Evaluate the use of scientific information - Understand the elements of research design and how they influence scientific discover	Students carry out the "Let's Arrange" activity on a Worksheet using the designs that have been made and the material tools that have been provided in the edukit.	- Science: The concept of renewable energy on the bridge is using solar panels. -Technology: use of QR codes as guidebooks, and magnetic sticks as media for bridge structure - Engineering: The process of assembling a bridge using magnets and balls and arranging lights. - Art: The colored magnets used add an aesthetic element
5	Prepara tion of reports and present ation/p ublicati on of project results	- Solve problems using quantitative skills - Create graphs that represent data - Reading and interpreting data - Understand and be able to interpret basic statistics	Students present the results of assembling designs and experiments and also discuss the results with other friends.	- Science: The concept of renewable energy in bridges -Technology: When conducting demonstrations, you can use technology to make videos
6	Evaluati on of project process es and results	- Solve problems using quantitative abilities - Read and interpret data - Present conclusions based on quantitative data	Students carry out a joint evaluation of the results of the worksheet discussion to test student understanding with teacher guidance.	- Science: Applying the renewable energy concept of solar panels to lighting lamps as an alternative energy source. - Mathematics: Determine the electrical energy used by the bridge lighting using the formula on the problems in the assignment section of the.

Results & Discussion

The product was developed by using R&D methode, and ADDIE model. The first stage is analysis by studies literature then observations in lower secondary school that can be concluded they need learning media to train science literacy that were also carried out and the results were that the learning media used at school was not optimal and there was still a lot of use of text books. At the design stage, namely selecting measurement and quantity material as a learning topic.

And then in development stage namely the development of educational components in a set box containing magnetic sticks, balls, miniature cars, rulers, batteries and solar panels. and in this stage we have conducted media product test results which is came from two media expert validators and two material expert validators. The validity test was carried out to find out whether the development of the ALEBB educational kit based on the material was worth developing or not. Validation was carried out by a material expert validator who is a lecturer at the Department of Science Education at Universitas Negeri Malang. The results of the Material Expert Validation Test data are divided into two, namely quantitative data and qualitative and did percentage analysis techniques.

Table 2: Results of material validation to ALEBB Edukit

Indicator	Validator 1		Validator 2	
	Validity(%)	Qualification	Validity (%)	Qualification
Content Eligibility	86	Very valid	89	Very valid
Presentation Techniques	96	Very valid	86	Very valid
Language	88	Very valid	88	Very valid
Ease of use	96	Very valid	93	Very valid
Usefulness	100	Very valid	94	Very valid
Concept truth	100	Very valid	100	Very valid
Average	94	Very valid	92	Very valid

Table 3: Results of media validation to ALEBB Edukit

Indicator	Validator 1		Validator 2	
	Validity(%)	Qualification	Validity (%)	Qualification
Presentation aspect	89	Very valid	96	Very valid
Graphic aspects	88	Very valid	100	Very valid
Ease of use	88	Very valid	96	Very valid
Average	88	Very valid	97	Very valid

Based on the media validation and material validation test results, the ALEBB learning media has very valid qualifications, this shows that the learning media is very suitable for use and development without revision. The valid qualification test result indicates that the approach used can be applied to students in training science literacy. This is in accordance with the literature study by Azizah et al. (2019) and Nuraini et al. (2023) which states the STEAM approach directs students to express ideas and apply outcomes through action and also statements by Pujiati (2019) and Yang et al., (2018) that STEAM was proven to be able to train science literacy.

Then the implementation stage is carried out by implementing the product into lower secondary school and then also obtaining practical test results for teachers and students, as in the table below.

Table 3: Teacher and student response results

Aspect	**Percentage(%)**			
	strongly agree	**agree**	**disagree**	**don't agree**
usability	39,8 %	65%	-	-
appearance	38%	69,3%	14,3%	-
innovation	28,6%	71,4%		
Average	35%	68,6%	14,3%	-

Based on the results of research through questionnaires, 21 respondents were obtained including lower secondary school teachers, students and guardians. We take three aspects, namely usability, appearance and innovation. Table 3. Results of respondents to ALEBB Edukit. In Addition, teacher give response that ALEBB Edukit can be used as permanent teaching media, and student responses state that learning through ALEBB edukit is fun, the last is parents response which is that this media assisted in teaching children. These results are in accordance with the literature study by Fuadi (2020) and Huang et al. (2023) that the use of creative and innovative learning media is an appropriate step to increase students' interests and abilities. This was also proven in Anasta's statement (2022) that Educational Kits can develop into 3D works so that they are more interest and fu. In the validation test for material experts and media experts, then we analyzed the readability test for teachers and students using percentage analysis techniques which refers to the Likert scale with the following results

Table 3: Teacher and student practicality test results

Indicator	**Practicality**	**Qualification**
Test students' practicality	83%	Very practical
Test the teacher's practicality	77%	Practical

The results of the teacher practicality test questionnaire were carried out by the science teacher at SMP Putri Al Irsyad Islamiyyah, namely Mrs. Ida Alfiah S.Si. And the last stage is evaluation, which is we have did in every stage with purposed we can develop the product as well.

Conclusion

Edukit ALEBB STEAM based on PjBL-STEAM has the specification of applying scientific literacy through problems related to designing bridge structures such as the use of alternative energy. ALEBB learning media received a positive response to be realized and applied in lower secondary, apart from that, very valid results were obtained in media validation and material validation, and very practical in student and teacher practicality tests. With an attractive appearance, innovative elements, and scientific literacy training, it is hoped that PjBL-STEAM-based learning media can be a solution to the low quality of education in Indonesia. Then, to develop this media, it is necessary to increase the durability of tools and materials and add elements of better technological innovation.

Acknowledgement

We thank the team, lecturers, and partners who have held this activity, so that we can gain new knowledge and experience. The author realizes that the abstract is far from perfect, therefore we apologize profusely.

References

Ifaien, N.I., Kosim, A.M. , Fadil, K. (2023). Upaya Meningkatkan Kualitas Pendidikan Agama Islam di Indonesia dalam Mewujudkan Program Sustainable Development Goals (SDGs). *Edupedia, 7 (2): 127-142*.

Anasta, N.D.C., Giwangsa, S.F., Magistra, et al. (2022). Implementasi Literasi Kriya melalui Pengembangan Edukits sebagai Media Pembelajaran Inovatif di SD. *Jurnal Cakrawala Pendas, 8 (4)*.

Azizah, W.A., Sarwi, & Ellianawati. (2019). Pendekatan STREAM terhadap peningkatan Kemampuan Berpikir Kritis Siswa Sekolah Dasar. *Prosiding Seminar Nasional Pascasarjana UNNES*.

Brown, S. E., Lee, J. D., & Brown, S. J. (2023). The Impact Of Project-Based Learning On Science Literacy: A Systematic Review Of The Literature. *Review of Educational Research, 92(1), 1-30*.

Caron, J.L., Epler, M.E., Brown. S.E. (2023). The Challenges of Teaching Renewable Energy to Middle School Students. *Journal of Science Education and Technology, 2023, 32(2), 175-188*.

Fatmawati, Wahyudi, Harjono, A. (2022). Pengambangan Perangkat Pembelajaran Berbasis Proyek untuk Meningkatkan Keterampilan Proses Sains Peserta Didik. *Jurnal Ilmiah Profesi Pendidikan, 7 (4b): 2563 – 2568*.

Fuadi, H., Robbia, A.Z., Jamaluddin., Jufri, A. W. (2020). Analisis Faktor Penyebab Rendahnya Kemampuan Literasi Sains Peserta Didik. *Jurnal Ilmiah Profesi Pendidikan, 5 (2)*.

Harun, S. (2021). Pembelajaran di Era 5.0. *Prosiding Seminar Nasional Pendidikan Dasar*.

Huang, Y.-C., Kuo, C.-H., Hsu, Y.-H., & Yeh, H.-W. (2023).The Effects Of Innovative Instructional Media On Student Engagement In The Classroom: A Meta-Analysis Of Experimental Studies. *Computers & Education, 157*.

Miroah, Budi, E., & Serevina, V. (2015). Pengembangan Media Pembelajaran Energi Terbarukan untuk Meningkatkan Kemampuan Berpikir Kritis. *Prosiding Seminar Nasional Fisika (E-Journal) SNF2015, IV, 11–16*.

Noroozi, R. M., Ahmadi, S. A., & Ghasemi, M. R. (2021). The Role Of Instructional Media In Enhancing The Quality Of Education. *International Journal of Educational Research, 101*.

Nuraini, Fajri, N. Himayatul, I., Waluyo, E. (2023). Development Of PjBL with Steam Approach Model In Improving The Science Literacy Ability Of High School Students. *Indonesian Journal of Science Edication*.

OECD. (2016). PISA 2015 Assessment and Analytical Framework, http://dx.doi.org/10.1787/9789264255425-en.

Rahayu, S.S.D. (2020). Pengaruh Model Pembelajaran Search, Solve, Create And Share Terhadap Kemampuan Literasi Sains Ditinjau dari Minat Belajar Peserta Didik Kelas VIII Pada Mata Pelajaran IPA di SMPN 2 Tulang Bawang Tengah. *S1 Thesis.*

Ramdani, E. (2020). Pengembangan Handout Matematika Berbasis Pendekatan STEAM pada Materi Bangun Ruang Sisi Datar untuk Siswa Kelas VIII SMP. *S1 Thesis*.

Safitri, A.O., Yunianti, V.D., Rostika, D. (2022). Upaya Peningkatan Pendidikan Berkualitas di Indonesia: Analisis Pencapaian Sustainable Development Goals (SDGs). *Jurnal Basicedu, 6 (4): 7096-710*.

Sanjaya, L.A., Budi, A.S., Astra , i.M. (2016). Pengembangan Alat Peraga Energi Terbarukan. *Prosiding Seminar Nasional Fisika (E-Journal)*.

Yang, X., Zhang, X., & Wang, X. (2018). The Effects Of STEAM Education On Science Literacy Of Elementary School Students. *Journal of Science Education and Technology, 27(6), 1293-1302*.

IPO-One stop support center (trading simulation)

Norliza Che-Yahya[1], Siti Sarah Alyasa-Gan[2]
Universiti Teknologi MARA (UiTM) Puncak Alam Selangor, Malaysia[1],
Management and Science University (MSU), Shah Alam Selangor, Malaysia[2]
norliza9911@uitm.edu.my, sitisarahgan@msu.edu.my

Highlights: Initial Public Offerings (IPO) One-Stop Support Center website is created to help students, the public and academic researchers. One of the significant features of this website is a stock trading simulation which enables stock trading practice in a simulated or virtual environment. It simulates the experience of trading equities with virtual currency. The main aim of this trading simulation is to offer students and the public (potential retail investors) a risk-free environment to learn and practice trading before entering the real stock market. This trading simulation also aims to improve students' lifelong learning skills from the investment aspect.

Keywords: IPO One-Stop Support Center; Stock Trading Simulation; Investment Literacy; Passive Income Generation

Introduction

In alignment with the 21st Century Skills, the IPO One-Stop Support Center website (can be reached here: https://sites.google.com/uitm.edu.my/ipo-one-stop-support-center/home) is built to help students, the public (potential retail investors), and academic researchers gain important information about the initial public offerings and the stock market of Malaysia through creative and innovative learning methods. This website was initially created to help students, especially students of the Investment and Portfolio Analysis course (FIN 768), for a learning experience oriented to the real situation in the stock market. In addition to receiving lectures in class, students taking this course will have the opportunity to experience real stock investing activity using the trading simulation platform on the IPO One-Stop Support Center website. The main objective of this stock trading simulation is to offer students and the public (potential retail investors) a risk-free environment to learn and practice trading prior to entering the real stock market.

The real investment understanding will be wholly comprehended if the teaching and learning process focuses on reference books and hands-on activities. This investment simulation experience is seen as an initial preparation for students when participating in the stock market with a high level of uncertainty. Students need to understand the ins and outs of the stock market more deeply to brace for investment risks while guaranteeing consistent investment returns in the short and long term. This investment literacy is also important in helping students, and the general public create a source of side income through investment activities in the future. From the student's view, this trading simulation is expected to improve students' lifelong learning skills from the investment aspect.

In addition, there are other information available on this website. Among others are; general information on the initial public offerings market, how to invest and list companies listed on Bursa Malaysia, knowledge sharing and educational resources for several academic courses (Investment and Portfolio Analysis, Technical Analysis, Personal Financial Planning. This website is also accessible to the general public who wish to get important information and build investment literacy before performing stock trade. Overall, the IPO One-Stop Support Center website is a platform that can benefit various parties for a transparent and important information channel in the stock market, particularly the initial public offering market in Malaysia. The existence of this website is publicized to students during the teaching activities in class and is also made known via YouTube at:
https://www.youtube.com/watch?v=fUILQr_57mU.

The main objectives of the IPO One-Stop Support Center are to:

1. Provide an online platform as an initiative for students and lecturers to comprehend the Investment and Portfolio Analysis course (FIN 768).
2. Provide an alternative platform, especially for students and the public (potential retail investors), to get investment training through trading simulations as an initial exposure to real trading experience.
3. Provide initial public offering data as an initiative to improve the integrity of data access for academic researchers and retail investors.
4. Become a support centre that helps students and academics with reference materials such as slide presentations and publication of the latest articles related to initial public offerings and the stock market.
5. Develop an online platform with important information for investment in initial public offerings such as information about businesses listed on Bursa Malaysia.

The IPO One-Stop Support Center benefits several parties as follows:

1. Help students better understand the Investment and Portfolio Analysis course (FIN 768) and have a general understanding of the stock market, especially the initial public offerings.
2. Help students and retail investors perform trading simulations without the potential of capital loss.
3. Help students and the general public to improve investment literacy before real stock investment activities.
4. Assist academic researchers in conducting studies in the initial public offerings area.

5. Become an alternative platform for information and initial public offerings data search in Malaysia.

From the practical implication point of view, this website supports the Securities Commission Malaysia's (SCM) objectives and the ASEAN Capital Market Forum's key point, inspiring to promote higher transparency in information disclosure for the capital market's long-term sustainability. In this context, the investment community should be better informed by the importance of companies' information disclosure retrieved in a more accessible platform for better protection of their investment portfolio and value. Disclosing higher specificity of information can attract higher participation from potential investors to the Malaysian stock market. In other words, IPO One-stop Support Center is in line with a part of Malaysia's 8th Sustainable Development Growth (SDG); the Malaysian market and economic growth are expected to partly improve through a more transparent, fair, and better-regulated platform and a reachable and friendlier platform to retail investors in their early stage of investment on IPOs.

Product Description

One of the IPO One-stop Support Center key features is the "Trading Simulation" feature (see attachment 2), also known as virtual trading aims to provide individuals with a risk-free environment to practice and learn about financial markets and trading strategies. The IPO One-stop support Center directs visiting individuals to the Bursa Marketplace platform for hands-on experience. Individuals are able to experience real-world trading scenarios using virtual money, allowing them to practice trading activities without risking their actual capital. While the trading simulation can offer educational and learning tools, individuals can hone their trading skills, such as technical analysis, fundamental analysis, risk management, and decision-making, by experimenting with different approaches and gaining practical experience.

The actual trading features can complement the formal education if students are able to experience investing before becoming real traders. Some of the key features that a Trading Simulation can offer similar to actual trading activities are:

Key Features of Trading Simulation:

1. Users are provided virtual money to trade, eliminating the risk of financial loss. The virtual funds represent a simulated trading account balance users can use to execute trades.
2. Typically uses real-time or delayed market data to replicate actual market conditions accurately. This allows users to experience the price fluctuations and market dynamics they would encounter in real trading.
3. Often offer a wide range of assets from different financial markets. Users can trade individual stocks, exchange-traded funds (ETFs), forex pairs, commodities, options, and more.
4. Provide various trading tools and features, including charting tools, technical indicators, order types (market orders, limit orders, stop-loss orders, etc.), and portfolio tracking.
5. Access to historical market data, allowing users to back-test trading strategies using past market movements.

Therefore, IPO One-stop Support Center encourages learning theoretically and practically to ensure a holistic learning experience for students. Below is the process of utilizing the Bursa Marketplace Trading Simulation platform:

Step 1: Visit the Trading Simulation in IPO One-stop Center, and Register in the Bursa Marketplace platform https://sites.google.com/uitm.edu.my/ipo-one-stop-support-center/trading-simulation?authuser=0

Step 2: Log in to the Bursa Marketplace account using the verified email and password

Step 3: Go to "My Games" in "My Market" to start using the Trading Simulation platform

Step 4: Join any games created on the platform to start practising your trading strategy!

Results & Discussion (The impact/potential impact of product/project/idea towards education stakeholder(s))

"IPO One Stop-Support Center" Feedback Survey was carried out to understand the impact of this website on students and public users; from which 110 Respondents answered the survey. Feedback forms were distributed through Google Form: https://sites.google.com/uitm.edu.my/ipo-one-stop-support-center/feedback-survey.

Demographic Profiles

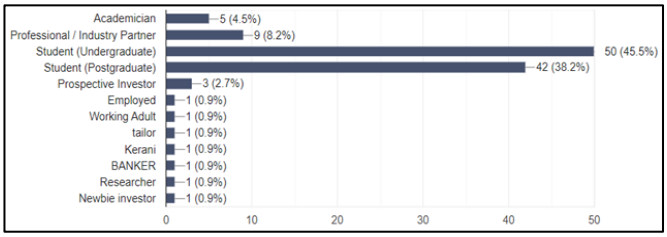


Figure 1: Respondents Categories

From the total number of respondents (110 people), 5 respondents (4.5%) are academics, 9 respondents (8.2%) are industrial or professional workers, 50 respondents (45.5%) are undergraduate students, 42 respondents (38.2%) are students postgraduate, 3 respondents (2.7%) are potential investors and 7 respondents (6.3%) are either researchers, banking institute employees, new retail investors and clerk.

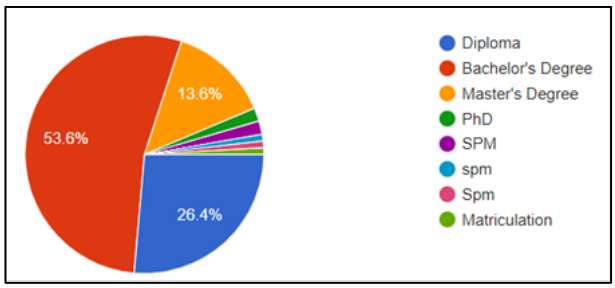


Figure 2: Academic Qualifications

From the total number of respondents (110 people), 29 respondents (26.4%) have a diploma qualification, 59 respondents (53.6%) have a bachelor's degree qualification, 15 respondents (13.6%) have a master's degree, 2 respondents (1.8%) have a Phd qualification, 4 respondents (3.6%) are SPM graduates and 1 respondent (0.9%) is a matriculation graduate.

Main Survey Findings on the Application of IPO One-Stop Support Center

1. As a student, potential investor or academic, does this IPO One-Stop Support Center help improve your understanding of initial public offerings and stocks in general?

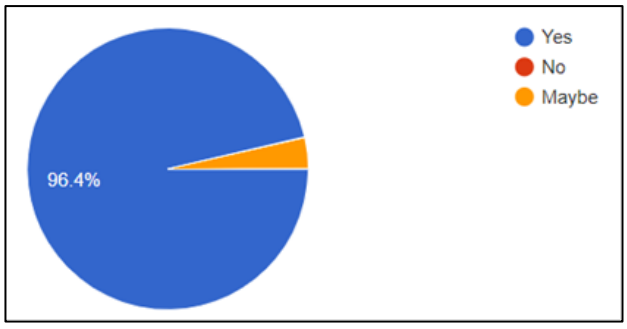


Figure 3: Improving Stock Market Understanding

From the total number of respondents (110 people), 106 respondents (96.4%) think that this support center helps to improve their understanding of initial public offerings and shares, in general. In contrast, 4 respondents (3.6%) think that there is a possibility that it can help to improve their level of understanding.

2. Is the IPO One-Support Center useful for your investment-related learning activities?

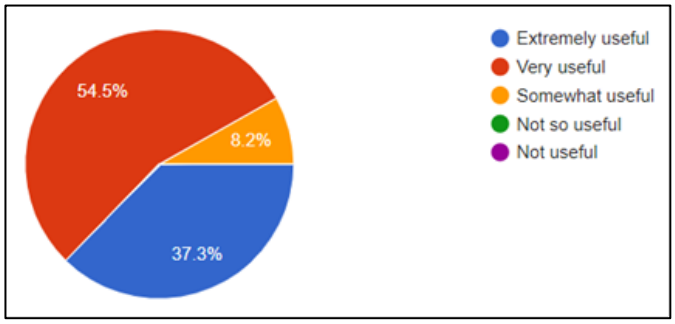


Figure 4: Uses in Learning Activities

From the total number of respondents (110 people), 41 respondents (37.3%) stated that the IPO One-Support Center is extremely useful in investment-related learning activities, 60 respondents (54.5%) stated that the IPO One-Support Center is extremely useful in investment-related learning activities and 9 respondents (8.2%) stated that the IPO One-Support Center is very useful in investment-related learning activities.

3. Is the IPO One-Support Center useful for improving your lifelong learning skills on investing and stock trading?

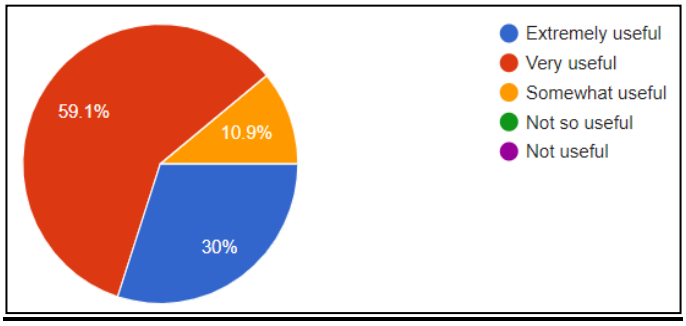


Figure 5: Improving Lifelong Learning Skills

From the total number of respondents (110 people), 33 respondents (30%) stated that the IPO One-Support Center is extremely useful in improving their lifelong learning skills from the investment aspect, 65 respondents (59.1%) stated that the IPO One-Support Center is extremely useful in improving their lifelong learning skills from the investment aspect. Meanwhile, 12 respondents (10.9%) stated that IPO One-Support Center is useful in improving their lifelong learning skills from the investment aspect.

4. What information in the IPO One-Support Center do you find very useful?

- *Trading simulation*
- *The link to the trading simulator, along with detailed explanations.*
- *The 'How to Invest' part is the most useful and the updated list of market share*
- *The background of IPO (what it is and how it works), how to invest in public offerings, and the simulated trading.*
- *The initial overview of IPO and also the information on How to Invest, this is good for new investors.*
- *The investment simulation where it mimics the real-life investment system.*
- *It is very helpful especially for those who want to start investing in the equity market. It has a detailed description of how to start investing, where to invest, what new IPOs will be announced in the near future, how to buy an IPO, which IPO is best to buy based on the prospectus and so on. In the issued prospectus explains why the company wants to be public.*

Conclusion

This website can be the first of its kind to integrate information in catering both the needs of the Malaysian investment community (i.e., those in the early stage as investors), students and academics. This website is a "user-friendly" platform that gives interested parties free access to Malaysian stock information (i.e., IPOs) and stock trading experience. The information gathered and conveyed on this website is tailored-made to the Malaysian IPO market. Nonetheless, this website must offer continuous effort, particularly in the trading simulation platform, to better serve its users.

Some of the features to be included in improving the innovation are as follows:

- To provide information on different types of investment for students to diversify their investment interests and portfolio.
- To provide a stock trading tutorial video to navigate the trading simulation experience better.
- To provide weekly notification of the newly announced IPOs in Malaysia.
- To include IPO listing day performance and to-date performance.
- To provide a Frequently Asked Questions (FAQ) Section.

Publication, Award and Intellectual Property

The Copyright Application for this website has been fully approved by MyIPO (see attachment 3) to ensure exclusive rights to authors and to protect this innovation (IPO One-Stop Support Center) in the future. IPO One-Stop Support Center has also competed in three innovation, invention and invention competitions (see attachment 4):

1. International Innovation Competition (INNOCOM III) 2022 – Silver Medal
2. The 10th International Innovation, Invention & Design Competition (INDES) 2021 – Gold Medal
3. The 1st International Business and Management Virtual Innovation and Invention of Ideas Competition (VIIIC) 2021 – Silver Medal

References

Jay R. Ritter (2021), The Audit Analytics Initial Public Offerings (IPO) Database and IPO Statistics, College of Business, University of Florida Warrington.

Securities Commission Malaysia. (2020). Prospectus Guideline Part II, Contents of Prospectus. 1-77.

Securities Commission Malaysia. (2021). Capital Market Masterplan 2. 1-99.

Empowering Learning through Project-Based Assessment: A Transformative Shift in the Communication Course

Norizzati Azudin
Sunway University, Bandar Sunway, Malaysia
norizzatia@sunway.edu.my

Highlights: This paper will present the assessment changes made to course COM2014 Integrated Marketing Communication for Sunway University undergraduate students which incorporate a project-based. This course went through major revision in its curriculum in 2022 to ensure the sustainability of the communication program, and to guarantee employability for the students with the experience they gained from the project-based assessment. From 40% final exams based, the instructor changed the largest portion of the project-based assessment to 100% project-based coursework, where students run actual campaign with Sunway Group of companies' partner, Sunway Malls to give them real-life industrial experience. An MOU was signed to continue this partnership for 3 years.

Key words: Project-Based; Assessment; Coursework; Marketing; Communication.

Introduction

The School of Arts (SoA) at Sunway University has three dynamic departments, among which is the Department of Communication (DoC). Within DoC, students have the opportunity to pursue a Bachelor of Communication (BComm) or a Bachelor of Advertising and Branding (BAB). These aspiring communicators for both programs are required to enrol in COM2014, an Integrated Marketing Communication (IMC) course. This course is important in their field of academic journey and future careers because of the trend in communication and market demand in marketing and communication area. This course will equip them with the important knowledge and skills in marketing and communication, thus prepare them for the internship the following they are required to take. It is also a preparation for them before they start applying for jobs during their final year. COM1014 is offered in the second year which, some students take in their first semester which falls in April, while some take in their second year which falls in August.

Since August 2021, this IMC course has been thoroughly reimagined with a bold vision to meet the ever-evolving demands of the marketing communication industry in Malaysia. In this transformative journey, a passionate endeavour to instil novelty and innovativeness was undertaken by the author of this abstract herself. One significant contribution made was the establishment of a pioneering Memorandum of Understanding (MOU) between Sunway University and Sunway Malls in 2022, which both belongs to Sunway Group of Companies. Over a period of three years, this visionary collaboration served as a bridge, effectively narrowing the gap between traditional academic teachings and the dynamic world of industry practices. The MOU fostered an ecosystem of reciprocal learning, enriching both students and industry professionals. The project COM2014's instructor worked on is the revamped of its syllabus from 40% coursework and 60% exams, to 100% coursework. It is believed that courseworks are able to measure a greater range of abilities than exam (Kniveton, 1996). Besides, coursework marks are a better predictor of long term learning of course than exams (Gibbs & Simpson, 2004). This section has explained the importance of the knowledge and skills students should be prepared for considering the industry rapid changes today in marketing and communication. Details of the project will be described in details under the following section.

Project Description

At the core of the visionary collaboration between two parties, lies the author's innovative approach of integrating actual social media campaigns into the IMC course curriculum. By incorporating these campaigns as a communication tool for marketing purposes, students were empowered to harness their creativity and adaptability in real-world marketing communication scenarios. This ground-breaking initiative not only provided students with hands-on experience, but also empowered them to witness the tangible impact of their efforts. The impact of this approach on teaching and learning has been profound. Students immersed themselves in the practical implementation of marketing and communication strategies, gaining insights that transcended conventional textbook knowledge and input. They developed a deeper understanding of audience engagement, branding strategies, and the power of storytelling, all while embracing the fast-paced nature of the digital landscape. All these were possible through the project-based assessment which according to some scholar, can be characterized as a pedagogical innovation which integrates theory and practice by means of problem solving of working life issues (Baert, Beunens, & Dekeyser, 2002; Poell, van der Krogt, & Wildemeersch, 1998; Tynjälä, Välimaa, & Sarja, 2003).

The department had the privilege to bring back one very experienced instructor from abroad to the university. Because of this experience and deep knowledge in marketing and communication, this instructor changed COM2014's syllabus to 100% coursework, meaning there is no more final exams for the students. In fact, assessments were improvised as literature shows that as a teacher, the lecturer can alter those approaches in her curriculum mix when evidences says they are not working (Pearson, 2003). Previously, the arrangement in the curriculum was 30% written final exams which students were required to write several pages of essays from several questions, 30% midterm test which was given after seven weeks of lecture, and 40% comes from their coursework which was to write an IMC campaign plan. This previous arrangement was followed when the new instructor came in

during August 2021 semester, and found that the 60% exam components will not help the students to secure internship or jobs after they graduate. The skills have to be ungraded, especially looking into the trend and changes in the media and communication world nowadays. COM2014 assessment grades in its curriculum was then changed to 100% coursework. The process at department level was taken place from submitting a proposal by the instructor and received agreement during a meeting from all the department members, brought to the school level, then approved at the university level via academic meeting as well. The 100% coursework consists of 40% IMC Plan, 40% Execution Work, and 20% Showcase where they presented all their work at the end of the semester. Table below describe this breakdown while Appendix 1 was attached for the details of their assignment brief and rubrics for this current semester.

Table 1: Integrated Marketing Communication (IMC) (COM2014) Project-based Assessment

Project-based Assessment	**Percentage**	**Method**	**Deadlines**	
			Sunway Malls	***Lecturer***
IMC Plan	40%	Group	-	-
Execution	40%	Group	-	-
Showcase	20%	Individual	-	-

Integrated Marketing Communication is about using the best communication channels (including media) to run the marketing campaign for any products or services of the client. Media here includes traditional media like newspaper or radio, or the new ones like Instagram and TikTok. Because the lack of understanding the importance of these skills and requirement, the curriculum was run for several years. The first semester taught the instructor that changes needed urgently and it was investigated and reviewed. She had conversations with multiple marketing and communication conglomerates within the industry, and seek support from Sunway Mall's marketing and communication department. Sunway Malls have several malls like Sunway Pyramid, Sunway Putra, Sunway Velocity, and more under it. Sunway Malls is also under Sunway Group of Companies, just like Sunway University. Together, the Sunway Malls' Senior General Manager and the instructor came out with the idea to make the run students run actual social media campaign for Sunway Malls.

April 2022 was the first trial to see the capabilities of the students and also the outcome from their work. Students were given a task to run the social media campaign for Jurassic World Dominion movie, which is the last sequel of this movies from Jurassic Park. Their content creation for Sunway Pyramid for that semester was monitored closely by the instructor. The students' progress and learning journey was recorded by both parties and it was concluded that, the students have more knowledge in communication channels and creating great content than what the curriculum taught them. This generation have the knowledge at their fingertips from the mobile and peers sharing on daily basis. They are more up-to-date of the trend and very creative with writing content and graphic designs. Therefore, the project-based assessment change was validated and both parties agreed to continue this and make this as official collaboration.

In June 2022 in the middle of the April semester, an MOU was signed between Sunway University and Sunway Malls. This MOU was an agreement between Department of Communication which stated specifically about COM2014 running actual campaign with and for Sunway Malls. The collaboration was instructor's decision because will be an essential skill for students this era (Redecker *et al.,* 2011). The April semester continued and new project-based assessment was implemented until this paper is being written. Upgrade was done for August semester 2022 where COM2014 were running an important social media campaign which is the SDG Goals for three malls; Sunway Pyramid, Sunway Putra, and Sunway Velocity. Several visits were made to re cce the location and shooting content for their campaign. Again, this was monitored closely by the instructor and Sunway mall's staff from the marketing and communication department. The same process and steps are taken for this current April 2023 semester which the students are running Minecraft campaign for Sunway Putra mall in Kuala Lumpur. The campaign runs for two weeks in July where four groups compete with each other to pitch to Sunway Putra their ideas, then best ideas were chosen by the mall, and number of contents were divided equally to all groups for them to work on the content. The four groups have both planning team which work on the ideas, proposal, and pitching, while there is also the execution teams which prepare for the content which work on the recce, shooting, writing, and editing the contents they were assigned for. As of today when this paper being written, students are still running the social media campaign, and praises have been given to them for increasing Sunway Putra's social media viewers and followers in TikTok, Instagram, and Facebook.

As a result of this novel approach, students exhibited heightened enthusiasm, motivation, and ownership of their learning journey. They showcased remarkable growth in critical thinking, problem-solving, and teamwork, skills that are essential for success in the competitive marketing communication arena. These transformative efforts undertaken by the author cum instructor of the IMC course at Sunway University have yielded significant contributions in terms of novelty, innovativeness, and the tangible impact on teaching and learning. By fostering a symbiotic relationship between academia and industry, and introducing cutting-edge approaches to education, this endeavour has paved the way for a new generation of marketing communicators equipped with the skills and vision to shape the future generation in the industry.

Results & Discussion

The realignment of the COM2014 course assessment in Integrated Marketing Communication (IMC) at Sunway University has yielded profound and positive impacts on the education stakeholders, particularly the students. The pivotal change involved transitioning from a traditional 60% exams component to a 100% coursework evaluation. This bold shift in assessment methodology has opened new avenues for student development, empowering them with invaluable skills and broadening their knowledge through hands-on experiences. The below impact have been seen from three semester of running actual social media campaign with and for the malls.

1. Student-Centric Learning Experience

By eliminating the heavy reliance on traditional exams and embracing coursework as the primary assessment approach, the education stakeholders, particularly the students, have witnessed a fundamental transformation in their learning experience. Engaging in real-world projects such as the actual social media campaigns for Sunway Malls, students are no longer bound by the constraints of theoretical examinations. Instead, they embark on a journey that encourages creativity, critical thinking, and innovative problem-solving, aligning their education with the dynamic demands of the marketing communication industry.

2. Practical Application of Theoretical Concepts

The shift to a project-based assessment has provided students with the opportunity to apply the theoretical knowledge acquired in the classroom to real-world scenarios. By immersing themselves in the design and execution of actual marketing campaigns for Sunway Malls, students bridge the gap between theory and practice, culminating in a comprehensive understanding of marketing communication concepts. This practical application fosters a deeper appreciation for academic content and reinforces its relevance in the professional realm.

3. Nurturing Skills for Career Readiness

The practical nature of the project-based assessment equips students with a wide array of skills that are essential for success in their future careers. As they collaborate with industry partners, work in teams, and engage with real clients, students hone their communication, project management, and leadership abilities. The exposure to actual marketing campaigns allows them to navigate real challenges, instilling adaptability, resilience, and a growth mindset.

4. Fostering Industry-Relevant Competence

Education stakeholders, particularly the university, benefit from this transformative shift as it aligns the course with the demands of the marketing communication industry. Employers seek graduates who possess practical experience and are capable of contributing effectively from day one. By running actual campaigns for Sunway Malls, students demonstrate industry-relevant competence, enhancing their employability and strengthening the university's reputation as a provider of industry-ready talent.

5. Building Lasting Partnerships

The collaboration with Sunway Malls has transcended traditional academia-industry relationships. Through the Memorandum of Understanding (MOU), the university fosters a deep and lasting partnership with industry stakeholders, cultivating a mutually beneficial ecosystem of knowledge exchange. This synergistic alliance provides students with access to valuable resources, mentors, and networking opportunities, further enriching their educational journey and prospects for future employment.

Conclusion

The transformative impact of changing assessment in COM2014 at Sunway University has been profound and positive for all education stakeholders, especially the students. By embracing project-based assessment and immersing students in real-world marketing campaigns using the actual social media as communication channels, the changes have empowered students with practical skills, broadened their knowledge, and prepared them for a successful transition into the industry. The university's commitment to nurturing industry-ready graduates through innovative partnerships reinforces its position as a progressive institution dedicated to providing a student-centric and future-focused education. The teaching and learning for some courses like marketing and communication are to be suggested as 100% coursework and project-based assessment for the student's benefits. This course will continue its revised curriculum assessment until the expiry date of the MOU signed which is two years from now. By that time, the marketing and communication trend could change, and the future ideas for improvement will be depending on how it is in 2025.

References

Baert, H., Beunens, L., & Dekeyser, L. (2002). Projectonderwijs: Sturen en begeleiden van leren en werken [Project-based education: Steering and guiding to learn and work]. Leuven: Acco

Gibbs, G. and Simpson, C. (2004-5) Conditions under which assessment supports students' learning. *Learning and Teaching in Higher Education*. 1 (1), 3-29.

Kniveton, B.H. (1996) Student perceptions of assessment methods. Assessment and Evaluation in Higher Education 21(3), 229-238

Pearson, P. D. (2011, November). An endangered species act for literacy education. In *Defying Convention, Inventing the Future in Literary Research and Practice* (pp. 246-262). Routledge.

Poell, R.F., van der Krogt, F.J., & Wildemeersch, D.A. (1998). Solving work-related problems through learning projects. International Journal of Lifelong Education, 17 (5), 341-351

Redecker, C., Ala-Mutka, K., Leis, M., Leendertse, M., Punie, Y., Gijsbers, G., Kirschner, P., Stoyanov, S., and Hoogveld, B. (2011). *The future of learning: Preparing for change*. Luxembourg, Publication office of the European Union.

Tynjälä, P., Välimaa, J., & Sarja, A. (2003). Pedagogical perspectives on the relationships between higher education and working life. Higher Education, 46, 147-166.

Title : Riveting Simulator: River Waste Sorting Management Integrated STEAM Approach to Achieve Sustainable Development Goals (SDGs)

Salsabila Rofifah [1], Dhea Revita [2], Ifta Alifia Zahrani [3], Maulia Nafri Febrian [4], Alfina Nuril Lailia Rk [5]
Universitas Negeri Malang, Malang, Indonesia
salsabila.rofifah.2103516@students.um.ac.id [1], dhea.revita.2103516@students.um.ac.id [2],
ifta.alifia.2103516@students.um.ac.id [3], maulia.nafri.2103516@students.um.ac.id [4],
alfina.nuril.2103516@students.um.ac.id [5]

Highlights: Waste problems especially in the river are increasing and require problem solving. This ability can be improved in learning by developing learning media for sorting waste as supporting material for environmental pollution. The aim of this research is to overcome waste problems by increasing problem solving abilities of students, integrated with STEAM Approach. The method carried out by R&D with the ADDIE Model. The results showed that the Riveting Simulator was valid and practical. In conclusion, this learning media can encourage students to apply problem-based learning in their environment by implementing an independent curriculum to support the SDGs.

Key words: Learning Media; Problem Solving; SDGs; Sorting Waste; STEAM Approach

Introduction

Waste is an inseparable part of human life. In 2022, according to data from the National Waste Management Information System of the Ministry of Environment and Forestry, the national amount of waste reached 21.1 million tons. The amount of this waste continues to increase along with the increase in population, the quality of people's lives, and advances in science and technology which can change people's lifestyles to become consumptive (Syaputra, 2021). Waste problems especially in the river are caused by dumping waste into the river due to lack of awareness regarding waste management (Rifani & Jalaluddin, 2019). One example of a polluted river is the Brantas River in Malang City, precisely in Tridi Village. Waste problems especially in the river are increasing and require problem solving. This ability can be improved in learning by developing learning media for sorting waste as supporting material for environmental pollution.

Problem solving is the ability that must be possessed by students in using their knowledge and ability to solve problems. Problem solving is the embodiment of a mental activity consisting of a variety of cognitive skills and actions. Solving a problem can be in the form of solving story problems, solving problems that are not routine, applying mathematics in everyday life, or solving problems around us (Hidayat et al., 2022). According to the Programme for International Student Assessment (PISA) in 2012 on Creative Problem Solving, Indonesia ranks 62 out of 65 countries far below China which ranked first with a score of 613. While Indonesia has a score of 375, the value is far below the OECD average of 500. Problem solving skills are rarely measured and learned in learning so that students problem solving skills are low because learning still often uses conventional methods (Pisa, 2014).

Based on the problem of waste in the river, it is necessary to solve one of the problems with a media that can sort organic and inorganic waste automatically by using STEAM Approach to support SDGs. SDGs have 17 goals, of which the 4th is quality education which is realized in the development of educational curriculum. Currently, the curriculum used is the Independent Curriculum (Khafidin et al, 2022). STEAM Approach in this case can be implemented as a student learning media for environmental pollution.

In supporting the implementation of the Independent Curriculum, learning is supported by the P5 program (Strengthening the Profile of Pancasila Students). The Pancasila Student Profile is a manifestation of Indonesian students as lifelong learners and have global competence and behave according to Pancasila values. In the Student Profile, Pancasila has six main dimensions, namely first, faith and fear of God Almighty. In our products, this dimension is in morality to nature, namely by not bullying or abusing the environment, stopping nature's destructive behaviour, and assisting in handling problems related to nature. The second dimension is mutual cooperation. The aspect that appears in the components of organic waste separation devices and inorganic is an ability to carry out activities together voluntarily (Handayani, et al. 2023). The third dimension is independent. The creation of this organic and inorganic waste separation tool is also one manifestation of this dimension which teaches to be aware of environmental problems, especially waste and its impact if it will be left unsorted for a long time.The fourth dimension is critical reasoning. The creation of organic and inorganic waste separation tools is also one of the applications of environmental problem capabilities, namely in waste sorting. Furthermore, critical reasoning skills can also be trained in the development of tools that will later be even better. The fifth dimension is global diversity. This product focuses on intercultural communication for product development. The last dimension contained in the Pancasila student profile is creative. The creative dimension that arises in making this tool is the ability and flexibility of thinking in finding alternative solutions to the problems faced (Irawati, et al. 2022).

The Pancasila Student Profile is contained in the Regulation of the Minister of Education and Culture Number 22 of 2020 concerning the Strategic Plan of the Ministry of Education and Culture for 2020 – 2024. The implementation of the Pancasila Student Profile can be started from students who practice Pancasila values in their daily lives both at school and in their home environment. This can be started from the emergence of a spirit of sensitivity to the surrounding environment, such as helping to solve waste problems, how to reduce pollution, and so on (Kahfi, A. 2022).

In relation to SDGs 9, Industry, Innovation, and Infrastructure, the abundance of plastic waste is not adequately overcome by relying on waste banks. In relation to the goal of SDGs 13, Climate Change Handling, the process of waste processing in Indonesia is mostly carried out at the Final Processing Site (TPA). Improper selection of landfill sites

and open dumping systems can have a negative impact on the environment because it will produce side products in the form of gas methane and leachate liquid which will affect the greenhouse effect and climate change (Agustina et al., 2017) The 14th goal is related to Life Below Water. Based on data from the Indonesian Plastic Industry Association and the Central Statistics Agency, plastic waste in Indonesia reaches 64 million tons/year which is dominated by 80% coming from waste land that flows into rivers and the sea (Rarasati &; Pradekso, 2019). In this case, rivers are the largest contributor of plastic waste because they will empty into the ocean which can have adverse consequences for marine ecosystems.

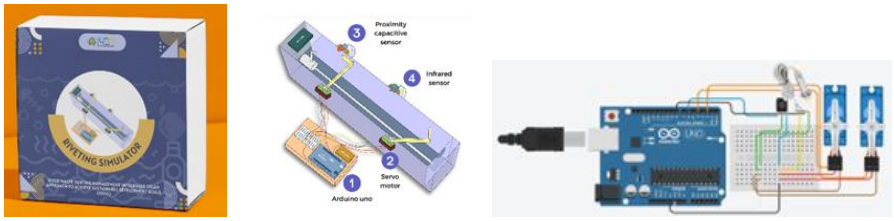
Product Description

Based on the background related to the waste problem in the river, we have an idea to improve in learning by developing learning media through STEAM approach to junior high school students. We innovate to make an innovative product by linking students' knowledge in science learning by integrating the Independent Curriculum project in order to increase students' awareness of the problems that occur around them, and improve problem solving skills.

Table 1. STEAM components:

Science	• Environmental pollution and its impact on ecosystems • Waste sorting (organic waste and inorganic waste)
Technology	• Use arduino uno and sensors
Engineering	• Products are created through a programming process for the sensors used
Art	• Students can develop products and encouraged to work together to solve problems around them based on what they have learned
Mathematics	• Regulate the distance between the sensor and the servo motor in response to sorting waste

To solve the problem of the large amount of waste in the river, there has been an automatic waste cleaning simulator using sensors but no sorting (Komarawidjaja, 2017). In connection with this, we have developed a product equipped with automatic sorting of organic and inorganic waste using capacitive proximity sensors and IR sensors. The use of capacitive proximity sensors and IR sensors for sorting organic and inorganic waste has been widely used in trash bins. Waste sorters equipped with these sensors are based on Arduino (Nindria, 2021). In addition, no one has linked waste management innovations to students' problem solving skills to surrounding problems. There are learning media related to waste sorting but limited to education to raise awareness of the importance of waste management (Prinanto & Suwarni, 2017). So these two things are the novelty of the Riveting Simulator as an innovative waste sorting tool in the river that can be used as a learning media that improves students' problem solving skills.



(a) (b) (c)

Figure (a). Product packaging, (b). Product display, (c). Product lineup

This media is integrated with Arduino uno, proximity capacitive sensor, and infrared sensor. Two servo motors are also included with this media to help sweep trash from the river into the reservoir. When trash is carried by a river's current, it passes by proximity capacitive sensors to be processed, where organic waste is rinsed away, and then it enters the first reservoir. Additionally, trash that fails to comply with the requirements will pass through the second sensor, namely the infrared sensor, in order to be swept into the second reservoir. The IR sensor works to detect all objects in front of it in order to sweep away everything that passes through the sensor. After the waste has been sorted, it is believed that the river's environment will remain intact because the river's water will be cleaner and waste-free.

Results & Discussion

Riveting Simulator is made using the R&D method with the ADDIE model as a new product that improves the previous product. The stages of making products with the ADDIE model are that we analyze the problems and their correlation to learning, the product is designed according to its function and developed innovation, then the product is made and tested, and evaluation for further development. Products are validated by lecturers and material experts. While the practical test of the product is carried out on the learning of junior high school students.

The validation results from both validators stated that the Riveting simulator is a valid product. The product is made as intended and meets production standards (durability, efficiency, safety, and aesthetics). The results of the questionnaire research were obtained from 7th grade junior high school students. The aspects we take are cognitive, affective and cognitive. The cognitive aspect is the knowledge aspect, the affective aspect is the attitude that is

formed, and the cognitive aspect is the behavioral aspect. These three aspects contain enough information needed to determine the suitability of the Riveting Simulator for the Pancasila Student Profile as an Independent Curriculum program.

Table 1. Percentage of respondents to Riveting Simulator

No	Statement	Assessment Indicators					Total
		SS	S	CS	KS	TS	
Cognitive							
1	Riveting Simulator add insight	33.33%	58.33%	8.33%	-	-	100.00%
2	Riveting Simulator being difficult to understand	-	-	8,33%	58,33%	33,33%	100,00%
3	Riveting Simulator guide uses language that is easy to understand	25,00%	75,00%	-	-	-	100,00%
4	Riveting Simulator was difficult to understand	-	-	-	33,33%	66,67%	100,00%
5	Riveting Simulator procedure was confusing	-	-	-	50,00%	50,00%	100,00%
6	The information in the Riveting Simulator being easy to understand	33,33%	66,67%	-	-	-	100,00%
7	Riveting Simulator guide was not clear, making it difficult for students to use it	-	-	-	33,33%	66,67%	100,00%
8	the material was not appropriate to the learning learned by students	-	-	-	33,33%	66,67%	100,00%
9	The size of the Riveting Simulator being incorrect so that students have difficulty using it	-	-	8,33%	50,00%	41,67%	100,00%
10	colour appearance of the Riveting Simulator which made students interested in learning it	8,33%	41,67%	50,00%	-	-	100,00%
Affective							
1	Riveting Simulator is considered to be able to motivate studying environmental pollution material	25,00%	75,00%	-	-	-	100,00%
2	Riveting Simulator display that they were not interested in environmental pollution material	-	-	-	25,00%	75,00%	100,00%

3	The Riveting Simulator helps implement waste sorting in this related environment	66,67%	33,33%	-	-	-	100,00%
4	Riveting Simulator was interesting to use	50,00%	50,00%	-	-	-	100,00%
5	The Riveting Simulator uses an electrical circuit and simple programming so they are not interested in trying it	-	-	-	33,33%	66,67%	100,00%
6	Riveting Simulator increased curiosity about studying environmental pollution	33,33%	66,67%	-	-	-	100,00%
7	Riveting Simulator decreases curiosity about studying environmental pollution	-	-	-	33,33%	66,67%	100,00%
Conative							
1	The riveting simulator made me actively ask questions if there was material I didn't understand	58,33%	25,00%	16,67%	-	-	100,00%
2	The riveting simulator helped me answer the teacher's questions well	-	83,33%	16,67%	-	-	100,00%
3	The riveting simulator makes me passively ask questions if there is material that I don't understand	-	-	-	25,00%	75,00%	100,00%
4	If the teacher has a question, I just keep quiet	-	-	-	58,33%	41,67%	100,00%

Table 2. Results of respondents to Riveting Simulator

Aspect	Result
Cognitive	Adds insight, easy to understand and learn, easy to use
Affective	Motivate, increase curiosity, encourage application of material
Conative	Increase activeness in asking and responding

From the research results, it was found that the Riveting Simulator can encourage students to apply learning based on problems in their environment, raise students' awareness of waste management and environmental (water) pollution by applying the Pancasila Student Profile, problem solving, and support innovative learning through a variety of learning media. Sothe Riveting Simulator has the potential for innovative learning through a variety of learning media.

Riveting Simulator can train students' problem solving skills, because the product is made in accordance with existing problems and related to the subject matter studied. So that it can train students to recognize problems around them and solve them based on what is learned at school.

Conclusion

The Riveting Simulator is effectively used to support science learning material on Environmental Pollution for Class VII Middle School which is in accordance with the Pancasila Student Profile as an Independent Curriculum program and has the potential to contribute to the SDGs. In the future, it is hoped that this product can be developed and applied in real terms to overcome the problem of waste in rivers.

References

Agustina, N., Irianty, H., &; Wahyudi, N. T. (2017). The relationship between the characteristics of cleaners and waste management at the Banjarbaru City Health Center. Journal of Indonesian Community Health Publications, 4(2), 66–74. https://doi.org/10.20527/jpkmi.v4i2.3843

Handayani, R., Minarti, I., Mulyaningrum, E., &; Sularni, E. (2023). The Realization of Pancasila Student Profile through Problem Based Learning in Science Learning at SMPN 37 Semarang. Journal on Education, 6(1), 518-525. https://doi.org/10.31004/joe.v6i1.2965

Hasibuan, R. (2016). Analysis of the impact of household waste/waste on the environment. Scientific Journal "Advocacy," 04(01), 42–52. https://www.google.com/search?client=firefox-b-d&q=jurnal+issn+rosmidah+hasibuan

Hidayat, R., Siregar, E. Y., & Elindra, R. (2022). Analysis of Factors of the Low Mathematical Problem Solving Ability of Students at the Private Vocational School Teruna Padangsidimpuan. MathEdu JOURNAL (Mathematic Education Journal), 5(3), 114–120.

Irawati, D., Iqbal, A., Hasanah, A., &; Arifin, B. (2022). Pancasila Student Profile as an effort to realize the nation's character. Edumaspul: Journal of Education, 6(1), 1224-1238. https://doi.org/10.33487/edumaspul.v6i1.3622

Kahf, A. (2022). Implementation of the Pancasila Student Profile and its implications for the character of students in schools. Dirasah : Journal of Islamic Thought and Basic Education, 5(2), 138-151. Https://Doi.Org/10.51476/Dirasah.V5i2.402

Khafidin, D., Sadana Aura Diva, &; Sumiaji. (2022). Implementation of the Independent Curriculum using STEAM in Mathematics Learning on Cube and Block Volume Material for Class V Elementary School Students.Proceedings of the National Seminar,101–110.
https://conference.umk.ac.id/index.php/snapmat/article/view/386%0Ahttps://conference.umk.ac.id/index.php/snapmat/article/download/386/387

Komarawidjaja, W. (2017). Prospects for the Utilization of River Waste Filters in the Implementation of Payments for Environmental Services in the Ciliwung River Watershed Segment 2, Bogor City. Prospects of Solid Waste River Filters Utilization in the Implementation of Payments for Environmental Services on th. Journal of Environmental Technology, 18(1), 37–44.

Nindria, P. (2021). Implementation of an Arduino Based Organic and Inorganic Waste Separator Tool. Scientific Work of Students of the Faculty of Science and..., 2013–2015. https://journal.pancabudi.ac.id/index.php/fastek/article/view/1817

Pisa. (2014). Creative Problem Solving Students' Skills in Tackling Real-Life Problems: Vol. V. https://doi.org/10.1787/9789264208070-table1-en

Prinanto, M. R., & Suwarni, S. (2017). Design and Implementation of Android-Based Organic and Inorganic Waste Processing Educational Games in Class VII of Fajar Sentosa Middle School. Journal of Information Technology, 3(1), 4.

Rarasati, R., &; Pradekso, T. (2019). The influence of news exposure to marine animals that die due to plastic waste and zero waste campaigns on the behavior of reducing the use of plastic bags. Online Interactions, 7(4), 295–304.

Rifani, D. N., &; Jalaluddin, A. M. (2019). Collective waste management : the role of government and public awareness. Journal of Paradigms (JP), 7(1), 45-54.

Sudarmin. (2021). Creating Ethnoscience-Based Learning to Support Sustainable Development (Sudarmin &; W. Sumarni (eds.)). C1nta Home Library.

Let's Help Mr. Benedict and His Friends Gamified Project

Low Jie Ying, Balamuralithara Balakrishnan, Mohd Ikhwan Hadi Yaacob
Sultan Idris Education University, Tanjong Malim, Malaysia.[1,2,3]
yingl.j2019@gmail.com, balab@fskik.upsi.edu.my, ikhwan@ieee.org

Highlights: A gamified project, "Let's Help Mr. Benedict and His Friends Game Challenge," was developed and implemented to teach Newton's laws to enhance students' levels of engagement during the COVID-19 pandemic. It was crafted in alignment with the Standard Based Curriculum for Secondary Schools (KSSM) Physics syllabus and underwent thorough validation by experts in the field. Game elements such as points, competition and rewards were incorporated into the project to offer students a gamified learning experience to captivate their attention, motivation and active participation. It consists of a teacher's manual, judging rubrics, student handouts and worksheets.

Key words: Project-based learning, gamified project-based approach, Newton's laws, flipped classroom

Introduction

The COVID-19 pandemic has significantly disrupted the traditional educational landscape, compelling schools and educators worldwide to swiftly adapt to online learning environments (Basilaia & Kvavadze, 2020). Online learning has brought numerous challenges, particularly in maintaining students' engagement and active participation.

Newton's laws of motion form a fundamental topic in physics education, presenting conceptual challenges that can be further compounded in the absence of hands-on experimentation and physical classroom interactions. To bridge this gap, project-based learning allows students to apply theoretical knowledge to practical, real-world scenarios, promoting a deeper understanding of the subject matter.

The integration of gamification and project-based learning methodologies offers a promising solution to address the lack of student engagement in remote educational settings (Reina-Guzmán, Sandoval-Parra, Ortiz-Moreno & Guerrero, 2022). By incorporating game elements into the curriculum, such as points, levels, rewards, and competition, gamified learning experiences can captivate students' attention, foster their intrinsic motivation, and stimulate active participation.

Product Description

The gamified project "Let's Help Mr. Benedict and His Friends" was designed and developed based on the ADDIE model. It went through the five stages of the ADDIE model: analysis, design, development, implementation and evaluation. During the analysis phase, the problems teachers and students faced during the teaching and learning process of Newton's laws of motion were identified. At the same time, their needs were determined as well.

Next, the Octalysis Framework developed by Yu-Kai Chou was integrated as the game design framework of the gamified project because it is widely recognised and used in the field of gamification. The Octalysis Framework consists of eight cores: Epic Meaning and Calling, Development and Accomplishment, Empowerment of Creativity and Feedback, Ownership and Possession, Social Influence and Relatedness, Scarcity and Impatience, Unpredictability and Curiosity, Loss and Avoidance, which could keep the students motivated and engaged with the project and gamified experiences (Chou, 2019).

After the gamified project prototype was created, it was validated by seven experts (game design, game-based learning, physics education and science education). The gamified project was revised based on the comments from the experts. It was then implemented in two schools involving 84 upper secondary school physics students during the implementation phase through a quasi-experimental approach, and its effectiveness in enhancing students' engagement and learning was evaluated in the last stage.

This gamified project differs from the usual project-based learning (PBL) approach. This project has a storyline and characters that keep students engaged: Mr. Benedict and his friends. Students must create a car to help Mr. Benedict (an egg) travel down a slopy hill in groups. Moreover, game elements such as rewards, competitions and points are incorporated. Students need to discuss with their peers, apply their knowledge and skills related to Newton's laws they learnt through online lessons and create a car model that could protect Mr Benedict from a head-on collision when travelling down the slopy hill. Concurrently, students are requested to produce a folio and answer the list of questions in the students' handout. Through the process, students are indirectly guided to explore Newton's laws and apply knowledge to create the car prototype.

When classes are conducted face-to-face in school, students will test out their cars in the laboratory during Mr. Benedict's Egg Car Challenge. During the game challenge, they must compete with the other groups to ensure they gain the highest points to be the game's champion and be rewarded.

Furthermore, this gamified project was designed based on the Standard Based Curriculum for Secondary Schools (KSSM) Physics syllabus. In order to gain performance level 6 (TP 6) for the topic of Forces and Motion for Form 4 physics, students are required to invent something by applying the knowledge and skills about forces and motion in daily life problem-solving or decision-making to carry out activities or assignments in a new situation creatively and innovatively (Ministry of Education Malaysia, 2019). Hence, if the students could produce a car prototype to protect Mr Benedict, they would be graded as achieving TP 6.

With the help of this innovation, teachers' burden could be lessened, as they could use this gamified project directly. This gamified project consists of the teacher's manual, judging rubrics, slides, students' handouts and worksheets (in softcopy and hardcopy). Teachers can distribute the handouts in class or online. Teachers could assess students' understanding of Newton's laws of motion through the car prototype and the completion of the folio and worksheets. Besides, this gamified project could foster students' learning, 21st-century skills, motivation and engagement.

Results & Discussion

Table 1 shows that the post-test mean score for the experimental group is 6.17, and the control group is 4.05. This indicates that the experimental group outperformed in the post-test compared to the control group after the intervention.

Table 1: The experimental and control group pre and post-mean scores.

Group	N	Mean Scores		Std. Deviation (SD)	
		Pre-Test Scores	Post-Test Scores	Pre-Test Scores	Post-Test Scores
Experimental Group	42	2.670	6.170	0.846	1.513
Control Group	42	2.240	4.050	0.849	1.324

Table 2 shows the paired sample t-test of the experimental group. Since the p-value is less than 0.05, it can be concluded that there is a statistically significant mean difference between the pre-test and post-test scores for the experimental group. Students' performance in Newton's laws of motion improved after the intervention.

Table 2. Results of paired sample t-test of the experimental group

	Paired Differences		
	Mean	Std. Deviation (SD)	Sig. (2-tailed)
Pre-test & post-test scores	-3.500	0.863	0.000

By exploring the potential benefits and challenges associated with the implementation of gamified project-based learning, this study could contribute to the existing body of knowledge on effective pedagogical strategies for online education during crisis situations. Findings from this research will provide valuable insights and recommendations for educators seeking to enhance student engagement and promote meaningful learning experiences in remote learning environments.

Conclusion

In conclusion, this research study holds the potential to revolutionize the way physics education is delivered online, addressing the challenges posed by the COVID-19 pandemic. By implementing a gamified project-based learning approach, students' engagement can be reinvigorated, fostering a deeper understanding of Newton's laws of motion while ensuring an enjoyable and interactive educational experience even in remote settings.

Publication, Award and Intellectual Property

International Virtual Innovation Competition 2023- Silver Medal
Intellectual Property: CRLY2022P01500

References

Basilaia, G., & Kvavadze, D. (2020). Transition to online education in schools during a SARS-CoV-2 coronavirus (COVID-19) pandemic in Georgia. *Pedagogical Research*, *5*(4).

Chou, Y. K. (2019). *Actionable gamification*. Packt Publishing.

Ministry of Education Malaysia. (2019). Standard Based Curriculum for Secondary Schools (KSSM) Physics. Putrajaya.

Reina-Guzmán, N. D., Sandoval-Parra, K. X., Ortiz-Moreno, M. L., & Guerrero, S. C. (2022). Gamification in the microbiology classroom for biology students during the COVID-19 pandemic. *Entramado*, *18*(1).

Figure 1. The cars models that students created in groups.

Figure 2. Condition of Mr. Benedict during the game challenge.

EquiBrilliant module: Game-based learning to empower HOTS

Nurul Hanani Rusli[1], Nor Hasniza Ibrahim[2], Norliyana Md Aris[3], Nurulhuda A. Ghani[4]
Universiti Teknologi Malaysia, Skudai, Malaysia[1,2,3,4]
Nurul.hanani.utm@gmail.com, p-norhaniza@utm.my, liyanaaris23@gmail.com, nurulhuda86@graduate.utm.my

Highlights: The EquiBrilliant module is a game-based learning material on Chemical Equilibrium to enhance students' higher-order thinking skills (HOTS) at the matriculation level in Malaysia. It is developed based on the Plass et al. (2015) model and HOTS of Bloom Taxonomy. It is an interactive game board with QR codes linked to the Padlet platform that performs a unique module for HOTS practice. The impact is shown by the 47.3% increase in the mean score of the post-test compared to the pre-test and the significant difference is proven by the t-test. The product survey also shows a high-impact value of the mean score.

Key words: HOTS; game-based learning; Chemical Equilibrium

Introduction

As a move towards educational transformation on 21st-century learning, the Ministry of Education (MOE) of Malaysia has established a policy on teaching higher-order thinking Skills (HOTS), and its practices are being emphasized throughout the Malaysian education system. The implementation of HOTS is one of the vital initiatives that is given a special focus in the Malaysia Education Blueprint (MEB) 2013-2025. This new practice has changed the students to apply knowledge in a different setting with the use of higher-order thinking skills.

Since the MEB implementation, Malaysia aims to be at the top of one-third of countries in international assessments such as the Program for International Student Assessment (PISA) and Mathematics and Science in the Trends in International Mathematics and Science Study (TIMSS) in 15 years. Reaching the third wave of MEB, according to Laporan Tahunan 2020 Pelan Pembangunan Pendidikan Malaysia, this country has made progress on the results but still does not achieve the top of one-third countries. The TIMSS score 2019 in science ranks Malaysia at 460 and this is still considered low and does not achieve the target of the top one-thrid countries (Ministry of Education, 2020).

Furthermore, according to the SPM Report Analysis of the year 2022, the student's achievements in analyzing, evaluating, and creating are more than 50% at low and moderate levels. After school, these students will further their studies to a higher educational level like the matriculation level. As one part of the Ministry of Education divisions, the matriculation division will receive the school products and needs to continue producing quality students of matriculation graduates with the skills of higher-order thinking. Based on the TIMSS, PISA, and SPM reports, show that students need to continue enhancing their HOTS at the matriculation level so that their thinking skills will improve.

At the matriculation level, the HOTS level among students still needs improvement. According to the analysis from Laporan Kerja Calon (LKC) for the Peperiksaan Semester Program Matrikulasi (PSPM) for semester 1 of the year 2022, 60% of matriculation students fail to use analyzing thinking skills to relate the concept of chemical equilibrium to solve the problem. 80% of students fail to make a judgment (evaluate) on the Equilibrium position to the related phenomenon and 70% of students fail to prove the solution to the problems by relating the concepts of chemical equilibrium. This report shows that there are some issues or problems involving the HOTS practice among matriculation students.

The problem of low HOTS achievement among matriculation students is caused by the exam-oriented mind among matriculation students that makes them have memorization-based learning of the concepts without mastering how to apply the concepts critically to solve real problems. This problem is also due to the lack of HOTS practice among students (Rusli, Arsyad & Miranda, 2022) as they are drilling the examination questions with the aim of scoring the subject. Furthermore, at the matriculation level, there is a lack of HOTS material for students (Andromeda, Fitriza & Aini, 2022) to practice their HOTS as the students only focus on the material provided to them which involve the materials from lectures, tutorials, and practical class. These materials emphasize the concepts based on the syllabus and do not prepare the students to practice their HOTS.

Based on the issues and problems stated, there is a need to continue guiding students to enhance their higher-order thinking skills at the matriculation level. One of the initiatives is to provide a learning material that can be utilized by the students to practice their HOTS and enhance their HOTS as the preparation for quality matriculation graduates in this country.

Product Description

The EquiBrilliant Module is a Gameboard play-learning on Chemical Equilibrium for the matriculation level. It is designed under the social constructivism theory, that learners make meaningful connections between prior knowledge, new knowledge, and their learning processes (Anshori et al., 2020) It is developed based on the Plass et al. (2012) game-based learning model that incorporates the elements of challenge, response, and feedback as shown in figure . This game-based learning model is aligned with the HOTS of Revised Bloom's taxonomy (Anderson & Krathwohl, 2001) namely analyzing (C4), evaluating (C5), and creating (C6) in the form of HOTS task that will be provided at the challenge part and will be solved as the response of the challenge. Students play this game as a group competition

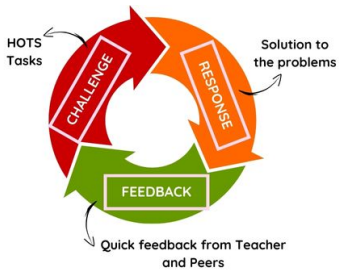


Figure 1: Game element adapted by Plass et al. (2015) game-based learning

The product is an interactive game board with QR Codes linked to the Padlet platform that provides the "Fun Fact" of Chemical Equilibrium, HOTS task, and as a platform for students to communicate instead of discussing face to face. The instructor will act as the facilitator for this game. Each group will take turns to choose the challenge either Awesome, Clever, or Brilliant which represents the types of HOTS-level tasks to be solved. Awesome is the analyzing thinking level (C4), Clever is evaluating thinking level (C5), and Brilliant is creating thinking level (C6). The students then need to solve the task within the time limit. If the students answer the questions correctly, points will be given to the group based on the level of questions they pick; C4 has 10 points, C5 has 30 points, and C6 has 50 points. The answers will then be discussed in front of the whole class. Students will receive quick feedback from peers and teacher. There are also rewards provided on the game board that motivate students to compete and win in the game.

Results & Discussion

This product was conducted on 30 students of a matriculation college and the impact was studied through an experimental design with one-group pre-test and post-test. The impact was also studied through a feedback survey using a 5-Likert scale questionnaire after the intervention. The data is analyzed descriptively and also by using inferential analysis.

Pre-test and post-test

Pre-post-testing showed an increase of 47.3% mean score of post-tests compared to the pre-test. As shown in Figure 2.

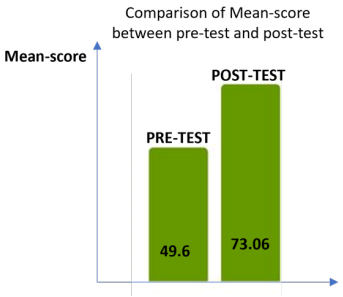


Figure 2: Comparison of Mean-score between pre-test and post-test

The pre-test mean score is 49.6% but increased to 73.06% after the intervention using the EquiBrilliant Module. This proves students' improvement in the HOTS in solving the Chemical equilibrium problems while applying the concept and objective of the product achieved.

The pre-post data is then analyzed using the paired sample T-test to see the significant difference between both tests. Table 1 shows the result of the paired-sample T-test. Before taking into the statistical computation, the hypothesis of statistics is formulated as follows:
H_0: There is no significant difference between the mean of the pre-test and the mean of the post-test.
H_1: There is a significant difference between the mean score of the pre-test) and the mean score of the post-test.

Table 1: Paired sample T-test

		Paired Differences					*t*	*df*	*Sig. (2-tailed)*
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre-test - post-test	-23.452	11.750	2.110	-27.761	-19.142	-11.113	30	0.000

Based on Table 1, the result of the paired sample T-Test was significantly different when the significance level (P) was 0.000 < 0.05. The result rejects the null hypothesis (H0) and confirms the alternative hypothesis (H1). Therefore, there was a significant difference between HOTS Test (pre) scores and HOTS Test (Post) scores.

Students' Feedback Survey

Students' feedback survey using a 5-Likert scale questionnaire shows a high mean score. Table 2 shows the mean score for each item for the survey.

Table 2: Mean Score on Students' Feedback Survey

No	Item	Mean Score
1	HOTS	4.74
2	Knowledge Construction	4.82
3	Cooperative	4.77
4	Content	4.79
5	Effective Play-Learning	4.79
6	interactive	4.82
7	feedback	4.79

This data proves that the EquiBrilliant Module has a high impact on students' HOTS, as well as knowledge construction and cooperation. The survey also shows that this product provides effective play-learning, good content, interactive, and feedback during learning activities.

Impact on Education Stakeholders

This product is significant for the Ministry of Education in Malaysia because it provides insights into the effectiveness of game-based learning modules in promoting higher-order thinking skills among matriculation students in chemistry. The impact of this product can inform policy decisions in the field of education to produce more engaging and interactive game-based learning in Malaysian education.

In the context of the matriculation level, this product offers a new approach to teaching chemical equilibrium that leverages game-based learning and implements the game-based learning cycle. The impact of this product can inform the Matriculation Division and instructional developers about the implementation of effective game-based learning modules that promote higher-order thinking skills in future education initiatives at the matriculation level in Malaysia. As a result, a good transformation started in the Matriculation Division in Malaysia will also benefit the matriculation teachers as well as the matriculation students.

Besides that, this product is important for teachers, specifically matriculation teachers since it provides experience in the usage of game-based learning modules in the classroom that can enhance students' higher-order thinking skills. This product is useful not only for matriculation teachers but it can also be implemented in form 6, foundation, and all pre-university levels in the science course.

Last but not least, this product offers a fun and engaging approach to learning chemical equilibrium that can enhance students' higher-order thinking skills. The impact of this product can inform students about the goods of game-based learning and motivate them to take a more active role in their own learning and use higher-order thinking skills during the learning process. Hence, the contribution will help to produce matriculation graduates as knowledgeable, creative, and competitive in the STEM area as possible, as well as having 21st-century skills that are compatible with the needs of future careers.

Potential Commercial Value

The recognition from experts gives credit to the EquiBrilliant Module in its commercial value as it is convincing to implement. As the benefits spread wide, this product will give potential commercial value not only for the matriculation level but also for the STPM, pre-university, and foundation level of Science courses

Conclusion

In conclusion, the EquiBrilliant Module is a quality product because of its uniqueness and benefits to students, as well as teachers and other education stakeholders. Students' HOTS improves besides increasing their knowledge construction and cooperative skills. As it is interactive, effective, has good content, and provides quick feedback, it makes it easier for students to practice their HOTS and indirectly benefits the matriculation institution in students' achievement.

This product also has the potential to be adapted or implemented in other subjects as it benefits Students' achievement in many aspects. The high achievement of students, especially in STEM-related subjects like chemistry will have a good impact on the matriculation community as these achievements prepare students for productive university graduates inside or outside the country. Based on the good findings of the products, it is supposed to be a benchmark for other parties in the education field to produce better game-based learning materials especially to enhance students' HOTS as it is beneficial for students' achievements in the future.

Potential Commercial Value

This product has achieved some recognition awards since it was developed in 2021. The product has also improved from the first development to this latest version of EquiBrilliant Module. The awards list is as follow:

1. Platinum Award (14th SoE Innovation Day) 2022
2. Gold Award (14th SoE innovation Day) 2022
3. Gold Award (International Learning Innovation Competition 2022)
4. Silver Medal (Kimia Invensi dan Inovasi Malaysia 2022)

This product also has been credited an Intellectual Property protection (copyright) with file number FM2023J02770.

References

Anderson, L. W. and Krathwohl, D. R., eds. 2001. A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives, New York: Longman.

Andromeda, A., Fitriza, Z., & Aini, Q. (2020). Evaluasi Kompetensi Pedagogik Guru Kimia Dalam Menyusun Instrumen Penilaian Higher Order Thinking Skill (HOTS) Siswa SMA. EduKimia Journal, 2(2), 91-95.

Anshori, M. I., Mulyono, & Sinaga, B. (2020). The Effect of Problem-Based Blended Learning Models on the Mathematical Problem Solving Ability of Middle School Students. Journal of Education and Practice. https://doi.org/10.7176/jep/11-18-18

Bahagian Matrikulasi Kementerian Pendidikan Malaysia (2023). Laporan Kerja Calon Dan Kertas Soalan Peperiksaan Semester Program Matrikulasi: Chemistry 1 SK015 Sesi 2022/2023.

Lembaga Peperiksaan Malaysia (2023). Laporan Analisis Keputusan Peperiksaan Sijil Pelajaran Malaysia 2022.

Ministry Of Education (2013). Malaysian Education Blueprint 2013-2025.

Ministry of Education (2020). Laporan Tahunan 2020. Pelan Pembangunan Pendidikan Malaysia 2013-2025.

Rusli, M. A., Arsyad, A. A., & Miranda, S. (2022). Penerapan E-Learning Berbasis Google Sites untuk Meningkatkan Higher Order Thinking Skills Peserta Didik Kelas VIII SMPN 27 Makassar. JURNAL PENDIDIKAN MIPA, 12(4), 1203-1209.

Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of gamebased learning. Educational Psychologist, 50(4), 258–283. https://doi.org/10.1080/00461520.2015.1122533.

Augmented reality applications in educational technology subject for undergraduate students at UTM Skudai.

Jehan Adiba Binti Ahmad Taha[1], Mohd Fadzil Bin Abdul Hanid[2]
Universiti Teknologi Malaysia, Skudai, Malaysia[1,2]
Jehanadiba@graduate.utm.my[1], mohdfadzilabdulhanid@utm.my[2]

Highlights: Augmented Reality (AR) is one of the technologies that can be used to overcome issues in learning complex topics in Educational Technology subject. The study was conducted to examine the effectiveness of using AR applications in Educational Technology subject for undergraduate students at UTM, Skudai. The research design is quasi-experimental, with quantitative data collected from 56 sample using pre-test and post-test outcomes. To compare differences between treatment and control groups before and after the intervention, Wilcoxon Signed-Rank Test was utilised. The findings indicate and suggest that learning approach based on AR applications has positive impact on undergraduate students in Educational Technology subject.

Key words: Augmented reality; Augmented reality application; Educational technology

Introduction

Education in Malaysia has now developed the concept of 21st century learning and emphasizes the use of ICT in classroom. The education system will always evolve and change with the passage of time. The majority of educator and learner have mobile devices and are prepared to perform mobile learning, according to Ling & Matore (2020). They can also employ mobile technologies for educational purposes. Most educators and learners see the usage of mobile learning favorably psychologically. This technology is defined in computer science by several important characteristics which is overlay real world with virtual elements, real-time interaction and registration in 3D. Augmented reality applications enable more natural human-machine interaction and preserve the user's environment. This process can be achieved by integrating virtual objects with the real environment (Manikam et al. 2023). AR applications in the classroom can helps to increase students' interest and engagement and students are better able to interact and collaborate. This shows that AR provides students with a variety of opportunities, increases students' motivation and improves academic achievement. Using AR can enrich students learning experience and help them gain more information from their environment. If used to enhance the educational process, augmented reality has enormous potential, particularly in technical and vocational education. Combining offline and online learning resources is one application of AR technologies. By substituting virtual resources for actual costly ones, such as laboratory supplies and equipment, it is possible to reduce costs (Tun et al., 2019).

According to Nurul' et al., (2022), the augmented reality approach can increase the effectiveness of learning activities through engagement mechanisms. AR technology can capture students' interest, thus simultaneously improving their performance and making their learning experience more enjoyable. The usage of AR system has been considered in a number of fields, demonstrating the value and advantages of doing so in business, marketing, and even education. The main pros of AR application in education are typically observed in the areas of student activities, affordability, and safety. When teaching practical skills in technical and vocational courses, AR can assist in presenting knowledge in a thorough and meaningful way (Tun et al., 2019). Three different kinds of Augmented reality objects were used in the design of a research, together with a variety of materials that were especially made for it. A reference to material from the field of "Educational Technology" is made in one of these things. conclusion a significant correlation between students' motivation when using the enriched notes and an improvement in performance in the academic topic where it was used was the study's most remarkable main conclusion. In addition, it is proven that using Augmented reality has a positive impact in learning (Cabero-Almenara et al., 2019).

AR technology will become common and can make it easier for students not only to read books but help in visualizing the content of the lesson. However, not all topics have this advantage but, in a way, it helps students gain a better understanding of certain academic subjects and topics (Nadiah et al., 2019). According to Azuma (1997) stated that many college students find it difficult to understand and absorb complicated topics in disciplines like biology, physics, and engineering. By offering immersive and interactive visualisations, augmented reality (AR) may improve their comprehension. In undergraduate mathematics, traditional teaching strategies frequently fail to engage students and don't take into account different learning preferences. Teachers might develop interactive mathematical simulations and models using augmented reality (AR) technology, resulting in a more interesting and individualised learning experience (Kerawala et al. 2006). Liarokapis et al. (2015) noted that in undergraduate courses in educational technology, students frequently lack opportunities for practical application of theoretical concepts and hands-on learning. By utilising augmented reality (AR) technology, teachers can design hypothetical situations and environments that let students actively interact with educational technology resources and ideas, encouraging a more hands-on and interactive approach to learning. Traditionally explained through textual explanations and two-dimensional graphics, complex notions and theories are difficult for undergraduate students studying educational technology to understand. Because it offers immersive visualisations that are interactive, AR has potential to improve students' learning experiences by promoting a deeper comprehension of educational technology topics (Bacca et al. 2014).

Product Description

Figure 1 : EduTech-AR Interface

Design and Development Phase

Based on the Cognitive Theory of Multimedia Learning, EduTech-AR was created. EduTech-AR was created with the users' cognitive abilities in mind in order to help students deepen their understanding of the topic of educational technology and provide experience using AR applications with multimedia content that suits the students' cognitive abilities. (Hamzah et al., 2022) stated that there are three basic stages to the multimedia design process. These three designs are interrelated with each other and are essential to ensure that the learning application produced meets the set requirements. The three basic stages are:

1. Information design
2. Interaction design
3. Interface design

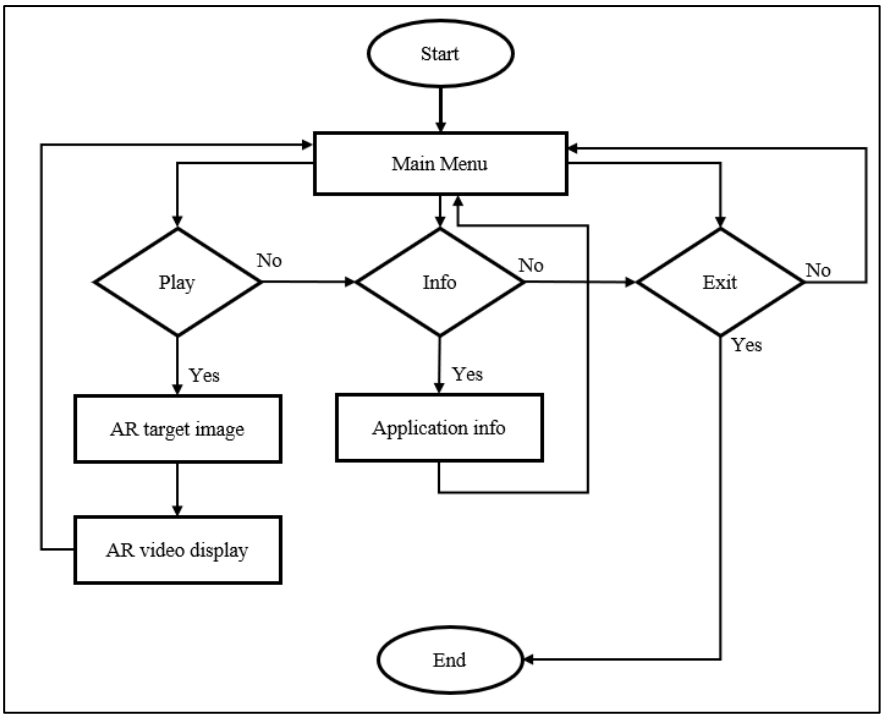


Figure 2 : Flowchart of EduTech-AR

Method:

- EduTech-AR uses devices such as smartphones and tablets as a method in teaching-learning situations.
- This AR application uses AR markers for students to scan the markers to display teaching videos related to educational technology topics.
- EduTech-AR combines audio, visual, and video elements, which is a teaching video that features the presenter's voice and slide-based visuals. This is a teaching tool meant to enhance efficient instruction and encourage improved learning

Innovativeness:

- Enhances engagement with interactive visualizations.
- Fosters experiential and immersive learning.
- Supports complex concept comprehension.
- Adapts to diverse learning styles.

Results & Discussion

Analysis of Student's Level of Achievement

Table 1: Analysis of Post-Test for Treatment and Control Group

	Score Post-test Treatment Group Score Post-test Control Group
Z	- 4.636[b]
Asymp. Sig. (2-tailed)	0.001

According to the table, there are significance different between the achievement level of undergraduate students for control and treatment group after intervention when the significance value ($p< 0.05$). Thus, it disproves the null hypothesis, $H_0 4$.

Conclusion

This study shows that there is a significant difference in the level of achievement of undergraduate students for the control group and the treatment group before and after the intervention. This is described by a conceptual framework that has been constructed, which combines components of augmented reality, educational technology, and project-based learning with the Cognitive Theory of Multimedia Learning, which serves as the primary theoretical foundation. The results of this study can support the Cognitive Theory of Multimedia Learning, which emphasises the necessity of organising multimedia teaching techniques and employing more successful cognitive skills techniques to aid learning. In the context of this study, the construction of mental representations from words and pictures is used in developing the subject content of Educational Technology using Augmented Reality applications. Using the Cognitive Theory of Multimedia Learning will improve cognitive abilities that help students organize and organize information in a more organized manner.

Overall, it can be concluded that the employment of Augmented Reality apps in Educational Technology has been found to have a positive influence on student accomplishment in Educational Technology. The study's findings also suggest that students' problem-solving skills increase after employing this strategy in their learning process. More research is needed to see a more substantial influence with a broader aspect and diversity of respondents and technique.

References

Azuma, R. (1997). A survey of augmented reality. Presence: Teleoperators & Virtual Environments, 6(4), 355-385.

Bacca, J., Baldiris, S., Fabregat, R., Graf, S., & Kinshuk. (2014). Augmented reality trends in education: A systematic review of research and applications. Educational Technology & Society, 17(4), 133-149.

Cabero-Almenara, J., Barroso-Osuna, J., Llorente-Cejudo, C., & Martínez, M. del M. F. (2019). Educational uses of augmented reality (AR): Experiences in educational science. Sustainability (Switzerland), 11(18). https://doi.org/10.3390/su11184990

Kerawalla, L., Luckin, R., Seljeflot, S., & Woolard, A. (2006). "Making it real": Exploring the potential of augmented reality for teaching primary school science. Virtual Reality, 10(3-4), 163-174.

Liarokapis, F., & Mourkoussis, N. (2015). Augmented reality applications in education: A literature review of current trends and developments. Journal of e-Learning and Knowledge Society, 11(3), 13-24.)

Ling, T. J., & Matore, M. E. E. (2020). Kesediaan Guru dan Pelajar Terhadap Penggunaan Pembelajaran Mobil dalam Pembelajaran danPemudahcaraan (PdPc): Sorotan Literatur Bersistematik. Malaysian Journal of Social Sciences and Humanities(MJSSH), 5(10), 83–94.

Manikam, R., & Maat, S. M. (2023). Sorotan Literatur Bersistematik: Trend Augmented Reality dalam Pengajaran dan Pembelajaran Matematik. Malaysian Journal of Social Sciences and Humanities (MJSSH), 8(1), e002046. https://doi.org/10.47405/mjssh.v8i1.2046

Nadiah, N., Kamal, M., Haimi, A., Adnan, M., Yusof, A. A., Ahmad, K., Anwar, M., & Kamal, M. (2019). Immersive Interactive Educational Experiences-Adopting Education 5.0, Industry 4.0 Learning Technologies for Malaysian Universities. MNNF. https://ssrn.com/abstract=3511172

Nurul', F., Nordin, A., Azim, A., Isa, M., Zaidi, M., Zakaria, B., Yahya, H., Zhafri Bin, M., & Nazmi, M. (2022). AR-Learn Model: Augmented Reality (AR)-Based Learning Application Development Model.

Tun, U., Onn Malaysia, H., Othman, H., Erfy Ismail, M., Faziehan Zakaria, A., Ismail, I. M., Samsudin, M. A., & Utami, P. (2019). Design and Development of Augmented Reality Teaching Kit: In TVET Learning Context Irwan MAHAZIR Ismail Design and Development of Augmented Reality Teaching Kit: In TVET Learning Context. Article in International Journal of Engineering and Technology, 8(1), 129–134. https://doi.org/10.14419/ijet.v8i1.24792

Online Storytelling for Enhancing English Language Speaking Practice Among Secondary School Students

Tanalachumi Karupayah, Mohd Nihra Haruzuan bin Mohamad Said, Mohd Fadzil bin Abdul Hanid
University Technology Malaysia, Johor, Malaysia.
tanalachumi@graduate.utm.my, nihra@utm.my, mohdfadzilabdulhanid@utm.my

Highlights: The Ministry of education (MoE) has taken the step to upgrade ICT through the 7th shift to scale up the quality of learning across the nation and achieve English language proficiency through 2nd shift in the Malaysian Education Blueprint (2013- 2025), to produce a globally competitive younger generation. MoE believes that the use of ICT models; self-directed online learning and interactive online tutoring can make learning the English language more effective. Hence, in pursuit of achieving MoE's vision, an online learning environment based on a digital storytelling approach is developed on Microsoft Teams to enhance speaking practice among secondary school students.

Key words: Digital storytelling; online learning; Microsoft Teams; Speaking; English.

Introduction

Technology in general does not only aid teaching and learning but also creates a meaningful learning experience for students, especially in learning English as a second language (ESL). This is because learning has been made more engaging, interactive, and motivating while ensuring efficiency and boosting an increase in productivity when technology is integrated (Bull, 2013; Kartal, 2020; Mufidah & Roifah, 2020; Ude, 2021). Technology-supported learning creates better outcomes in language learning and also well-received by both teachers and students. Moreover, technology also enables language instructors to extend their teaching practice beyond the physical constraint of their language classroom (Chong & Reinders, 2020; Zhang & Zou, 2022). This allows teachers to actively give feedback through an online learning environment while monitoring learners' development of language skills (Cong-Lem, 2018). Integrating technology also enables self-regulated learning where students take control over learning and reflect on practice (Duță & Martínez-Rivera, 2015) and this is what the Ministry of Education (MoE) has envisioned at the end of reformation of Malaysian Education system. Hence, MoE included leveraging ICT as one of the 11 shifts in 2013 as the ministry believed integrating technology would make teaching and learning language more effective and thus proposed distance and self-paced learning in the Malaysian education system transformation to achieve English language proficiency. However, it is up to educators to utilize the facilities to achieve the nation's aspirations.

Even though English language is not the official language, globalization, and advancement in technology have increased the need for one to be well-versed in the language to keep abreast with the development (KPM, 2013; Ministry of Education, 2015). Proficiency in the English language is vital to overcome unemployment among fresh graduates as it has been reported by several studies as one of the top reasons behind unemployability (Hossain et al., 2018; Idham et al., 2014; KPM, 2013; Rusli et al., 2018; Tengku Kamarul Bahrim et al., 2019). In general, a person's proficiency is determined based on one's speaking skill. Speaking is the hardest skill to acquire as it creates anxiety among students (N. Zakaria et al., 2019). The Cambridge baseline studies (2013) involving the form 5 students revealed that most of students were at CEFR Band A1/A2 for Speaking in comparison to Writing (Band B1/B2) (Cambridge, 2013; MOE, 2015). This clearly shows that Malaysian students have a problem with Speaking (MOE, 2015). Band A1 or A2 is the lowest band and is to be achieved at the end of primary education (KPM, 2013). Therefore, the Cambridge Baseline studies prove that generally there is not much progress in their speaking skill at the end of their secondary school upon finishing 11 years of formal education.

Active participation in learning speaking can enhance learners' speaking skill as it increases practicing (Hayuningtyas & N.H., 2020; N. Y. K. Zakaria et al., 2018). N. Y. K. Zakaria et al. (2018) stated that practicing is the most effective strategy in improving speaking skill. However, (Leong & Ahmadi, 2017) highlighted that performance pressure should be reduced by providing more support and time for students when speaking practice is done. Krashen, (2004), stated that reducing affective filter is vital to encourage speaking practice among learners. However, in real, students do not have enough exposure to the target language, or opportunities to use the target language in interactions (Akbulut, 2014). Lack of speaking practice causes unfamiliarity of the spoken language to the students; hence, they are afraid of making mistakes whenever they speak (Aziz & Kashinathan, 2021). This hampers their attempts to speak English with others. Most of the studies highlighted that psychological factor such as lack of motivation, high anxiety, and low self-confidence, as the most prominent reasons behind students' poor performance in speaking (Aziz & Kashinathan, 2021; Mohd Nor et al., 2019; Nadesan & Md. Shah, 2020; Agatheswari Paneerselvam & Mohamad, 2019; Qureshi et al., 2020; Rusli et al., 2018)

Therefore, pedagogical approach should focus in lowering affective filter (Krashen, 2004) and learners should also get the opportunity to practice speaking in English on daily basis (A. A. Aziz & Kashinathan, 2021a). Reducing inhibition can improve learning environment and encourage students to practice speaking (Nadesan & Md. Shah, 2020)This can be done through integration of technology in learning speaking. Studies show that technology integrated language lesson creates space for students to practice speaking anytime anywhere which makes them to be more familiar with the language (Nijat et al., 2019; Asshadwi Paneerselvam, 2021; Sosas, 2021). Hence, it is vital to design technology integrated learning activities to overcome psychological barriers and provide more time and opportunity to practice speaking English language by creating an engaging virtual learning environment. This can be done with integration of technology in conducting speaking activities that are more interactive and engaging.

Product Description

Digital storytelling (DST) is a suitable pedagogical approach that integrates technology to facilitate speaking practice (Sosas, 2021) and enhances confidence in speaking (Foley, 2013; Hava, 2019; Kallinikou & Nicolaidou, 2019; Mohamed Salama Eissa, 2019). However, very few studies conducted in Malaysia on the usage of DST as pedagogical approach to facilitate speaking practice among upper secondary students. DST is mostly used in physical classrooms, especially at primary schools. Hence, this online learning environment that contains learning activities based on DST approach is one of its kind in the nation. The online learning activities are developed in Microsoft Teams based on learning standards set by the Curriculum Development Centre (CDC) to facilitate speaking practice among form four students. Moreover, under the new SBELC, students are to take part in project-based learning (PBL). Thus, the DST activities can also be used by teachers to carry out PBL. Activities are designed to facilitate self-directed learning where students get to explore and learn by actively taking part in the learning activities and teachers will function as moderators to assist students while online. The Microsoft teams' features allow students to be more engaged in learning and collaborate with moderator and peers. Hence, activities and tasks assigned to maximize the use of the features where students get to collaborate, give peer feedback, receive feedback from peers and teacher, interact and be more engaged. Most importantly, the online storytelling learning activities provide the opportunity to practice speaking anytime and anywhere. Practice is the most effective way to improve speaking and it is always hindered by the time factor. With online storytelling learning activities on Microsoft Teams, time is not an issue, and every student can now practice speaking and gain confidence.

Results & Discussion

A pre-experimental study (one group pre-test post-test) was conducted to study the effectiveness of the online storytelling learning activities on students' speaking performance among 30 form four students in a school in Melaka after taking part in a 4-week intervention. The speaking was assessed based on LPM's new CEFR based assessment on three criteria: Grammar, Vocabulary, and Communicative Competence. The overall result is as shown in figure 1. The students' post-test scores clearly showed improvement in the speaking performance as more students moved in to achieving Band B1/B2 in comparison to pre-test. The minimum score of both tests also indicates that lowest band achieved has increased from CEFR A2 during the pre-test to B1 in post-test and more students have achieved CEFR B2 which is the expected level that upper secondary level students should be in when they finish secondary education (Ministry of Education, 2015) and some even reached CEFR C1. With these statistical findings, it can be concluded that digital storytelling learning activities have created positive effect on the form four students' speaking performance.

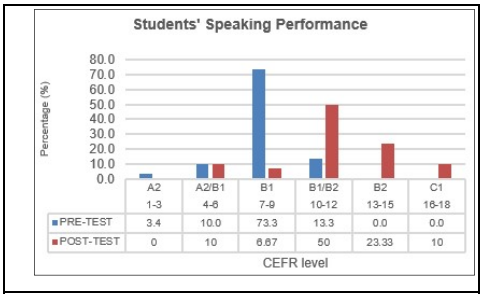


Figure 1: Comparison of students' speaking performance based on CEFR.

The overall result is verified with the Wilcoxon Signed Rank test which was employed to study significance difference between the pre-test scores and post-test scores. The Wilcoxon Signed Rank test result as shown in table 1.1, indicates that there is a significant difference between pre-test scores and post-test scores where $p < 0.001$ ($p<0.05$). Hence, it can be concluded that digital storytelling learning activities are effective in improving the students' individual speaking performance.

Table 1: Wilcoxon Signed Rank test result on pre-test and post-test scores

Test Statisticsa	
	Post-Test - Pre-Test
Z	-4.726[b]
Asymp. Sig. (2-tailed)	<0.001
a. Wilcoxon Signed Ranks Test	
b. Based on negative ranks.	

To obtain an insight of students' perceptions of the online storytelling learning activities on students' speaking practice and psychology, a Likert-type questionnaire was employed and analysed. The results, as shown in table 2 indicates that students agree that online storytelling learning activities facilitate speaking practice outside classroom on their own, makes English language speaking practice fun, improves their individual speaking performance, and allows them to spend more time practicing speaking. The data also showed that students agree that online storytelling activities makes them to be more confident to speak, feel happy practicing speaking, and reduces the fear of speaking English language and fear of making mistakes when speaking. The students' perception amplifies the findings as mentioned above.

This is parallel to various studies conducted at different levels, in different parts of the world that reported practising is the most effective strategy to improve speaking skill because it helps students to familiarise with the language (N. Y. K. Zakaria et al., 2018) and the finding of this study establishes that online learning activities based on DST enable students to practice speaking and subsequently improve their speaking performance.

Table 2: Students' perception on impact of online storytelling learning activities towards their speaking and psychology

CONSTRUCT		N	LIKERT-TYPE SCALE Frequency/ Percentage of Agreement				Mean
A.	SPEAKING		1	2	3	4	
NO	ITEM		(SD)	(D)	(A)	(SA)	
1.	The online storytelling activities help me to practise speaking English the language outside the classroom.	30	1 3.30%	0 0%	21 70.00%	8 26.70%	3.20
2.	The online storytelling activities allow me to practise speaking English language on my own.	30	0 0%	0 0%	21 70.00%	9 30.00%	3.30
3.	The online storytelling activities make English language speaking practice fun.	30	1 3.30%	2 6.70%	24 80.00%	3 10.00%	2.97
4.	The online storytelling activities improve my individual speaking performance.	30	0 0%	3 10.00%	18 60.00%	9 30.00%	3.20
5.	The online storytelling activities allow me to spend more time to practise speaking English language.	30	0 0%	5 16.70%	17 56.70%	8 26.70%	3.10
6	The online storytelling activities allow me to make corrections before speaking.	30	0 0%	0 0%	16 53.3%	14 46.7%	3.47
B.	PSYCHOLOGY						
7.	The online storytelling activities make me more confident to speak in the English language.	30	1 3.30%	5 16.70%	19 63.30%	5 16.70%	2.93
8.	Online storytelling activities reduce the fear of speaking the English language.	30	1 3.30%	6 20.00%	17 56.70%	6 20.00%	2.93
9.	The online storytelling activities reduce the fear of making mistakes when speaking.	30	1 3.30%	5 16.70%	17 56.70%	7 23.30%	3.00
10.	The online storytelling activities make me happy to practice speaking.	30	0 0.00%	2 6.70%	23 76.70%	5 16.70%	3.10
11.	The online storytelling activities make me more confident to speak in the English language.	30	1 3.30%	5 16.70%	19 63.30%	5 16.70%	2.93

Conclusion

In conclusion, this research shows that digital storytelling learning activities through Microsoft Teams influences the form four students' speaking performance. The improvement in speaking performance was observed in terms of their grammar control, usage of vocabulary and communicative competence. The outcome of the research also amplifies that digital storytelling activities enable active participation and practicing which contributes towards improvement in speaking performance. This is complimented by students' positive perception towards digital storytelling learning activities through Microsoft Teams. Truly, online storytelling learning activities are accepted by the students as a tool that can assist them to practice speaking at their own convenience. Students also agreed that the activities were seen to have positively impacted their psychology allowing them to practice more confidently, without having to fear of making mistakes in the attempt to practice speaking. Online storytelling learning activities are also perceived to enable students to practice speaking in a fun way. However, further research should be conducted to study the significance of the impact on different groups of samples, at a bigger scale and using different methodologies.

References

Adnan, N. I. (2014). *Using Public Speaking to Improve Malaysian Students' Confidence Level in Speaking Skill: A Case Study*.

Akbulut, N. (2014). *Teaching English to Young Learners Through Task-Based Language Teaching English to Young Learners Through Task-Based Language Teaching*.

Aziz, A. A., & Kashinathan, S. (2021). ESL Learners' Challenges in Speaking English in Malaysian Classroom. *International Journal of Academic Research in Progressive Education and Development*, *10*(2). https://doi.org/10.6007/ijarped/v10-i2/10355

Bull, P. H. (2013). Cognitive Constructivist Theory of Multimedia: Designing Teacher-Made Interactive Digital. *Creative Education*, *04*(09), 614–619. https://doi.org/10.4236/ce.2013.49088

Cambridge, U. of. (2013). *Cambridge Baseline 2013 Introduction 1*.

Chong, S. W., & Reinders, H. (2020). Technology-mediated task-based language teaching: A qualitative research synthesis. *Language Learning and Technology*, *24*(3), 70–86.

Cong-Lem, N. (2018). Web-Based Language Learning (WBLL) for Enhancing L2 Speaking Performance: A Review. *Advances in Language and Literary Studies*, 9(4), 143. https://doi.org/10.7575/aiac.alls.v.9n.4p.143

Duță, N., & Martínez-Rivera, O. (2015). Between Theory and Practice: The Importance of ICT in Higher Education as a Tool for Collaborative Learning. *Procedia - Social and Behavioral Sciences*, *180*(November 2014), 1466–1473. https://doi.org/10.1016/j.sbspro.2015.02.294

Foley, L. M. (2013). *Digital Storytelling in Primary-Grade Classrooms* (Issue April). ARIZONA STATE UNIVERSITY.

Hava, K. (2019). Exploring the role of digital storytelling in student motivation and satisfaction in EFL education. *Computer Assisted Language Learning*, *0*(0), 1–21. https://doi.org/10.1080/09588221.2019.1650071

Hayuningtyas, N., & N.H., M. F. (2020). Developing "Speak It Up" Board Game in Speaking Skill for Undergraduate Efl Students. *Pesat*, *6*(5), 13. http://paradigma.web.id/ejournal/index.php/pesat/article/view/20

Heriansyah, H. (2012). Speaking Problems Faced by The English Department Students of Syiah Kuala University. *Lingua Didaktika: Jurnal Bahasa Dan Pembelajaran Bahasa*, *6*(1), 37–44.

Hossain, M. I., Yagamaran, K. S. A., Afrin, T., Limon, N., Nasiruzzaman, M., & Karim, A. M. (2018). Factors Influencing Unemployment among Fresh Graduates: A Case Study in Klang Valley, Malaysia. *International Journal of Academic Research in Business and Social Sciences*, *8*(9), 1494–1507. https://doi.org/10.6007/ijarbss/v8-i9/4859

Idham, M., Razak, M., Yusof, A. M., Syazana, W. N., Jaafar, W. E., & Talib, A. H. (2014). Factors Influencing Unemployment among Graduates in Malaysia – An Overview. *ISSN*, *5*(11).

Kallinikou, E., & Nicolaidou, I. (2019). Digital Storytelling to Enhance Adults' Speaking Skills in Learning Foreign Languages: A Case Study. *Multimodal Technologies and Interaction*, *3*(3).

Kartal, G. (2020). AN ANALYSIS OF USING TECHNOLOGY IN LANGUAGE LEARNING IN THREE FLAGSHIP JOURNALS. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi*, 515–532. https://doi.org/10.21764/maeuefd.645551

KPM. (2013). Malaysia Education Blueprint 2013 - 2025. *Education*, *27*(1), 1–268. http://linkinghub.elsevier.com/retrieve/pii/S0742051X10001435

Krashen, S. D. (2004). Principles and Practice in Second Language Acquisition. In *CWL Publishing Enterprises, Inc., Madison* (Vol. 2004, Issue 2). http://onlinelibrary.wiley.com/doi/10.1002/cbdv.200490137/abstract

Leong, L., & Ahmadi, S. M. (2017). An Analysis of Factors Influencing Learners' English Speaking Skill. *International Journal of Research in English Education*, 34–42.

Ministry of Education, M. (2015). English Language Education Reform in Malaysia (The Roadmap 2005-2025). In Z. Mohd Don (Ed.), *Ministry of Education* (Issue 1).

MOE. (2015). *The Road Map 2015 - 2025* -. Ministry of Education, Malaysia.

Mohamed Salama Eissa, H. (2019). Pedagogic Effectiveness of Digital Storytelling in Improving Speaking Skills of Saudi EFL learners. *Arab World English Journal*, *10*(1), 127–138. https://doi.org/10.24093/awej/vol10no1.12

Mohd Nor, K., Mohd Razali, M., Talib, N., Ahmad, N., Sakarji, S. R., Wan Mohamed Saferdin, W. A. A. binti, & Mohd Nor, A. (2019). *Students' Problems in Learning English as a Second Language among MDAB Students at UITM Malacca*. *October*. https://doi.org/10.35631/ijhpl.27001

Mufidah, Z., & Roifah, M. (2020). VLOG AS LEARNING MEDIA TO TRAIN ENGLISH FLUENCY AND PUBLIC SPEAKING SKILL. *Jurnal Ilmu Bahasa Dan Sastera*, *14*(1), 45–56.

Nadesan, N. K., & Md. Shah, P. (2020). Non-Linguistic Challenges Faced by Malaysian Students in Enhancing Speaking Skills. *Creative Education*, *11*(10), 1988–2001. https://doi.org/10.4236/ce.2020.1110145

Nijat, N., Atifnigar, H., Chandran, K., Tamil Selvan, S. L., & Subramonie, V. (2019). Psychological Factors that Affect English Speaking Performance among Malaysian Primary School Pupils. *American International Journal of Education and Linguistics Research*, *2*(2), 55–68. https://doi.org/10.46545/aijelr.v2i2.117

Paneerselvam, Agatheswari, & Mohamad, M. (2019). Learners ' Challenges and English Educators ' Approaches in Teaching Speaking Skills in an ESL Classroom : A Literature Review. *Creative Education*, *10*, 3299–3305. https://doi.org/10.4236/ce.2019.1013253

Paneerselvam, Asshadwi. (2021). Using Digital Toolkits for Effective Learning in A Rural Primary School. *10th International English Language Teaching Conference*, 67–76.

Qureshi, H., Javed, F., & Baig, S. (2020). The Effect of Psychological Factors on English Speaking Performance of Students Enrolled in Postgraduate English Language Teaching Programs in Pakistan. *Global Language Review*, *V*(II), 101–114. https://doi.org/10.31703/glr.2020(V-II).11

Rusli, R., Yunus, M. M., & Hashim, H. (2018). Low Speaking Proficiency Among the Malaysian Undergraduates : Why and How ? *E-Prosiding Persidangan Antarabangsa Sains Sosial Dan Kemanusiaan 2018*, *April*, 678–689.

Sosas, R. V. (2021). Technology in teaching speaking and its effects to students learning English. *Journal of Language and Linguistic Studies*, *17*(2), 958–970. https://doi.org/10.52462/jlls.66

Tengku Kamarul Bahrim, T. A. I., Hassan Azahari, H. I., Zulkarnal, N. A. A., Sallehhudin, N. A., & Mohd Yusop, R. (2019). HIGH RATE OF UNEMPLOYMENT AMONG GRADUATES. *E-Journal of Media & Society*, *3*, 1–15.

Ude, J. (2021). Effect of Using Information and Communications Technology (Ict) in Teaching and Learning English Language in Tertiary Institutions in Nigeria During Covid-19 Pandemic Era. *Journal of Educational Research and Development*, *4*(2), 130–143.

Zakaria, N., Hashim, H., & Yunus, M. M. (2019). A Review of Affective Strategy and Social Strategy in Developing Students ' Speaking Skills. *Creative Education*, *10*, 3082–3090. https://doi.org/10.4236/ce.2019.1012232

Zakaria, N. Y. K., Zakaria, S. N., & Azmi, N. E. (2018). Language Learning Strategies Used by Secondary Schools Students in Enhancing Speaking Skills. *Creative Education*, *09*(14), 2357–2366. https://doi.org/10.4236/ce.2018.914176

Zhang, R., & Zou, D. (2022). Types, purposes, and effectiveness of state-of-the-art technologies for second and foreign language learning. *Computer Assisted Language Learning*, *35*(4), 696–742. https://doi.org/10.1080/09588221.2020.1744666

Innovate the Use of PowerPoint (PPT) to Revitalize Hands-On Learning

Hoo Choon Lih
Heriot-Watt University Malaysia, Putrajaya, Malaysia
c.hoo@hw.ac.uk

Highlights: In response to the pandemic's shift to online learning or inaccessibility to the lab facilities, hands-on lab work has become challenging. Despite demonstration video and live sessions support, learners may still feel disconnected. The developed cost-effective PPT-Lab module transforms the lab experience through PowerPoint to engage the multiple learning domains. It offers practical, distinct experimental result collection and 3D models for effective learning. The PPT-Lab's implementation spans across Malaysia and Edinburgh campuses and received positive feedback for enabling precise off-campus lab work.

Key words: Virtual; CAD; psychomotor; learning styles.

Introduction

The transition to virtual learning due to the pandemic has brought forth significant challenges. Even in traditional in-person settings, effectively engaging learners with various styles of multiple intelligences has never been a straightforward task. Research has consistently focused on improving its effectiveness (Nasri et al., 2021). Following the principles of outcome-based education, the guiding philosophy has always been to cultivate knowledge progression. Starting from comprehension and recall levels in Bloom's Taxonomy, it then advancing to application, analysis, evaluation, and creation of knowledge (Rao, 2020). The instructional design and curriculum content have been intricately aligned with the three primary learning domains: cognitive (mind), psychomotor (hand), and affective (heart). However, facilitating learning within the psychomotor domain becomes particularly challenging when physical labs or workspaces are inaccessible.

During the beginning of 'new normal', conventional approach may involve the adoption of video recordings for lab demonstrations and the distribution of raw lab data to aid students in writing lab reports. However, this practice of sharing raw lab data can inadvertently promote plagiarism, especially in a large class size. Consequently, the virtual laboratories emerge as a viable alternative, particularly when physical facilities are unavailable. A study conducted by Rajendran, Veilumuthu, and Divya (2010) investigated the effectiveness in understanding concepts and self-paced learning using computer-assisted tools compared to traditional textbooks. The results indicated that students prefer computer-assisted tools, as they encourage creative thinking. The virtual laboratory has demonstrated its potential to provide an experience equivalent to face-to-face instruction, which potentially offer cost and time savings while enabling learning from the comfort of one's own home (Hamed & Aljanazrah, 2020). Despite the positive outcomes and effectiveness of utilising virtual laboratories have been well-documented, there are limitations in extending this approach to all physical experiments.

With the remarkable advancements in technology and internet accessibility that allow the development of digital learning, observations suggest the need to strike a balance by integrating both virtual and physical labs. This is crucial to accommodate different learning styles and cater to the needs of learners with various intelligences (Xhomara & Shkembi, 2020).

Product Description

This project endeavours to develop a cost-effective virtual lab module framework that aims to augment practical learning. The approach seeks to enhance interactivity in practical activities while engaging multiple learning skills through readily available resources. The module is generated through a familiar tool, PowerPoint (PPT), which is widely used by educators in daily teaching activities. This initiative is designed to minimise the need for learning new technological or software skill to prevent potential technological challenges faced by some users. The PPT-Lab encompasses theoretical explanations and provide an open-ended context for students. It also encourages group discussions, promoting teamwork in deciding testing variables before embarking on the practical application, thereby engaging kinesthetics learning styles. Individual student or group can run the experiment virtually and collect distinct data. This approach assures high quality analysis and prevent potential plagiarism caused from sharing of raw lab data practice especially in larger class settings. In addition, the incorporation of 3D computer-aided design (CAD) models of experimental hardware imparts a virtual tactile experience for students, as compared to the static 2D images. The 3D navigation feature allows users to manipulate the orientation of the 3D model, providing a user friendly, detailed and comprehensive view.

Figure 1 illustrates the transformation layout from a physical engineering lab structure to the proposed PPT-Lab, showcasing the corresponding learning styles being mapped. The PPT-Lab was implemented across two campuses in Malaysia and Edinburgh, catering to 155 local and international engineering undergraduate students. An online session was conducted to introduce the theoretical background, followed by a question-and-answer session aimed at stimulating critical, in-depth learning. Subsequently, the group engaged in discussions to design the experiment and determine the parameters for investigation. Finally, students would run the experiment within the PPT-Lab, enabling them to collect the requisite data.

Results & Discussion

Based on a student survey, over 90% expressed confidence in their ability to replicate practical lab work using the PPT-Lab. The approach garnered an impressive average rating of 8/10 for its excellent user experience, with particular praise for the helpfulness of CAD models in comprehending hardware setups. Comments highlighted its user-friendly interface, innovative features, and the reliability of data collected in comparison to real-world results. In terms of academic outcomes, students were able to generate high-quality technical reports without compromising learning efficiency, even when compared to previous years when labs were conducted in person. The success of the PPT-Lab concept has led to its expansion into other engineering labs, showcasing the transferability of this innovative approach. However, it's important to note that the feasibility of this method is contingent on the nature of the specific experiment and whether it aligns with the available features in PowerPoint.

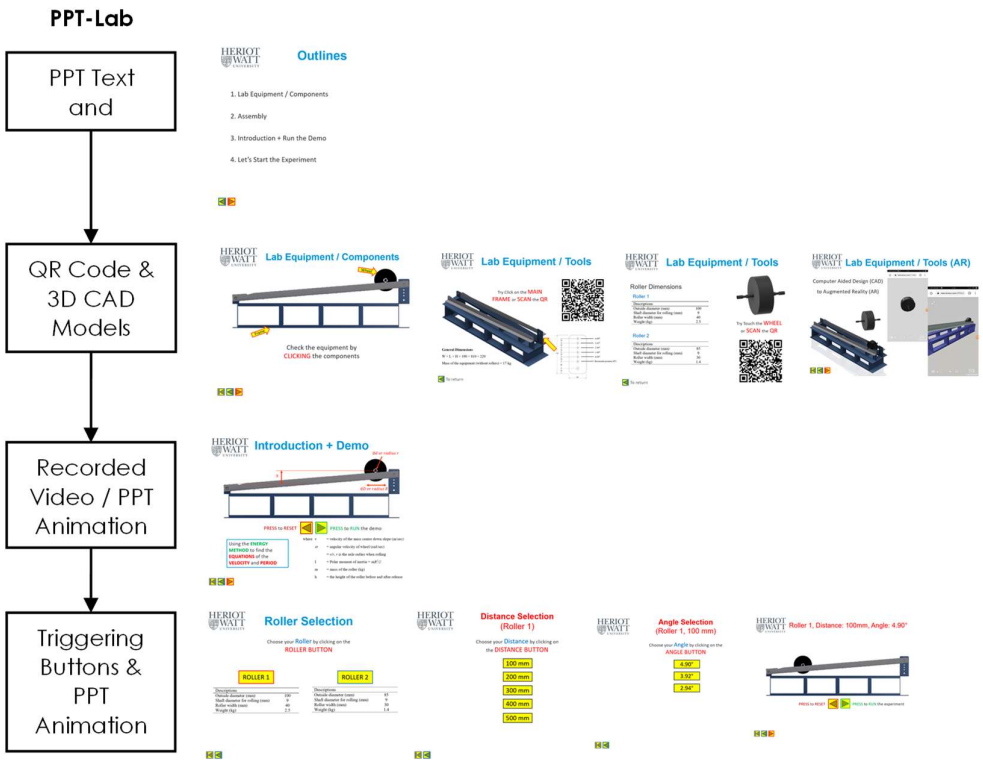


Figure 1: Engineering lab transformation through PPT feature.

Conclusion

A novel, cost-effective method has been introduced, leveraging familiar technology resources. The PPT-Lab integrates 3D CAD models to simulate physical hardware, while animated features and navigation/triggering buttons enable real-time data collection within PowerPoint. Users have responded positively, and the quality of lab work remains comparable to previous instances of physical experimentation. It is worth noting that the applicability of this approach is contingent on the specific nature of the experiment, which can be complemented by the features within PowerPoint. While a preference for physical labs persists, this approach offers a viable alternative in the current educational landscape. Despite the return of physical face to face study, the PPT-Lab still available to students who require distance learning. In future, there is potential to enhance the scalability of PPT-Lab by combining video recording with this innovative methodology.

Publication, Award and Intellectual Property

Award: Commendation for HWU Teaching Excellence Awards 2021

Published proceedings: Hoo, C. L. (2021). Reconstruct Practical Learning Experience through PowerPoint (PPT), kNOVASI 2021 Proceeding, pg225-227, e-ISBN 978-983-3168-51-4

Published journal: Hoo, C. L. (2021). Transformation of Dynamical Practical Lab for Interactive Virtual Learning Experience, ASEAN Journal of Teaching & Learning in Higher Education, 13(2).

Award: Kongres dan Pertandingan Inovasi dalam Pengajaran dan Pembelajaran (kNOVASI) 2021, Bronze medal

Award: International University Carnival on E-Learning (IUCEL) 2022, Gold medal

References

Hamed, G., & Aljanazrah, A. (2020). The Effectiveness of Using Virtual Experiments on Students' Learning in the General Physics Lab. Journal Of Information Technology Education: Research, 19, 977-996. https://doi.org/10.28945/4668

Nasri, N., Rahimi, N., Nasri, N., & Talib, M. (2021). A Comparison Study between Universal Design for Learning-Multiple Intelligence (UDL-MI) Oriented STEM Program and Traditional STEM Program for Inclusive Education. Sustainability, 13(2), 554. https://doi.org/10.3390/su13020554

Rajendran, L., Veilumuthu, R., & Divya, J. (2010). A study on the effectiveness of virtual lab in E-learning, International Journal on Computer Science and Engineering, 2(6), 2173-2175.

Rao, N. (2020). Outcome-based Education: An Outline. Higher Education For The Future, 7(1), 5-21. https://doi.org/10.1177/2347631119886418

Xhomara, N., & Shkembi, F. (2020). The influence of multiple intelligences on learning styles in teaching and learning. Journal of Applied Technical and Educational Sciences, 19-48, https://doi.org/10.24368/jates.v10i1.148

Entrepreneurial Chemistry Module: A Pathway from Lab to Market

Wimbi Apriwanda Nursiwan[1], Siti Rahmi[2]
,Universiti Teknologi Malaysia[1] , SMA Negeri 1 Koto Gasip[2]
wimbiiapriwanda@gmail.com

Highlights: Entrepreneurial Chemistry Module is module based on integration of project based-learning and chem-entrepreneurship orientation, with the aim of fostering students' entrepreneurial by applicating chemical concepts. This module provides up-to-date chemistry information and engaging activities with entrepreneurial aspects. Expert validation confirms its effectiveness in promoting self-instruction, self-contained, adaptability, user-friendliness, pedagogical, and visual aspects. Also, users' feedback from students and teachers has been overwhelmingly positive. This module is innovation which potential to nurture students' entrepreneurial interests as preparation in the future.

Key words: Chemistry; Entrepreneur; Module; Student

Introduction

The perception that chemistry is a difficult, complex, and abstract topic is inherent in the subject of chemistry, so it requires unique intellectual abilities and extra study time to understand it thoroughly (Cardellini, 2012). This assumption is the cause of low student motivation in studying chemistry. One of the causes of low student interest is caused by the learning activities implemented by the teacher. Even though chemistry is very close to everyday life, it can produce products (Sumarti, et al., 2018). In addition, chemistry is a fun subject because it deals with interesting phenomena, interesting experimental activities, and knowledge that is useful for understanding the natural and artificial world (Chiu, 2005). Kusuma & Siadi (2010) found that learning chemistry would be more fun and less boring if it gave students the opportunity to optimize their potential by producing a product. If students are used to such learning conditions, then students are motivated to learn. In fact, not only motivation, life skills such as interest in entrepreneurship can also arise. This is supported by the 21st century national education paradigm which states that chemistry is a lesson that has many applications in life and has the potential to be developed into an entrepreneur in the field of chemistry, so that if these two elements are linked it will make an impression on students. This means that the relationship between chemistry and entrepreneurship is very close in terms of producing products because of learning chemistry (Wijayanti & Rengga, 2016). Entrepreneurship-oriented chemistry learning is known as chemistry-entrepreneurship learning. Through the application of this chemistry-entrepreneurship approach, it is hoped that students will be able to obtain provisions to be more creative in producing products that have economic value. This is crucial because not all students after completing school continue their education to university, so it is the learning outcomes at school that become their provision for the future (Dewi & Mashami, 2019).

Based on data from Badan Pusat Statistik (BPS) from 2017-2022, the largest unemployment comes from individuals with a high school education. This ratio is equivalent to 8.42 million people from the more than 143 million Indonesian workforce in that period (Javier, 2023). This means that many secondary school graduates do not work, even though what they learn at school can be a provision for survival in the future. Therefore, developing entrepreneurial interest in chemistry learning can be one solution in reducing unemployment rates. This can be done by training students to produce products using chemical principles with ingredients that are easily experienced in everyday life. So, the chemistry learning that students gain is useful in their future lives. Therefore, integration is needed that is oriented towards chemistry module and elements of entrepreneurship, which is called chemistry-entrepreneurship. Learning oriented towards chemical entrepreneurship can provide students with direct learning experiences about the usefulness of chemistry for individuals, society, and the environment. According to Jack & Blessed (2015) the aim of chemistry education is to ensure that every student gains a good understanding of science and then applies it in everyday life. Therefore, chemistry learning activities that apply entrepreneurial elements can be an innovation in chemistry learning. Therefore, this study aims to develop a module integrated entrepreneurship and chemistry learning.

Product Description

The entrepreneurial chemistry module is a chem-entrepreneurship oriented module or combines the application of chemical concepts with elements of entrepreneurship. There are three innovations implemented in this module, namely activities that encourage students' entrepreneurial spirit, inspiring stories of success in selling products resulting from the application of chemistry, and rubrics for assessing products produced by students. This module aims to motivate students to study chemistry which has an impact on their interest in applying chemistry from an entrepreneurial aspect.

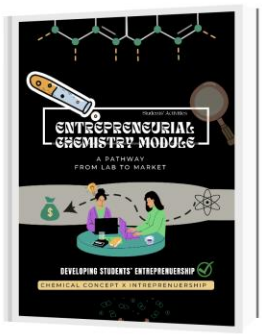


Figure 1. Entrepreneurial Chemistry Module

This module equips with activities that support entrepreneurship elements. These activities help students apply the theoretical concepts they learn in the entrepreneurial chemistry module to real-world situations. Additionally, these activities can help them develop the skills and understanding necessary to become successful entrepreneurs in the chemical field or related industries. It also prepares them to face the challenges of the business world with more confidence and competence. Apart from activities, what makes this module different from other modules is that there are stories about the entrepreneurial spirit. This story is related to related products, so this can be an example of the application of chemistry in everyday life which can result in success in business in the future. Success stories about successful chemical entrepreneurs can be a powerful source of motivation for students. They can see how other people, with similar backgrounds, have created successful companies. This can stimulate an entrepreneurial spirit among students, encouraging them to pursue their own innovative ideas. In the entrepreneurial chemistry module, success stories can be a very effective tool for inspiring and teaching students about the world of entrepreneurship in the field of chemistry. This helps them connect academic theory with real-world practice, helping them develop the skills necessary to succeed in the business world. The following Figure 2 shows the overview of activity and inspiring story about the entrepreneurial spirit.

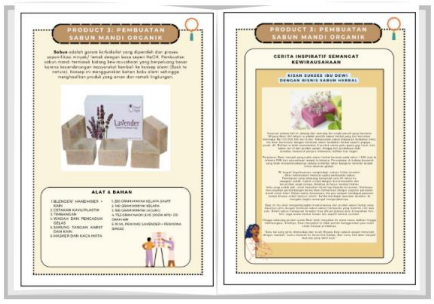


Figure 2. The overview of activity and inspiring story about the entrepreneurial spirit

Apart from that, this module is also equipped with a rubric for assessing the products produced. Product assessments allow teachers to evaluate students' entrepreneurial skills, understanding of business concepts, and chemistry skills. This helps teachers determine the extent to which students have achieved the set learning objectives. The following Figure 3 shows the overview of tasks and rubric of scoring in the module.

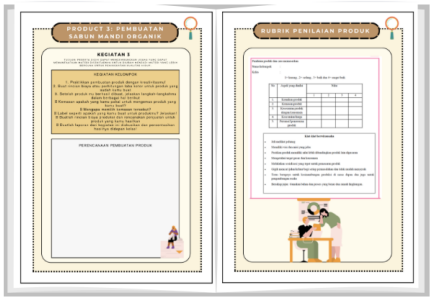


Figure 3. The overview of tasks and rubric of scoring in the module

It is hoped that this module was developed to contribute to a role in SDGs (Sustainable Development Goals) such as SDG-4 quality of education. In this case, the learning activities presented can enrich students' learning experiences. They can learn in a more practical way and get involved in projects that allow them to apply theory in practice. This can improve the quality of education by giving students the practical skills and understanding needed to succeed in the real world. Then, SDG-8, namely Decent Work and Economic Growth, can also be supported by implementing this module well with the hope that through this module students can develop important entrepreneurial skills. They can understand how to start and manage a business, which in turn can increase their chances of becoming successful entrepreneurs. So there is potential to reduce the number of unemployed with secondary school education because they already have the provisions. If this is implemented well, it will have an impact on economic growth.

Results & Discussion

The entrepreneurial chemistry module was developed to be a solution in improving the quality of chemistry learning which has an impact on students' entrepreneurial interests. This module was validated by experts so that it was obtained as shown in Table 1.

Table 1: Validation Results of Entrepreneurial Chemistry Module

Aspect	Validation Result	
	Percentage (%)	Category
Self-instruction	92.50	Very Valid
Self-contained	95.83	Very Valid
Self-learning	95.83	Very Valid
Adaptability	95.83	Very Valid
User-friendliness	88.33	Very Valid
Chem-Entrepreneurship	100	Very Valid
Pedagogical	91.67	Very Valid
Visuality	83.14	Valid
Average	**92.89**	**Very Valid**

Based on Table 1, it shows the percentage result of 92.89 with the very valid category. There are eight aspects assessed namely self-instruction, self-contained, self-learning, adaptability, user-friendliness, chemical-entrepreneurship, pedagogical and visuality which show valid category.

1) Self-Instruction
   Based on Table 1, this module is valid in terms of the self-instruction aspect. This means module designed for independent learning allow students to learn at their own pace and at a time of their choosing. This can increase flexibility in education and help students who have different learning styles.
2) Self-Contained
   In the self-contained aspect, this module is also valid in that the module is independent in terms of material allowing students to gain a comprehensive understanding of the topic of chemical entrepreneurship without the need to look for additional references. This can improve learning efficiency.
3) Self-Learning
   Furthermore, this module is also valid in terms of self-learning. This means that this module has the potential to support independent learning and can help students develop independent learning skills that are important in chemical entrepreneurship. They can learn how to search for information, evaluate sources, and take initiative in the learning process.
4) Adaptability
   This module is also very valid with a percentage of 95.83 in the adaptability aspect, meaning that the module can be adapted or adapted to student needs or the latest developments in the chemical industry will be more relevant. This allows students to stay current with changes in the world of chemical entrepreneurship.
5) User Friendly
   In terms of user-friendliness, this module is also very valid (percentage of 88.33). If the module is user-friendly, it will improve the student's learning experience. They will find it easier to navigate modules, access materials, and follow instructions, which in turn can increase learning effectiveness.
6) Chem-Entrepreneurship
   Based on assessments from experts, all experts agree that the module developed contains a chem-entrepreneurship aspect with a percentage of 100. The focus on chemical entrepreneurship in the module will prepare students with relevant knowledge and skills for the chemical industry. This can increase their chances of success in the chemical business or a related career.
7) Pedagogical
   From a pedagogical perspective, the module developed is also very valid. This means that module designed with pedagogical principles are good and have the potential to help students understand the material better. This can increase their retention rate and understanding.

8) Visuality

The final aspect is visuality, where based on the results of validation, this module is valid in terms of this aspect. According to Ismail (2017), the use of visual elements such as diagrams, image, or illustrations in module can help students understand concepts better. Visualization can also make learning more interesting.

Overall, an entrepreneurial module designed with these aspects in mind has the potential for a significant positive impact on learning effectiveness, student preparation for chemical entrepreneurship, and adaptability to changes in the chemical industry. This module can improve the quality of education (support SDG number 4) in the context of chem-entrepreneurship and provide better benefits for students and other stakeholders. A successful product or idea can provide industry with access to graduates who have the necessary chemical entrepreneurship skills and understanding. In addition, direct experience with chemical entrepreneurship projects can provide motivation and inspiration for students to pursue careers in this field so that successful chemical businesses that emerge from the entrepreneurial module can contribute to local economic growth, create jobs, and drive innovation in the region (support SDG number 8).

Furthermore, the result of responses from students show that this module is very interesting, giving rise to their entrepreneurial spirit with a percentage of 90% (very good). Also, overall the teachers gave a positive response to the module with a percentage of 93.94% (very good). Thus, this module has the potential to attract students' interest in studying chemistry and develop students' entrepreneurial interests.

Conclusion

The Entrepreneurial Chemistry Module is valid and has the potential to develop students' interest in entrepreneurship through the views of experts. Apart from that, user responses also show very good feedback. However, there is a limitation of the module which makes future efforts to continue and improve necessary, as this module emphasizes products that apply the concept of carbon chemistry, therefore there is still a need for many other innovations such as proposing products related to the chemical industry that are more environmentally friendly. and sustainable by using other chemical principles. Furthermore, to have a greater impact on students, the future researcher can conduct a survey of the success of alumni who have used this module by highlighting the achievements of alumni who have been successful in chemical entrepreneurship so that it can provide additional inspiration and motivation for students to apply their chemical knowledge to developed in a business.

References

Dewi, C. A., & Mashami, R. A. (2019). The effect of chemo-entrepreneurship oriented inquiry module on improving students' creative thinking ability. *Journal of Turkish science education*, 16(2), 253-263.

Gladys Uzezi Jack and Dimas Jen Blessed. (2015). Promoting Entrepreneurship Opportunities through Chemistry Education A Path to the Empowerment of Nigerian Youths for Sustainable Development in the 21st Century, *International Journal of Research and Development (IJRD),* Volume II. No 1, pp. 5-15.

Ismail, M. E., Othman, H., Amiruddin, M. H., & Ariffin, A. (2017). The use of animation video in teaching to enhance the imagination and visualization of student in engineering drawing. In *IOP conference series: materials science and engineering* (Vol. 203, No. 1, p. 012023). IOP Publishing.

Javier (2023), Tingkat Pengangguran Berdasarkan Jenjang Pendidikan. https://data.tempo.co/data/1625/tingkat-pengangguran-berdasarkan-jenjang-pendidikan.

Kusuma, E., & Siadi, K. (2010). Pengembangan bahan ajar kimia berorientasi chemo-entrepreneurship untuk meningkatkan hasil belajar dan life skill mahasiswa. *Jurnal Inovasi Pendidikan Kimia*, 4(1).

Sumarti, S. S., Aris, S. R. S., & Aini, R. N. (2018). Chemoentrepreneurship with Cooperative Integrated Process Inquiry Strategy to Increase Students' Entrepreneurial Interest and Learning Motivation. *Jurnal Pendidikan IPA Indonesia*, 7(2), 172-180.

Wijayati, N., & Rengga, W. D. P. (2016). Implementation of Chemo-Entrepreneurship Teaching Approach For Improving Students' Life Skills. *Jurnal Ilmu Pendidikan*, 16(2).

Rainwater processing project for engaging students to Goal 6 SDGs: Clean Water and Sanitation

Muhammad Syamsudin Umar, Nabila Tazkiyyatul Afifah, Nur Ilmiah Sakinah, Cicilia Tiara, Aini Septiana
Universitas Pendidikan Indonesia, Bandung, Indonesia[1,2,3,4,5]
mhdsyamsudinnn544@upi.edu[1]

Highlights: This research focused on STEM-based learning design to engage students in realizing SDGs 6 Clean Water and Sanitation issues. STEM-based learning is carried out to overcome problems about water scarcity. The project was carried out by making a prototype for processing the rainwater and converting it to ready-to-use water. The results show that this project can train students to be aware of problems, carry out the design process, build technology prototypes, test and evaluate the prototypes they have made and make improvements to the prototype.

Key words: Rainwater processing; SDGs 6; STEM based Learning; Students' Engagement

Introduction

Clean water is an environmental component that is very important for the survival of humans and other living creatures. However, the current growth in the human population on earth has led to an increase in demand for the availability of clean water. In Indonesia, 30% of the population in various provinces in the last 10 years experienced difficulty accessing clean water and sanitation (Wulandhari, 2019). In certain areas, people take a long time and travel a long way every day just to get a clean water source. In some areas, clean water is an object to be sold but for poor families it can cost up to half of their monthly income (Wulandhari, 2019). Global and comprehensive attention is needed in dealing with water availability in the world today, so that it does not become a long-term disaster (Lestari *et al*., 2021).

Therefore, it is important to train students to be aware of the problem of decreasing clean water that occurs, especially when entering the dry season. The ability to solve problems is very important for students to master because problems in the future will become increasingly diverse and require integration between various scientific disciplines. One way to learn the ability to recognize and solve problems is by applying STEM learning (Kartini et al., 2021). Researchers stated that STEM-based learning is a learning model that integrates several subjects such as science, technology, engineering and mathematics (Afriana et al., 2016; Hsu & Yeh, 2019; Izzani, 2019). STEM-based learning has learning stages that are similar to problem-based learning, but STEM learning requires students to create final results in the form of products as a form of problem-solving (Widodo, 2021). According to Afriana (2016) STEM learning is able to shape creative thinking abilities and raise students' awareness of environmental care behavior. This result was caused by students' enjoyment to be actively involved and play a role in project learning (Afriana et al., 2016). In creating STEM technology products, a creative thinking process is needed so that the products made by students still meet the standards that will be achieved. The higher ability to solve problems and think creatively, the better the expected product will be too (Rusydiyah et al. , 2021).

One way to overcome clean water problems is to process the rainwater into ready-to-use water. Rainwater can be used as a clean water reserve without requiring a special water distribution system. Rainwater harvesting or collection methods can reduce dependence on general clean water supply systems such as groundwater sources. Rainwater harvesting techniques can now be developed with easy and flexible technology and can be built according to needs. As well as supporting development that is operational and maintenance friendly because it does not require workers with special skills (Rahim & Damiri, 2018). This technology can be used to train students to recognize clean water problems and then develop technology to solve these problems. Based on the description above, this research will be focusing on the STEM project learning named "Rain Water Processing" to support the SDGs program number 6 regarding Clean Water and Sanitation on the school level.

Product Description

This research was conducted in Indonesia at the high school level. This learning was developed using the STEM model that consists of a few stages, with a project theme of rain water processing. The framework used basically adopted from STEM learning steps that was developed by Widodo (2021). Further detail about the learning stages in this research can be seen on Table 1.

Table 1. STEM Model Stages for Rain Water Processing Project

STEM Model Stages	Student Activities	Teacher Activities
Problem Recognition about potential scarcity of clean water originating from groundwater	Identify the issues regarding potential scarcity of clean water and groundwater problems.	Presents issues regarding potential scarcity of clean water that is originated from groundwater, groundwater problem, and rainwater that is not utilized
Think about what technology can solve these problems	Thinking about technological designs that can be developed to overcome potential scarcity of clean waters, leads to rainwater processing	Directing forms of technology that can be developed as solutions to the problems

	prototype	
Design the rainwater processing prototype	Elaborate the ideas with their teammate to design a prototype that is expected to handle the problems, including making a blueprint about how they will build it and what tools and materials are needed to build it. Design stage ended by presentation from each team so each team will receive any suggestions regarding to their designs	Guiding the designing process to develop a prototype, giving the suggestions that are needed.
Create the rainwater processing prototype	Creating technology based on the designs that have been made and presented to the teacher and the class	Guiding the creation of the technology that has been designed
Test the rainwater processing prototype	Identify the advantages and disadvantages of the prototype being developed	Direct students to evaluate the advantages and disadvantages of the prototype that has been made
Redesign the rainwater processing prototype	Improve the rainwater processing prototype design that has been made based on test results	Guiding improvements to the designs that have been tested

Results & Discussion

At the learning stage that has been implemented, students are trained in 6 stages of learning through STEM-based learning with a rain water processing project. In the first stage of recognizing problems, students gain attention to environmental problems. Students have been able to develop a caring and empathetic attitude towards the existence of water around them. After students have succeeded in gaining experience and generating attention, students are asked to analyze the problem solving plans they have obtained and evaluate their plans. In this case, students have been able to develop their knowledge because they can analyze and evaluate the plan. Students also search for information related to clean water problems. The following is one of the solutions given by students at the problem formulation stage.

"*Rainwater can be a source of clean water that is cheap and easy to obtain. If rainwater is not managed properly it can cause disasters such as flooding. Basically, rainwater can be processed into a source of clean water for daily living needs such as bathing, defecating, washing, cooking and even consumption. Rainwater produced in an area with high rainfall can be distributed to areas that experience drought and rarely rain. Ways to utilize rainwater can be by collecting it (harvesting) and filtering it (filter) so that the resulting clean water is sufficient and hygienic, then involving the community in the production process*" *(group 1).*

The next stage is students focus on thinking about solutions that can be done to overcome the problem using engineering technology. The designs made by the participants can be seen in Figure 1 below. At this stage, students are trained to find as much information as possible about how to make a rainwater filter by considering economic, social and environmental aspects. Figure 1 shows one of the designs created by the participant group.

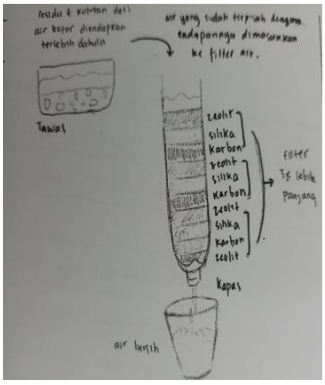


Figure 1: Technology Design Made by Students

After the designing stage, the students create the prototype with their teammate. The create stage is carried out outside of school so that students are more flexible in finding the necessary materials and also efficient in implementation time. The next stage is to test the rainwater filter technology that has been created. At this testing stage students can identify problems with the rainwater filter that has been made.

Table 2: Rainwater Filter Trial Data by Each Group

Group	Colour		Taste		Smell	
	Before	**After**	**Before**	**After**	**Before**	**After**
1	Clear to yellow	Clear	Tasteless	Tasteless	Odourless	Odourless
2	Clear to yellow	Clear	Slightly sour	Tasteless	Odourless	Odourless
3	Turbid	Clear to yellow	Slightly sour	Slightly sour	Stings	Smell of soil

Based on the trial results of the rainwater filters that have been made, some groups have been able to make water filters as expected because the water they have made has improvement in color, taste and smell if compared to the control water (a clean water that is consumable).

After students do the test for a rainwater filter, there are several suggestions from the teacher and other students to improve the design that has been created. After that, students made conclusions and improved the rainwater filter technology from the previous design. This proves that learning this project can stimulate students to think about what needs to be improved on the tools they make. So, students have the ability to evaluate their work and the work of their friends. Figure 2 shows the results of the redesign of Figure 1 which is the work of one of the participant groups.

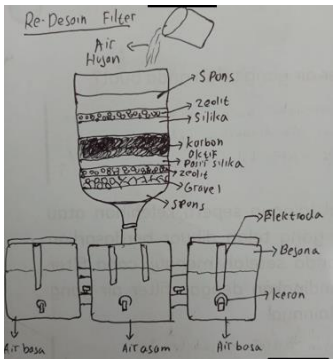


Figure 2. Redesigned Technology Design After Testing Stage

Apart from that, it is known that learning with the STEM rainwater processing project can increase students' awareness and involvement regarding clean water and sanitation as proven by the results of the interview below.

"Usually I don't pay much attention to water at home, but after studying, I know more about the importance of water. So you want to change your lifestyle to a healthy lifestyle with clean water. As much as possible, don't use too much water when in the bathroom. After learning, we became more grateful because we were given many blessings in the form of clean water. This lesson on making filters is also very useful and I will apply it in my daily life and also teach other people how to make water filters." *(MRA)*

The student initiatives will contribute to the educational process in Indonesia, emphasizing problem-solving skills. Additionally, these ongoing projects can serve as a valuable resource for addressing SDGs Goal 6, focusing on utilizing rainwater at the school level, by integrating STEM and Education for Sustainable Development (ESD). The design of STEM-based projects, particularly those centered on sustainability, holds the potential to align with the Proyek Penguatan Profil Pelajar Pancasila (P5) initiative, which supports the implementation of the Kurikulum Merdeka, the curriculum used in Indonesian education. Furthermore, this adaptable project concept can be customized to align with the educational policies of various countries and schools.

Conclusion

This research gives a good impact in the field of education in the form of variations in STEM learning with sustainable concepts. Apart from embedding student awareness and action, learning about the STEM project rain water processing also has other influences in the form of increasing students' understanding and creativity when making observations related to existing environmental problems and creating a sustainable solution. The STEM learning model can help students solve problems in everyday life by creating sustainable technology. The STEM project learning in this research requires costs in the implementation process. Therefore, it would be good for future researchers to pay attention to the tools and materials used that can be reduced or use alternative materials, remembering that not all students have a good economy and not all schools provide the required facilities.

References

Afriana, J., Permanasari, A., & Fitriani, A. (2016). Penerapan project based learning terintegrasi STEM untuk meningkatkan literasi sains siswa ditinjau dari gender. *Jurnal Inovasi Pendidikan IPA*, 2(2), 202. https://doi.org/10.21831/jipi.v2i2.8561

Hsu, Y. S., & Yeh, Y. F. (2019). Asia-pacific STEM teaching practices: From theoretical frameworks to practices. In Asia-Pacific STEM Teaching Practices: From Theoretical Frameworks to Practices. https://doi.org/10.1007/978-981-15-0768-7

Izzani, L. M. (2019). Pengaruh Model Pembelajaran STEM Terhadap Hasil Belajar Siswa Pada Materi Asam Basa di SMA Negeri 1 Baitussalam Aceh Besar. Skripsi Universitas Islam Negeri Ar-Raniry Aceh, 6(2), 96. https://doi.org/10.31764/civicus.v6i2.679

Kartini, F. S., Widodo, A., Winarno, N., & Astuti, L. (2021). Promoting Student's Problem-Solving Skills through STEM Project-Based Learning in Earth Layer and Disasters Topic. Journal of Science Learning, 4(3), 257–266. https://doi.org/10.17509/jsl.v4i3.27555

Lestari, F., Susanto, T., & Kastamto, K. (2021). Pemanenan Air Hujan Sebagai Penyediaan Air Bersih Pada Era New Normal Di Kelurahan Susunan Baru. SELAPARANG Jurnal Pengabdian Masyarakat Berkemajuan, 4(2), 427. https://doi.org/10.31764/jpmb.v4i2.4447

Rusydiyah, E. F., Indrawati, D., Jazil, S., Susilawati, & Gusniwati. (2021). Stem learning environment: Perceptions and implementation skills in prospective science teachers. *Jurnal Pendidikan IPA Indonesia*, *10*(1), 138–148. https://doi.org/10.15294/jpii.v10i1.28303

Rahim, S. E., & Damiri, N. (2018). Pemanenan Air Hujan dan Prediksi Aliran Alternatif Penyediaan Air Bersih. *Prosiding Seminar Nasional Hari Air Dunia*, 131–140.

Widodo, A. (2021). Pembelajaran Ilmu Pengetahuan Alam. In UPI Press (Vol. 53, Issue 9).

Wulandhari, A. (2019). Peranan UNICEF dalam Memulihkan dan Memperbaiki Layanan Air Bersih dan Sanitasi di Aceh. Jispo, 9(1), 367–381.

GamiKelas: elevate student motivation, interaction and engagement in hyflex teaching and learning

Abd Hadi Abd Razak & Yussalita Md. Yussop
School of Multimedia Technology and Communication, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia[1,2]
ahadiar@uum.edu.my, yussalita@uum.edu.my

Highlights: Gamification, which involves the application of game elements and principles in a non-game context, can positively impact student motivation, engagement, and learning outcomes by making learning more fun, interactive, and personalised. Although gamification has shown promise in improving the teaching and learning process, there are some weaknesses and limitations that need to be considered based on past studies, especially related to the immersion factor of student participation, and the gamification method itself. To investigate this phenomenon, the GamiKelas approach was developed, implemented, and tested. GamiKelas is a learning and teaching approach that uses gamification methods applied in the Learning Management System (LMS) by using the Moodle platform that include synchronous and asynchronous learning processes and materials. It was designed using the Mechanical, Dynamic, and Aesthetic (MDA) framework to enhance the student experience of the implemented gamification method. GamiKelas was implemented for 2 semesters concurrently involving 4 separate classes and experienced by 200 students. Contrary to previous research findings, GamiKelas has provided more insight into the factors for a successful gamification approach that can be accepted by the students. GamiKelas findings indicate that the use of game elements and principles is not just enough to ensure the success of the gamification approach, but it needs the integration of mechanical, dynamic, and aesthetic aspects for the student's immersion into the teaching and learning thus it enhanced the student's experiences and performance. By using GamiKelas students will experience a teaching and learning approach that is different from the norm, and this can motivate them to get involved and ultimately influence the achievement and effectiveness of achieving learning outcomes.

Key words: gamification; GamiKelas; HyFlex

Introduction

According to TalemntLMS (2022), student engagement is a measurement that reflects the quantity and quality of student participation in their courses and every other aspect of their educational program. In addition, it echoes the interaction and collaboration of students with students along with instructors. In other words, student engagement is a measure of a learning experience that has the potential to be successful for everyone involved. Student involvement is very important to launch the learning and teaching process, especially when classes are held, and it is an important challenge for instructors.

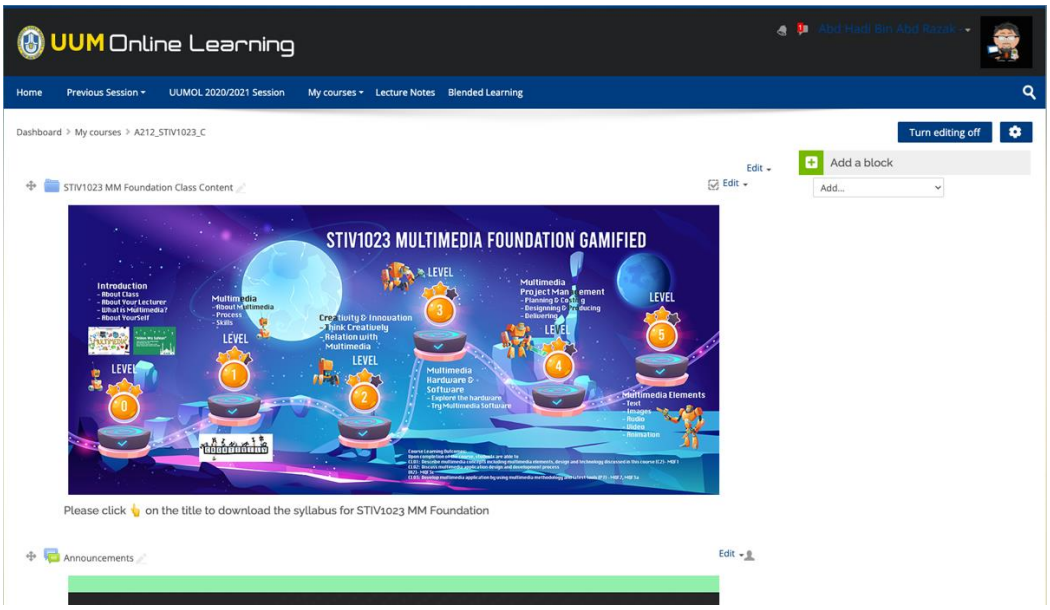


Figure 1. GamiKelas Implementation in UUM-OL (LMS)

In relation to increasing student involvement, a blended teaching and learning method known as GamiKelas has been implemented (Figure 1). GamiKelas applies gamification methods to motivate student involvement in class activities that do not give marks and are free from coercive elements. The Mechanics-Dynamics-Aesthetics (MDA) framework is used (Figure 2) to make the experience in the UUM-Online Learning (UUM-OL); a type of Learning Management System (LMS) is immersive and motivate student engagement in line with gamification methods. The reason why the MDA framework is used as a guide in developing GamiKelas is because it can be used as a tool to better understand the game elements deployed and is a method to increase motivation, achievement, and involvement in learning activities.

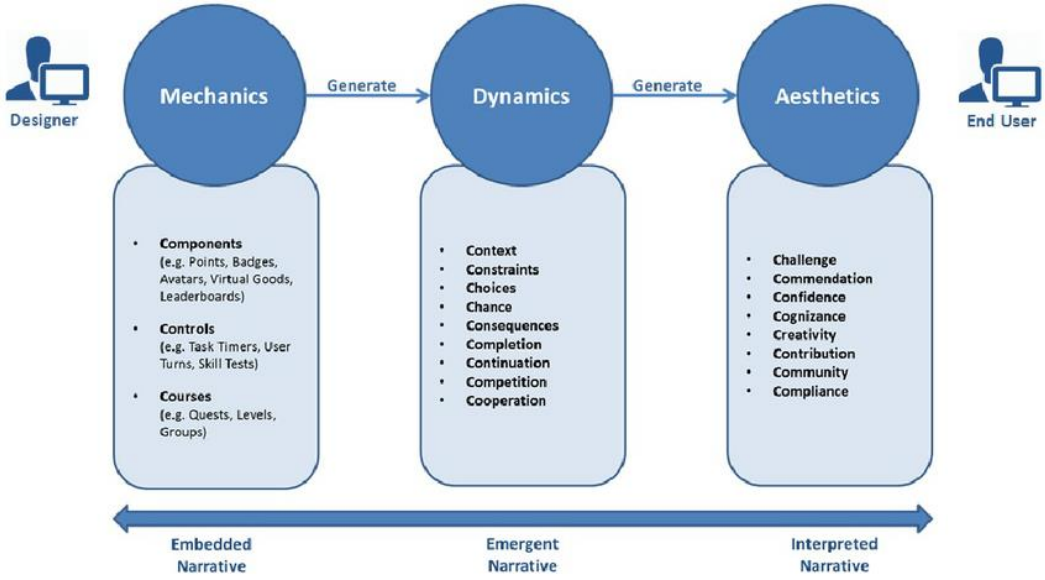


Figure 2. Components of the MDA framework for Developing GamiKelas

GamiKelas is implemented in a blended method by emphasizing student involvement during synchronous classes (face-to-face) and asynchronous class activities in UUM-OL (non-face-to-face). The use of game aesthetic elements, leaderboards, and badges play an important role in the implementation of GamiKelas. Through these elements, students will be self-motivated to do class activities and compete in a healthy way and further achieve the targeted course learning outcome (CLO). Based on the findings and feedback from students, the GamiKelas method can encourage and increase student engagement for blended classes where students voluntarily engage in activities that do not give marks and they enjoy doing them. At the end of the semester, the impact from GamiKelas can be translated into a better final result than before.

Based on the experience of teaching a class for the subject Basic Multimedia Systems (STIV1023), it was found that students do not interact with the instructor and the most important thing is that they do not carry out the teaching and learning activities that have been set in the learning management system (LMS - UUM OL) (Figure 3). These class activities do not give marks to the students, and they are the reinforcement activities for the topic learned/discussed during the face-to-face class.

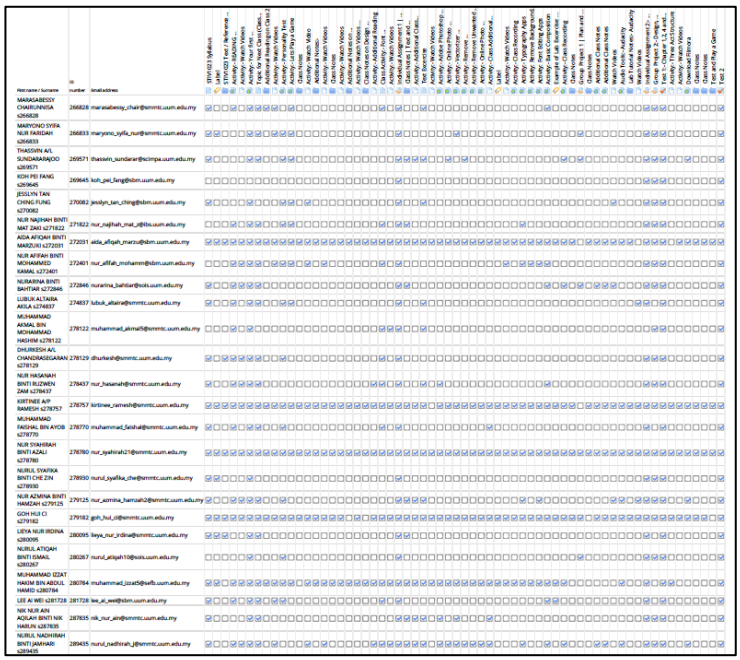


Figure 3. Section of Student Involvement in Class Activities of STIV1023 Basic Multimedia System Semester A212 in UUM-OL

Since these class activities must be done by every student as a process of strengthening teaching and learning (TnL), it is a must for them to do it without any coercion. In the 2021/2022 semester 2 session of the 29 asynchronous class activities listed in the UUM-OL, only 40% of the activities were carried out by students (Figure 3). In addition, the students' final results also justify the importance of carrying out class activities to provide excellent final results. The lack of implementation of TnL activities in the class will cause the final results of the students to be quite unimpressive. This notion is supported by Bond et al. (2020) who emphasized the importance of student involvement in class activities in ensuring that learning outcomes (LO) can be met.

Product Description

Meyer (2014), Banna et al. (2015), and Britt (2015) emphasized the importance of student engagement in learning because they believe student engagement can be used as evidence of the effort made by students which is essential for their cognitive development and the ability to create their own knowledge, leading to a high level of success for students. Gachkova etc. (2016) stated that gamification methods can increase student engagement in class especially through the learning management system (LMS). Therefore, it can be concluded that the main goal of using GamiKelas is to make the learning process interesting, motivating students, fun and enabling students to engage in the teaching and learning process without the element of coercion. The specific objectives of GamiKelas implementation are as follows:

1. Identifying gamification elements to be applied into the learning management system (UUM-OL) known as GamiKelas.
2. Applying the GamiKelas method in the classroom using the blended learning method.
3. Record student engagement and analyze test results from the implementation of GamiKelas.

Those objectives will be implemented through UUM-OL and all student engagement records will be obtained through the "Activity Completion" feature available in the UUM-OL. The effectiveness of using the GamiKelas method can further be proven by looking at the final results of the students which will be compared with the normal UUM-OL method that has been implemented in the previous semester. Based on the problem statement that has been stated, the use of the GamiKelas method is implemented to increase student involvement in class activities (UUM OL). This gamification method will cover the entire topic and focus on the implementation of the blended class for the subject STIV1023 Fundamentals of Multimedia Systems. This is in line with the findings of previous studies that provide a positive effect of the use of gamification to increase student engagement in class (Mohamad et al., 2019). UUM OL will be used as a class management platform that includes face-to-face classes and asynchronous class activities.

The implementation of GamiKelas is based on the Hadi Teaching Model. The model will be combined with the gamification method in UUM-OL which contains 5 items for each weekly classes. Teaching class items should be done in a physical class or in the lecture hall. The second item, which is class teaching materials such as notes and tutorials, will be uploaded to UUM OL for students to obtain. The third item is class activities such as Padlet, Flip, website resources, assignment instructions and others. Meanwhile, the fourth item is video material to help students understand the content of the topics taught that week. The last item is a brief display either in the form of a video or a reading article for the topic that will be taught in the next topic. Figure 4 shows the gamification map for each class that constitute all the elements described.

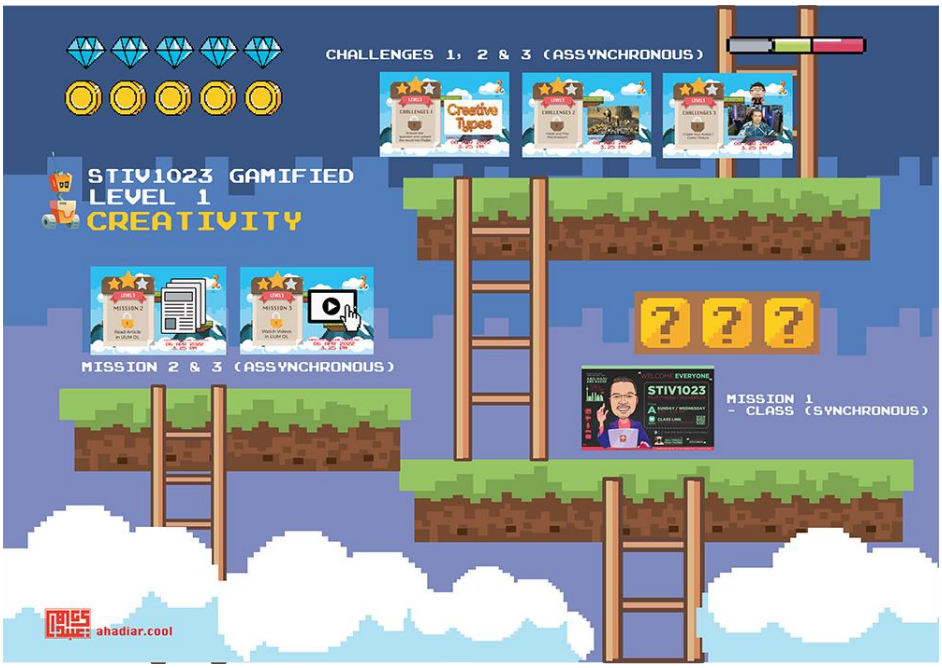


Figure 4. GamiKelas Gamification Map

Every time students press or execute these items, the UUM-OL system will record their engagement, and this will be used as data for gamification methods regarding their engagement. For each class, the activities will be visualized like game levels where there are missions and challenges that need to be executed. No marks are given except for individual and group assignments that have been set. Students will perform these activities and their participation will be recorded to produce a leaderboard. Students who have completed the activities will be given badges for motivational purposes and this leader board will be displayed in UUM-OL for all to see. Students are expected to be individually motivated to carry out the next activity. At the end of the semester, students will be asked to provide feedback in the form of a video recording along with answering questionnaires to get feedback on the GamiKelas method that has been followed.

Results & Discussion

Through GamiKelas implementation, an increase in "Activity Completion" from the UUM-OL LMS has occurred with 95% of activities being implemented by students in the A221 semester after GamiKelas was implemented. Figure 5 shows almost all the activities in the UUM-OL LMS have been carried out by students. This proves that GamiKelas has an impact on teaching and learning and further will affect the student overall performance in assignments and examination.

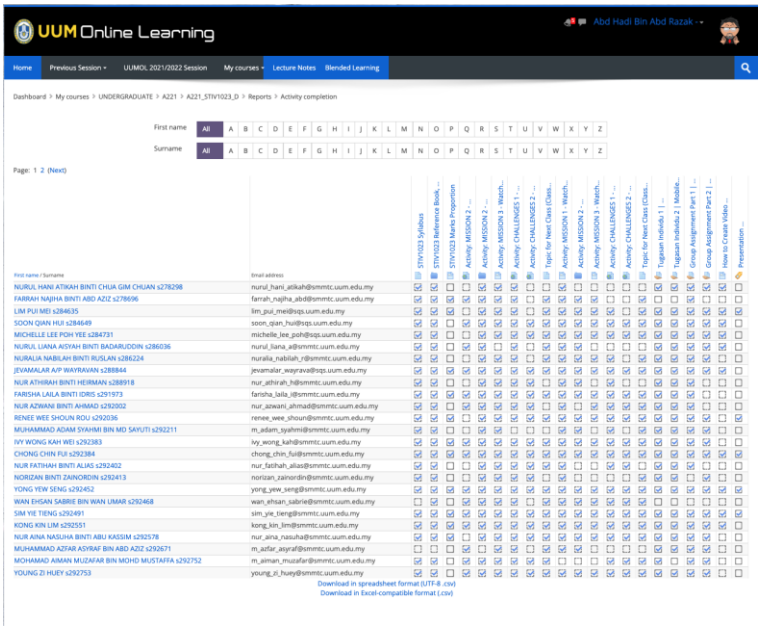


Figure 5. Section of Student Involvement in Class Activities of STIV1023 Basic Multimedia System Semester A221 in UUM-OL

In addition, this approach has motivated students to follow blended classes by performing asynchronous activities voluntarily and this improves their knowledge and understanding of the topics that have been discussed in class. A very significant effect can be seen with the increase in final exam results where this final exam has been mapped directly to achieve CLO 1 that has been set. CLO 1 for the course is: Identify multimedia concepts including multimedia elements, design and technology discussed in this course. (C2)-MQF1 which involves LOC 1 and 2 has been successfully achieved through GamiKelas through the difference in final course results from semester A212 with semester A221 as in Figure 6.

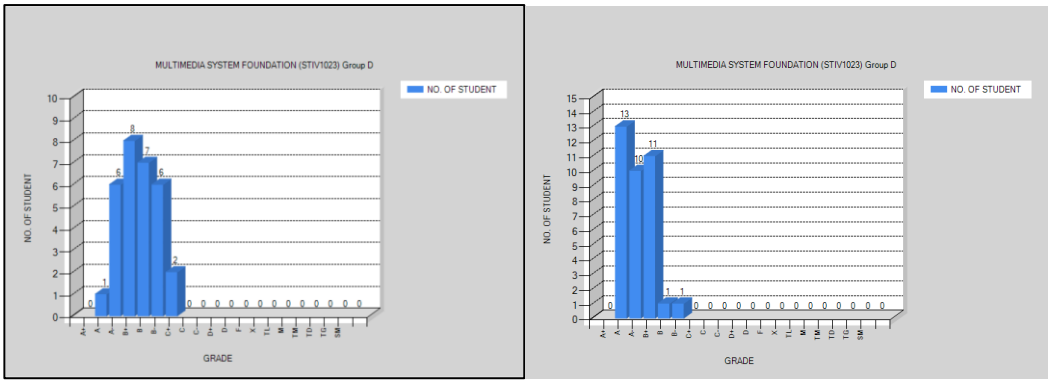


Figure 6. Before And After GamiKelas:- Final Result of Subject STIV1023 Fundamentals of Multimedia Systems Semester A212 VS A221

From the two student achievement graphs for semester A212 (without GamiKelas) and semester A221 (with GamiKelas) have shown a significant difference in the improvement of student grade achievement. This proves that the effectiveness of GamiKelas in motivating students to do blended class teaching and learning activities. As explained in the previous section, the approach of GamiKelas is to motivate student involvement in teaching and learning activities. Through GamiKelas, students can perform activities without coercion and encourage them to do these activities voluntarily and enjoy. Their involvement has been recorded through UUM-OL and overall, students have shown a change in attitude to do the activities even though no marks are provided in line with the purpose of gamification which can encourage and motivate students voluntarily. Figure 7 shows student comments taken from the e-CEVAS course evaluation system that express their views on the GamiKelas method.

COMMENT

Term : A212

Course :STIV1023

Group :C

NO	COMMENT
1	Overall, i love all the lessons.
2	Overall, it was a good experience.
3	Overall, this lecturer is good. Willing to explain to students patiently about everything. But something need to make some adjustment is the time management of the class. Maybe can straight to the point and point out something important might be useful to the student and reduce some unwanted information in the class. In conclusion this lecturer is very nice.
4	overallisgood
5	P&P yang sangat menarik dan kumpulan tugasan juga memberika kerjasama yang baik
6	Pengalaman semasa mempelajari multimedia sangat menarik. Saya telah mempelajari pelbagai aplikasi untuk digunakan bagi membantu menyelesaikan tugasan saya dan sebagainya.
7	Pensyarah menyampaikan topik pembelajaran dengan sangat menarik dan membuatkan saya mudah untuk memahami dan sentiasa untuk teruja mengikuti kelas. Terdapat elemen-elemen mengejutkan dengan gimik yang bersesuaian dengan tajuk yang memberikan saya kefahaman dan mudah untuk mengingati apa yang dipelajari.
8	saya amat berpuas hati dengan kursus ini.Pengajar sentiasa membuatkan saya bersemangat untuk menghadiri kelas.
9	saya dapat memahami pembelajaran dengan jelas dan pensyarah banyak membantu saya untuk memahami subjek ini dengan lebih mendalam. pensyarah subjek ini merupakan pensyarah paling kreatif dan sporting sepanjang saya belajar di UUM
10	Sir best!!!!!!!
11	SIR HADI IS VERY NICE LECTURER WHO CREATES A FUN LEARNING ENVIRONMENT. HE HAS BEEN VERY HELPFUL IN DOING ASSIGNMENTS AND TASKS GIVEN.
12	Subjek ini sangat best sebab sir mengajar kami dengan cara yang menarik dan unik dan membuatkan kami seronok belajar dengan sir subjek ini.. Sir juga mengajar benda yang baru bagi kami dan ianya sangat menarik. Subjek ini best dan banyak info yang kita dapat belajar dari sir .Sir memang terbaik.
13	Thank you for the beneficial lecture Sir. So fun and this lecturer is willing to help the students 24/7. So greatful and really appreciated.
14	Thank you for your dedication and teaching effort
15	The lecturer is full of experienced and love to share the ideas with students in creative way
16	The way to conduct the lecture is very creative and it is the first time to attend the physical class in such way. Overall, I like the way that lecturer taught in this course.
17	this course helped me in various problems I faced and the lecturer Sir Hadi was very helpful to me in understanding and teaching this course successfully
18	What a one of a kind lecturer that he is. Not bound by the rule of teaching that he teaches with his own way. Make use what he really capable of, showing all the characteristic that are related to the course. Of course, not everyone was able to accept a non-formal teaching way. Overall, it is a fun class to have with this lecturer and even though assignments was not same as the usual but it is related to the subject, all about applying the skills that he teach.

Figure 7. Students Feedback/Comment on the GamiKelas Implementation

Conclusion

In conclusion, the application of gamification in education has shown its potential to significantly increase student motivation, engagement and learning outcomes by inserting elements of fun, interactivity, and personalization into the learning process. While previous studies hint at the promise of gamification, the development and implementation of the GamiKelas approach sheds new light on the key factors required for its success. Simply including the elements and principles of the game is not enough; on the other hand, the integration of mechanical, dynamic, and aesthetic aspects is essential to achieve student involvement in the teaching and learning experience. GamiKelas, a learning and teaching approach that uses gamification methods in the Learning Management System, appears as a valuable tool in this regard. Through its implementation and subsequent findings, it turns out that this approach not

only deviates from traditional teaching methods but also offers a unique and immersive learning experience to students. This uniqueness, in turn, serves as a strong motivator for student engagement, ultimately influencing their performance and the effectiveness of achieving learning outcomes. In essence, GamiKelas highlights the importance of a holistic approach to gamification, where the synergy of mechanical, dynamic, and aesthetic elements plays an important role in creating a truly engaging and effective learning environment. As we continue to explore innovative approaches to education, GamiKelas and similar methodologies provide valuable insight into the potential of gamification to revolutionize the way we teach and learn, offering a promising path towards more motivated and successful students.

Publication, Award and Intellectual Property

For the year 2023, GamiKelas has received recognition from the International Teaching Enhancement & Learning Innovation Carnival (ITeLiC) 2023 organized by Universiti Malaysia Kelantan (UMK) where GamiKelas has received the GOLD Medal for the LMS/eCampus Innovation category and successfully received the "Best Award" for the competition. In addition, GamiKelas has successfully entered the pitching phase (final stage) for the Innovative Teaching Award (ITA) 2023 for the Blended Immersive Learning Experience category organized at the Universiti Utara Malaysia (UUM) level. GamiKelas will also represent UUM for the International University Carnival on E-Learning (IUCEL) 2023 competition organized by Universiti Malaysia Pahang (UMP) on 25-26 September 2023 and will also compete in the Special Award of YB Minister of Education Malaysia (AKRI) 2023. This GamiKelas has also been registered to get 2 "Intellectual Property" (IP) from MyIPO and this process is waiting for approval.

References

Adham, Mohd. (2022). Gamification and MDA Framework in Game Design.

Ariani, D. (2020). Gamifikasi Untuk Pembelajaran. Jurnal Pembelajaran Inovatif, 3(2), 144–149. https://doi.org/10.21009/jpi.032.09.

Banna, J., Lin, M.-F. G., Stewart, M., & Fialkowski, M. K. (2015). Interaction matters: Strategies to promote engaged learning in an online introductory nutrition course. Journal of Online Learning and Teaching, 11(2), 249–261.

Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and Educational Technology in higher education: A systematic evidence map. International Journal of Educational Technology in Higher Education, 17(1). https://doi.org/10.1186/s41239-019-0176-8.

Britt, M. (2015). How to better engage online students with online strategies. College Student Journal, 49(3), 399–404.

Gachkova, Mariya & Somova, Elena. (2016). Game-based approach in E-learning.

Meyer, K. A. (2014). Student engagement in online learning: What works and why. ASHEHigher Education Report, 40(6), 1–114. doi:10.1002/aehe.20018.

What is learner engagement? A modern definition for 2018. TalentLMS. (n.d.). Retrieved April 12, 2022, from https://www.talentlms.com/ebook/learner-engagement/definition.

The strengths, weaknesses, opportunities, and threats analysis of implementing STEAM education in Makassar City

Nurfitriah Ramdhani, Nurul Khatimah Syahid, Fadliyah Zahrah, Masyta Nurfadya, Nur Aqidah Hafid, Muhammad Ammar Naufal

The State University of Makassar, Makassar, Indonesia[1,2,3,4,5,6]

nurfitriahramdhani71@gmail.com, nurullkhatimaah@gmail.com, fadliyah.zahrah07@gmail.com, masytanf19@gmail.com, nuraqidahafid33@gmail.com, ammar.naufal@unm.ac.id

Highlights: This study aims to provide the strengths, weaknesses, opportunities, and threats (SWOT) of STEAM education. This study used a survey method. The population consisted of teachers in Makassar at the elementary school level. This study involved 379 teachers using simple random sampling. The data analysis technique is quantitative-descriptive. The result showed that using the SWOT analysis and IFAS-EFAS, the SO strategy had the highest score of 4.27. Additionally, the WO, ST, and WT strategies received consecutive scores of 3.25, 2.71, and 1.69, respectively. These findings suggest that STEAM education in Makassar is in the growth stage.

Key words: SWOT Analysis; Implementation; STEAM Education

Introduction

The 21st century learning strategy demands that the learning syntax prioritizes the needs of students (Poluakan & Katuuk, 2021). Learning is expected so that students are able to develop cooperation, problem solving, creativity and innovation skills so that they can contribute to solving problems in the real world (Mulyani, 2019). STEAM education is a concept of collaboration between knowledge (*science*) and skills (*technology*) to design a method (*engineering*) based on mathematical data calculations (*mathematics*) with design thinking and creativity (*art*) in order to obtain a solution (Hadinugrahaningsih et al., 2017).

The implementation of STEAM in the learning process in schools is expected to increase pedagogical competence in mastering the concepts of learning material in order to accelerate the era of digitalization in the education sector (Metaphysics & Pangastuti, 2020). Teachers use teaching methods that can enhance the implementation of knowledge, skills, and values in various disciplines (Othman & et al., 2021). STEAM education is very relevant to the independent curriculum, the main characteristics of which include teacher flexibility and focus on essential material (Fahlevi, 2022).

In order to spread the positive impact of STEAM education, the Indonesian government has made various efforts in the form of outreach, teacher training and government programs. However, the implementation of STEAM in schools is still very low. The results of a survey conducted by Ramlawati and Yunus (2021) on 167 science teachers spread across Makassar City showed that 93% of teachers were familiar with the term STEAM, nevertheless only 40% of them had ever implemented STEAM learning in the classroom. Furthermore, the results of the survey revealed that 50% of teachers still had difficulty implementing the STEAM education in the learning study. According to Mabsutsah & Yushardi (2022), revealed that teachers face difficulties in STEAM education due to time constraints and inadequate teacher expertise.

Research related to the implementation of STEAM learning has been carried out at several elementary school levels in Makassar City, such as SD Pertiwi Makassar (Nasrah, Amir, & Purwanti, 2021), SD-IT Wahdah Islamiyah 01 (Zubair, 2021), and SD Telkom Makassar (Redaksi, 2021). In practice, these three elementary schools showed a positive response to STEAM learning. In research conducted by Nasrah, Amir, and Purwanti (2021) at SD Pertiwi Makassar, it was revealed that there was a very significant difference in the mean scores of students before and after they were taught with STEAM learning, namely 31.25 and 84.18. This again confirms the good impact of integrating STEAM on student learning outcomes.

STEAM education provides opportunities for students to observe problems or design processes from various points of view or perspectives that can be used in real-world situations (Betrand & Namukasa, 2020). Unfortunately, facts in the field indicate that there are obstacles in implementing it because some previous research still focuses on student learning achievement only (Nasrah, Amir, & Purwanti, 2021; Zubair, 2021; Redaksi, 2021). Until now, there are still few studies that have been carried out in analyzing the implementation of STEAM learning regarding the potential SWOT of the STEAM learning process at the elementary school level, especially in Makassar City. To date, instead, little research has been conducted to analyze the implementation of STEAM learning regarding the potential SWOT of the STEAM learning process at the elementary school level, especially in Makassar City. In fact, the government has signaled the massive implementation of this learning. Therefore, the purpose of the study is to provide an overview that can become a benchmark regarding the implementation of STEAM learning in schools so that it can be implemented well in the future.

Product Description

The results of the SWOT analysis related to the implementation of STEAM can help the government improve the quality of education, and help educators identify what they can improve from the previous learning process. Apart from

that, this research will also produce several recommendations for study material which can become a reference for further research related to improving the quality of STEAM education implementation in Makassar City.

Result and Discussion

This research examines four variables, namely strengths, weaknesses, opportunities and threats in the implementation of STEAM education in Makassar City, which are measured using teacher perception questionnaires to elementary school teachers in the Makassar City. The population in this study was 7,340 elementary school teachers (Kemendikbud, 2022) in Makassar City and a sample of 379 teachers was obtained using a simple random sampling technique using the Slovin formula to estimate an accurate and representative sample size of the population (Susanto, 2021). The results of the data were then analyzed using the IFAS and EFAS, where internal factors and external factors were coded first.

The statements contained in the internal and external factors are statements before calculating the data validity and reliability tests. Internal factors consist of strengths, which consist of five statements with codes S1, S2, S3, S4, and S5. Furthermore, in the internal factors there are also weaknesses, which consist of four statements with codes W1, W2, W3, and W4. Meanwhile, external factors are divided into opportunities, which consist of three statements with codes O1, O2, and O3, and threats, which only have one statement with code T1.

Validity and Reliability Test

After coding the internal and external factors of the STEAM learning implementation, validity and reliability tests were then carried out. As for the research sample, there were 104 teachers who had implemented STEAM learning, the r table value was 0.195. The model used in this test is Cronbach's Alpha which shows directly the results of the validity and reliability of a questionnaire used in study (Murniati & Palupi, 2013). The higher the Cronbach's Alpha value, the more reliable and the indicator is said to be valid if the Cronbach Alpha Value if Item Deleted < Cronbach Alpha. The following are the results of reliability and validity calculations:

1. Validity Test

A question item is declared valid if r count > r table, then the summary of the validity test results of the Corrected Item-Total Correlation variable. The SPSS output results show that the value of r count > r table, therefore all statement items are declared valid.

2. Reliability Test

The Cronbach's Alpha SPSS output results were obtained at .749 or 74.9%. According to Nunnally's criteria, if the Cronbach's Alpha value is greater than 60%, then the questionnaire or indicator is declared reliable. Thus, the table above shows that the Cronbach's Alpha value of 74.9% > 60% is declared reliable.

Data analysis

a. Weight Calculation

1) Calculation of Internal Factor Weights

Internal factors originating from within the STEAM learning environment in the form of strengths and weaknesses are then calculated based on the level of importance or treatment starting from a scale of 0.00 (not important) to 1.00 (very important) and where the weights are added up and do not exceed the total score. 1.00. The calculation results show that the strength weight in statements S1 and S5 is 0.13, while in statements S2, S3, and S4 is 0.12. That way, the total weight for strength is 0.62. On the other hand, the weakness weight in the W1 statement is worth 0.08, W2 is worth 0.09, W3 is worth 0.11, and W4 is worth 0.10. Thus, the total weight of weakness is 0.38. Therefore, the total internal factor is obtained at 1.00.

2) Calculation of External Factor Weights

The process of calculating external factors is the same as calculating internal factors. From the calculation results, the probability weight for statement O1 is 0.26, while statements O2 and O3 have the same weight, namely 0.25. Thus, the total probability weight is 0.76. Meanwhile, the threat calculation only has one T1 statement with a weight of 0.24. Therefore, the total threat weight is equal to 0.24. This results in a total external factor obtained of 1.00.

b. Calculation of Weight and Rating Martices

In calculating the Internal Strategic Factors Analysis Summary (IFAS) Matrix and the External Strategic Factors Analysis Summary (EFAS) Matrix, the first step is to determine the weight and rating for each factor. Ratings are given on a scale from 4 (high) to 1 (low) for each factor to be evaluated. This assessment is very important to determine the Internal Strategic Factors Analysis Summary (IFAS) and External Strategic Factors Analysis Summary (EFAS). After the rating value has been calculated, the next step is to multiply the weight by the rating for each factor.

The calculation results show that in the IFAS matrix, the score for strengths is 1.99 and the score for weaknesses is 0.97. Therefore, the total score for the internal factor is 2.96. Meanwhile, in EFAS matrix, the score for opportunities is 2.28 and the score for threats is 0.72. This results in a total score for external factors of 3.00. The results of the weight and rating calculations in the IFAS and EFAS matrices will be used to produce a Cartesian diagram which will assist in further strategic analysis.

SWOT Analysis Diagram

After identifying the results of internal factors and external factors, they were then created into a SWOT analysis Cartesian diagram in Figure 1 which was obtained from the IFAS and EFAS matrices. From the calculation results, the values obtained for the coordinate points are (0.51; 0.78).

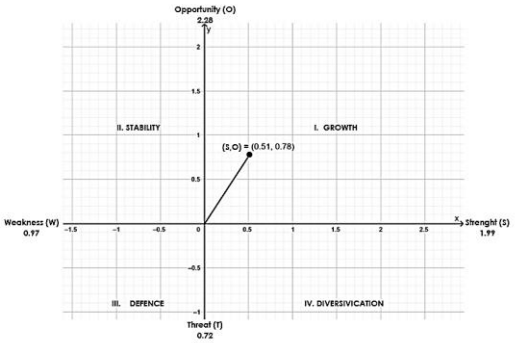


Figure 1. SWOT Analysis Cartesian Diagram

From the Cartesian diagram, it can be concluded that the implementation of STEAM learning in Makassar City is currently in the "*growth*" stage. This means that STEAM learning will likely continue to grow if its opportunities are used well, especially with the support of government-backed innovations, such as the training programs they provide. In addition, the integration of STEAM education into the Merdeka Curriculum in Indonesia is openly a positive step, and the hope is that the government will continue to provide financial assistance to advance the implementation of STEAM in Indonesia, especially in Makassar City.

SWOT Matrix

The total value of the IFAS and EFAS matrices is depicted in the SWOT analysis diagram as well as the SWOT matrix combination formula, after obtaining the results of formulating alternative combinations of SO, ST, WO and WT strategies from the internal and external environment. The formulation of alternative strategies is an alternative used to evaluate the strengths, weaknesses, opportunities and threats of implementing STEAM learning in Makassar City. The following are the results of a combination of internal and external factors.

Table 1. SWOT Matrix Strategy Combination

EFAS \ **IFAS**	**Strength (S)**	**Weakness (W)**
	S1. Students develop critical thinking skills through STEAM education. S2. Students are able to improve their ability to identify and analyze problems. S3. Students experience progress in understanding the material after teachers apply STEAM in education. S4. Student learning outcomes can improve when STEAM is applied in the classroom. S5. Professional teachers are able to improve pedagogical competence through STEAM education at school.	W1. Teachers are not sure about what STEAM actually is so it is difficult for them to teach students with this learning W2. Teachers need a long time to prepare teaching materials that are suitable for STEAM education. W3. Teachers need to allocate quite a lot of time to align and connect the concepts of STEAM. W4. Lack of learning support tools that can help teachers apply STEAM in the classroom.
Opportunity (O) Q1 The Merdeka Curriculum is very relevant to STEAM education which involves collaboration from 5 scientific disciplines by	a. Utilizing critical thinking and problem analysis skills from STEAM learning to support an inclusive Merdeka Curriculum. (S1, S2, O1) b. Utilize teachers trained (motivating teachers) in STEAM	a. Train teachers intensively in STEAM concepts to overcome mistrust and increase their readiness in developing appropriate learning materials. (W1, O2)

facilitating student learning in the classroom. Q2 Teachers are active in participating in STEAM education training. Q3 BOS funds are used to support complete school facilities.	to become mentors for other teachers in integrating STEAM learning effectively in schools. (S5, O2) c. Using improved student learning outcomes through STEAM as a basis for obtaining BOS funds to improve educational facilities that support more effective STEAM learning. (S4, O3)	b. Allocate BOS funds to improve STEAM learning resources and tools, including software, laboratory equipment and readily available teaching materials, to reduce teacher preparation time. (W2, W3, W4, O3) c. Using collaboration between teachers in developing STEAM teaching materials according to the Independent Curriculum to better align STEAM concepts. (W1, O1)
Threats (T) T1. Outer schools first develop quality learning that focuses on STEAM.	a. Explain the STEAM program in schools with a focus on the critical thinking skills of students and teachers, thereby creating a competitive advantage for schools in Makassar. (S1, S2, S5, T1) b. Continue teacher training to remain competent in implementing an effective STEAM approach. (S5, T1)	a. Collaborating with external schools that are experienced in STEAM to exchange experiences, resources and teacher training to follow developments in STEAM education. (W1, T1)

After carrying out the SWOT matrix, then create a quantitative model analysis as a basis for the total score values for each factor in each SO, WO, ST and WT strategy. The calculation results show that the implementation of STEAM education needs to utilize the SO strategy which has the highest score of 4.27, followed by the WO, ST, WT strategies respectively with scores of 3.25, 2.71, and 1.69.

Conclusion

Based on the SWOT analysis results, it was determined that STEAM education implementation in Makassar City was in the "growth" stage and had the highest score on the SO strategy, namely 4.27. This demonstrates that the implementation of STEAM education in Makassar City had a positive impact on increasing human resource productivity by utilizing strengths to capitalize on opportunities to enhance STEAM education, and the government can provide recommendations that can serve as a benchmark for future STEAM education in Makassar City.

References

Betrand, M. G. & Namukasa, I. K. (2020). STEAM education: student learning and transferable skills. *Journal of Research in Innovative Teaching & Learning,* 13(1), pp. 43-56.

Fahlevi, M. R. (2022). Upaya Pengembangan Number Sense Siswa Melalui Kurikulum Merdeka (2022). Jurnal Sustainable, 5(1), pp. 11-27.

Hadinugrahaningsih et al., 2017. Developing 21st century skills in chemistry classrooms: Opportunities and challenges of STEAM integration. *AIP Conference Proceedings,* 1868(1), p. 030008.

Kemendikbud (2022). *Data Pokok Pendidikan.* [Online] Available at: https://dapo.kemdikbud.go.id/guru/2/196000 [Accessed 24 February 2023].

Mabsutsah, N. & Yushardi (2022). Analisis Kebutuhan Guru terhadap E Module Berbasis STEAM dan Kurikulum Merdeka pada Materi Pemanasan Global. *Jurnal Pendidikan MIPA,* 12(2), pp. 205-213.

Mulyani, T. (2019). *Pendekatan Pembelajaran STEM untuk menghadapi Revolusi Industri 4.0.* Semarang, Prosica UNNES.

Murniati, Monika Palupi, dkk. (2013). Alat-Alat Pengujian Hipotesis. Semarang: Unika Soegijapranata.

Nasrah, Amir, R.H. & Purwanti, R.Y. (2021). *Efektivitas Model Pembelajaran STEAM (Science, Technology, Engineering, Art, and Mathematics) Pada Siswa Kelas IV SD.* URL: https://journal.unismuh.ac.id/index.php/jkpd/article/view/4166. Diakses tanggal 19 Maret 2022.

Othman, Z. S., Tukiman, N., Khalid, A. K. & Ahmad, N. I. S., (2021). Practicing BizMath Challenge Modul for Primary Scools based on the STREAM Curriculum. *ESTEEM Academic Journal,* Volume 17, pp. 67-76.

Poluakan, C. & Katuuk, D. (2021). PIMCA: A New Alternatives to Physics Learning Model. *Journal of Physics: Conference Series,* pp. 1-6.

Ramlawati & Yunus, S.R. 2021. Desain Pembelajaran Inovatif Berbasis Pendekatan STEM. *Prosiding Seminar Nasional Pendidikan IPA II*. 14 Agustus 2021, Makassar, Indonesia, pp.15-22.

Redaks (2021). Inovasi SD Telkom Makassar dalam Kegiatan Belajar-Mengajar di Tengah Pandemi. [Online] URL: https://koranseruya.com/inovasi-sd-telkom-makassar-dalam-kegiatan-belajar-mengajar-di-tengah-pandemi.html. Diakses tanggal 24 Februari 2023.

Zubair (2021). *Siswa SD Wahdah Belajar dengan Pendekatan STEAM.* [Online] Available at: https://sdwahdah.sch.id/siswa-sd-wahdah-belajar-dengan-pendekatan-steam/?amp=1 [Accessed 24 February 2023].

Integration design thinking in STEAM project based learning in chemistry learning for students' creative problem solving skills

Talitha Erinna
Universitas Negeri Jakarta, Jakarta, Indonesia
talithaerinnaratriharyastuti_1303619011@mhs.unj.ac.id

Highlights: The Integration of Design Thinking and STEAM Project-Based Learning can be implemented in chemistry learning. chemistry is interconnected with other fields such as physic, mathematics, biology, and engineering. This integration helps students understand multidisciplinary connections. Design thinking involves utilizing multidisciplinary to solve problem based on users' perspective. Through the integration of Design Thinking and STEAM Project -Based Learning, students can solve problem by applying multidisciplinary approaches within STEAM Project. Implementing this integration in learning can develop students' creative problem solving skills, which is an important skill in the 21st Century.

Key words: chemistry learning; design thinking models; creative problem solving skills

Introduction

Indonesian education system is currently facing complex challenges in the global era, especially challenges in preparing the quality of human resources to compete on a global era (Zahroh, 2020). The development of the era makes individuals must master the 21st century skills, significantly impact the world of education(Anazifa & Djukri, 2017). Education plays a vital role in preparing students for the future, especially developing 21st century abilities or competencies(Dishon & Gilead, 2020). The current learning process aims to make students have the ability to think critically, the ability to solve problems, be creative, innovative, and be able to communicate and collaborate well(Hobri et al., 2020).

One of the problem that occur in chemistry learning is the lack of exploration in the learning experiences that can engage student realistically, analyze problems, work in teams, apply their knowledge, and use creativity to find real-life problems (Veerasinghan et al., 2021). Teacher-centered learning is still found in Indonesia. according to the research by Firmansyah dan Jiwandono (2022), there are secondary school teachers in Cirebon region who still use a teacher-centered approach. As a result, after these learning activities, students tend to become passive and less stimulated since they only follow and implement the instruction provided by teacher. This also makes student difficult to understand the chemistry concept (Heliawati et al., 2021).

As time passes, the challenges confronting the present generation are more complex. Problems that exist in everyday life have various forms that cannot be manipulated using algorithmic formulas and require different levels of thinking to find solutions. Therefore, the ability to solve problems creatively must be possessed as a survival skill. The ability to solve problems is very important in various fields, including chemistry(Cardellini, 2006; Puccio et al., 2020; Wood, 2006).

Solving problems creatively requires extensive and deliberate cognitive processes. Someone must be able to construct a problem, find and select information that is relevant to the problem, then compile and evaluate various solutions(Mumford et al., 1991; Reiter-Palmon & Illies, 2004). It is very important for students to understand the application of their specific knowledge and enable them to come up with a creative problem solution(McCrum, 2017). So it is necessary to use a learning model that can facilitate processes for solving problems creatively (creative problem solving skills) while at the same time increasing students' understanding of the material.

The preliminary analysis for the research conducted in December 2022 at one of Senior High School in Jakarta shows that student perceived chemistry topics as abstract and difficult to understand. To address this issue, teachers implemented problem-based learning and project-based learning models, which were considered effective in increasing students' interest in learning chemistry. These models also made the learning process more contextual. By applying these models, students' critical thinking, creativity, and collaboration skills were developed. However, it was observed that students' creative problem solving skills had not fully developed. This was because the problems presented in the learning process were mostly related only to chemistry topics, and did not sufficiently stimulate students to provide a variety of creative solutions.

Implementing the integration of design thinking model and STEAM Project-Based Learning in chemistry learning is considered to be able to develop students' creative problem solving skills. Students can solve the problem creatively by applying their multidisciplinary understanding.

Product Description

The learning process that combines the integration of design thinking model and STEAM project-based learning consist of 5 stages of design thinking according to Kelley and Brown (2018); empathy, define, ideate, prototype, and test. In the prototype stage, students are tasked with working on a project with the STEAM approach, creating a design or prototype of a product as a solution for a specific problem. Explanation of each stage are detailed below:

1. Empathy: this is the first stage in the design thinking process. This stage is a process to understand the situation and problems experience from the users' perspective. Student activities during this stage include observing a video, creating an interview script and conducting interviews to gain a deep understanding of the situation and the problem.

2. Define: In this stage, the information and data obtained during the empathy stage are analyzed and categorized. Students determine the focus of the problem and create a design statement.
3. Idetae; in this stage, students brainstorm and generate wide range of ideas to solve the problem. the brainstorming techniques used in this stage is braindrawing and mind mapping. Braindrawing is a brainstorming method that is used to generate ideas by illustrating these ideas in the form of designs, icons, a layout or other visual concepts.(Wilson, 2013). Mind mapping i a visual representation of an idea and the relationship between each of these ideas (Biktimirov & Nilson, 2006).
4. Prototype: the prototype will be made as a visualization of the idea which is the solution of the problem. in this learning student only make a design of their product as a solution of the problem.
5. Test: in this stage, student will present their prototype and get feedback from users and their friends.

Prototype created by students in project using a STEAM (Science, Technology, Engineering, Arts, and Mathematics) approach. During the learning process, students involve their multidisciplinary understanding to solve the problem. the aspects of STEAM in the project are detailed below:

1. Science aspect: students apply chemistry concept to create a solution
2. Technology aspect: students use technology to understand problems, design the prototype, and present their prototype.
3. Engineering aspect: students design a product that serves as a solution for the problem
4. Art: students design a product for solving the problem in various types and models
5. Mathematics aspect: students calculate products' dimensions and determine the required composition quantity

Results & Discussion

The integration of design thinking and STEAM project-based learning was implemented in rate reaction topic and nanotechnology topic. The research result indicates that the implementation in nanotechnology topic can develop students' creative problem solving skills. Four indicators for creative problem solving skills are assessed during the design thinking process. The indicators and aspect assessed in the design thinking process are detailed below:

Table 1 indicators and the aspect of creative problem solving skills

Design Thinking Stage	Indicator	Aspect
Empathy	Fact finding	Fluency, flexibility
Define	Problem finding	Fluency, elaboration, flexibility, originality
Ideate	Idea finding	flexibility, originality, usefulness
Prototype	Solution finding	elaboration, flexibility, originality, usefulness

In the process of nanotechnology learning, students are tasked with comprehending the issue of global warming through video and conducting interviews in the empathy stage. The information gained from empathy stage are categorized in the define stage to make a design statement. in ideate stage, students engage in brainstorming during the ideate stage to generate ideas to solve the problem. During this stage, students generate various ideas. The solutions proposed by students must involve the application of nanotechnology. Examples of solutions from students include electric cars, nanobiocomposite plastics, nano fertilizers, soap with nano silver, and seed production utilizing nanotechnology. In the prototype stage, students are tasked to visualizing their ideas and then present the prototype in the test stage. student will get feedback from other students as a users. STEAM Project is created in prototype stage. Students apply their chemistry concept about nanotechnology (science aspect), students use technology to gain information about global warming and present the prototype (technology aspect), students design their solution use their creativity (art aspect), students calculate products' dimensions and the required composition of their product (mathematics aspect). Students are using multidisciplinary knowledge to solve the problem during the learning process. its makes student understand nanotechnology topics before applying to make a prototype. The learning process also help student to understand about nanotechnology as shown from students 16A reflective journal.

It's much easier to understand nanotechnology material by making prototypes because there we write, we read, we search, we do everything that makes us understand about nanotechnology, there are many ways to learn by making prototypes"

(student 16A , Reflective Journal, 31 January 2023)

By making prototype, students enable to build a better understanding of the solution in concrete terms. The learning activities engage student to active that rains students to understand learning materials. The learning process also help student to develop their creative problem solving skills as shown from students 1A interview

"The ability to solve problems increases in everyday life because when we learn about nanotechnology it can solve problems in the natural environment, for example pollution. our awareness also increases, especially since there are too many pollution problems in Indonesia, so we are motivated to solve problems"

(student 1A, interview 14 February 2023)

Given task develop processing skills such as finding and analyzing data, choosing the right method, suitability of criteria, as well as discussion and presentation skills. Its also motivated student to creatively solve the problem by using nanotechnology. Here is an example of students prototype

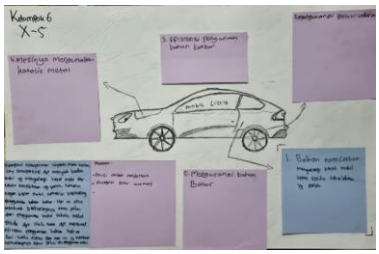


Figure 1 students' prototype

After the implementation, students are tested using learning assessment instrument consist of 7 question. The question compiled based on creative problem solving indicators and indicator of learning outcomes from Merdeka curriculum. The test result shows that students can identify facts and problem from various perspective and analyze the problems concretely and critically. Based on the identified problems, students can determine unique ideas and solutions by considering various perspectives. Here is the diagram of students creative problem solving score:

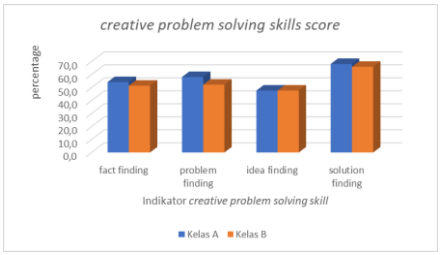


Figure 1 Students' Creative Problem Solving Skilss Score

Students' creative problem solving skills are in the adequate to high category based on creative problem solving skills rubric developed by Chen (2021) and creative problem solving skills categorization by Diani (2019). the test result from both classes indicate that students have a good creative problem-solving skills. However, class A achieved higher scores because the brainstorming techniques used in class A, which is braindrawing, was more effective than mind mapping technique used in Class B. Thus, it can be concluded that brainstorming techniques affect students' creative problem solving skills

The result indicates that the integration of design thinking models and STEAM project-based learning can develop students' creative problem solving skills in chemistry learning at secondary level, especially in senior high school.

Conclusion

Integration of Design Thinking and STEAM Project-Based Learning can develop students' creative problem solving skills. Through the implementation in learning, student can understand the subject matter and its application in solving problem. Based on the research results, students' creative problem solving skills were on average in the adequate to high category. Student can identify facts and problem from various perspective and analyze the problems concretely and critically. Based on the identified problems, students can determine unique ideas and solutions by considering various perspectives. The brainstorming technique in design thinking stage affect students' creative problem solving. Braindrawing technique more effective than mind mapping technique. This integration can be implemented in learning materials that can produce product and related to the application in daily life. Students must be stimulated to be able to see and associate a chemical concept in several aspects such as industry, economy, agriculture, and environment.

Furthermore, research can be conducted regarding brainstorming techniques that are suitable for students' needs and more effective to enhance students' creative problem solving skills. Student can develop the prototype to a real product. If the product can be commercialized, students can also learn about entrepreneurship. This integration can be applied to students' final project especially in chemistry learning and P5 (Projek Penguatan Profil Pelajar Pancasila) project in the Merdeka curriculum in Indonesia.

References

Anazifa, R. D., & Djukri, D. (2017). Project-Based Learning and Problem-Based Learning: Are They Effective to Improve Student's Thinking Skills? *Jurnal Pendidikan IPA Indonesia*, *6*(2), 346–355.

Bang, D., Park, J., Song, J., & Kang, S. (2011). The development of teaching strategy for the enhancement of the creative problem solving thinking skills through general chemistry laboratory and the effects of it's applications(I). *Journal of the Korean Chemical Society*, *55*(2), 290–303. https://doi.org/10.5012/jkcs.2011.55.2.290

Biktimirov, E. N., & Nilson, L. B. (2006). Show them the money: Using mind mapping in the introductory finance course. *Journal of Financial Education*, 72–86.

Cardellini, L. (2006). Fostering creative problem solving in chemistry through group work. *Chemistry Education Research and Practice*, *7*(2), 131–140. https://doi.org/10.1039/B5RP90019K

Chen, S. Y., Tsai, J. C., Liu, S. Y., & Chang, C. Y. (2021). The effect of a scientific board game on improving creative problem solving skills. *Thinking Skills and Creativity*, *41*(June), 100921. https://doi.org/10.1016/j.tsc.2021.100921

DeHaan, R. L. (2009). Teaching creativity and inventive problem solving in science. *CBE—Life Sciences Education*, *8*(3), 172–181.

Diani, R., Herliantari, H., Irwandani, I., Saregar, A., & Umam, R. (2019). Search, Solve, Create, and Share (SSCS) Learning Model: The Impact on the Students Creative Problem-Solving Ability on the Concept of Substance Pressure. *Jurnal Penelitian Fisika Dan Aplikasinya (JPFA)*, *9*(1), 65–77.

Dishon, G., & Gilead, T. (2020). Adaptability And Its Discontents : 21ST- CENTURY SKILLS AND THE PREPARATION FOR AN UNPREDICTABLE FUTURE. *British Journal Of Educational Studies*, *00*(00), 1–21. Https://Doi.Org/10.1080/00071005.2020.1829545

Firmansyah, A., & Jiwandono, N. R. (2022). Kecenderungan Guru dalam Menerapkan Pendekatan Student Centre Learning dan Teacher Centre Learning dalam Pembelajaran. *Jurnal Guru Indonesia*, *2*(1), 33–39.

Heliawati, L., Afakillah, I. I., & Pursitasari, I. D. (2021). Creative Problem-Solving Learning through Open-Ended Experiment for Students' Understanding and Scientific Work Using Online Learning. *International Journal of Instruction*, *14*(4), 321–336.

Hobri, Ummah, I. K., Yuliati, N., & Dafik. (2020). The effect of jumping task based on creative problem solving on students' problem solving ability. *International Journal of Instruction*, *13*(1), 387–406. https://doi.org/10.29333/iji.2020.13126a

Kelly, D., & Brown, T. (2018). *An introduction to Design Thinking. institute of Design at Stanford*.

McCrum, D. P. (2017). Evaluation of creative problem-solving abilities in undergraduate structural engineers through interdisciplinary problem-based learning. *European Journal of Engineering Education*, *42*(6), 684–700. https://doi.org/10.1080/03043797.2016.1216089

Mumford, M. D., Mobley, M. I., Reiter-Palmon, R., Uhlman, C. E., & Doares, L. M. (1991). Process analytic models of creative capacities. *Creativity Research Journal*, *4*(2), 91–122.

Naser, A., & Almutairi, M. (2015). *The Effect of Using Brainstorming Strategy in Developing Creative Problem Solving Skills among male Students in Kuwait : A Field Study on Saud Al-Kharji School in Kuwait City*. *6*(3), 136–146.

Phaksunchai, M., Kaemkate, W., & Wongwanich, S. (2014). Research and development of a training package for developing creative problem solving of undergraduate students. *Procedia-Social and Behavioral Sciences*, *116*, 4824–4828.

Puccio, G. J., Burnett, C., Acar, S., Yudess, J. A., Holinger, M., & Cabra, J. F. (2020). Creative Problem Solving in Small Groups: The Effects of Creativity Training on Idea Generation, Solution Creativity, and Leadership Effectiveness. *Journal of Creative Behavior*, *54*(2), 453–471. https://doi.org/10.1002/jocb.381

Reiter-Palmon, R., & Illies, J. J. (2004). Leadership and creativity: Understanding leadership from a creative problem-solving perspective. *Leadership Quarterly*, *15*(1), 55–77. https://doi.org/10.1016/j.leaqua.2003.12.005

Veerasinghan, K., Balakrishnan, B., Damanhuri, M. I. M., & Gengatharan, K. (2021). Design Thinking for Creative Teaching of Chemistry. *International Journal of Academic Research in Business and Social Sciences*, *11*(3), 670–687. https://doi.org/10.6007/ijarbss/v11-i3/8979

Wilson, C. (2013). *Brainstorming and Beyond A user-centered design method*. Morgan Kaufmann.

Wood, C. (2006). The development of creative problem solving in chemistry. *Chemistry Education Research and Practice*, *7*(2), 96–113. https://doi.org/10.1039/B6RP90003H

Zahroh, F. (2020). *Pengaruh Model Pembelajaran Project Based*. *Phenomenon: Jutnal Pendidikan MIPA*, *10*(2), 191–203.

Interactive storytelling and captivating illustrations: using Big Book as an innovative teaching aid to motivate young children's reading

Aina Yasmin Mohd Amin, Aini Syahira Jamaluddin, Nurul Huda Hassan Bakri
School of Education and Human Sciences, Albukhary International University, Malaysia[1,2,3]
yasmin.amin@aiu.edu.my, aini.jamaluddin@aiu.edu.my, huda.bakri@aiu.edu.my

Highlights: This study investigates using interactive Big Books as a teaching aid and emphasizes the effectiveness of having a hands-on activity in the Big Book to further enhance children's reading motivation. It employs qualitative methods, including interviews with preschool teachers and observations of children aged 4 to 6. Thematic analysis identified recurring themes, including captivating illustrations, interactive storytelling, and the development of a positive reading environment. The children exhibited an increased eagerness to participate in reading activities, demonstrated greater interest in storylines, and expressed joy and enthusiasm during storytime. This qualitative approach effectively captures the multifaceted aspects of the reading experience and provides valuable insights for educators and policymakers seeking to enhance early literacy programs.

Keywords: big book; innovative teaching aid; interactive storytelling

Introduction

Early Childhood Education has long recognized the importance of instilling a passion for reading at a young age due to its positive impact on children's cognitive development. Piaget's theory on cognitive development emphasizes that children learn best when they are actively participating in the learning process such as conducting experiments, making observations and doing hands-on activities. Children learn to be active learners by exploring and discovering through their five (5) senses which are sight, sound, taste, smell and touch. Teachers are encouraged to use teaching aids that could enhance these senses, thus, innovative and attractive ways of teaching are needed to make the young learners involved in the learning process.

Big book is an interactive teaching aid especially for young readers to build their interest in reading. A "Big Book" is a large-sized book that includes both captivating pictures and stories in an interactive format. It is widely considered to be a highly effective teaching tool for reading because its substantial size ensures that every student in a classroom can easily access and benefit from the visual content within the book (Rohaniawati, Ratnasih, Ruswandi, and Fauziah, 2018). Big books, in general, contain a repetitious language structure, attractive themes and bright and colourful illustrations. Despite the numerous benefits of using Big Books as a tool for reading, many kindergartens or child centres are not implementing them in their teaching and learning due to less awareness of their benefits and limited resources. Most centres are still using the conventional storybooks with small letters which could easily impair children's focus and attention in class. These Big Books with pop-up illustrations are designed and created focusing on the innovative use of interactive Big Books as a teaching aid for enhancing reading motivation among preschool children. While Big Books have been a staple in classrooms, this innovation takes a step beyond conventional pedagogical practices by placing a significant emphasis on hands-on engagement with these oversized literary wonders and their 3-dimensions illustrations.

Product Description

One of the challenges of teaching in early childhood is to retain attention and build motivation among children during the lesson. As an educational tool, Big Book symbolises a dynamic mix of unique ideas and innovativeness targeted at increasing children's reading motivation and engagement. Most teachers agree that children require tangible activities in class for them to focus until the end of the lesson. The solution to this issue is to introduce Big Books with pop-up illustrations and post-activities during the lesson for better engagement and participation of children in the classroom. The idea of the Big Book innovation has a few impactful elements as a teaching aid in the lesson. The most impactful element is the interactive visual experience that children enjoy from the pop-up illustrations. Big Books are designed to be visually captivating, with large, colourful illustrations that span across oversized pages. This engaging visual experience immediately draws children into the world of the story as it incorporates interactive elements such as pop-ups, flaps, and movable parts. These interactive features transform reading into an engaging and hands-on activity, allowing children to actively participate in the storytelling process. The innovative use of these elements enhanced the overall reading experience and encouraged active exploration.

This Big Book product also taps into the power of multisensory learning by combining text, visuals, and tactile engagement. This approach recognizes that children have diverse learning styles and preferences. By engaging multiple senses simultaneously, Big Books cater to a broad spectrum of learners, making them a versatile and inclusive teaching aid. Big Books are large enough for all children in a classroom to see and engage with simultaneously. This inclusivity eliminates competition for visual access, ensuring that every child can participate actively in the reading session. It promotes a sense of equality and fairness in the classroom, contributing to a positive and motivating learning environment. The most important element considered in this innovation is the impact of the Big Book on children's engagement and attention which were measured through the teacher-student interaction throughout the reading activities. The implementation of Big Book in the classroom consists of three stages which are pre-reading, reading and post-reading stages. Teachers can guide discussions, ask questions, and promote critical thinking through the use of

these oversized texts. This interactive dimension strengthens children's attention and motivation in the reading session and further enhances engagement. Further impact of the interactive Big Book will be discussed in the results & discussion section.

Results & Discussion

To determine the effectiveness of the Big Book, a qualitative study is conducted which combines interviews with preschool teachers and observations of children aged 4 to 6 years old who are still in the early stages of their literacy development. The central objective is to assess the effectiveness of Big Books as a tool for stimulating reading motivation and engagement. Interviews with teachers explored their perceptions of Big Books' effectiveness in stimulating reading motivation among children. Additionally, teachers incorporated Big Books into their reading sessions, and observations were made to gauge the children's engagement and enthusiasm during these sessions. The interview with two (2) teachers highlighted the knowledge and understanding of teachers on Big Book and the effectiveness of implementing Big Book in their classrooms. It is found that teachers' knowledge and understanding of Big Books are still lacking as they were not familiar with Big Books in their teaching. After being trained to create and design Big Books, teachers were able to implement the use of Big Books in their lessons and observe children's responses towards the innovative teaching aid. Teachers reported that children's engagement level with the story is higher when using the Big Book as compared to the conventional storybook. Children were found to be more engaged using the Big Books due to the pop-up illustrations and interactive storytelling. The teachers also shared that there was a significant positive environment where children were found to communicate well with their peers on the storyline of the Big Book. The teachers also would like to further explore the best practice of using Big Book in the classroom in the future.

Observation of children's engagement and enthusiasm for using Big Book in the classroom was done in three (3) stages of reading which are pre-reading, reading and post-reading activity. Pre-reading activities encompass initial lessons that educators can employ to prepare a preschool child for the process of reading. The primary objective of these pre-reading activities is to facilitate the acquisition of word decoding and pronunciation skills, which constitute the fundamental initial stage in the journey toward reading proficiency. Within the scope of this research, the pre-reading phase encompasses the practice of posing uncomplicated questions at the commencement of the session, all while displaying the cover page of the Big Book entitled "Little Red Riding Hood" in Figure 1 and "Mrs. Chicken and the Hungry Crocodile" in Figure 2.

Figure 1

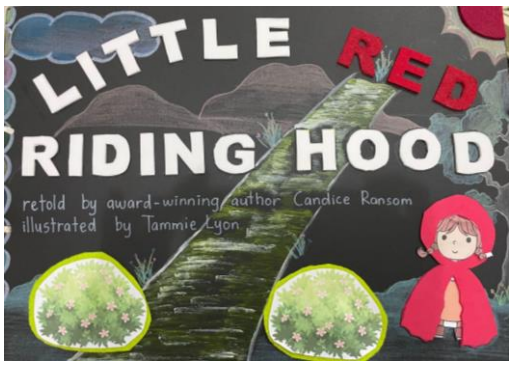


Figure 2

During the reading session, teachers engage in a multifaceted approach that includes storytelling, questioning, facilitating simple activities, and encouraging students to pose their questions. Certain words are emphasized and translated into Malay to ensure that students can comprehend the story effectively. Additionally, the teacher employs repetition of these words, encouraging students to follow along. In the post-reading phase, the teacher instructs a few students to summarize the story, identify its moral values, origami, and puzzles and provide synonyms and antonyms for specific words. Towards the last pages of the Big Book, supplementary activities were incorporated, further heightening the students' enthusiasm. Thematic analysis was applied to the qualitative data gathered from the observation, allowing for the identification of recurring themes related to the impact of Big Books on reading motivation which are:

A) Interactive Design of the Big Book As the Main Criteria for Learning

The teachers successfully captured the students' interest merely by displaying the book's cover page. During the pre-reading phase, a few simple questions were posed, resulting in enthusiastic and exuberant responses from all the students. During the reading session, several students began to stand up and interact with the media presented in the Big Book. Even during storytelling sessions led by the teacher, the students remained fixated on the book. They gaze at the characters as if expecting the characters to speak. Furthermore, they eagerly complete the tasks within the Big Book, often showing enthusiasm to redo them. Some of the activities featured in our Big Book include mazes, word-matching exercises, fill-in-the-blank exercises, and pasting fruit illustrations, among others.

The Big Book captivated the interest of students and motivated them to engage in more extensive reading due to its distinctive dimensions and the vibrant illustrations it featured. Given that the focus of this research pertained

to young learners, it is worth noting that young learners typically possess a limited attention span and are susceptible to becoming disinterested, as described by Harmer (2007).

B) Learning Activities Using Big Books Encourage Students' Speaking Skills

Employing a multi-sensory approach to reading can effectively address various challenges children encounter when learning to read, particularly those related to concentration difficulties. This approach introduces an element of excitement to lessons and actively engages multiple senses in a child's cognitive process, thereby enhancing their retention of acquired skills. Gascoyne (2016) asserts that engaging in multi-sensory activities offers a foundational basis for the development of children's skills, encompassing knowledge, critical thinking, and creativity.

The students' responses were triggered upon gazing at the cover page of the first Big Book. One student exclaimed, "The girl looks suspicious," while another eagerly chimed in with, "I can't wait to open the book," and a third concurred, saying, "Yes, she is sus!". In the case of the second Big Book, the students exhibited excitement by enthusiastically shouting upon reading the title. A number of them expressed curiosity about the texture of the crocodile's skin, while others inquired about the shapes of the chicken's eyes as they examined the cover page. Throughout the reading session, students were actively seeking clarification regarding the pattern and design of the multisensory media featured in the Big Book. Some of their inquiries pertained to the cloud patterns created with cotton and the dimensions of the apples involved in the pasting activity, and they also sought information about the character depicted and the various sizes of the media components within the Big Book. Several students voiced their eagerness to redo the maze activity, and some were quite persistent in their attempts to convince the teacher to permit them to do so. Additionally, when the teacher posed questions about the story during the session, the majority of students actively participated by providing answers and even sought further clarifications to enhance their understanding of the narrative.

Based on our observations from both sessions, it is evident that employing the Big Book not only serves as a motivating factor for students' learning but also significantly enhances their communication skills. These enhancements in motivation can be attributed to a multitude of factors, including captivating illustrations, interactive storytelling, and the creation of a positive reading environment facilitated by Big Books. As a result, the children exhibit an increased eagerness to participate in reading activities, a heightened interest in storylines, and a palpable sense of joy and enthusiasm during storytime. Moreover, teachers report noteworthy improvements in children's overall reading engagement and their propensity to initiate reading activities beyond the confines of the classroom. The enthusiasm they displayed when encountering the multimedia elements and activities encouraged them to pose more questions to the teacher and engage in discussions with their peers. Their proficiency in speaking is particularly noteworthy, as they continued to ask questions even after the story had concluded, showcasing their ongoing engagement and eagerness to communicate.

The innovation of Big Book has significant impacts on various stakeholders including children, teachers and policymakers. As concluded in the findings, the implementation of Big Book could enhance children's reading motivation as it captivates children's attention and sparks their interest in reading. The interactive visual, features and immersive storytelling make reading a joyful and exciting experience, motivating children to read more frequently. Children's communication skills are also enhanced as they explore the use of Big Books with teachers in the classroom. As for teachers, Big Book is known to be a great teaching aid as it could create dynamic and hands-on activities with children. Teachers would be more motivated to continue using Big Book to further enhance children's engagement and build a positive reading culture in the centres. Policymakers could also use this project to further study the effectiveness of Big Books in the classroom and create more early literacy programs that incorporate engaging teaching strategies. The use of Big Books can contribute to the success of early literacy programs, aligning with educational goals and initiatives aimed at improving literacy rates among young learners.

In summary, interactive Big Books have a positive impact on education stakeholders by promoting reading motivation and engagement among children, offering effective teaching tools for educators, and aligning with broader educational goals and initiatives. Their multifaceted benefits contribute to a more enriched and effective educational experience for all involved.

Conclusion

In conclusion, Big Books represent a groundbreaking innovation in education, characterized by their exceptional visual design, interactive features, multisensory approach, and storytelling quality. They foster inclusivity, cater to diverse interests, and facilitate meaningful teacher-student interaction. As a teaching aid, Big Books have the potential to ignite a lifelong passion for reading and learning, making them a transformative tool in early childhood education. Their innovative qualities make them a valuable asset in enhancing children's reading motivation and engagement. Furthermore, the qualitative approach employed in this research opens a window into the multifaceted dimensions of the reading experience, offering valuable insights for educators and policymakers striving to enhance early literacy programs. Future recommendations would include creating a module that encompasses different themes of the Big Book suited to the syllabus of a kindergarten or childcare centre. Establishing a structured Big Book module could allow opportunities for teachers to apply it to their teaching and learning without needing to create their own Big Books. As we embark on this journey through the world of interactive Big Books, there emerges a compelling narrative that beckons us to explore the long-term impact of this innovative approach on sustained reading motivation and its potential effects on academic achievement as these children progress through their education.

References

Abdul, Rahim Normaliza & Nik Ismail Harun. (2010). Students'Perception Towards The Usage of the Big Book, Gading Bussiness and Management Journal, Vol.14.

Allam, F. C., & Martin, M. M. (2021). Issues and challenges in special education: A qualitative analysis from teacher's perspective. Southeast Asia Early Childhood Journal, 10(1), 37-49. https://doi.org/10.37134/saecj.vol10.1.4.2021.

Gascoyne, S. (2016). Sensory play: Play in the EYFS (Vol. 1). Andrews UK Limited.

Harmer, J. (2007). The Practice of English Language Teaching. Harlow: Longman.

Mahayanti, N.W., Asrina, N.K. (2017) The Implementation of Big Book as Media to Teach Reading Comprehension for the Sixth Grade Students of Elementary School, *Advances in Social Sciences, Education and Humanities Research, Volume 134*.

Nalantha, I.M.D., Artini, Luh, & Mahayanti, N.W.S. (2018). The Effect Of Big Books As Teaching Media On The Third Grade Students' Reading Comprehension In South Bali. International Journal of Language and Literature. 2. 10.23887/ijll.v2i2.16096.

Nurani, R. Z. & Mahendra, H. H. (2019). Use of Big Book Learning Media to Improve Students' Beginning Reading Skills in Primary Schools. Mimbar Sekolah Dasar, 6(3), 330-340. DOI: 10.17509/mimbar-sd.v6i3.22893.

Rohaniawati, D., Ratnasih, T., Ruswandi, U., & Fauziah, S. (2018). Literacy Learning through Big Book in Elementary Schools. In *2nd International Conference on Sociology Education - Volume 1: ICSE*; ISBN 978-989-758-316-2; ISSN 2184-2728, SciTePress, pages 200-204. DOI: 10.5220/0007095402000204.

Enhancing pre-service elementary education teachers' Math laboratory activities through desmos

Ildefonso Halipa Jr , Aini Syahira Jamaluddin
Albukhary International University, Alor Setar, Kedah, Malaysia[1,2]
ildefonso.halipa@aiu.edu.my, aini.jamaluddin@aiu.edu.my

Highlights: The utilisation of the Desmos dynamic mathematics software platform in the context of the improved Math Laboratory Activities is an innovative approach to transforming the manner in which pre-service primary school teachers engage in mathematical laboratory exercises. This innovative approach facilitates the engagement of learners in active problem-solving activities, fosters a more interactive and cooperative learning atmosphere, and enhances the comprehension and application of mathematical concepts. The objective of this innovation is to provide prospective elementary educators with the necessary information and materials to cultivate a passion for mathematics among their students through the integration of Desmos into their instructional practices.

Key words: mathematics education; pre-service teachers; desmos; math laboratory activities; innovative teaching

Introduction

Technology now plays a bigger part in modern mathematics teaching, improving students' interest and knowledge of the subject. To properly use these technology tools, future educators, in particular primary school teachers in preparation, must be adequately prepared. The development of these future teachers' pedagogical abilities and subject understanding is greatly aided by maths laboratory activities. In order to meet this requirement, this innovation suggests a cutting-edge pedagogical strategy that centres on integrating Desmos, a flexible and user-friendly mathematics software platform, with Math laboratory exercises for aspiring primary school teachers. Desmos, as indicated by Kristanto in 2019, is a web-based application specifically created to assist students in mastering mathematics while also making the subject an engaging and enjoyable experience.

Numerous studies have repeatedly demonstrated the favourable effects of incorporating technology into the realm of mathematics teaching. Joshi's (2017) study highlights the positive impact of Information and Communication Technology (ICT) on various aspects of education, including knowledge acquisition, skill development, performance enhancement, achievement, self-directed learning capacity, communication skills, problem-solving abilities, motivation to learn, promotion of mathematical understanding, enjoyable learning experiences, and active engagement in mathematical problem-solving activities among students. Furthermore, Pope (2023) emphasised the potential of Desmos and GeoGebra in enhancing student engagement and interest, promoting a student-centred and discovery-oriented teaching environment, and facilitating students' comprehension of mathematical assignments and their corresponding answers. Haryani and Hamidah (2022) underscored the significance of interactive and technology-integrated mathematics worksheets, highlighting the utility of Desmos as a tool for enhancing teaching and learning in this context.

The absence of technical training within the pre-service teacher curriculum contributes to a deficiency in the necessary technical skills required for successful utilisation of technology in mathematics education, despite the well-documented benefits of such integration (Akaadom, 2020). The deficiency in their training may impede their capacity to deliver captivating and participatory Mathematics education in primary school settings.

The current innovation aims to address this disparity by equipping prospective elementary education teachers with the necessary knowledge and competencies to properly utilise Desmos. The incorporation of Desmos into teacher preparation programs is in line with the overall trend towards modern educational approaches, as technology continues to advance. Technology helps learners and teachers in multiple aspects in the mathematics classroom, which allows permanent and effective learning (Adelabu et al., 2019).

Our objective is to provide future educators with both theoretical knowledge and practical tools to enhance Math laboratory activities, making them lively and engaging for teachers and students. This will result in mutual benefits for all parties involved.

Product Description

The educational innovation is on the effective incorporation of Desmos, a sophisticated dynamic mathematics software platform, with Math laboratory activities designed for pre-service elementary education teachers.

Desmos is a highly advanced mathematics software platform that is widely recognized for its intuitive user interface and robust mathematical functionalities. The platform enables users to create graphical representations of equations, investigate mathematical principles using interactive visualisations, dynamically adjust variables, and participate in collaborative problem-solving activities. This digital tool functions as a fundamental element of our

invention, facilitating pre-service teachers in fully utilising its capabilities to enhance the field of Mathematics instruction.

Math laboratory activities are educational exercises that have been specifically created to promote active learning and enhance comprehension of mathematical principles. These educational approaches extend beyond conventional classroom teaching methods by fostering active problem-solving, critical thinking, and collaborative engagement among students. Within the framework of our innovation, these activities function as the foundation upon which Desmos is intricately integrated, facilitating a dynamic and engaging educational encounter.

The novel technique incorporates several crucial aspects:

1. The Utilisation of Desmos as an Educational Instrument: Pre-service educators are exposed to Desmos as a multifaceted and dynamic instrument for visualising mathematical topics. Students acquire the skills necessary to generate interactive graphs, investigate mathematical correlations, and modify variables, thus cultivating a more profound comprehension of abstract mathematical concepts.
2. Developing Interactive Mathematics Laboratories: Pre-service educators receive guidance in the development and execution of Mathematics laboratory exercises that effectively include the use of Desmos. The aforementioned activities have been meticulously designed to foster interactivity, captivate learners, and adhere to the established norms of basic Math curriculum. Consequently, their applicability in authentic classroom environments is guaranteed.
3. Collaborative Learning: The utilisation of Desmos, as it allows for the real-time sharing and study of mathematical concepts, hence promoting problem-solving among participants. Our idea is to promote the integration of collaborative learning into the Math laboratory activities of pre-service teachers, thereby promoting the development of students' collaboration and communication abilities.
4. Assessment and Feedback: Desmos provides educators with tools for formative evaluation, enabling them to actively monitor the development of their students and promptly offer comments. This particular characteristic enables pre-service instructors to modify their instructional methods in order to cater to the unique learning requirements of individual students, hence fostering improved educational outcomes.

The teaching innovation enhances the abilities of pre-service elementary school teachers to produce dynamic, engaging, and concept-rich learning experiences by effectively incorporating Desmos into Math laboratory activities. The process of integration not only serves to deepen individuals' comprehension of mathematics, but also equips them with the necessary tools to motivate and empower future generations of students to achieve excellence in the field of mathematics.

Results & Discussion

Table 1 presents an overview of the main themes derived from interviews conducted with a sample of 29 pre-service elementary school teachers who incorporated the use of Desmos in their Math laboratory activities. The aforementioned themes provide significant insights about the efficacy of integrating Desmos into pre-service teacher education, shedding light on the specific areas in which this instrument exerts a considerable influence.

Table 1. Thematic Analysis of Pre-Service Elementary Education Teachers' Experiences with Desmos in Developing Math Laboratory Activities

Theme	Description of Theme	Sample Responses
Enhanced Conceptual Understanding	The utilisation of Desmos in mathematical laboratory activities resulted in an augmentation of their own comprehension of mathematical topics. The utilisation of dynamic graphs and simulations to visualise abstract concepts resulted in a heightened level of comprehension.	"I had trouble teaching fractions, but Desmos made it so much easier for me to understand. I could see why it was hard for many kids."
Increased Student Engagement	Educators observed a notable rise in student involvement during Mathematics laboratory exercises. The utilisation of Desmos as a mathematical learning platform led to increased student motivation, which in turn resulted in heightened levels of participation and passion towards the subject of Mathematics.	"I was surprised when one of my more quiet students took the lead during a Desmos practice. It was amazing to see how excited they had become."
Collaborative Learning	Numerous pre-service teachers have emphasised the efficacy of Desmos in facilitating collaborative learning. The platform facilitated a collaborative classroom environment by promoting student collaboration, the sharing of insights, and mutual assistance in problem-solving.	"While doing a task on Desmos, students began to explain ideas to each other. It was like a small Math group was coming together."
Improved Assessment	The use of Desmos facilitated the implementation of real-time formative assessment. Educators expressed their appreciation for the capability to oversee the progress of students and deliver prompt comments. This functionality	"Desmos let me see in real time where kids got stuck. I could give them feedback right away to

	empowered educators to customise their teaching methods in order to properly cater to the unique learning requirements of each student.	help them better understand the idea."
Technological Proficiency	Multiple educators conveyed that the use of Desmos enhanced their technological aptitude. The educators exhibited heightened levels of confidence in the incorporation of technology into their pedagogical approaches, recognizing its indispensability in contemporary elementary education.	"Desmos gave me the confidence to try out other tech tools, knowing that I can adapt and learn."

The investigation reveals that Desmos has a substantial impact on the enhancement of pre-service teachers' conceptual knowledge of mathematical ideas. Desmos offers a highly effective platform for enhancing comprehension by enabling the dynamic visualisation of abstract concepts. This proved to be of significant value for ideas that educators first encountered difficulties with, such as fractions and geometry. Therefore, Desmos functions not only as a pedagogical resource but also as a means for individual scholarly development among prospective educators.

Another notable feature seen was the enhanced level of student participation that resulted from the integration of Desmos into laboratory operations. According to the accounts provided by pre-service instructors, it was observed that there was a noticeable sense of excitement among the pupils, suggesting a heightened degree of passion and active engagement. The heightened level of involvement holds promise for enduring advantages, including enhanced scholastic achievement and a more favourable disposition towards the field of mathematics.

The topic of collaborative learning has surfaced prominently. Desmos fostered an educational setting that promoted both individual and collaborative student engagement. According to the teachers, the platform facilitated spontaneous group conversations and collaborative problem-solving among peers, resulting in a notable enhancement of the classroom environment and the cultivation of a strong sense of community among students.

The advantageous nature of Desmos' real-time formative assessment capabilities was underscored. The quick feedback loop was highly valued by pre-service instructors as it facilitated the detection of misconceptions and enabled the customization of education to address individual requirements. The prompt feedback system shown here exhibits a notable distinction from conventional approaches, since the latter often lack the capability to offer instantaneous insights.

The investigation also demonstrated that the utilisation of Desmos resulted in enhanced technological skills among pre-service instructors. The incorporation of technology has become indispensable in the contemporary educational environment, as it is no longer considered an optional enhancement but rather a fundamental element for facilitating successful instruction and knowledge acquisition. Educators that possess a high level of technological proficiency are more ideally positioned to effectively incorporate diverse educational resources into their prospective instructional environments.

The utilisation of thematic analysis has yielded valuable insights into the experiences of pre-service elementary education teachers when including Desmos in Math laboratory activities. The incorporation of Desmos has the potential to provide numerous advantages that can greatly enhance the landscape of pre-service teacher education. These benefits range from improved conceptual comprehension to more effective real-time evaluation. The results of this study indicate that the use of Desmos in teacher education has the potential to be a significant and influential educational breakthrough.

Conclusion

In summary, the incorporation of Desmos into Math Laboratory Activities has exhibited its capacity to effectively revolutionise the domain of mathematics education in a favourable manner. The examination of themes in the experiences of pre-service elementary school instructors highlights the advantages of higher comprehension of concepts, heightened involvement of students, and expanded abilities in evaluation. Furthermore, the endorsement of cooperative learning, the cultivation of technological expertise, and the smooth integration with educational benchmarks all underscore the diverse benefits of this innovative methodology.

In order to enhance the progress of this innovation, forthcoming endeavours should prioritise numerous important domains. The prioritisation of continual professional development for pre-service teachers is crucial in order to assure their proficiency in effectively utilising the complete capabilities of Desmos. Furthermore, it is imperative that further study be conducted to investigate the enduring effects of integrating Desmos into the learning environment on students' academic achievements in mathematics. Given that pre-service teachers and educators may not possess sufficient training in conducting lessons with Desmos, it is advisable to consider the implementation of comprehensive training programs or workshops to equip them with the necessary skill.

In conclusion, the establishment and dissemination of a collection of excellent Math laboratory activities with Desmos might have a positive impact on educators worldwide. This initiative would facilitate the formation of a collaborative community of practitioners committed to enhancing the field of mathematics education. By considering and examining these elements, we can further improve and broaden this invention, thereby guaranteeing its continued impact in boosting the standard of mathematics instruction in the future.

References

Adelabu, F. M., Makgato, M., & Ramaligela, M. S. (2019). The Importance of Dynamic Geometry Computer Software on Learners' Performance in Geometry. Electronic Journal of E-Learning, 17(1), 52–63.

Bernard Wiafe Akaadom (PhD). (2020) " Pre-service teachers' technology skills and its effects in using 1 technology for instruction: In pursuit for quality teacher training." International Journal of Engineering and Science, 10(9), pp. 18-28.

Cohen, J., Hollebrands, K. F. (2011). Technology Tools to Support Mathematics Teaching. Focus in High School Mathematics: Technology to Support Reasoning and Sense Making, 105–120.

Haryani F., Hamidah A.S., (2022) Exploring the Impact of Technology-Integrated Mathematics Worksheet in the Teaching and Learning during Covid-19 Pandemic, Mathematics Teaching Research Journal 39 Golden Fall 2022, 14(3).

Joshi, D. R. (2017). Influence of ICT in mathematics teaching. International Journal for Innovative Research in Multidisciplinary Field, 3(1), 7–11.

Kristanto, Y. D. (2019). Creating Interactive and Mathematically Rich Activity with Desmos. *Figshare.*

Pope, D. (2023). Using Desmos and GeoGebra to Engage Students and Develop Conceptual Understanding of Mathematics., 104-129. do:10.4018/978-1-6684-5920-1.ch006.

Did we just preserve the food using LEDs lamps? Light to Preserve Project: A way to engage students to SDGs 2 (Zero Hunger)

Cicilia Tiara, Nabila Tazkiyyatul Afifah, Fakhran Rozali Daulay, Muhammad Syamsudin Umar, Aini Septiana
Universitas Pendidikan Indonesia, Bandung, Indonesia[1,2,3,4,5]
ciciliatiara@upi.edu[1]

Highlights: This research focused on STEM-based learning design to engage students to issues about SDGs 2 Zero Hunger. STEM-based learning is carried out with 6 stages which are integrated with the problem of food waste which is also a big problem in Indonesia. The project was carried out by preserving vegetables and fruit using technology in the form of LED lighting. The results show that this project can train students to be aware of problems, carry out the design process, build technology prototypes, test and evaluate the prototypes they have made and make improvements to the prototype.

Key words: Food Preservation; SDGs 2; STEM based Learning; Students' Engagement

Introduction

Indonesia faces a serious food waste problem with an estimated 1.3 billion tons of food wasted and lost every year (Munir & Fadhilah, 2023). Indonesia is one of the largest food waste producing countries in the world with a value of 300 kg/capita/year (Saliem et al., 2021). Other data shows that around 70% of waste disposed of in landfills is organic waste, especially food waste (Waluyo & Kharisma, 2023). According to the Ministry of National Development Planning, the most inefficient type of food processing is vegetables which contribute 62.8% of the total food waste produced (R. A. Putri et al., 2022). Food loss and waste has a negative impact on food insecurity. Furthermore, it can even contribute to climate change due to greenhouse gasses produced from the accumulation of organic waste (Munir & Fadhilah, 2023). By preventing the emergence of food waste, not only food availability and household consumption can increase, but also greenhouse gas emissions and agricultural land needed for cultivating food crops can be reduced (Malahayati & Masui, 2022).

This problem is related to everyday life because the process of eating is a process that humans carry out every day. So, there needs to be a learning model that facilitates students' way of thinking to overcome these problems. Therefore, the STEM learning model is used to realize the achievements of SDGs 2: zero hunger. This research was based on another research which states that the model for teaching sustainable development is STEM (Pahnke, O'Donnell, & Bascopé, 2019). STEM education that is integrated with education for sustainable development can encourage students to utilize STEM competencies and scientific processes as the main basis for acting in problem solving, including introducing students to issues related to food problems. Knowledge, skills, and understanding of science, technological development, engineering, and mathematical phenomena are essential to help students understand global issues and support action in society to address challenges in meaningful and knowledge-based ways (Pahnke, O'Donnell, & Bascopé , 2019). Based on previous research, STEM-based learning has a positive effect on students' mastery of concepts. By implementing STEM projects, students are directed to develop and form concepts in the process of problem formulation, thinking, designing, creating and testing (Hanif et al., 2019; Lestari , 2017; Rustaman et al., 2018; Tonra et al., 2022). Apart from that, classes with STEM-based learning show better results in understanding and application compared to students who did not receive STEM learning (Lestari, 2017).

One of the things that can be done to make sure the availability of food is to prolong the quality by processing and preserving food. There are various types of food processing and preservation techniques, including cooling, freezing, packaging, canning, use of chemicals, heating, fermentation and irradiation (Cahyadi, 2008). One method of food preservation is the application of light emitting diodes (LED), which is a non-thermal method that works by converting light energy into heat. LEDs have the potential to revolutionize food production, protection and preservation. LEDs have been proven to improve the nutritional quality and shelf life of food, control ripening, induce the synthesis of bioactive compounds and antioxidants and reduce microbial contamination. Apart from that, this technology is considered environmentally friendly (Poonia et al., 2022). Therefore, STEM-based learning by utilizing LED technology in food preservation has the potential to build direct student involvement in recognizing problems in the SDGs 2 context and developing technology to solve the problems found. Based on the description above, this research will focus on STEM learning called *Light to Preserve* project to support SDGs 2 regarding Zero Hunger.

Product Description

This research is aimed to develop a STEM-project learning framework that focuses on food preservation using LED. This research was conducted in Indonesia at the high school level. This learning was developed using the STEM model which has certain stages, with a project in the form of food preservation with LED being delivered. The framework used basically refers to and developed from STEM learning in the form of problem formulation, thinking, designing, creating, testing and redesigning (Widodo 2021). Table 1 shows the learning stages that were carried out in this research.

Table 1. STEM Model Stages for Food Preservation Project Using LED Lamps

STEM Model Stages	Student Activities	Teacher Activities

Problem Recognition	Identify potential food waste and recognizing that there are needs to take action by doing observation to the local market and their household	Presents issues regarding potential food waste by bring the student to the local market and make sure the students are observing their household
Think	Thinking about technological designs and forms of technology that can be developed to overcome potential food waste problems, leads to food preservation using LED lamps	Directing forms of technology that can be developed as solutions to the problems
Design	Elaborate the ideas with their teammate to design a prototype that is expected to be able to handle the problems, including making a blueprint about how they will build it and what tools and materials are needed to build it. Design stage ended by presentation from each team so each team will receive any suggestions regarding to their designs	Guiding the designing process to develop food preservation prototype, giving the suggestions that are needed.
Create	Creating technology based on the designs that have been made and presented to the teacher and the class	Guiding the creation of food preservation technology that has been developed
Test	Identify the advantages and disadvantages of the prototype being developed	Direct students to evaluate the advantages and disadvantages of the prototype that has been made
Re-design	Improve the food preserving prototype design that has been made based on test results	Guiding improvements to the designs that have been tested

Results & Discussion

At the learning stage that has been implemented, at the problem formulation stage students make observations so that learning can be more meaningful. Students make observations on the surrounding environment to identify food problems that occur. After the problem is found, students focus on thinking of solutions that can be done to deal with the problem by using technological engineering. The designs made by the participants can be seen in Figure 1 below.

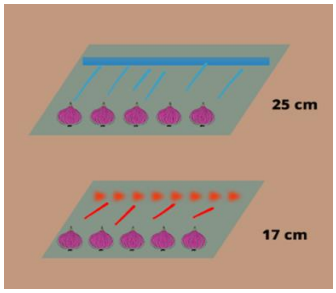


Figure 1: Technology Design Made by Students

The design made is the result of a solution in dealing with the problems found, namely in the form of food loss and food waste problems. The problem found by students is the amount of organic waste which is mostly food waste. Making this technology is the application of light emitting diodes (LED) which is used as a technology to preserve food by utilizing non-thermal techniques that convert light energy into heat. The next learning process is to make food preservation technology based on the designs that have been made. The results of the technology that has been created by students can be seen in Figure 2 below.

Figure 2: Food Preservation Technology Made by Students

Preserving food is one of the solutions students do in overcoming existing food problems. This is the ability of students to analyze the problems found and the solutions given based on the results of observing these problems. The next activity is to test the food preservation technology that has been created. The test results show that there are several successful treatments for preserving food. At this testing stage, students can identify problems with the food preservation tools that have been made.

Students are able to identify the advantages and disadvantages of the tools that have been made. At this testing stage, recording of food preservation was carried out for 7 days. One of them found that there was a treatment that had no effect on the object of preservation. After testing the food preservation tools that have been made and finding problems that occur, students make improvements to the design and carry out tests again to identify problems with the tools that have been repaired. This learning process is intended so that students can formulate problems, engineer or develop technology, and produce solutions in the form of technological engineering for problems that occur.

Table 2. Students Learning Process

Learning Model Stages	Structure of Student Activities
Formulation of the problem	The problem formulation done by the students is based on the observations in the surrounding environment. The observation results show that students can find out the problems that occur by marking the completion of the Student Worksheet (LKPD). In completing the completed LKPD, students wrote down several problems, namely food insecurity caused by difficulty of access, there were transactions selling vegetables and fruit that were no longer suitable for consumption, and so on.
Think	In the second STEM learning stage, students are required to think about solutions to the problems they have found. Students focus on overcoming food problems in the everyday environment and sustainable food availability. The solution given by the students to this problem was the use of LEDs (static power consumption specifications of 0.5-1 watt and operational temperature -20~25º) and making food preservation equipment.
Design	The design carried out by students at this stage is to design a food preservation tool as an effort that can be made to overcome the food problems found. Making food preservation equipment is one step to overcome food problems and sustainable food availability. At this stage, students choose what kind of fruits/vegetables they want to preserve, the color of the light (blue and red) because different colors have different wavelength and energy, and also design how much length from the LED lamp to the objects that are preserved.
Create	The stages of making food preservation equipment are carried out using LEDs as well as tools and materials available around the students. Making food preservation tools is carried out based on a planned tool design using predetermined tools and materials. The object is given treatment in the form of illumination in each blue and red box with illumination for 10, 20, 30, 40 and 50 minutes respectively. Then observations were made of changes in the preservation object for 7 days.
Test	Observation of treatment results was carried out for 7 days. During that time, an evaluation was carried out on the treatment in the form of LED color, length of illumination time, distance of the LED from the object, which had the most influence on the object. Assessments or tests are carried out qualitatively on objects that can be seen from physical changes.
Design improvements	The design improvement process is carried out by students to correct deficiencies in the tools that have been made. This process is carried out after testing and checking the tools and materials that have been made to evaluate errors that occur in the process of making food preservation equipment.

The entire 'Light to Preserve' project is intended to formulate problems, develop technology, and produce solutions. The results of the research that has been carried out can provide an analysis of students' abilities in overcoming problems in everyday life. The learning process that has been implemented provides an overview of students' process skills for overcoming problems in food preservation technology engineering.

The projects carried out by students will support the project learning process in Indonesia which focuses on problem solving. Apart from that, the project being implemented can be used as a reference for overcoming the problem of SDGs point number 2 regarding Zero Hunger at the School Level, as an integration between STEM and Education for Sustainable Development (ESD). STEM learning design in the form of *light to preserve* projects also has potential to be used as a project for the Proyek Penguatan Profil Pelajar Pancasila (P5) which supports the implementation of the *Kurikulum Merdeka*, a curriculum that is used in Indonesia's Education. This project can also be adapted according to the educational policies of each country and school.

Conclusion

Based on the results of this research, it shows that this project can train students to be aware of problems, carry out the design process, build technology prototypes, test and evaluate the prototypes they have made and make

improvements to the prototypes. However, there is a need for development of this project. Among them, there needs to be an assessment in the form of a more complete organoleptic test at the *test* stage process. This project can be taken as consideration for the school to implement this project in science or Biology class, on extracurricular activity or furthermore to be implemented as one of school projects about food preservation themes or SDGs learning activities.

References

Benmoussa, K., Laaziri, M., Khoulji, S., Kerkeb, M. L., & El Yamami, A. (2019). Evaluating the usability of a Moroccan University research management web platform. *Procedia Manufacturing*, 32, 1008-1016.

Cahyadi, W. (2008). Teknologi Pengolahan Keju Cottage Sari Kedelai dalam Upaya Pengembangan Industri Rakyat. *Jurnal)*. *Pasundan: Universitas Pasundan*.

Hanif, S., Wijaya, A. F. C., Winarno, N., & Salsabila, E. R. (2019). The Use of STEM Project-Based Learning Toward Students' Concept Mastery in Learning Light and Optics. *Journal of Physics: Conference Series*, *1280* (3).

Lestari, D. (2017). *Pengaruh Pembelajaran Berbasis STEM terhadap Keterampilan Rekayasa dan Penguasaan Konsep Siswa pada Materi Pencemaran Udara*. Universitas Pendidikan Indonesia.

Malahayati, M., & Masui, T. (2022). Potential impact of the adoption of food loss reduction technologies in Indonesia. *Journal of Environmental Management*, *319*, 115633.

Munir, A., & Fadhilah. (2023). Climate Change and Food Insecurities: The Importance of Food Loss and Waste Reduction in Indonesia. *IOP Conference Series: Earth and Environmental Science*, *1134*(1), 012040.

Pahnke, J., O'Donnell, C. & Bascopé, M. (2019). Using Science to Do Social Good: STEM Education for Sustainable Development. *International Dialogue on STEM Education*, *5* (6), 1–22.

Poonia, A., Pandey, S., & Vasundhara. (2022). Application of light emitting diodes (LEDs) for food preservation, post-harvest losses and production of bioactive compounds: a review. *Food Production, Processing and Nutrition*, *4*(1).

Putri, R. A., Rinold, S. R., Adeline, V., & Wardani, D. C. (2022). Indonesia As The Second Largest Food Waste Contributor In The World. Binus University.

Rustaman, N. Y., Afianti, E., & Maryati, S. (2018). STEM Based Learning to Facilitate Middle School Students' Conceptual Change, Creativity, and Collaboration in Organization of Living System Topic. *Journal of Physics: Conference Series*, *1013* (1).

Saliem, H. P., Mardianto, S., Sumedi, Suryani, E., & Widayanti, S. M. (2021). Policies and strategies for reducing food loss and waste in Indonesia. *IOP Conference Series: Earth and Environmental Science*, *892*(1).

Tonra, W. S., Tonra, W. S., Ikhsan, M., & Achmad, F. (2022). Improving Conceptual Understanding through STEM-Based Mathematics Learning. *JTAM: Jurnal Teori dan Aplikasi Matematika,* 6 (3), 789–798.

Waluyo, & Kharisma, D. B. (2023). Circular economy and food waste problems in Indonesia: Lessons from the policies of leading Countries. *Cogent Social Sciences*, *9*(1).

Widodo, A. (2021). Pembelajaran Ilmu Pengetahuan Alam. In UPI Press (Vol. 53, Issue 9).

Mobile App of Monitoring Profiling for Nano Materials and Experimentation

Mohamad Nor Haikal, Mohammad Aizat Basir, Engku Abd Ghapur Engku Ali
Universiti Malaysia Terengganu, Kuala Nerus, Terengganu[1,2,3]
mohamadnorhaikal@gmail.com, aizat@umt.edu.my, engku_ghapur@umt.edu.my

Highlights:
The "Mobile App for Monitoring Profiling of Nano Materials and Experimentation" is a ground-breaking solution in materials science and nanotechnology. With the help of this ground-breaking mobile application, researchers and scientists may easily do precise profiling, real-time monitoring, and effective experiments on nanomaterials from the comfort of their mobile devices. This app democratizes access to cutting-edge nano material analysis capabilities by dismantling conventional hurdles associated with laboratory-bound research, promoting quick innovation across various sectors, including electronics, energy, and healthcare. This mobile app promises to revolutionize the way nanomaterial research is conducted and open up new opportunities for scientific growth thanks to its user-friendly design and cutting-edge features.

Key words: Mobile App; Monitoring; Profiling; Nano Materials; Experimentation

Introduction

In materials science and nanotechnology, the development and application of nano materials have garnered considerable attention due to their exceptional properties and transformative potential. At the nanoscale, these minuscule materials exhibit unique electrical, mechanical, and chemical characteristics, opening up new horizons for technological breakthroughs across diverse industries. However, harnessing the full potential of nano materials requires precise monitoring, thorough profiling, and efficient experimentation.

Traditionally, the characterization and experimentation of nano materials have been confined to well-equipped laboratories, necessitating specialized instrumentation and dedicated personnel. Such constraints have limited the accessibility and scalability of nano material research, impeding the pace of innovation in this field. Furthermore, the need for real-time monitoring and rapid experimentation has become increasingly pressing as the demand for novel nano materials in areas such as electronics, energy storage, and biomedicine continues to surge.

In response to these challenges, this abstract introduces the "Mobile App for Monitoring Profiling of Nano Materials and Experimentation." This groundbreaking innovation addresses the critical need for a versatile, portable, and user-friendly solution that democratizes access to nano material research tools. In the following sections, we will delve into this mobile application's key features and functionalities, shedding light on how it can revolutionize how researchers approach nano material analysis and experimentation, ultimately accelerating the pace of innovation in this dynamic field.

Product Description

The "Mobile App for Monitoring Profiling of Nano Materials and Experimentation" is a sophisticated tool designed to cater to the needs of lecturers and students engaged in the fascinating world of nano material research. With its user-friendly interface and powerful features, this mobile application facilitates seamless experiment monitoring, making it an invaluable asset within educational and research environments.

For lecturers, this app offers a dynamic platform to oversee and guide experiments in real-time, regardless of their location. Through the app, they can remotely monitor students' progress, view experiment data, and provide immediate feedback, ensuring a more interactive and engaging learning experience. Additionally, lecturers can access a wealth of educational resources and experiment templates within the app, enhancing their teaching capabilities.

The app is a versatile companion for students throughout their journey in nano material experimentation. It allows them to conduct experiments efficiently, record data, and visualize results on mobile devices. Furthermore, the app provides a collaborative environment where students can share their findings, collaborate on projects, and seek instructor guidance, fostering a supportive and engaging learning community.

In summary, this mobile app bridges the gap between lecturers and students in nano material research. It simplifies experiment monitoring and enriches the overall learning experience by promoting collaboration, accessibility, and hands-on learning in the fascinating world of nanotechnology.

Results & Discussion

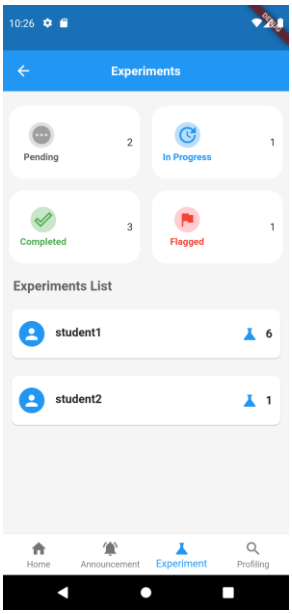


Figure 1

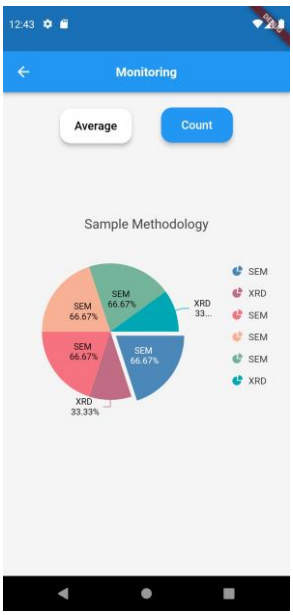


Figure 2

Figure 1 shows the system interface for a lecturer to view the progress of the experiment made by the students under their class. Figure 2 shows the data analysis of the experiment made by the students. The data can be viewed by the lecturer for effective analysis.

The "Mobile App for Monitoring Profiling of Nano Materials and Experimentation" can potentially bring about transformative impacts for various education stakeholders, revolutionizing how nano material research is conducted and taught.

1. **Students:** This app empowers students by providing an accessible and engaging platform for hands-on learning. It enhances their understanding of complex materials science and nanotechnology concepts through real-world experimentation. It fosters active participation and self-directed learning by enabling remote access to experiments and immediate feedback. As a result, students are better equipped to grasp intricate concepts and develop critical problem-solving skills, preparing them for successful careers in science and technology.

2. **Lecturers and Instructors:** Lecturers benefit from the app's ability to streamline teaching. They can monitor multiple experiments simultaneously, assess student progress in real time, and offer timely guidance. The app also offers access to a repository of experiment templates and educational resources, reducing the time spent on content creation. This enables educators to focus on more interactive and personalized teaching, ultimately improving the quality of education in nanotechnology-related disciplines.

Conclusion

In conclusion, the "Mobile App for Monitoring Profiling of Nano Materials and Experimentation" stands as a promising innovation with significant potential to reshape the landscape of nano material research and education. However, as with any pioneering endeavor, there are opportunities for future efforts to continue and improve upon this innovation:

1. **Enhanced User Experience:** Iterative improvements to the user interface and overall user experience can make the app even more intuitive and user-friendly. Incorporating feedback from both students and educators is essential for refining the app's functionality.
2. **Integration with Lab Equipment:** Exploring the app's integration with physical lab equipment, such as microscopes or sensors, could further enhance its capabilities. This would allow a seamless transition between virtual and physical experimentation, providing a holistic learning experience.
3. **Data Analytics and Machine Learning:** Leveraging data analytics and machine learning algorithms within the app can give users deeper insights into experiment results and predictive analysis. This can help students and researchers make more informed decisions and identify patterns in their data.

In summary, the "Mobile App for Monitoring Profiling of Nano Materials and Experimentation" holds immense promise for advancing education and research in nanotechnology. Future efforts should focus on refining and expanding the app's capabilities, ensuring accessibility, and fostering collaborations to harness its full potential. By embracing these opportunities for improvement, we can continue to propel innovation in nano materials and empower the next generation of scientists and researchers.

References

Nanomaterials - an overview | ScienceDirect Topics. (n.d.). Nanomaterials - an Overview | ScienceDirect Topics. https://doi.org/10.1016/B978-1-78242-373-7.00026-3

Vollath, D. (2008). Nanomaterials an introduction to synthesis, properties and application. *Environmental Engineering and Management Journal*, *7*(6), 865-870.

Baig, N., Kammakakam, I., & Falath, W. (2021, February 24). *Nanomaterials: a review of synthesis methods, properties, recent progress, and challenges*. Nanomaterials: A Review of Synthesis Methods, Properties, Recent Progress, and Challenges - Materials Advances (RSC Publishing). https://doi.org/10.1039/D0MA00807A

Pillar, K., Richards, M., & Cole, M. (2021, May 5). *Best Nanotechnology Apps of 2021 (Android) - LeapDroid*. LeapDroid - Mobile Apps | Mobile Business | Android & iOS. https://www.leapdroid.com/best-nanotechnology-apps-of-2021-android/

Title : Mobile app of monitoring profiling for chemical characterization and experimentation

Nor Shahira[1], Mohammad Aizat Basir[2], Md Uwaisulqarni Osman[3]
Universiti Malaysia Terengganu, Kuala Nerus, Malaysia[1,2,3]
norshahira222@gmail.com, aizat@umt.edu.my, uwais@umt.edu.my

Highlights: A mobile app of monitoring profiling for chemical characterization and experimentation (ChemPro) is an application used to provide scientists with an efficient and user-friendly way for lecturers and students at University Malaysia Terengganu (UMT). The app can collect, organize, and analyse data in real-time. It allows researchers to simultaneously monitor multiple experiments and provide detailed statistical analysis. It is developed based on an Agile methodological software development lifecycle which mainly combines six levels of meeting customers, planning, designing, developing applications, testing applications, and evaluating applications. It is a mobile app-based system that uses Flutter and is written in Dart language.

Key words: Monitoring Profiling; Chemicals Characterization; Experimentation; Computerized Circulation System; Experiment Monitoring

Introduction

In the realm of science education, the art of conducting experiments holds a pivotal role in fostering a deeper understanding of fundamental concepts. However, the traditional approach to teaching and learning science experiments has encountered significant challenges that impede both students and lecturers. The reliance on manual storage of experimental records in paper format has emerged as a hindrance, leading to potential loss of crucial data and making it arduous to monitor the progress of each student effectively. Furthermore, lecturers often face difficulties in comprehending their students' grasp of the experimental process and struggle to monitor each student's individual journey in acquiring essential skills.

Recognizing these obstacles, this study embarks on a mission to provide an innovative and effective solution. The primary objective is to empower lecturers with the tools they need to monitor students' comprehension and abilities in conducting experiments efficiently. Simultaneously, the study aims to introduce a secure and reliable mobile application that mitigates the risk of data loss while enabling seamless storage of experimental results. Through the development and testing of this pioneering mobile application, our mission is to facilitate improved communication between students and lecturers, streamline the process of monitoring each student's progress, and offer a digital repository for safely storing experimental work.

Product Description

The "Mobile App of Monitoring Profiling for Chemical Characterization and Experimentation" is a groundbreaking mobile application poised to revolutionize the landscape of science education. This innovative tool offers a seamless and efficient platform for students and lecturers alike. Students can effortlessly submit their experimental work, bidding farewell to the era of paper-based submissions. Lecturers, in turn, gain the capability to provide immediate feedback and personalized evaluations, while also closely tracking each student's progress. The app ensures the secure electronic storage of experimental data, eliminating concerns about data loss or damage to physical records. With its state-of-the-art technology, this application aims to enhance the teaching and learning of science experiments, fostering an engaging and collaborative educational experience for all users.

Results & Discussion

Figure 1 shows the profiling process by students to get the true result based on chemical properties. Figure 2 shows the monitoring process by the lecturer to know whether the result of an experiment is correct or not.

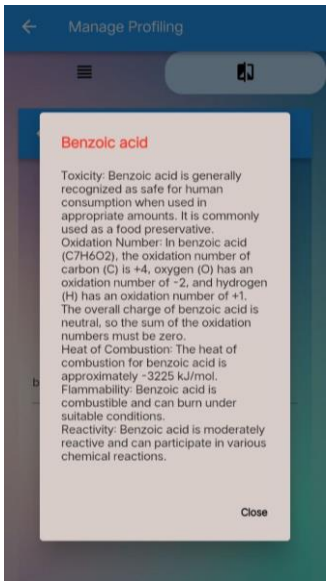


Figure 1: Profiling process

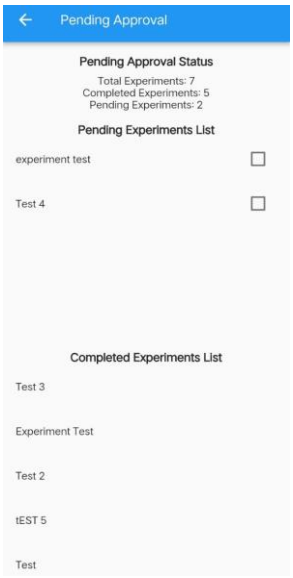


Figure 2: Monitoring process

1. **Lecturer:**

   Lecturers stand to benefit significantly from the introduction of the "Mobile App of Monitoring Profiling for Chemical Characterization and Experimentation." This innovative tool streamlines the assessment process, saving valuable time and resources by eliminating the need for manual paper submissions and storage. Moreover, it empowers lecturers to gain deeper insights into students' progress on an individual basis, enabling personalized support and guidance for struggling students and recognition of high achievers. The real-time feedback feature facilitates more dynamic teaching and assessment, ultimately enhancing the quality of science education and fostering a collaborative learning.

2. **Student:**

   For students, the "Mobile App of Monitoring Profiling for Chemical Characterization and Experimentation" offers a transformative learning experience. It simplifies the submission process, making it quick and efficient, while also reducing the risk of data loss. The real-time feedback and evaluation feature is a game-changer, providing immediate insights into your strengths and areas for improvement, accelerating your understanding of scientific concepts and experimental techniques. Furthermore, the app empowers you to take charge of your learning journey by tracking your progress and receiving personalized support from lecturers when needed, making science experiments more engaging, efficient, and tailored to your individual needs.

Conclusion

In conclusion, the challenges faced in the teaching and learning of science experiments are not insurmountable. This study has identified the issues surrounding manual storage of experimental work and the difficulties lecturers encounter in monitoring students' progress individually. By introducing the "Mobile App of Monitoring Profiling for Chemical Characterization and Experimentation," we have taken a significant step toward addressing these challenges.

This innovative mobile application has the potential to transform science education by providing an efficient solution for both students and lecturers. It enables real-time communication, progress monitoring, and secure data storage, ultimately leading to a more dynamic and effective learning environment. We anticipate that the implementation of this application will yield positive outcomes, improving the efficiency of the teaching and learning process for science experiments and paving the way for a brighter future in science education.

References

Aresta, M., Dibenedetto, A., & Angelini, A. (2014). Catalysis for the valorisation of exhaust carbon: from co2 to chemicals, materials, and fuels. technological use of co2. Chemical reviews, 114(3):1709–1742.

Fenimore, C. P., & Martin, F. J. (1966). Flammability of polymers. Combustion and Flame, 10(2):135–139.

Lyman, W. J., Reehl, W. F., & Rosenblatt, D. H. (1990). Handbook of chemical property estimation methods.

Perrier, C., & Segre, E. (1937). Some chemical properties of element 43. ´ The Journal of chemical physics, 5(9):712–716.

Thornton, W. (1917). Xv. The relation of oxygen to the heat of combustion of organic compounds. The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science, 33(194):196–203.

Title : Collaborative lesson plan development: norms in moral education

Sri Rahayu Alam[1], Samsinar[2], Taiyu Shigematsu[3], Hiroyuki Endo[4], Amane Honda[5]
Ahmad Dahlan University, Yogyakarta, Indonesia[1,2]
Naruto University of Education, Tokushima, Japan[3,4,5]
2207050010@webmail.uad.ac.id

Highlights: Moral education is an important aspect of forming students' character. However, the fact is that the crisis in children's moral development is getting worse and worse. So, it is necessary to have learning that can increase the morale of students. This research aims to develop a collaborative Lesson Plan on the norm material. The data in this study were obtained through literature reviews, interviews with teachers, observation of teachers' civic education lesson plans in Indonesia, and Japanese moral textbooks. The lesson plan contains seven learning steps, namely introduction, literacy activity, critical thinking, collaboration, communication, creativity, and closing.

Key words: Lesson Plan; Norms; Moral Education

Introduction

Moral education (ME) is education that children must receive from an early age. This will equip children throughout their life span in interacting with other people (Khaironi, 2017). In simple terms, morality can be understood as an individual's or society's perspective on what is considered the ultimate good. This perspective is founded on a collection of principles, concepts, and norms that serve as a basis for discerning between actions that are considered 'correct' and those that are 'incorrect' (Kaur, 2019). The erosion of national personality, moral degradation, lack of optimal participation in the process of building national character and the loss of noble moral values among the younger generation, are urgent problems (Nurpratiwi, 2021). Schools are educational institutions that can support social reconstruction towards a better society, and carry out the mission of forming good character in the nation's children (Syaparuddin, 2020).

The law states that national education functions are to develop capabilities and shape dignified national character and civilization in the context of educating the nation's life, aiming at developing the potential of students to become human beings who believe and fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become a democratic and responsible citizen (Kemdikbud, 2003). Considering the function of education, teachers play an important role in developing students' morals. In Indonesia, one of the subjects that focuses on student morals is Civic Education (CE) (Giwangsa, 2018).

CE has norm material in it. Norm material discusses the rules that must be obeyed by the entire community. In the norm material, students are also taught to carry out their obligations first before demanding their rights (Uchrowi & Ruslinawati, 2021). In teaching norm material, teachers certainly use learning instruments. One of them is a lesson plan (Nurtanto et al., 2021). The lesson plan is seen as an instructional roadmap for teachers throughout the learning journey (Oliva, 2009; Yusnida et al., 2017), emphasizing the inseparability of the learning scenario from the previously established context (Arifin, Nurtanto, Priatna, et al., 2020; Arifin, Nurtanto, Warju, et al., 2020).

Based on observations, lesson plan norms owned by CE teachers are still not varied enough. The lesson plans they have only contained a few activities, such as observing problems in CE textbooks, group discussions, etc. This is considered less effective in helping students improve their morals. Rahiem et al (2020) and Winston (1999) in their research mention that drama can help students to increase their moral because students directly role and experience events that they only observe in textbooks. Junaedi & Syukur (2017) also concluded in their research that ME in Japanese schools can be used as a reference as a model for ME in Indonesia. Based on interviews with Japanese ME teachers, they use the role-play method in implementing moral learning.

The objective of this study is to develop a norm lesson plan that integrates role-play into core learning activities, Thus, it can help improve student morale.

Product Description

The lesson plan contains seven learning steps, namely introduction, literacy activity, critical thinking, collaboration, communication, creativity, and closing. The first step is an introduction in the form of sharing how to greet in Indonesian and Japanese. The second step is Literacy Activities in the form of the teacher conveying the topics to be studied and distributing situation cards, dividing into groups and asking students to read the situation cards. The third step is Critical thinking. In this step, students are asked to write down their opinions on the events on the situation cards obtained. The fourth step is collaboration, where students are asked to share the ideas they have written on the worksheet with their group mates. The fifth step, namely communication, in this step, students are directed to choose roles and practice in their groups. The sixth step is Creativity, where students perform role play in front of the class according to what they are practising. The final step, namely closing, students are asked to write down what they get from the learning process and what they think is important from learning about norms.

The learning steps and situation cards can be seen in Figure 1 and Figure 2.

C. Learning Steps

Duration	Activity of students	Instruction of teachers	Remarks
Introduction (4min)	1. Sharing how to greet with Japanese teachers	-Teach how to greet in Japanese -Short Role-play for greeting	Slides
Literacy Activities (4min)	2. Check today's topic and activity What do you do in this situation? -Norms and Justice- 3. Read a situation card in a group	-Show today's topic -Explain what activity they do -Distribute situation cards	Slides Blackboard Situation cards
Critical Thinking (3min)	4. Write own opinion in worksheet -If you were in this situation, what would you do?	-Support the students who do not understand the situation	Worksheet
Collaboration (5min)	5. Share the idea in a group	-Teachers support and facilitate in each group to elicit idea	
Communication (8min)	6. Practice role-play -Decide the role and practice role-play	-Tell them to act as if they were in the real situation	
Creativity (16 min)	7. Presentation of role -play -Each group share the situation and present their role-play to all of classmates	-Pay attention to the time management	Slides (Situation)
Closing (5min)	8. Reflection and Greeting -What did you learn? What is important? - What is the definition of norms?	-Tell them to write comments in worksheet	Worksheet

Figure 1: Learning steps

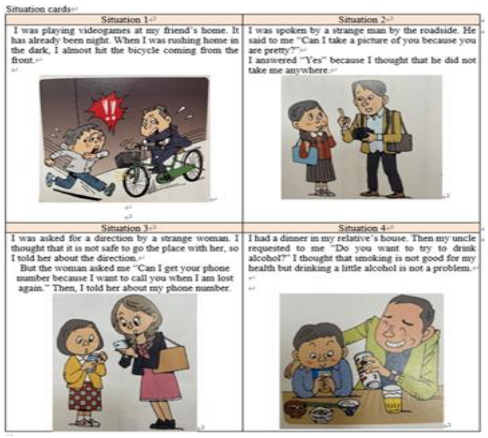


Figure 2: Situation cards

Results & Discussion

In preparing a Lesson Plan, the first step taken is an interview. Interviews were conducted with CE teachers (in Indonesia) and ME teachers (in Japan). The questions asked in the interview relate to student morality at school and how teachers carry out learning in the classroom. Based on interviews with CE teachers, it can be seen that classroom learning more often uses discussion methods. Meanwhile, the results of interviews with ME teachers showed that learning in class was carried out using the role-playing method.

Next, observations were made on the lesson plans of CE teachers and ME teachers. In the CE teacher's lesson plan, there are five core learning activities, namely literacy activities, critical thinking, collaboration, communication, and creativity. In literacy activities, the teacher asks students to observe problems in the CE textbook (usually in the form of pictures) and write down the results of their observations. For the critical thinking step, the teacher gives students the opportunity to write as many questions as possible based on the results of their observations. For example, students can ask "What forms of norms exist in school?". Then, in the collaboration step, students in groups collect various information from various sources to answer the questions they wrote in the previous step. In the communication step, students present the questions and answers they have collected in front of the class and are responded to directly by other groups. In the final step (creativity), students analyse and evaluate what they have learned and draw a conclusion about the essential points that arise in the learning activities that have just been carried out.

Meanwhile, the Japanese teacher's ME lesson plan only contains three learning steps. In the first step, students read the text on the worksheet. In the second step, students will be asked several questions related to the text they have read, then students will discuss the answers they will give. In this step, the teacher also distributes name cards to students to play characters in the role-play. Role-play activities are also carried out in the second step. On the last step, students are asked to write down what they have learned and what they consider important about the topic being taught. Based on these two lesson plans, a norm lesson plan was created which was previously described.

Conclusion

It is hoped that the lesson plans that have been developed can be used by teachers to help them teach norm material with more varied methods. Apart from that, this lesson plan is also expected to help improve student morale through learning norms.

References

Arifin, Z., Nurtanto, M., Priatna, A., Kholifah, N., & Fawaid, M. (2020). Technology andragogy work content knowledge model as a new framework in vocational education: Revised technology pedagogy content knowledge model. *TEM Journal*, 9(2), 786–791. https://doi.org/10.18421/TEM92-48

Arifin, Z., Nurtanto, M., Warju, W., Rabiman, R., & Kholifah, N. (2020). The tawock conceptual model at content knowledge for professional teaching in vocational education. *International Journal of Evaluation and Research in Education*, 9(3), 697–703. https://doi.org/10.11591/ijere.v9i3.20561

Giwangsa, S. F. (2018). Pentingnya Pendidikan Moral Dalam Pendidikan Kewarganegaraan. *MADROSATUNA : Jurnal Pendidikan Guru Madrasah Ibtidaiyah*, *1*(1), 26–40. https://doi.org/10.47971/mjpgmi.v1i1.16

Junaedi, M., & Syukur, F. (2017). Moral Education in Japanese Schools a Model for Improving Character Education in Indonesia.

Analisa: Journal of Social Science and Religion, *2*(01), 23. https://doi.org/10.18784/analisa.v2i01.416

Kaur, S. (2019). Moral Values in Education. *IOSR Journal of Humanities and Social Science*, *8*(1), 57–62. https://doi.org/10.25073/0866-773x/263

Kemdikbud. (2003). *Undang-undang Republik Indonesia Nomor 20 Tahun 2003 Tentang Sistem Pendidikan Nasional*. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.88.5042&rep=rep1&type=pdf%0Ahttps://www.ideals.illinois.edu/handle/2142/73673%0Ahttp://www.scopus.com/inward/record.url?eid=2-s2.0-33646678859&partnerID=40&md5=3ee39b50a5df02627b70c1bdac4a60ba%0Ahtt

Khaironi, M. (2017). Pendidikan Moral Pada Anak Usia Dini. *Jurnal Golden Age*, *1*(01), 1. https://doi.org/10.29408/goldenage.v1i01.479

Nurpratiwi, H. (2021). Membangun karakter mahasiswa Indonesia melalui pendidikan moral. *Jipsindo*, *8*(1), 29–43. https://doi.org/10.21831/jipsindo.v8i1.38954

Nurtanto, M., Kholifah, N., Masek, A., Sudira, P., & Samsudin, A. (2021). Crucial problems in arranged the lesson plan of vocational teacher. *International Journal of Evaluation and Research in Education*, *10*(1), 345–354. https://doi.org/10.11591/ijere.v10i1.20604

Oliva, P. F. (2009). *Developing The Curriculum*. Pearson 7th ed.

Rahiem, M. D. H., Abdullah, N. S. M., Krauss, S. E., & Rahim, H. (2020). Moral education through dramatized storytelling: Insights and observations from Indonesia kindergarten teachers. *International Journal of Learning, Teaching and Educational Research*, *19*(3), 475–490. https://doi.org/10.26803/ijlter.19.3.26

Syaparuddin, S. (2020). Peranan Pendidikan Nonformal Dan Sarana Pendidikan Moral. *Jurnal Edukasi Nonformal*, *1*(1), 173–186.

Uchrowi, Z., & Ruslinawati. (2021). *Pendidikan Pancasila dan Kewarganegaraan untuk SMP Kelas VII*. http://www.fkip.unsyiah.ac.id/wp-content/uploads/2015/06/Hasil-Tes-Online-2015.pdf

Winston, J. (1999). Theorising Drama as Moral Education. *Journal of Moral Education*, *28*(4).

Yusnida, D., Muslem, A., & Manan, A. (2017). A Study of Teaching Listening. *English Education*, *8*(4). https://doi.org/10.1515/9783486739251

Inovasi Pembelajaran Sosial Melalui V-Care V-Concern: #SatuHati

Siti Nur 'Atikah Zulkiffli[1], Yuary Farradia[2], Siti Falindah Padlee[3], Noor Zatul Iffah Hussin[4] & Fatin Nur Aina Aidi[5]

Fakulti Perniagaan, Ekonomi dan Pembangunan Sosial, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia[1,2,3,4,5]

Email address: [1]atikahzulkiffl@umt.edu.my

Sorotan: Kursus Pemasaran Sosial (MGM3053) adalah kursus teras bagi pelajar Sarjana Muda Pengurusan (Pemasaran) dengan Kepujian di Universiti Malaysia Terengganu (UMT). Tujuannya adalah meningkatkan kesedaran tentang kempen kebajikan sosial. Pada Semester I 2022/2023, kami mengambil konsep Satu Hati sebagai teras aktiviti pelajar. Pelajar UMT bekerjasama dengan pelajar dari Universitas Narotama (UN), Universitas Wijaya Kusuma (UWK), dan Rumah Sakit Umum BUNDA Sidoarjo di Surabaya untuk aktiviti seperti nyanyian, lakonan, dan pembukaan booth yang berkaitan dengan kesedaran kesihatan. Program pemindahan ilmu/USR V-Care, V-Concern: #SatuHati berlangsung selama 15 hari, bermula dari 1 Januari 2023 hingga 8 Mac 2023. Program in merupakan platform bagi pelajar SMP (Pemasaran) dengan Kepujian di UMT dalam menunjukkan kemahiran keusahawanan sosial, bekerja dalam pasukan, dalam memenuhi keperluan kursus Pemasaran Sosial (MGM3053).

Kata Kunci: Inovasi; We Care; We Concern; Malaysia; Indonesia

Pengenalan

Kursus Pemasaran Sosial (MGM3053) adalah kursus kepada pelajar Sarjana Muda Pengurusan (Pemasaran) dengan Kepujian Semester III (Tahun 2), Fakulti Perniagaan, Ekonomi dan Pembangunan Sosial (FPEPS), Universiti Malaysia Terengganu. Program V-Care V-Concern: #SatuHati dirangka sebagai salah satu platform kepada para pelajar terlibat bagi mempamerkan kemahiran keusahawanan sosial, kerja berpasukan dan tanggungjawab sebagai memenuhi keperluan kursus SULAM bagi subjek Pemasaran Sosial (MGM3053).

Tujuan utama program ini kepada para pelajar adalah:

i. Meningkatkan pengetahuan pemasaran sosial yang berbeza dengan pemasaran sedia ada;
ii. Melatih para pelajar untuk lebih cakna dengan keperluan masyarakat bagi membantu masyarakat terpinggir di sekitar Kabupaten Sidoarjo, Surabaya, Indonesia untuk mengubah kelakuan/pemikiran mereka ke arah yang lebih baik;
iii. Mengembangkan pengetahuan dan pengalaman pelajar terhadap situasi masyarakat di negara yang berbeza;
iv. Meningkatkan kemahiran komunikasi pelajar dalam memberikan nasihat dan kesedaran kepada masyarat terpinggir di sekitar Kabupaten Sidoarjo, Surabaya;
v. Melatih pelajar untuk mengaplikasi teori 4P's dalam skop kemasyarakatan yang berbeza.

Mengikut statistik yang dikeluarkan pada 2020, penduduk di Kabupaten Sidoarjo adalah seramai 2,282,215, dan statistik menunjukkan kabupaten ini mempunyai kependudukan paling tinggi dicatatkan di wilayah Kecamatan Sidoarjo yang merupakan ibukota dan pusat ekonomi dan perdagangan bagi Kabupaten Sidoarjo. Manakala, purata umur 15-64 tahun (71.62%) merupakan kitaran umur yang produktif di Sidoarjo dan merupakan penyumbang utama berkenaan isu kesihatan di kapubaten tersebut.

Melalui perbincangan dengan pihak Rumah Sakit BUNDA Sidoarjo, komuniti di Kabupaten Sidoarjo masih lagi ketinggalan dalam aspek pengendalian kesihatan, antaranya: (i) kekurangan Gizi di kalangan kanak-kanak; (ii) kekurangan pengetahuan kesihatan ibu mengandung dan selepas bersalin, dan (iii) pengguguran bayi di kalangan remaja. Justeru, projek V-Care, V-Concern: #SatuHati dengan Tema Penjagaan Kesihatan dipilih sebagai sebahagian aktiviti Kursus Pemasaran Sosial (MGM3053) Sesi I 2022/2023.

Program SULAM V-Care, V-Concern: #SatuHati adalah terhasil melalui kolaboratif antara pelajar Pemasaran Sosial (FPEPS), Pusat Pemindahan Ilmu dan Jaringan Industri (PIJI), Pejabat Hal Ehwal Pelajar dan Alumni (HEPA), Rumah Sakit Umum BUNDA Sidoarjo Surabaya, Universitas Narotama dan Universitas Wijaya Kusuma. Program ini juga merupakan platform untuk program SULAM 2022/2023 V-Care V-Concern: #SatuHati bersama masyarakat di kawasan sekitar Terengganu, selain daripada masyarakat di sekitar Surabaya. Justeru, penglibatan Rumah Sakit Umum BUNDA Sidoarjo sebagai rakan strategik di mana pihak pelajar UMT akan mendapat akses kepada kumpulan sasaran. Selain itu, pihak Rumah Sakit Umum BUNDA juga menawarkan penglibatan kakitangan perubatan dalam program ini seperti sebagai penceramah *Industry in the Classroom* dan juga penasihat kepada para pelajar yang terlibat.

Deskripsi Produk

Tujuan utama kursus ini adalah untuk mendidik dan meningkatkan kesedaran tentang kempen kebajikan sosial melalui salah satu tema utama subjek ini, iaitu penjagaan kesihatan. Konsep pemasaran komuniti mengaplikasikan pelbagai prinsip dan amalan daripada teori pemasaran komersil untuk memberi manfaat kepada pelajar untuk tidak hanya mementingkan keuntungan, malah menekankan aspek sumbangan kepada komuniti sosial yang berimpak positif

dan saksama. Pembentukan sifat "pemasaran kemasyarakatan" dalam program pemasaran sosial ini merupakan satu pendekatan inovatif ke arah transformasi sosial masyarakat.

Justeru, beberapa inisiatif telah dibangunkan bagi menjayakan program kesedaran antara dua negara (Malaysia dan Indonesia) ini melalui beberapa aktiviti inovasi antaranya:

i. Beberapa sesi kuliah dijalankan secara maya dan bersemuka antara para pelajar UMT, Universitas Narotama dan Universitas Wijaya Kusuma dengan pengendalian dijalankan secara bergilir-gilir antara pensyarah ketiga-tiga university dan pegawai kesihatan dari Rumah Sakit BUNDA Sidoarjo,
ii. Penganjuran Konsert Secara Langsung yang dikendalikan oleh wakil 30 pelajar UMT dan 30 Pelajar Universitas Narotama dan Universitas Wijaya Kusuma dalam membawa mesej Kesedaran Kesihatan, dan
iii. Penganjuran Konsert ini dirakam dan dikongsi di pelbagai saluran, antaranya *Youtube* bagi capaian seluruh masyarakat Malaysia dan Indonesia.

Secara keseluruhannya, program V-Care V-Concern: #SatuHati ini melibatkan seramai 144 pelajar tahun dua Sarjana Muda Pengurusan (Pemasaran) dengan Kepujian dan 30 pelajar Kuliah Kerja Nyata dari Universitas Narotama dan Universitas Wijaya Kusuma Surabaya, dan dapat memenuhi pencapaian empat (4) sasaran CLO kursus Pemasaran Sosial (MGM3053) iaitu:

CLO 1: Menerangkan konsep asas pemasaran, sosiologi dan persuasi sosial (C2, PLO1).
CLO 2: Menyampaikan secara lisan maklumat yang dikumpul daripada projek pemasaran sosial yang diberikan dengan jelas dan yakin (A2, PLO4).
CLO 3: Mengatur projek pemasaran sosial dengan komuniti dalam kumpulan dengan berkesan (A4, PLO5).
CLO 4: Mempraktikkan kemahiran kepimpinan dalam menguruskan projek pemasaran sosial bersama komuniti secara berkumpulan (A4, PLO9).

Hasil dan Perbincangan: Impak Program kepada Pemegang Taruh

Pelaksanaan program ini telah memberi impak kepada:

1. **Pelajar:**
   - meningkatkan kecaknaan pelajar terharap keperluan komuniti, dan kemahiran keusahawanan sosial, kerja berpasukan dan tanggungjawab sebelum menceburi dunia pekerjaan sebenar agar dapat merasai keperluan komuniti Malaysia dan antarabangsa,
   - penganalisaan sesuatu isu dalam perspektif antarabangsa,
   - menyampaikan mesej Kesedaran kesihatan yang yang diberikan dengan jelas dan yakin, dan
   - melahirkan bakat kepemimpinan di kalangan para pelajar dalam menguruskan V-Care, V-Concern: #SatuHati dengan komuniti sasaran secara dalam kumpulan
2. **Komuniti:**
   - melalui peningkatan kesedaran masyarakat dan seterusnya dapat mengurangkan bilangan komuniti yang terdedah (atau terkesan) dengan pelbagai isu kesihatan (sebagai contoh: kekurangan gizi, post-maternity, dan keguguran).
3. **Universiti:**
   - meningkatkan keterlihatan dan kecaknaan UMT di persada antarabangsa, terutama untuk isu berkaitan kesihatan.
   - mewujudkan hubungan dua hala antara UMT dengan Universitas Narotama, Universitas Wijaya Kusuma, Rumah Sakit Umum BUNDA yang mempunyai banyak cawangan di sekitar Indonesia, dan komuniti sekitar.

Selain itu, impak program ini adalah mendukung tiga (3) Matlamat Pembangunan Mampan (SDG) iaitu:

1. Mempromosikan kesihatan dan kesejahteraan masyarakat (SDG No. 3 - Kesihatan yang Baik dan Kesejahteraan)
2. Mewujudkan kesedaran persekitaran kesihatan yang selamat dan inklusif untuk masyarakat kedua-dua negara (SDG No. 11 - Komuniti Mampan)
3. Membuka peluang kolaborasi komuniti dengan pelbagai pihak dan industri di Indonesia dan antarabangsa dengan adanya penganjuran Konsert yang akan disiarkan secara langsung dan rakaman di youtube / tiktok yang akan diviralkan (SDG No. 17 - Kerjasama)

Rumusan

Program V-Care V-Concern: #SatuHati merupakan program yang menyokong pencapaian Matlamat Pembangunan Mampan (SDG) yang ketiga, ketujuh dan kesebelas yang telah disasarkan sehingga tahun 2030. Skop Penjagaan Kesihatan in dibangunkan bagi kursus Pemasaran Sosial bagi sesi I 2022/2023 dan difokuskan di Kabupaten Sidoarjo, Surabaya, Indonesia dan di daerah Kuala Nerus dan Kuala Terengganu, Malaysia. Program ini juga diharap dapat dilaksanakan pada sesi-sesi pengajian yang akan datang dan dapat difokuskan di daerah-daerah lain di Malaysia dan juga di negara-negara lain sebagai salah satu medium *Outbound Mobility* dan SULAM KPT bagi membantu komuniti antarabangsa lain dan mewujudkan jaringan antarabangsa akademik, pengurusan dan perniagaan.

Penerbitan, Anugerah dan Harta Intelek

Program V-Care V-Concern: #SatuHati telah diiktiraf melalui:

- Satu (1) *Letter of Intent* antara Universiti Malaysia Terengganu dan Universitas Narotama
- Satu (1) Letter of Intent antara Universiti Malaysia Terengganu dan Universitas Wijaya Kusuma Surabaya
- Satu (1) Harta Intelek – *Copyright*

Rujukan

Lee, N.R. & Kotler, P. (2019) Social Marketing: Behavior Change for Social Good (6th Ed). LA: SAGE

Basil, D.Z., Diaz-Meneses, G., & Michael D. Basil, M.D. (2019). Social Marketing in Action: Cases from Around the World. Switzerland: Springer. Principles and practice of social marketing: An international perspective. Cambridge: Cambridge University Press." Basil, D.Z., Diaz-Meneses, G. &

Hay, R. Eagle, L. & Bhati, A. (2021). Broadening Cultural Horizons in Social Marketing: Comparing Case Studies from Asia Pacific. Singapore: Springer

Validity And Reliability Of The Instrument Of Akhlak Values Assessment (I-PENA) For Preschoolers Using Many-Facets Rasch Measurement Model

***Norazly Nordin[1], Muhammad Daoh[2], Nor Mashitah Mohd Radzi[3]**
[1,2]Faculty of Education & Human Sciences
Universiti Selangor

[3]Faculty of Human Development
Sultan Idris Education University

[1]School of Education and Human Sciences
Albukhary International University

norazly.nordin@aiu.edu.my

Highlights: This study aims to establish the validity and reliability of an innovative Instrument of Akhlak Values Assessment (I-PeNA) designed specifically for preschoolers using the Many-Facets Rasch Measurement Model (MFRMM). The research design employed 100 sample of preschool children aged 5 to 6 years, selected from two preschools in Kuala Lumpur. The I-PeNA was carefully developed, comprising a comprehensive set of items spanning various Akhlak domains, such as speech, social, and personality. Results indicate strong evidence of validity, as I-PeNA scores exhibited a clear progression with age and aligned with theoretical expectations for preschoolers' akhlak development. The implications of this research are significant for early childhood educators, psychologists, and policymakers. The validated I-PeNA can serve as a valuable tool for identifying akhlak values strengths and weaknesses in preschoolers, facilitating early interventions and tailored educational programs to foster optimal akhlak values growth. Moreover, the utilization of the Many-Facets Rasch Measurement Model highlights its potential as a robust and effective psychometric approach in the field of early childhood assessment.

Key words: akhlak development; assessment; many-facets rasch measurement model

Introduction

Assessment refers to any form of measurement and evaluation of children's knowledge, skills, and abilities in a particular area. This assessment includes tests, observations, interviews, reports, and other relevant sources on the child's level of achievement. (Mc Afee, Leong & Bodrova, 2016). The word "child assessment" is often used in early childhood education to explain the process of assessing their development and to replace the word "test" because it can create a negative perception of efforts to measure and assess children's achievement levels.

The scenario of child assessment has also evolved and changed. The transition from assessment that used to use pencil-and-paper tests to performance-based assessment (Nor Mashitah, 2017). Traditional tests such as pencil-and-paper tests and multiple-choice tests have weaknesses in measuring children's level of thinking and problem-solving skills (Wiggins, 1993). In this context, authentic assessment, or performance assessment, is a form of assessment now widely used in preschools to measure children's skill levels and mastery based on their performance on tasks given to them. This process differs from standardized tests based on scores or grade levels that are commonly used in formal assessment in more formal educational settings.

Through this performance-based assessment, educators can determine the developmental level of children and identify the skills that each child has already mastered, has not yet mastered, or needs to master. Based on this, educators can formulate strategies for appropriate follow-up to further optimize children's development. In addition, children's weaknesses and strengths can also be identified and help educators focus on overcoming and improving children's weaknesses (Mc Afee, Leong & Bodrova, 2016; Mariani, 2011).

One of the areas of child development that educators must assess is the affective domain. The affective domain refers to emotional and spiritual development such as feelings, values, esteem, motivation, and attitude (Sukanti, 2011). Children's affective development should also be given attention, and educators have a role and responsibility to promote good values in each child. The assessment of moral values development or mastery among students in Malaysia is still neglected because the assessment system in Malaysia is only focused on the assessment and evaluation of the cognitive domain (Safar, Embong & Mohamad, 2015). Students' development and achievement are measured through formal examinations, which nowadays only measure cognitive aspects (Ghani, 2008).

In the pre-school context, the assessment of mastery of moral values and virtues is done informally through the observation method by using notes in the Anecdotal record (Usman & Abdul Jabal, 2019; and Tabi'in, 2017). The teacher will make observations of the children's behavior that is considered significant and record it in the anecdotal record. After that, the observation findings will be analyzed to get an overview of moral development. However, the process of assessment and interpretation of observation data is still not carried out correctly and perfectly (Seo & Hong, 2009; and Nah, 2011).

Product Description

This product is an innovative Instrument of Akhlak Values Assessment and known as I-PeNA, designed specifically for preschoolers. This product is carefully developed, comprising a comprehensive set of items spanning various Akhlak domains, such as speech, social, and personality. After the process of development, I-PeNA was tested using the Many Facets Rasch Measurement Model (MFRM) to ensure that I-PeNA is Valid and reliable as the instrument for assessing the Akhlak Development among preschoolers.

Results & Discussion

1. Main Domain in I-PeNA

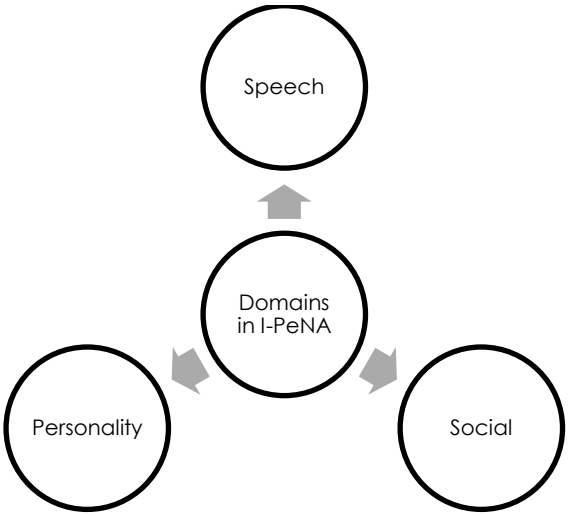


Figure 1: The Main Domain of I-PeNA. (Source: Summary Book of Ihya'Ulumuddin by Imam Al Ghazali translated by Sharhan Syafie (2016) on page 231)

Table 1: Items of I-PeNA in Each Domains and Sources

Item	Source
Domain: Speech	
Able to ask gently	Muhammad Jamaluddin Al-Qasimi (2009). Bimbingan Mukmin. Kuala Lumpur: Nadi Minda Resources
Able to speak politely.	Muhammad Jamaluddin Al-Qasimi (2009). Bimbingan Mukmin. Kuala Lumpur: Nadi Minda Resources
Able to answer Salam said to him	Muhammad Al Ghazali (2020). Akhlak seorang muslim. Kuala Lumpur: Victoria Agencies
Able to show a cheerful facial expression when interacting	Muhammad Jamaluddin Al-Qasimi (2009). Bimbingan Mukmin. Kuala Lumpur: Nadi Minda Resources
Able to speak clearly	Muhammad Jamaluddin Al-Qasimi (2009). Bimbingan Mukmin. Kuala Lumpur: Nadi Minda Resources
Able to speak without stuttering	Muhammad Al Ghazali (2020). Akhlak seorang muslim. Kuala Lumpur: Victoria Agencies
Able to accept the views of other friends.	Indonesia (2020). Panduan Praktis Penguatan Pendidikan Karakter Pada Pendidikan Anak Usia Dini. Jakarta: Kementerian Pendidikan dan Kebudayaan
Able to say good and pleasant words.	Malaysia (2011). Instrumen Kemenjadian Murid. Putrajaya: Kementerian Pendidikan Malaysia
Able to greet when meeting a friend.	Malaysia (2017). Kurikulum Standard Prasekolah Kebangsaan. Putrajaya: Kementerian Pendidikan Malaysia.
Able to refrain from uttering mocking words	Muhammad Zakaria. (2022). Eksiklopedia Adab. Kuala Lumpur: Telaga Biru.
Domain: Social	
Able to express requests to borrow other people's equipment	Imam Al Ghazali (2013). Ringkasan Ihya' Ulumuddin. Selangor: Pustaka Al Ehsan
Able to show effort to complete	Indonesia (2020). Panduan Praktis Penguatan Pendidikan Karakter Pada

assigned tasks	Pendidikan Anak Usia Dini. Jakarta: Kementerian Pendidikan dan Kebudayaan
Able to show compassion for the plight of others	Indonesia (2020). Panduan Praktis Penguatan Pendidikan Karakter Pada Pendidikan Anak Usia Dini. Jakarta: Kementerian Pendidikan dan Kebudayaan
Able to show love to others	Muhammad Jamaluddin Al-Qasimi (2009). Bimbingan Mukmin. Kuala Lumpur: Nadi Minda Resources
Able to share equipment together	Bahagian PERMATA. (2013). Modul Pendidik/Pengasuh Kursus Asuhan & Didikan Awal Kanak-Kanak PERMATA Negara. Serdang: Penerbit UPM
Able to work in a group	Bahagian PERMATA. (2013). Modul Pendidik/Pengasuh Kursus Asuhan & Didikan Awal Kanak-Kanak PERMATA Negara. Serdang: Penerbit UPM
Able to show how to respect older people	Indonesia (2020). Panduan Praktis Penguatan Pendidikan Karakter Pada Pendidikan Anak Usia Dini. Jakarta: Kementerian Pendidikan dan Kebudayaan
Able to show the right way to eat	Indonesia (2020). Panduan Praktis Penguatan Pendidikan Karakter Pada Pendidikan Anak Usia Dini. Jakarta: Kementerian Pendidikan dan Kebudayaan
Able to show politeness in socializing	Muhammad Jamaluddin Al-Qasimi (2009). *Bimbingan Mukmin*. Kuala Lumpur: Nadi Minda Resources
Domain: Personality	
Always dress clean and tidy	Al Quran (74:4)
Able to maintain good personal hygiene	Al Quran (87:14)
Able to keep the surrounding area clean	Imam Al Ghazali (2013). Ringkasan Ihya' Ulumuddin. Selangor: Pustaka Al Ehsan
Raise hand when ask a question	Muhammad Zakaria. (2022). Eksiklopedia Adab. Kuala Lumpur: Telaga Biru.
Prioritizing cleanliness and tidiness before doing anything	Muhammad Zakaria. (2022). Eksiklopedia Adab. Kuala Lumpur: Telaga Biru.
Always maintain punctuality	Ahmad Fahmi Zamzam (2020). 40 Hadis Akhlak Mulia. Kedah: Khazanah Banjariah
Able to follow the instructions given	Muhammad Zakaria. (202). Eksiklopedia Adab. Kuala Lumpur: Telaga Biru.

Content validity is an important aspect of psychometric measurement that assesses the extent to which a measurement instrument adequately represents the content domain to be measured. For this purpose, the data obtained from the pilot study was analyzed using the MFRM to obtain the Item Outfit Mean Square or MNSQ value. MNSQ is a mean-square infit statistic with an expected value of 1.0. Values tending towards less than 1.0 indicate compatibility with the data, while values tending towards more than 1.0 indicate interference to the data. However, according to Bond and Fox (2015) the range of productive item fit is between 0.5 to 1.5. If there is an item that is out of the range, then the item should be looked at again or refined or can also be dropped. A value higher than 1.4 or 1.5 indicates that the item is not homogenous with other items in a measurement scale and low value indicates the overlap of the construct with other items.

Table 2: MNSQ value for each I-PeNA item.

Item	MNSQ	Interpretation
Domain: Speech		
Able to ask gently	1.20	Accepted
Able to speak politely.	1.06	Accepted
Able to answer Salam said to him	1.10	Accepted
Able to show a cheerful facial expression when interacting	1.17	Accepted
Able to speak clearly	1.25	Accepted
Able to speak without stuttering	1.20	Accepted
Able accept the views of other friends.	1.20	Accepted
Able to say good and pleasant words.	0.97	Accepted
Able to greet when meeting a friend.	0.86	Accepted
Able to refrain from uttering mocking words	1.56	Dropped
Domain: Social		
Able to express requests to borrow other people's equipment	0.91	Accepted
Able to show effort to complete assigned tasks	0.78	Accepted
Able to show compassion for the plight of others	1.16	Accepted
Able to show love to others	0.83	Accepted

Able to share equipment together	1.11	Accepted
Able to work in a group	1.11	Accepted
Able to show how to respect older people	0.74	Accepted
Able to show the right way to eat	0.62	Accepted
Able to show politeness in socializing	1.04	Accepted
Domain: Personality		
Always dress clean and tidy	0.91	Accepted
Able to maintain good personal hygiene	1.40	Accepted
Able to keep the surrounding area clean	0.64	Accepted
Raise hand when ask a question	1.17	Accepted
Prioritizing cleanliness and tidiness before doing anything	0.87	Accepted
Always maintain punctuality	0.97	Accepted
Able to follow the instructions given	0.79	Accepted

In the context of the Rasch model, reliability refers to the consistency or accuracy of the person being assessed or evaluated and the item parameters. The Rasch model assumes that a person's probability of endorsing an item is a function of the difference between a person's ability and the item's difficulty. There are two things that need to be considered in the reliability of using the Rasch Model, namely person and item reliability. The results found that the reliability values for individuals and items for I-PeNA respectively show acceptable values. The reliability value for individuals or Person Reliability is 0.97 (very good) while for items it is 0.79 (good and acceptable).

Conclusion

I-PeNA shows a good content validity and only one item needs to be dropped and also reliable to be used in assessment of Akhlak Development for preschooler. However, further improvements to be done to ensure I-PeNA has a better-quality instrument. The further improvements are determining the construct validity of I-PeNA and preparing a comprehensive guideline or manual of instruction of I-PeNA. This will help the process of assessment more effectively and objective.

References

A.Tabi'iin (2017). Pengelolaan Pendidikan Karakter Disiplin anak usia dini studi kasus di al Muna Islamic Preschool Semarang. Jurnal Pendidikan Anak. 3(1),1-23.

Ahmad Fahmi Zamzam (2020). 40 Hadis Akhlak Mulia. Kedah: Khazanah Banjariah

Al Quran (74:4)

Al Quran (87:14)

Bahagian PERMATA. (2013). Modul Pendidik/Pengasuh Kursus Asuhan & Didikan Awal Kanak-Kanak PERMATA Negara. Serdang: Penerbit UPM

Bahagian PERMATA. (2013). Modul Pendidik/Pengasuh Kursus Asuhan & Didikan Awal Kanak-Kanak PERMATA Negara. Serdang: Penerbit UPM

Bond, T. G., & Fox, C. M. (2015). In Applying the Rasch model: Fundamental Measurement in the Human Sciences (3rd ed.). Routledge.

Imam Al Ghazali (2013). Ringkasan Ihya' Ulumuddin. Selangor: Pustaka Al Ehsan

Indonesia (2020). Panduan Praktis Penguatan Pendidikan Karakter Pada Pendidikan Anak Usia Dini. Jakarta: Kementerian Pendidikan dan Kebudayaan

Malaysia (2011). Instrumen Kemenjadian Murid. Putrajaya: Kementerian Pendidikan Malaysia

Malaysia (2017). Kurikulum Standard Prasekolah Kebangsaan. Putrajaya: Kementerian Pendidikan Malaysia.

Mariani Mohd Noor. (2011). Pemerhatian dan Penilaian Kanak-kanak. Pearson Malaysia Sdn Bhd.

Mc Afee, O, Leong, D. J, & Bodrova E. (2016). Assessing and Guiding Young Children's Development and Learning, 6th Edition. Pearson.

Muhammad Al Ghazali (2020). Akhlak seorang muslim. Kuala Lumpur: Victoria Agencies

Muhammad Jamaluddin Al-Qasimi (2009). Bimbingan Mukmin. Kuala Lumpur: Nadi Minda Resources

Muhammad Zakaria. (202). Eksiklopedia Adab. Kuala Lumpur: Telaga Biru.

Nor Mashitah Mohd Radzi. (2017). Pembinaan dan Pengesahan Instrumen Pentaksiran Prestasi Standard Awal Pembelajaran dan Perkembangan Awal Kanak-Kanak. [Tesis Kedoktoran yang tidak diterbitkan]. Universiti Malaya.

Safar, Ajmain @ Jimaain and Wan Embong, Wan Hassan and Mohamad, Ahmad Marzuki (2015) Pentaksiran akhlak satu tinjauan dalam sistem pendidikan di Malaysia. International Seminar Islam, Science and Civilization: Prospect and Challenge of Humanity, 19-23 Aug 2015, Indonesia.

Sukanti. (2011). Penilaian afektif dalam Pembelajaran Akuntansi. Jurnal Pendidikan Akuntasi Indonesia. 9(1). 74-82.

Grey Water Recycle Project: Way to Provide Clean Water for Daily Life

Aini Septiana[1], Baharudin Yusuf Haqiqi[2], Cicilia Tiara[3], Nur Ilmiah Sakinah[4], Rosyi Rahmawati[5]
Universitas Pendidikan Indonesia, Bandung, Indonesia[1,2,3,4,5]
ainiseptiana@upi.edu[1]

Highlights: This research focuses on the project learning process to overcome problem in SDGs number 6. Which focusing on the lack of clean water and sanitation problems. The project learning used STEM model which emphasises the solution process to overcome problems about water. Through the process, students carry out STEM learning steps by formulating problems about grey water, designing or making tools, and developing tools to solve water problems. In the research that has been done, students can formulate problems, make tools and redesign tools as a form of evaluation of the results of the tools that have been made.

Key words: Grey Water; SDGs number 6; STEM project learning

Introduction

It is stated in SDGs 6 goals to achieve universal access to clean water and adequate sanitation. Therefore, efforts to improve clean water are needed, including reducing pollution levels in water, recycling and reuse safe water (Johnston, 2016; United Nations, 2015). The main problem is water pollution that continues to occur in Indonesia due to low public awareness and action in protecting the environment (Chaerunnissa, 2018; Marpaung et al., 2022). Internal factors and external factors also have a big influence on community awareness and action. Meanwhile, the education about clean water access and proper sanitation is still at a low level (Nurzanah et al., 2020; Permatasari et al., 2018). Therefore, a solution is needed to create awareness and action through educational projects that reuse grey water by filtering it (Gautam et al., 2021).

Grey water is water that comes from household activities such as water used for washing dishes, washing clothes, mopping the floor, bathing, washing vehicles, etc. (Handoko, 2016). However, the chemicals contained in grey water are also dangerous for the environment. One of the activities that can help reduce grey water waste is to reuse it, the wastewater will be treated first before being reused (Aziz et al., 2011). Grey water is also recommended in the SDGs agreement which can be used as an alternative water source (Johnston, 2016). Grey water reuse has been implemented in several developed countries with predetermined standards, but the application of grey water in developing countries is still minimal (Filali et al., 2022). Indonesia is one of the developing countries where grey water utilisation is still at low level (Hidayat et al., 2019). Therefore, the introduction of the grey water recycling system can start from the educational environment. STEM-based grey water recycling project learning (STEM-ESD) is a project-based learning method that utilises grey water with several purification systems so that it can be reused in daily life (Gautam et al., 2021). This is because the STEM learning process can improve student ability to search for information and implement students' conceptual knowledge. Apart from that, another research also finds that STEM-based project learning can increase students' literacy and conceptual understanding (Aninda A, Anna Permanasari, 2019; Rohmah et al., 2019; Sumarni et al., 2019; Sutaphan et al., 2021; Wijayanto et al., 2015; Yulaikah et al., 2022). That's why the Grey Water Recycle Project is one of effort that can be done to involve student directly to overcome the water issue and let the student participate in realising SDGs Number 6 at school level.

Product Description

This research focuses on application of STEM-learning projects. The main problem that was raised is regarding water scarcity caused by grey water that is discarded to the water channel. The Grey Water Project is a project done by the student in order to explore and find a technology that is able to remove polluting elements from grey water. The goal of this project is so that the water can be reused or if the water is discarded then it will not pollute the environment. The learning step in this project was adapted from the STEM learning process that was developed by Widodo (2021).

Table 1. Stages of STEM learning (Widodo, 2021)

Learning Model Stages	Structure of Student Activities	Structure of Teacher Activities
Formulation of the problem	Identify environmental problems in the form of grey water waste	Presents issues regarding water pollution can affect life
Thinking	Thinking about technological designs that can be developed to overcome the grey water waste	Directing forms of technology that can be developed as solutions to recycle and reuse the grey water

Designing	Plan grey water filter technology that can be made using simple tools and used materials	Guiding the creation of technological designs to develop grey water filter projects
Creating	Creating the filter technology based on the design	Guiding the creation of water filter technology
Test	Identify the advantages and disadvantages of water filter that currently developed	Direct students to evaluate the advantages and disadvantages of the water filter that has been made
Design improvements	Improve the filter design that has been made based on test results	Guiding improvements to water filter designs that have been tested

The technology developed by students consists of two components, a grease trap and also a water filter. The grease trap functions to catch any grease and dirt in the water, while the filter functions to remove dissolved substances in the water that cause water pollution. At the design stage students are asked to innovate by creating the tools with used objects. All of this effort was to make sure that plastic waste also can be reduced through grey water recycling project activities.

Results & Discussion

Learning activities using a STEM learning model consist of five stages or syntax including: a) formulating problems, b) thinking about solutions to problems in the form of technology, c) designing technology by considering various aspects of life, d) creating technology based on design results or design, e) evaluating and improving technology products (Widodo, 2021). These five stages were applied in 4 face-to-face meetings with 10 hours of junior high school learning (300 minutes).

First stage, formulate the problem. Students are asked to observe daily activities related to water use, the results of the observations will be recorded in the observation table provided on the student worksheet (LKPD), then students will be invited to pay attention to household wastewater channels and see what impact the wastewater has on changes in life, be it plants or animals. Students observe that the majority of household wastewater was directly discharged into waterways that directly connected to river flows. This is proven by the students' answers to the question: Try to pay attention to where the waste water drainage channel is! Are the waste disposal procedures in your house correct? If so, state the reason, if not, state the reason! Here are the answers

"Correct, because it is thrown into the septic tank, some of it is also thrown into the river and also into the pond"- Student a

"Correct, because wastewater is discharged into the Cikapundung River which is connected to the Citarum River, which is a large river"- Student b

Students also observe the living creatures in the sewer area and compare it with waters that are still quite natural. They found that waterways that contained grey water had less life than natural waters. This is where they discovered problems related to water pollution. Based on the student observation and answer, it can be concluded that students are able to identify environmental problems and are sensitive to the surrounding environment.

Second stage, thinking about solutions to problems in the form of technology. Students are asked to think of a technology or tool that can solve the water pollution problem that has occurred. They thought about making a tool to make a grey water filter in order to reuse the water in limited activities. Besides, the water that has been filtered can be safely thrown into waterways.

Third stage, designing technology. Students are asked to describe the shape of the technology and look for information related to the tools and materials used. Students are also adding new ideas to the filter tools they design. Gray water recycling technology consists of two components, a grease trap and a filter device. A grease trap is a storage tank that consists of several partitions that are able to separate grease and dirt particles in the water by using the concept of density. How a grease trap works can be seen from Figure 3. For the filter tube itself, students use disposable gallons, the filtration material used can be seen in Figure 1.

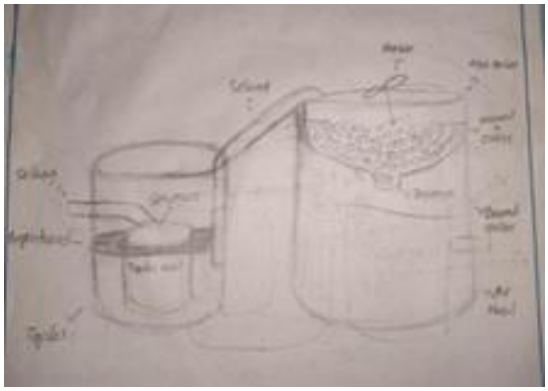


Figure 1. Student's Design of grey water recycling tool

Fourth stage, making the product. Students are making filter tools at school and continuing at home with the group. The students start making a grease trap and continue with making a filter. By doing the project, students need to applying the knowledge regarding the properties of the materials used, the function of activated carbon in the process of filtration. Within the process, students are sharpening their engineering skills and also their mathematical knowledge by measuring the composition and the water volume.

Fifth stage, evaluate and redesign. The products will be tested by using physical and chemical tests. Students observe the colour and the smell of the water. Besides, they also collecting data about water quality (pH and temperature of the water). The test results on water quality can be seen in Table 2.

Table 2. Gray Water Recycle Product Trial Results

No	Observed aspects	Before filtering	After filtering
1	Water color	Murky	Clear
2	The scent of water	Smell	Near odourless
3	pH	5,75	6,91
4	Temperature	23,9^{O}C	24,5 ^{O}C

After getting the results, students are asked to redesign the tools based on the evaluation results also by recommendation from the teacher or other group friends. This redesign stage can return to the making stage so that students can evaluate the products made to get better and more efficient products.

Figure 2. testing and evaluation activities

By doing the grey water project, students show great skills not only by finding the problem and designing the solution but also directly involved in recycling the water and developing tools that are able to clean water. This project shows how learning experience not only able to train the student's project skills but also builds up their awareness of the surrounding environment. On the other hand, the project also gives a chance for the student to solve the problem and contribute to realising the SDGs number 6 regarding clean water and sanitation.

Conclusion

Based on the grey water recycling project that has been carried out, it can be concluded that the entire learning process involves students directly in developing a grey water filter technology. This project also had a few shortcomings that can be seen as recommendations for further development. Firstly, the redesign stage should be carried out several times to produce a better product. Second, this project can be implemented on a larger scale and use more complex materials and tools. This needs to be done so the benefit of greywater recycling technology can be felt by many people. Third, the need to increase the water quality measurement that can make sure the water is really safe for daily uses. Based on the process and result of this project, it was recommended to implement this project at science class, extracurricular activity or even the school program as a way to provide a sustainable clean water and realising the SDGs.

References

Aninda A, Anna Permanasari, D. A. (2019). Implementasi Pembelajaran Berbasis Proyek Pada Materi Pencemaran Lingkungan Untuk Meningkatkan Literasi Stem Siswa SMA. Journal of Science Education And Practice, 3(2), 1–16. https://journal.unpak.ac.id/index.php/jsep/article/view/1719/1399

Aziz, T., Addelkader, C., Driss, B., Khadija, O., & Imane, T. (2011). Grey Water Recycling and Reuse. In Deutsche Gesellschaft.

Chaerunnissa, C. (2018). Partisipasi Masyarakat Dalam Program Penyediaan Ait Minum dan Sanitasi Berbasis Masyarakat (PAMSIMAS) di Kabupaten Brebes. Poltika, 5(2).

Filali, H., Barsan, N., Souguir, D., Nedeff, V., Tomozei, C., & Hachicha, M. (2022). Greywater as an Alternative Solution for a Sustainable Management of Water Resources—A Review. Sustainability (Switzerland), 14(2), 1–13. https://doi.org/10.3390/su14020665

Gautam, S., Makhitha, L. M., Gupta, A., Brema, J., James, E. J., & Chellaiah, G. (2021). Treatment and effective utilization of greywater: A preliminary case study. Applied System Innovation, 4(1), 1–12. https://doi.org/10.3390/asi4010016

Handoko, J. P. S. (2016). Studi Kasus : Rumah Susun Juminahan di Yogyakarta. Februari, 59–66.

Hidayat, M. Y., Fauzi, R., Harianja, A. H., & Saragih, G. S. (2019). Efisiensi Penggunaan Grey Water dan Air Hujan dalam Rangka Menurunkan Tingkat Penggunaan Air Baku. Jurnal Teknologi Lingkungan, 20(2), 215. https://doi.org/10.29122/jtl.v20i2.3347

Johnston, R. B. (2016). Arsenic and the 2030 Agenda for sustainable development. In Arsenic Research and Global Sustainability - Proceedings of the 6th International Congress on Arsenic in the Environment, AS 2016. https://doi.org/10.1201/b20466-7

Marpaung, D. N., Iriyanti, Y. N., & Prayoga, D. (2022). Analisis Faktor Penyebab Perilaku Buang Sampah Sembarangan Pada Masyarakat Desa Kluncing, Banyuwangi. Preventif : Jurnal Kesehatan Masyarakat, 13(1), 47–57. https://doi.org/10.22487/preventif.v13i1.240

Nurzanah, T. N., Zakianis, Z., Wispriyono, B., & Anwar, A. (2020). Sanitasi Dan Air Minum Di Daerah Perkotaan Dan Pedesaan Di Provinsi Bengkulu (Analisis Data Potensi Desa 2018). Jurnal Ekologi Kesehatan, 18(3), 159–170. https://doi.org/10.22435/jek.v3i18.2471

Permatasari, C., Soemirat, J., & Ainun, S. (2018). Identifikasi Tingkat Partisipasi Masyarakat dalam Pengelolaan Air Bersih di Kelurahan Cihaurgeulis. Jurnal Online Institut Teknologi Nasional, 6(1), 1–10. https://ejurnal.itenas.ac.id/index.php/lingkungan/article/view/1885

Rohmah, U. N., Ansori, Y. Z., & Nahdi, D. S. (2019). Pendekatan Pembelajaran Stem Dalam Meningkatkan Kemampuan Literasi Sains Siswa Sekolah Dasar. 471–478.

Sumarni, W., Wijayati, N., & Supanti, S. (2019). Kemampuan Kognitif Dan Berpikir Kreatif Siswa Melalui Pembelajaran Berbasis Proyek Berpendekatan Stem. J-PEK (Jurnal Pembelajaran Kimia), 4(1), 18–30. https://doi.org/10.17977/um026v4i12019p018

Sutaphan, S., Rincon, R., & Thuy, H. T. (2021). Promoting the middle school students ' engineering skills and conceptual understanding through STEM-based learning Promoting the middle school students ' engineering skills and conceptual understanding through STEM-based learning. https://doi.org/10.1088/1742-6596/1957/1/012020

United Nations. (2015). The 2030 Agenda for Sustainable Development's 17 Sustainable Development Goals (SDGs). https://sustainabledevelopment.un.org/content/documents/21252030 Agenda for Sustainable Development web.pdf

Widodo, A. (2021). Pembelajaran Ilmu Pengetahuan Alam Dasar-Dasar untuk Praktik. In UPI Press.

Wijayanto, T., Supriadi, B., & Nuraini, L. (2015). Pengaruh Model Pembelajaran Project Based Learning Dengan Pendekatan Stem Terhadap Hasil Belajar Siswa.

Yulaikah, I., Rahayu, S., & Parlan, P. (2022). Efektivitas Pembelajaran STEM dengan Model PjBL Terhadap Kreativitas dan Pemahaman Konsep IPA Siswa Sekolah Dasar. Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan, 7(6), 223. https://doi.org/10.17977/jptpp.v7i6.15275

Enhance Students' Character in Mathematics Education: Focussing on Computational Thinking Skill

Tutik Shahidayanti, Kanako Tanikawa, Oktiani Mersiliana Masturoh, Hiroyuki Endo, Rully Charitas Indra Prahmana

Universitas Ahmad Dahlan [1], Naruto University of Education [2]

Email addresses 2207050002@webmail.uad.ac.id

Highlights : The general aim of this research is to describe the implementation of character education in mathematics lessons applied at SMA Negeri 5 Purworejo which focuses on students' commutative thinking abilities. This research is a descriptive qualitative study. Research data sources consist of informants and documents. The data collection technique used in this research is (1) observation (2) in-depth interviews with teachers and students of SMA Negeri 5 Purworejo (3) Documentation. To test the validity of the data, data triangulation and informants were used. The analysis uses interactive analysis techniques which include four components: data collection, data reduction, data display, and conclusions. The results of this research are: Mathematics teachers at SMA Negeri 5 Purworejo have attempted to prepare a character learning model to strengthen students' character education, but have not fully focused on computational thinking abilities. student.

Key words: character; mathematics; computational thinking

Introduction

Education is the foundation for the formation of intelligent, ethical and responsible individuals in society (Sujana 2019) . Education also has an important role in shaping students' character and ethics (Effendy nd) . In the modern era, where technology and computational thinking have become the main foundation in many aspects of life, there is an increasingly strong demand to develop students' character while strengthening their computational thinking abilities (Asrol, Rifma, and Syahril 2021) .

Mathematics, as one of the core subjects in the educational curriculum, has an important role in the development of computational thinking abilities (Cahdriyana and Richardo 2020) . Skills such as understanding algorithms, data analysis, and programming are increasingly important in an increasingly digitalized world (Subroto, Wirawan, and Rukmana 2023) . Apart from that, mathematics lessons can also be a suitable place to integrate character education (Asdarina and Arwinda 2020) .

Character education is an approach that aims to form moral values, ethics and positive behavior in students (Ramdani 2018) . According to Rudyanto and Retnoningtyas (2018) many problems occur in Indonesia where character values have experienced a decline and the development of new behavior which did not appear much before the global era but now tends to become widespread. In fact, the benchmark for the success of mathematics learning cannot only be seen from students' achievements, but can also be seen from changes in attitudes and character in the current digital literacy era (Utami and Pendidikan 2020) . Then the aim of mathematics education in schools also places more emphasis on structuring reasoning, basics and forming attitudes or character, as well as skills in applying mathematics (Maryati and Priatna 2018) .

Currently, awareness is increasing regarding the importance of combining character education with academic learning, such as mathematics, to help students become morally better individuals and more competent in problem solving (Amelia, Marini, and Nafiah 2022) . This article will explore the concept of implementing character education in mathematics learning with a special focus on computational thinking abilities. Researchers will discuss how character values can be identified and instilled in a mathematical context, as well as how this integration can provide multiple benefits in student development. By combining character education and developing computational thinking skills in mathematics learning, this article hopes to make a positive contribution to students' learning experiences and help them become more competent individuals with integrity in an increasingly connected world.

Product Description

The research was carried out at SMA Negeri 5 Purworejo, Purworejo District, Purworejo Regency. The stages of implementing research activities from preparation to writing the research report as a whole were carried out for approximately 2 months. The research was carried out from July 2023 to September 2023. The data collected in this research was in the form of data about the role of students and teachers in implementing character education activities. Data collection methods in this research used observation methods, in-depth interviews, and documentation studies. This research is included in the type of field research which seeks to conduct research directly at locations with the aim of obtaining accurate, thorough and more complete data. In this research, researchers observed and recorded the implementation of character education that had been carried out at SMA Negeri 5 Purworejo. In carrying out data collection in the field, researchers used an open, in-depth interview method. Interviews are not only carried out once or twice, but repeatedly with high intensity. Researchers do not just "just believe" what informants say, but need to check the reality through observation. That is why checks and rechecks are carried out. Books, notes and documents are used for documentation methods. The data analysis process in this research was carried out from the

research design period to the data collection period. Furthermore, the data that has been collected will be analyzed using the Miles and Huberman model, which is carried out during data collection and after completing data collection within a certain period. For data validity, this research only uses three types of data validity, namely extended observation, triangulation by looking for corroborating data from other sources, and checking, namely the process of checking the data obtained by the researcher with the data provider.

Results & Discussion

Efforts to instill character values in students at SMA Negeri 5 Purworejo are carried out by mathematics teachers in the learning process indirectly. Characters that can be formed include accuracy, perseverance, and responsibility for students, independence, apart from that, students are also asked to do assignments according to deadlines and work in groups. If the teaching and learning process is carried out outside the classroom, the teacher tries to shape students' character in the form of group learning, working together, respecting each other, being polite, etc. Meanwhile, in daily activities, habits that are instilled in character formation are carried out by starting the activity by praying first.

During the learning process, the teacher uses an appropriate computational thinking model, which is reflected in the Teaching Module, which is reflected in students being invited to break down each problem into several effective and efficient parts or stages . Apart from that, honesty is the behavior of saying what is true. There are various ways used by mathematics teachers at SMA Negeri 5 Purworejo to instill an honest attitude in students, namely inviting students to always say the truth and behave honestly, paying attention to students' daily activities, giving assignments, and asking students to do their own assignments. in the classroom. If a student is dishonest or cheats in doing an assignment or exam, then a punishment in the form of a warning will be given to the student and playing sportsmanship contains the value of honesty. So it can be seen that what has been implemented by the mathematics teacher at SMA Negeri 5 Purworejo is an effort so that students have attitudes and behavior that can always be trusted in words and deeds.

This is in accordance with the objectives of character education launched by the government to instill character values in students. An attitude of mutual respect, a tolerant attitude is always applied in dealing with differences through various strategies such as debate strategies, giving group assignments for discussion, providing motivation. What has been done at SMA Negeri 5 Purworejo is in line with research conducted by (Aslan 2011) . This research shows that moral education and character education need to be implemented in the school environment, including in the classroom. This will indirectly shape the character of students because they will learn how to have good discussions, respect friends, tolerance, mutual love, empathy, attention, and so on.

The application of discipline at SMA Negeri 5 Purworejo is to try to enter school before 7 am, wear uniforms and attributes in accordance with the rules, and during ceremonies always carry out them solemnly, and carry out tasks on time. During education, students will get used to doing good things, for example being independent, learning to be disciplined, being punctual, respecting and obeying teachers, respecting friends, loving the environment, and so on.

The mathematics teacher at SMA Negeri 5 Purworejo also tries to ensure that students have attitudes and behavior that are always orderly and comply with the rules and regulations. Mathematics teachers there try to provide computational skills by giving questions with solution strategies using indicators of computational thinking skills. Students are also trained to think logically, coherently and are able to determine the right strategy in determining solutions.

Conclusion

Character learning that focuses on computational thinking skills has been attempted to be prepared by mathematics teachers in teaching and learning activities at SMA Negeri 5 Purworejo. Related to the ability to think in mathematics learning which consists of a coherent process with clear steps and procedures (algorithms), calculations (computation), determining the right strategy, and being oriented towards problem solving. Of course, all of this is needed in the computational thinking process. And several characters that are often instilled by mathematics teachers in learning include courage, discipline, environmental care, social care, hard work, responsibility, religiousness, self-confidence, cooperation, honesty, independence, good manners, obedience to teacher instructions, thoroughness. , tolerance and communicative. In an effort to instill character in students, mathematics teachers at SMA Negeri 5 Purworejo experienced several obstacles caused by both the students themselves and the teachers.

Publications, Awards and Intellectual Property (if any)

References

Amelia, Winda, Arita Marini, and Maratun Nafiah. 2022. "Pengelolaan Pendidikan Karakter Melalui Pembelajaran Matematika Di Sekolah Dasar." *Jurnal Cakrawala Pendas* 8(2): 520–31.

Asdarina, O, and N Arwinda. 2020. "Analisis Implementasi Pendidikan Karakter Dalam Proses Pembelajaran Matematika." *Mathema: Jurnal Pendidikan …* 2(1): 1–11.

Aslan, M. 2011. "Handbook of Moral and Character Education, Edt. Larry P. Nucci and Darcia Narvaez." *International Journal of Instruction*. https://www.e-iji.net/dosyalar/iji_2011_2_br.pdf.

Asrol, Leyli Desra, Rifma, and Syahril. 2021. "Evaluasi Literasi Kecerdasan Buatan Definisi." *Cybernetics: Journal Educational Research and sosial Studies* 2(April): 1–10.

Cahdriyana, Rima Aksen, and Rino Richardo. 2020. "Berpikir Komputasi Dalam Pembelajaran Matematika." *LITERASI (Jurnal Ilmu Pendidikan)* 11(1): 50.

Effendy, Rustan; Irmwaddah. "1976-Article Text-3607-3-10-20221109."

Maryati, Iyam, and Nanang Priatna. 2018. "Integrasi Nilai-Nilai Karakter Matematika Melalui Pembelajaran Kontekstual." *Mosharafa: Jurnal Pendidikan Matematika* 6(3): 333–44.

Ramdani, Emi. 2018. "Model Pembelajaran Kontekstual Berbasis Kearifan Lokal Sebagai Penguatan Pendidikan Karakter." *Jupiis: Jurnal Pendidikan Ilmu-Ilmu Sosial* 10(1): 1.

Rudyanto, Hendra Erik, and Weninda Ayu Retnoningtyas. 2018. "Integrasi Nilai-Nilai Karakter Melalui Pembelajaran Matematika Di Sekolah Dasar Hendra Erik Rudyanto 1) & Weninda Ayu Retnoningtyas 2) 12) PGSD, FKIP, Universitas PGRI Madiun." 1(7): 34–43.

Subroto, Desty Endrawati, Rio Wirawan, and Arief Yanto Rukmana. 2023. "Implementasi Teknologi Dalam Pembelajaran Di Era Digital : Tantangan Dan Peluang Bagi Dunia Pendidikan Di Indonesia." 01(07).

Sujana, I Wayan Cong. 2019. "Fungsi Dan Tujuan Pendidikan Indonesia." *Adi Widya: Jurnal Pendidikan Dasar* 4(1): 29.

Utami, Friska Mega, and Pendidikan. 2020. "291-568-1-Sm." *Prosiding* 9(20): 9.

PT'OPOLY

Razreena Ridzuan, Alif Fairus Nor Mohamad
SMK (P) Taman Petaling, Universiti Putra Malaysia [1,2]
razreena772@gmail.com. aliffairus@upm.edu.my

Highlights: This study was conducted to enhance students' interest and knowledge level regarding the topic of the Periodic Table of Elements using the board game PT'OPOLY and improve students communicating in English. PT'OPOLY is a type of board game involves one of the topic of the Periodic Table of Elements in the Chemistry curriculum for Form 4 (Grade 10) according to the KSSM syllabus. A total of 16 students from Form 4 Teratai and 14 students from Form 5 participated in the study, all of whom were identified as facing challenges with the Periodic Table of Elements topic. An initial survey was conducted using conventional teaching and learning methods in the classroom. The survey results revealed that students found the topic to be extensive and challenging to fully engage with during teaching and learning sessions. As a result, they struggled to grasp the concept of the Periodic Table of Elements. Therefore, the PT'OPOLY board game was introduced as a method to engage students' interest and improve their mastery of the Periodic Table of Elements topic. The post-test results demonstrated an improvement in students' performance in this topic. Students showed more interest in learning using the PT'OPOLY board game. The PT'OPOLY board game method helped students overcome their challenges. The utilization of the PT'OPOLY board game method managed to engage students' interest and subsequently enhance their mastery of the Periodic Table of Elements topic.

Key words: *Board game; PT'OPOLY; Periodic Table of Elements; Chemistry; English*

Introduction

Class 4 Teratai and 5 Teratai are classes that are enrolled in the Pure Science stream, following the KSSM syllabus for the subject of Chemistry at SMK (P) Taman Petaling. The students in this class have high potential to achieve excellent results in the Chemistry subject. Informal interviews were conducted with all the students in the class, and it was found that the students enjoy studying Chapter 1, 2, and 3. However, when they were introduced to Chapter 4, the Periodic Table of Elements, they began to feel stressed and anxious due to the extensive content in that chapter.

The students started to feel bored when the teacher used only PowerPoint slides to teach this chapter. Even though the teacher didn't use a teacher-centered approach exclusively, it was observed that students were less willing to come to the front of the class voluntarily to answer questions due to the fear of making mistakes. Consequently, since the students had a weak grasp of Chapter 4, some of them were less responsive during the teaching and learning process in the classroom.

Furthermore, based on observations, students showed less interest in participating during question and answer sessions. This lack of interest is a result of their disengagement with the less captivating teaching methods or due to communicating in English during the lesson is challenging for the students. This lack of interest and unengaging teaching methods have led to a weak grasp of the subject matter, making students feel less confident about answering questions posed by the teacher.

In the Periodic Table of Elements chapter, students are exposed to the development of the Periodic Table, the arrangement of elements within it, and details about Group 18, 1, 17, Period 3, and Transition Elements. In the teaching and learning sessions, We utilized a blended learning approach, giving students the opportunity to share knowledge they have acquired through reading and research. From our observations, only a few students paid attention to their peers' presentations. Those who presented also had misconceptions about facts related to Group 18 and Group 1 elements, which needed correction from me. the presenters also had problem presenting their ideas or answering questing in English due to lack to proper communicating skills in English. Moreover, students were unable to recall what they had learned on their own and simply read from their notes in front of the class. It was evident that we needed more time than originally planned in the Yearly Lesson Plan to ensure that students achieve the required level of mastery.

To gauge the students' understanding of the taught material, I posed several questions related to the chapter. However, only a small number were able to provide positive responses. Most of them gave blank expressions, and there were a few students who responded to the teacher's questions without providing substantial answers and opted to answer in Malay language. This was disappointing, as a significant number of students were unable to achieve the required level of mastery for this chapter.

Referring to this, we found:

a) The students' level of mastery is weak in Chemistry

b) Students fail to engage in the question and answer sessions with the teacher in English

c) A significant amount of time is needed to ensure that students attain a good level of mastery in Chemistry

This problem arises from less engaging teaching methods. It is our responsibility as a teacher and educator to seek out methods or alternative approaches that are more captivating and capable of helping students achieve their learning objectives.

Regarding the issues that have surfaced, Chemistry teachers should not overly depend on a single teaching method for students. The teaching and learning process is more effective when the curriculum incorporates playful activities (Sharifah Aliza, 2011). According to Zaida bt Torman (2002), memorization skills must be present in students to achieve mastery in any subject. This is because the process of memorization involves more than just recording information; it requires retrieving information for specific purposes when the time comes.

As such, teachers should take the initiative to make teaching and learning more unique, meaningful, and impactful in order to enhance students' interest in learning and, consequently, improve their mastery levels. Therefore, we have taken the initiative to translate my ideas into an action research study to assist students in achieving their learning objectives.

Product Description

This innovation aims to investigate whether the board game 'PT 'OPOLY' can enhance students' interest in teaching and learning, improve students communication skills in English as well as improve their mastery of the Periodic Table of Elements chapter. For students who are struggling and less interested in teaching and learning, it is challenging for them to identify the physical and chemical properties of Group 18, 1, and 17 elements. Students also face difficulties in writing balanced chemical equations for reactions. To address these challenges, We introduced a board game called PT 'OPOLY', which utilizes the concept of the 'MONOPOLY' board game but incorporates elements learned in the Periodic Table of Elements chapter.

Both game-based learning and gamification are being integrated into the teaching and learning processes of the 21st century. Both approaches share the same goal of applying innovative methods in teaching to make the process more interactive and enhance the quality of education in the country (Rahima Wahid, 2020). The current technological advancements should be leveraged in teaching methods like game-based learning, which not only captures students' interest but also fully engages them in the classroom.

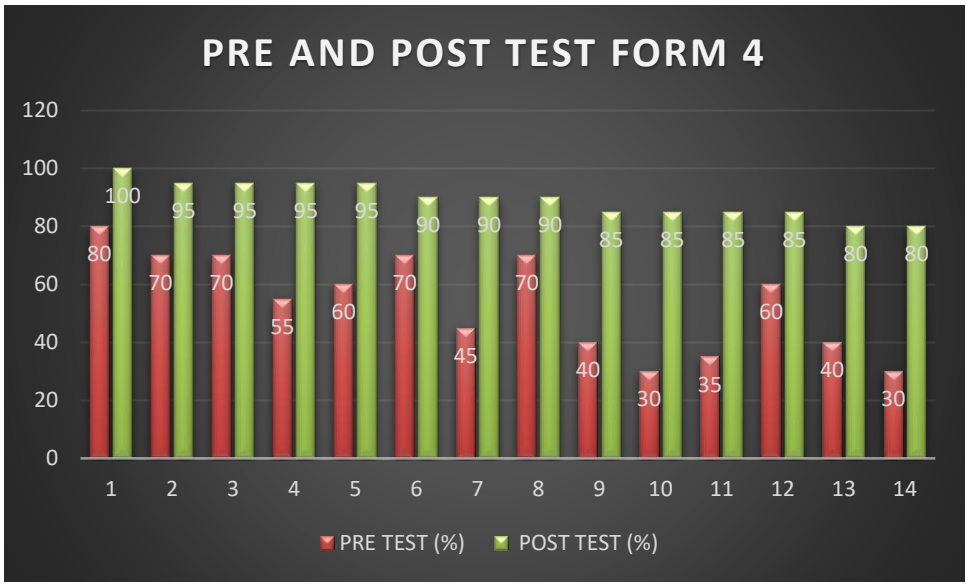
There are numerous benefits to game-based learning and gamification that help enhance the learning process for students at all academic levels. According to Smith-Robbins (2011), gamification encourages students to constantly seek knowledge to satisfy their curiosity and personal satisfaction. Compared to traditional question-and-answer methods in the classroom, embedding questions and answers within a game-based learning context can be conducted without students feeling pressure and stress. Moreover, students can interact with their peers and develop effective communication skills. Oyen and Bebko (1996) found that games have a positive impact on problem-solving abilities and engagement in completing assigned tasks. De-Marcos et al. (2016) also proved that this method has a positive effect on students' academic performance.

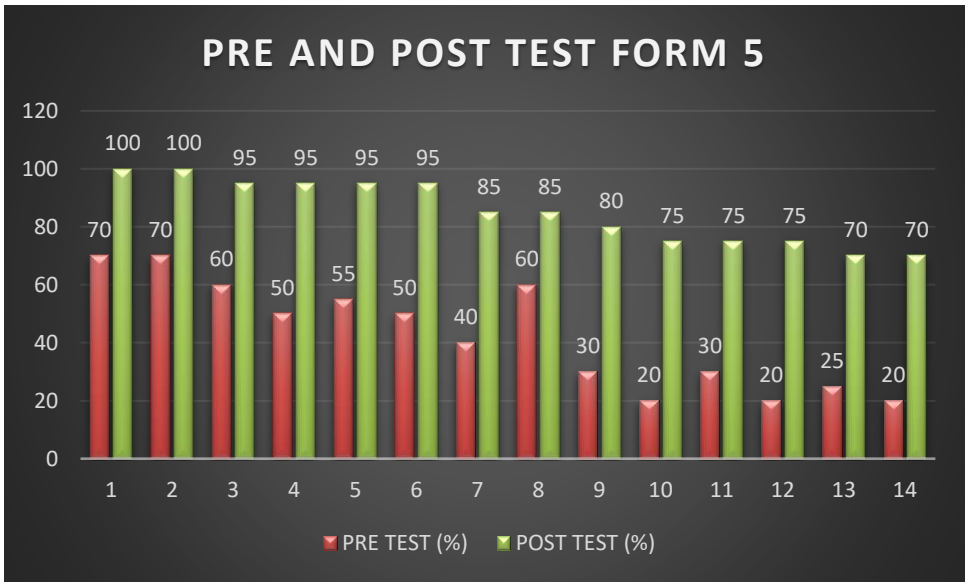
As students exposed to game based learning, they will need to communicate with other players to achieve their goals and their needs in the game. Therefore, in playing this PT'OPOLY board games, student will be able to practice communicating the right way in English to accomplish their goals.

Results & Discussion

Based on the test results, observations, and analyses conducted, we found a positive improvement in student engagement during teaching and learning sessions. Students were able to ask questions in the correct manner and students were eagerly waiting to communicate in English even though they had some wrong sentence structure or vocabulary used. On top of that, there was also a noticeable enhancement in students' mastery level.

Therefore, the PT'OPOLY board game method has proven to be an engaging and unique approach to teaching and learning that has a positive impact on both students' mastery and their participation in the learning process. The student's active participation has indirectly raised their level of mastery, leading them to achieve the learning objectives. The outcomes of this innovation demonstrate improvements in students' cognitive and psychomotor development. This can be seen in their pre and post-test given to them before and after the session with PT'OPOLY.





Conclusion

Here are some suggestions for improvements that can be implemented in teaching and learning using the PT'OPOLY board game method:

The PT'OPOLY board game can be designed to suit other chapters in Chemistry as well. In the near future, we would like to create a database of items and question banks for a subject and teachers are able to choose the subjects and topics that they would want the students to play with. This method can be used as an approach to engage students by incorporating more visually appealing elements and graphics using tools like Canva. This way teachers are able to design their own PT'OPOLY depending on the students' level of mastery. Future studies should also be conducted over a longer period to obtain more accurate findings and higher confidence levels.

Publication, Award and Intellectual Property

Gold Medal award from Kolokium dan Persidangan Guru Cemerlang Kebangsaan Tahun 2023

References

De-Marcos, L., Dominguez, A., Saenz-de-Navarrete, J., & Pages, C. (2014). An empirical study comparing gamification and social networking on e-learning. Computers & Education, 75(6), 82-91.

Hodson, D,. & Benceze, L. 1998. Becoming critical about practical work : Changing views and changing practice through action research. International "Journal of Science Education". 20(6), 683-694.

Oyen, A. & Bebko, J. (1996). The effects of computer games and lesson context an children's mnemomics strategies. Journal of Experimental Child Psychology, 62, 173-189.

Zaida bt Torman (2002), *Amalan Teknik Mengingat Di Kalangan Pelajar-Pelajar Sekolah Menengah Teknik Batu Pahat, Johor*. Tesis Sarjana Pendidikan Teknik danVokasional. Kolej Universiti Teknologi Tun Hussein Onn

"Moneydash" virtual reality expedition: The gamification of financial strategy board games.

Farah Raihana Ismail, Norashida Othman, Amer Hamzah Jantan, Siti Fazariah Binti Hashim, Lee Hui Hui
Universiti Putra Malaysia, Serdang, Malaysia[1,] Universiti Teknologi MARA, Puncak Alam, Malaysia [2] City University, Petaling Jaya, Selangor, Malaysia,[3] Universiti Teknologi MARA, Shah Alam, Malaysia [4] Veritas University College, Petaling Jaya, Selangor, Malaysia [5]
fara.raihana@gmail.com, shidaothman@uitm.edu.my,
amerhamzah@gmail.com, fazariah.hash@gmail.com, Joyce.LeeHH@gmail.com

Highlights: MoneyDash is a breakthrough virtual reality board game that immerses players in Malaysia's financial sector. This novel educational experience provides a deep dive into cash flow management within a dynamic VR environment. 'MoneyDash' easily converts from a classic board game to a fascinating virtual reality journey by fusing tradition and technology. Players learn real financial skills and benefit from VR's immersive nature, improving their knowledge of economic ideas. It's a fun, multigenerational activity that encourages creativity, improves family relationships, and allows participants of all ages to learn financial basics in a uniquely Malaysian setting.

Key words: Virtual Reality; Gamification; Financial Cash Flows; Education; Malaysian Context.

Introduction

In the current epoch characterized by the transformative influence of digital environments, the education domain finds itself on the brink of an unprecedented transformation. Traditional board games have encountered a significant obstacle in engaging the interest of contemporary youth, who have been brought up in an era dominated by digital technology and its immersive interactive encounters. The aforementioned traditional games frequently fail to adequately address the intricate problem of financial illiteracy that afflicts contemporary cultures. The lack of student engagement in traditional teaching methods, including the use of physical board games, can be attributed to various factors, such as the absence of active learning techniques, the lack of teacher competency in using these techniques, and the absence of student-teacher rapport (Verkruijsse & Albuquerque, 2023; Parija & Shrivastava, 2022; Kian & Chen, 2016; Imms et al., 2017). Other factors affecting student engagement include the availability and active usage of ICT resources, the university's reputation, and the difficulty in assessing students' current knowledge levels to effectively teach lessons (Vidakis et al., 2020).

Besides that, Traditional board games have many challenges when incorporated into contemporary educational settings. These challenges pertain to their endeavour to effectively involve digitally-native younger generations. The challenges faced by these educational games include the difficulty of attracting digitally-native younger generations due to their lack of interactivity, limited accessibility requiring physical presence, time-consuming gameplay that does not accommodate busy schedules, potential monotony over extended periods, a lack of practical application for financial skills in real-world contexts, rigid rules that restrict customization, design barriers related to age, limitations in scalability for broader educational settings, and the inability to effectively teach complex financial and economic concepts, especially those requiring dynamic real-time decision-making (Katmada et al., 2018). The abovementioned restrictions underscore the pressing need for innovative teaching methodologies, such as implementing a virtual reality financial cash flow board game. This game has been specifically intended to address these deficiencies and enhance the educational experience by fostering engagement and effectiveness among a wide array of learners. Therefore, the positive effects of game-based learning suggest that it could be a useful tool to aid young students in learning financial courses (Ozarslan & Kaya-Ozarslan, 2022; Platz & Juttler, 2022).

Virtual reality (VR) technology has yielded favourable consequences regarding student effect and academic achievement in hands-on disciplines such as the sciences (Wei & Zhang 2022). According to Su et al. (2022), virtual reality (VR) settings have been employed as educational tools for teaching analytical structure concepts, yielding favourable outcomes in augmenting students' sensory immersion and comprehension of subject matter. On top of this, Virtual reality (VR) environments were specifically developed for the purpose of enhancing students' learning experiences in finance and marketing courses (Korenova et al., 2022). The incorporation of VR technology was met with positive feedback from students, who expressed high satisfaction with its utilization (Korenova et al., 2022). Research has demonstrated that using immersive virtual reality (IVR) has yielded positive outcomes in terms of enhancing student engagement with course material, improving information retention, and fostering the development of clinical reasoning abilities among medical field students (McCaw et al., 2022). Makransky & Peterson (2022) debated that the use of virtual reality (VR) technology within the realm of education has witnessed a notable surge, hence necessitating the development of a research-grounded theoretical framework that facilitates a comprehensive comprehension of learning in immersive virtual reality (IVR) environments. Although there is a lack of particular research on the utilization of virtual reality (VR) technology for teaching financial courses, the existing evidence highlighting the favourable impact of VR technology on student learning outcomes across diverse subjects implies its potential as a valuable instructional tool for facilitating the acquisition of financial knowledge among young learners.

In light of this identified deficiency, we undertake an ambitious endeavour that combines visionary thinking, educational principles, and technological advancements. The objective of our work is unequivocal: to establish a connection between the allure of immersive digital environments and the urgent necessity for financial literacy. Through the utilization of virtual reality and artificial intelligence, our aim is to develop an exceptional educational experience that not only imparts knowledge but also engrosses and motivates learners.

The project's novelty stems from its innovative integration of virtual reality technology, practical financial use in real-world contexts, customizable features, and personalized experiences facilitated by artificial intelligence. This platform offers users a highly engaging and practical learning experience that surpasses traditional board games' educational value by providing users with a three-dimensional and interactive financial environment. The enhancement of content relevance in the Malaysian financial context, coupled with the inclusion of customizable difficulty levels and AI-driven components, contributes to the adaptability of the learning platform to cater to individual learners, hence promoting inclusivity and effectiveness. The initiative incorporates real-time economic updates, professional guidance, and interactive elements, thereby enhancing its novel and influential approach to financial education.

Product Description

Embark upon a captivating expedition into the realm of financial literacy unparalleled in novelty, facilitated by the innovative platform MoneyDash. This innovative virtual reality financial cash flow board game aims to transform the pedagogical approach to understanding money, finance, and economics concepts. Engage in an interactive three-dimensional setting that integrates the excitement of gaming with the pragmatic aspects of financial education. MoneyDash provides a customized educational experience that caters to individuals at various levels of financial expertise, whether they are beginners aiming to establish a solid financial base or experienced investors wishing to enhance their skills.

The platform is designed to adapt to the unique requirements of each user, encouraging them to acquire a comprehensive understanding of fundamental financial principles. This project examines the fundamental characteristics that position MoneyDash as a preeminent instrument for fostering financial empowerment and education. The innovativeness and features of the product are as follows:

(1) **Immersive Learning:** Dive into a virtual world that makes learning about money engaging and unforgettable. Explore financial scenarios, make decisions, and see the impact in real-time.
(2) **Malaysian Context:** MoneyDash is designed specifically for the financial environment in Malaysia, offering a culturally appropriate platform that facilitates the acquisition of financial knowledge within the local context.
(3) **Customizable Difficulty Levels:** Experience a customized learning journey that caters to individuals at various skill levels, including beginners, intermediates, and experts. Every level commences with distinct challenges and diverse initial funds, enabling individuals to advance at their individualized pace.
(4) **Interactive Gameplay:** Engage in collaborative efforts with friends and family, or alternatively, pursue an individual approach as you manage the complexities of financial difficulties, construct comprehensive budgets, and make prudent investment decisions.
(5) **AI-Powered Personalization:** Users can derive advantages from using AI-powered advice and challenges that dynamically adjust to their preferred difficulty level, thereby guaranteeing a customized and tailored learning experience.
(6) **Expert Advice and Opinions:** Gain access to expert opinions and guidance embedded within the game, providing useful insights and methods derived from financial professionals.
(7) **Cloud-Based Versatility:** The game may be accessed from a range of devices, allowing for convenient accessibility regardless of one's location.
(8) **Real-Time Economic Updates:** Enhance your knowledge by staying up-to-date with real-time economic updates integrated into the game, facilitating an interactive platform for linking in-game financial choices with real-world economic occurrences.
(9) **Multiplayer Collaboration:** Participate in the multiplayer mode to establish collaborative relationships with friends or family members, cultivating collaboration and collectively improving financial decision-making abilities.
(10) **Achievement and Progress Tracking:** Monitoring one's progress and successes throughout the game provides a sense of accomplishment and a motivational factor for the ongoing pursuit of financial knowledge.

Results & Discussion

Refining and developing the programme, culminating in a strategic decision, will let this breakthrough virtual reality financial cash flow board game reach its full potential. This project aims to create a virtual reality financial cash flow board game to improve financial literacy and education in Malaysia. The concept is promising despite its early stage and lack of a prototype. The project uses virtual reality to create an immersive and practical learning experience for all ages. This project potentially impacts the following:

(1) **Enhanced Financial Literacy in Malaysia:** The project possesses the capacity to augment financial literacy levels among students in Malaysia substantially. By providing an immersive and applicable educational encounter, it furnishes individuals with fundamental financial expertise and proficiencies specifically designed to align with the financial environment in Malaysia.
(2) **Educational Advancement in Malaysia:** The implementation of this project has the potential to foster innovation within the education sector of Malaysia. Providing a tool that offers an immersive and interactive learning experience can significantly enhance the teaching of financial and economic ideas. This initiative is in line with the country's educational objectives.
(3) **Enhanced Financial Decision-Making:** As individuals acquire a higher level of financial literacy through this initiative, they will probably exhibit improved decision-making skills in matters pertaining to personal finance. Consequently, this will positively impact their financial well-being and ability to adapt to financial challenges.

(4) **Enhanced Financial Resilience:** Heightened financial knowledge might enable individuals to mitigate prevalent financial challenges, such as excessive indebtedness and suboptimal investment choices. Consequently, this can potentially mitigate the financial susceptibility of Malaysians and foster a sense of financial stability.

(5) **Alignment with Educational Goals:** The project strongly aligns with the educational objectives outlined in the Malaysian Education Blueprint 2013-2025. This blueprint places significant emphasis on integrating new instructional approaches and developing critical thinking abilities in students. The project aligns with the blueprint's objective of cultivating proficient and internationally competitive Malaysian students by providing a comprehensive and hands-on approach to financial education. The utilization of this instrument plays a significant role in the attainment of the blueprint's objectives, which aim to cultivate versatile and comprehensive learners capable of meeting the demands of the contemporary workforce. Consequently, it is a valuable asset in fulfilling Malaysia's educational ambitions. The Progression of Education in Malaysia: The implementation of this project has the potential to foster innovation within the education sector of Malaysia. Introducing a highly engaging and interactive tool can significantly enhance the teaching of financial and economic ideas. This initiative is in line with the country's educational objectives.

Table 1: Estimation of the Budget for MoneyDash Project Development

Expense Category	Estimated Cost (MYR)
Software Development	30,000
Hardware (VR equipment)	20,000
Content Creation	15,000
Developers	20,000
Artists	10,000
Marketing Campaigns	5,000

Figure 1: The Visual Development of the MoneyDash Virtual Reality Board Game Interface

Figure 2: The Visual app features of the MoneyDash Virtual Reality Board Game Interface

Conclusion

To fully unlock the potential of this groundbreaking virtual reality financial cash flow board game, future endeavours should prioritize the enhancement and expansion of the software, leading to the development of a comprehensive commercialization strategy. It is imperative to acknowledge that the project is now in its initial stage and has yet to undergo development. The primary focus should be prioritizing continual software development and optimization to guarantee a smooth and captivating user experience. To maintain state-of-the-art software, it is possible to incorporate feature updates, such as artificial intelligence-based personalization and seamless integration of real-time financial data. Concurrently, it is imperative to develop a complete plan for commercialization that encompasses several aspects, such as marketing, distribution, and establishing relationships with educational institutions and financial organizations. The facilitation of wider accessibility can also be achieved through licensing agreements and partnerships with producers of virtual reality technology. Furthermore, integrating data analytics tools within the programme can facilitate the assessment of its instructional efficacy and provide valuable insights for continuous enhancements. Through the collective endeavours of various stakeholders, the innovation has the potential to progress from a promising idea to a generally acknowledged and economically prosperous instrument, thereby reinforcing its status as a catalyst for revolutionary change in the realm of financial literacy education.

References

Imms, Wesley; Byers, Terry (2017). Impact of classroom design on teacher pedagogy and student engagement and performance in mathematics. Learning Environments Research, 20(1), 139–152.

Katmada, A., Diplaris, S., & Kompatsiaris, I. (2018). Evaluating the user experience of a financial e-learning platform featuring gamification and personalization services.

Kian, L.T., & Chen, C. (2016). Mobile Education, Entertainment, and Exploration (MEEE) at heritage site.

Koreňová, L., Gurný, P., Hvorecký, J., Lůžek, P., & Rozehnal, P. (2022). Virtual Reality Retooling Humanities Courses: Finance and Marketing Experience at a Czech University. Applied Sciences, 12(19), 10170.

Makransky, G., & Petersen, G. B. (2021). The cognitive-affective model of immersive learning (CAMIL): A theoretical research-based model of learning in immersive virtual reality. Educational Psychology Review, 1-22.

McCaw, K., West, A., Duncan, C., Frey, D., & Duerr, F. (2022). Exploration of Immersive Virtual Reality in Teaching Veterinary Orthopedics. Journal of Veterinary Medical Education, 49(6), 716–720. https://doi.org/10.3138/jvme-2021-0009.

Parija, S.C., & Shrivastava, P.S. (2021). Fostering Student Engagement in Virtual Learning Environment. SBV Journal of Basic, Clinical and Applied Health Science.

Platz, L., & Jüttler, M. (2022). Game-based learning as a gateway for promoting financial literacy–how games in economics influence students' financial interest. Citizenship, Social and Economics Education, 21(3), 185-208.Su, Y. S., Cheng, H. W., & Lai, C. F. (2022). Study of virtual reality immersive technology enhanced mathematics geometry learning. Frontiers in Psychology, 13, 760418.

Vidakis, N., Barianos, A. K., Trampas, A. M., Papadakis, S., Kalogiannakis, M., & Vassilakis, K. (2020). In-game raw data collection and visualization in the context of the "ThimelEdu" educational game. In Computer Supported Education: 11th International Conference, CSEDU 2019, Heraklion, Crete, Greece, May 2-4, 2019, Revised Selected Papers 11 (pp. 629-646). Springer International Publishing.

Verkruijsse, S., & Albuquerque, A. (2023). Non-Traditional Learning Activities to Improve Student Engagement. 2023 32nd Annual Conference of the European Association for Education in Electrical and Information Engineering (EAEEIE), 1-5.

Wei, X., & Zhang, C. (2022, December). The Impact of Two Mediums Based on Virtual Reality Technology in the Education of Practical Courses. In 2022 Eleventh International Conference of Educational Innovation through Technology (EITT) (pp. 31-36). IEEE.

Soil nutrient and analysis e-laboratory report: A learning innovation

Nur Maizatul Idayu Othman, Zahirah Amirah Zamzuri, Azzarina Rahim, Nur Atieqa Aqila Aminuddin, Norazlina Abu Sari

Faculty of Plantation and Agrotechnology, Universiti Teknologi Mara, Kampus Jasin Merlimau Melaka [1]
Soil Conservation and Management Research Interest Group (RIG), UiTM, Malaysia[2]
Nurmaizatul@uitm.edu.my

Highlights: The "Soil Nutrient Analysis E-Laboratory Report" is a learning innovation that introduces students to interactive educational tools to increase their knowledge of soil nutrient and analysis. The E-laboratory report includes well-organized lab exercises, exact methods, and interactive aspects like instructional videos and voice command. These enhance practical skills and soil science understanding. The report's quality, relevancy, and instructional value are widely recognized and complimented by students based on their response in close-ended survey. This e-laboratory report fosters critical thinking and inclusion, preparing future agriculture, environmental sciences, and other professionals. The "Soil Nutrient Analysis E-Laboratory Report" revolutionizes soil analysis education by merging theory and practice, empowering students and making the material accessible.

Key words: Soil; Nutrient; Analysis; E-laboratory; Report

Introduction

The "Soil Nutrient Analysis E-Laboratory Report" is a comprehensive exploration of soil nutrient analysis (Figure 1). Spanning 55 pages, this extensive laboratory report provides an interactive learning experience through nine laboratory exercises complemented by instructional videos featuring voice commands. It helps in enhancing understanding on the significance of soil composition and nutrient analysis across fields such as agriculture and environmental sciences. Soil nutrient analysis often require practical skills and hands-on experience. Traditional laboratory report may struggle to provide this hands-on learning opportunity, especially in remote or overcrowded classrooms. It also requires sources of paper which is not environmental-friendly and cause harm to sustainability. An e-laboratory report can simulate real-life laboratory experiments, allowing learners to practice and refine their skills virtually, even if they do not have access to physical labs. It also reduces cost and do not require any resource from nature to produce. Through E-laboratory report, it might overcome the inadequacies of traditional static teaching methods. It seeks to immerse learners in a dynamic educational resource that promotes a profound understanding of soil health and nutrient analysis. Thus, the primary objective of this interactive laboratory report is to equip learners with a thorough comprehension of soil composition and nutrient analysis procedures.

Figure 1. Soil and Nutrient analysis E-laboratory report using Heyzine platform

Impact to Stakeholders

The implementation of the "Soil Nutrient Analysis E-Laboratory Report" has the potential to yield good effects for various education stakeholders. Engaging and practical learning experiences have been found to be advantageous for students, as they facilitate the development of practical skills, enhance their comprehension of soil science, and promote critical thinking abilities. The prestige of the institution is potentially to be bolstered, and student enrolment is expected to increased due to the high quality of the educational materials and its value, as evidenced by positive comments from students. Furthermore, the paper advocates for the enhancement of accessibility and inclusivity within the realm of education, hence providing significant advantages to learners with a wide range of needs. This resource is also will be highly valued by educators as it enables them to successfully conduct debates and provide guidance to pupils. This e-laboratory report fundamentally transforms the field of soil

analysis education by effectively connecting theoretical concepts with practical applications, empowering students, and yielding significant advantages for the wider educational community.

Product Description

1) Product Design
The schematic representation of the design process for the "Soil Nutrient Analysis E-Laboratory Report" is depicted in Figure 2. The educational resource in question is characterised by its meticulous craftsmanship and utilisation of a well-organized methodology. The provided resource presents a comprehensive examination of soil nutrient analysis, bolstered by in-depth laboratory methodology, resulting data, and subsequent discussions. The methodology also included step-by-step protocols. The findings and subsequent analysis were presented in tables and graph, accompanied by their respective interpretations. The Heyzine Flipbook platform of the report sharing site facilitates interactivity, as it incorporates background music and laboratory videos to create a multi-sensory learning experience. This approach serves to enhance comprehension and establish connections between theoretical knowledge and practical application.

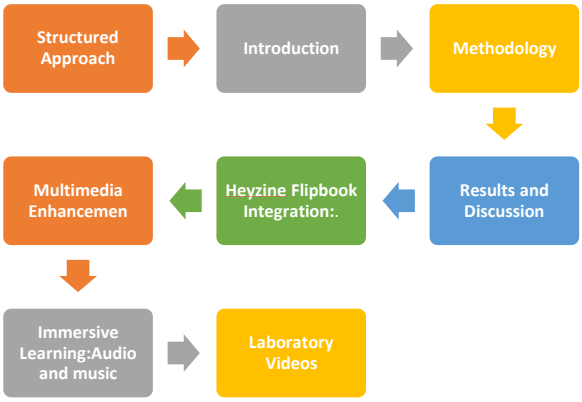


Figure 2. Workflow of Soil Nutrient and Analysis E- laboratory report design

2) About 46 Students from 80 of total Bachelor;s Degree of Smart Agrotechnology students were randomly selected to answer a survey on the objective-orient and quality of Soil Nutrient and Analysis: E- Laboratory report. The survey's questions were checked and confirmed by social science senior lecturer from Faculty of Plantation and Agrotechnology, UiTM.

Results & Discussion

Novelty, practicality and uniqueness of Soil Nutrient and Analysis E-laboratory report

The interactive laboratory report stands out due to its innovative approach. Every task is accompanied by instructional videos that provide a systematic approach to simplify intricate procedures and enhance accessibility and user involvement. Contemporary soil monitoring practices employ Internet of Things (IoT) technology, such as the Zentra meter, to gather and assess data instantaneously. Thorough analysis, extensive deliberation, and conclusive remarks are imperative to achieve a comprehensive comprehension of laboratory outcomes. The present laboratory report places a strong emphasis on usability through the provision of clear instructions, essential materials, and comprehensive protocols for each laboratory activity. The instructional videos effectively showcase the correct execution of techniques and provide clear voice commands, thereby facilitating learners' comprehension of the processes. Interactive content provides students with the opportunity to engage actively in the learning process, thereby rendering it flexible and suitable for various educational environments. The purpose of this laboratory report is to offer a thorough introduction to the composition of soil and the methodologies used in its analysis. It is intended to serve as a valuable resource for students, educators, and researchers involved in the study of soil analysis and nutrient evaluation. By providing a solid foundation in these areas, this report aims to equip individuals for future careers in agriculture, environmental sciences, and other related fields. The discussions and conclusions section serves as a platform for students to engage in a comprehensive analysis of their findings, fostering the cultivation of critical thinking abilities (Coote, 2023).

Students' responses to Soil Nutrient and Analysis: E-laboratory report

Most students find the e-laboratory report to be well-written and easy to understand (Figure 3). Specifically, 85% agree or strongly agree that it is well-written, and 78% agree or strongly agree that it is easy to understand. Regarding the clarity of objectives, there is a balanced distribution of responses, with 74% agreeing or strongly agreeing, and 26% remaining neutral. No students disagreed with the statement about well-defined objectives. For the second part of students' number of responses on the e-laboratory report quality (Figure 4), it shows most students find the contents of the report to be highly relevant, with 91% either agreeing or strongly agreeing with this statement. Then, a significant number of students (80%) believe that the report effectively reinforces concepts of soil science, indicating its educational value. The inclusion of audio contents is well-received, as 87% of students either agree or strongly agree that these contents aid in understanding the material. 80% of students' satisfaction shows that this product is relevant to be considered acceptable. Azhari et al. (2020) emphasized the importance of student satisfaction in e-learning. The study highlighted that student satisfaction in e-learning corresponds to the success of the method and ensures continuous participation of students in this form of learning.

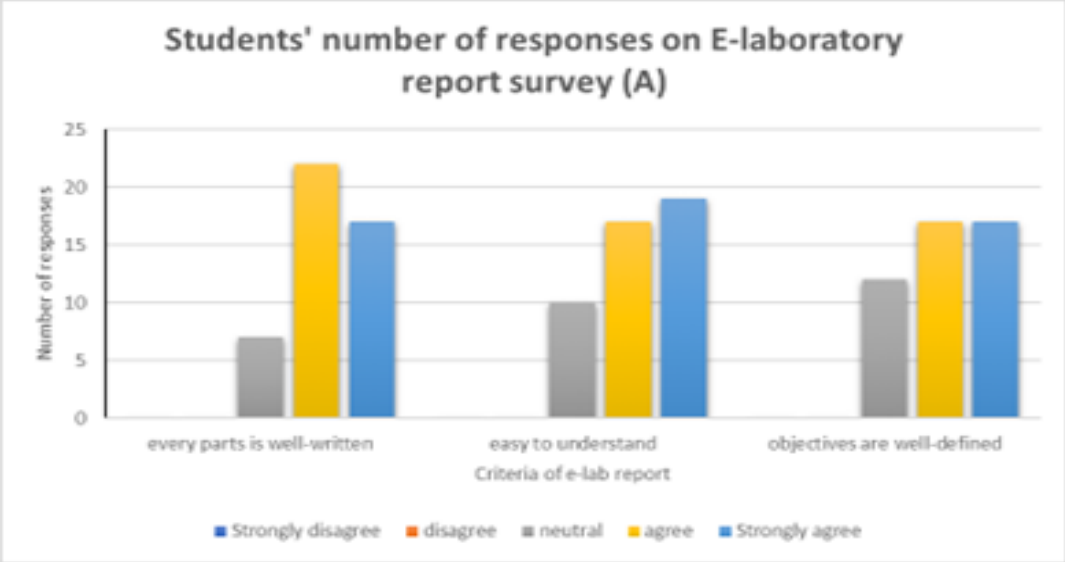


Figure 3. Students' number of responses on E-laboratory reports as objectives-oriented materials

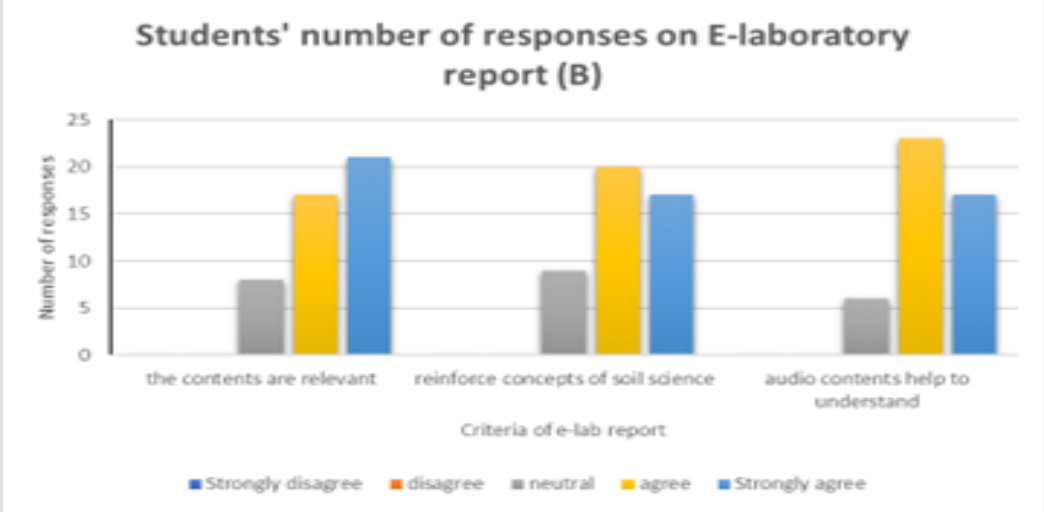


Figure 4. Students' number of responses on E-laboratory report's objectives on quality survey

Conclusion

The E-laboratory report is an engaging and practical approach gives learners a thorough understanding of soil composition and nutrient analysis procedures. This laboratory report supports an immersive learning experience by mixing guide videos with IoT technologies, making it a helpful resource for students, teachers, and researchers in a

variety of subjects as an open education that make this subject accessible to anyone. Most of Students' responses also show neutral, agree, and strongly agree to E-laboratory report survey which comprised with the objective, understanding and the quality of the e-laboratory report. For future, this laboratory report should include Augmented Reality (AR) for better understanding using visualization.

Award

Award for E-content Development Competition (UiTM 2023)

References

Azhari, F., Jasmi, N., Wahab, M., Jofrry, S., Lee, K., & Ming, L. (2020). Students' perceptions about social constructivist learning environment in e-learning. Indian Journal of Pharmaceutical Education and Research, 54(2), 271-278. https://doi.org/10.5530/ijper.54.2.31

Coote, L. 2023. The balance between critical thinking and paradigm thinking in the Arctic: Scientific cooperation across theoretical divides. Polar Record. doi:10.1017/s0032247422000377

Integration of open data access tool in teaching survival models: Empowering data analytical skills among actuarial science students

Syazreen Niza Shair, Sharifah Nazatul Shima Syed Mohamed Shahruddin, Shamshimah Samsuddin, Norazliani Md Lazam & Aida Yuzi Yusof
School of Mathematical Sciences, College of Computing, Informatics and Mathematics,
Universiti Teknologi MARA, 40450, Shah Alam, Selangor[1,2,3,4&5]
syazreen@uitm.edu.my

Highlights: The integration of real data in teaching methodologies has become increasingly essential to enhance the quality of education. This project introduces an innovative teaching approach involving the integration of open data access tool (ODAT) in Survival model subject particularly for Actuarial Science students. This technique provides effective ways to students to delve into publicly available human mortality database that offers massive mortality data of population around the world. Integrating open data access tools into the teaching framework, students empowered the skills to translate mortality modelling theories into a more practical data-driven analysis, facilitating the visualization of data.

Key words: open data access; Survival Models; practical-based teaching.

Introduction

In a world driven by data, a transformative innovation has emerged in education. Imagine a classroom where the boundaries between theory and reality blur, where students not only learn about theory but actively navigate real-world data landscapes. In particular, the power of the Integration of Open Data Access Tool (ODAT) in teaching methodology took a pioneering leap forward that does not just teach concepts; it immerses learners in dynamic, data-driven understanding. This approach steps into the future of education, where innovation meets application, and traditional learning methods are revolutionized.

The study of actuarial science usually engages in abstract and complex mathematical and statistical modelling that often poses challenges for students in understanding the connections of the theoretical models with real-world problems. For instance, some mathematics and statistics courses have been criticized for being overly rigid using teaching methods that remove much of the enjoyment from learning (Neumann & Hood, 2013). One way to address this issue is to integrate real data experiments in teaching to enable students to realize that imparting meaning to sets of data is a complex activity which involves conceptual flexibility, integration of all the procedures that one has learned, and creative reasoning (Childers & Taylor, 2020). While many researchers explored the real data experiments for statistical and mathematical courses (Petrovskaya et al., 2020; Meyer, 2022;), the integration of this teaching strategy in actuarial science courses is still underdeveloped.

Professional actuaries undertake the responsibility of predicting data patterns, assessing potential outcomes, and adjusting variables. Thus, the absence of proficient skills in handling datasets impedes students from adequately preparing for the job demands of their prospective careers. Acknowledging the important role of data analytical competencies. The Institute and Faculty of Actuaries (IFoA) took a proactive step in 2019, wherein they introduced an upgraded syllabus aimed at providing aspirant professionals with advanced analytical skills. This strategic action encompasses the integration of subjects pertinent to data analytics as a partial requirement for professional paper exemptions. In light of changes in the IFoA curriculum, this study proposes methods for integrating the real data experiment into teaching Survival models course thus providing data analytic skills among the students. This tool enables access to the Human Mortality Database (HMD) which consists of real mortality data of populations in many countries around the world. The approach is practical and offers intriguing ways to comprehend how the theory of survival models is used to solve actual issues. In addition, this tool provides visualization of data which is essential to illustrate analytical findings thus lessening the difficulties of learning the underlying concepts of mortality projections.

Product Description

Our teaching tool designed to revolutionize to provide a comprehensive learning experience and align with the requirement of actuarial professional body. Integration of the Open Data Access Tool (ODAT) stands as a groundbreaking innovation by blending the power of real-world data with the pedagogical process, we transcend traditional theory teaching methods and propel learners into a realm of hands-on understanding. The innovativeness of our approach is that, with ODAT seamlessly integrated into the teaching of survival models, students gain access to real mortality data, enabling them to explore dynamic scenarios and grasp complex concepts survival modelling. The implementation of the proposed methods describes as below.

Odat Sumo Setup: Using Project-Based Learning

Implementation of the proposed ODAT in Survival model is performed via project-based learning. According to Bailey (2019) and Knoll (2016), project-based learning provides methods to apply knowledge to something that is more meaningful. The materials covered in the Survival model course is outlined as follows: 1) Introduction to Survival Models; 2) The Life Tables; 3) Estimating the Lifetime Distribution Function; 4) Proportional Hazard Models; 5) Maximum

Likelihood Estimation for Transition Intensities; 6) Graduation and Statistical Test; 7) Methods of Graduation; 8) Exposed to Risk; 9) Mortality Projections. The implementation of ODAT is focusing on the Mortality Projection topic. Figure 1 demonstrates the teaching and learning workflow.

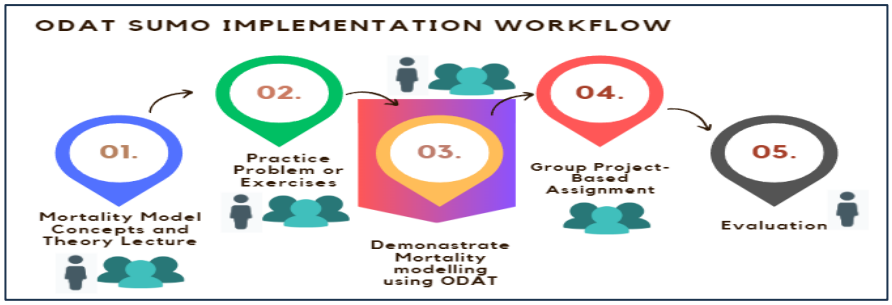


Figure 1: Integration of ODAT in teaching and learning process for the Survival Models subject.

First stage, students will learn the theoretical concepts and formulations of mortality models in class, either in-person or through online sessions using Microsoft Teams. This will involve conventional two-way teaching and learning methods. Comprehensive lecture notes and slides will be made available to students. Active participation and discussions are strongly encouraged during the lectures to foster engagement. This stage usually takes 4 hours or two sessions to complete. Moving to the second stage, students will engage with practice problems. They will work on questions revolving around mortality modelling and projections during class sessions, applying the concepts they've learned. One session or 2 hour is allocated for this stage.

The third and most important stage involves the incorporation of the Open Data Access Tool (ODAT) SUMO into the learning and teaching process. During this phase, the instructor will demonstrate the practical utilization of ODAT in accessing real data from the Human Mortality Database (HMD) (https://www.mortality.org/). These datasets possess a degree of complexity, involving 2x2 matrix data spanning from the year 1921 to the present, segmented by single ages. Furthermore, comprehensive manual step-by-step instructions will be provided to the students as a reference. This session involves 2-hour practical class. Students are required to install R software in order to execute the necessary code. The reason why we user R is because it is a powerful and widely used programming language and software designed for statistical computing and visualization. In addition, R is an open-source project, which means it's freely available to anyone. This accessibility encourages collaboration and innovation across a wide range of domains. Below is the example of tool to access the open data from the HMD website.

The fourth stage entails students applying ODAT SUMO independently. During this phase, students are organized into small groups, tailored to the class size, with an optimal group size of three to four students. Each group is assigned a project-based assignment comprising essential tasks and questions that require them to solve. Throughout this process, students are being asked to retrieve real mortality datasets from the Human Mortality Database (HMD) website. Consequently, data exploration and preprocessing become imperative. Students generate visualizations to depict the insights generated from the data. Subsequently, students proceed with modelling of the data using mortality models, estimating corresponding parameters, and subsequently formulating projections. This project executed beyond classroom hours, where students need to submit the report in three weeks. The analysis undertaken is open-ended, necessitating students to weave together their discoveries cohesively within their written reports.

The fifth or final stage involves the assessment of the project reports. The grading process might not that straight forward due to the project allows students to be creative in their answers. We typically divide the score into four equal parts as follows: one part for composition and presentation, including statistically sound statements; one part for a fundamental minimum set of analyses; one for pertinent, readable, and understandable graphs and tables; and finally, we create a list of numerous advanced analyses and look for a subset of these in the write-up. We also request an appendix to the report for technical material and coding. The reports normally account for 10% of the course grade, with the remainder coming from tests and final exam.

Results & Discussion

The proposed ODAT teaching method has been implemented to teach the Survival Model course to Actuarial Science students for the past semesters. This tool helps bridging the understanding gap between theory and practice for students. The theoretical formulations of mortality models are translated into practical solutions, effectively connecting data-driven values with visualizations of real data outputs as demonstrated in Figure 2.

The Effectiveness of Open Data Access Tools (ODAT) in Teaching Survival Model Course

To measure the effectiveness of implementing ODAT in teaching Survival model course, we performed a survey to students who have completed the course. In the actuarial study plan, students usually sit for the subject in their fifth semester. However due to certain circumstances, students took the subject at later semester.

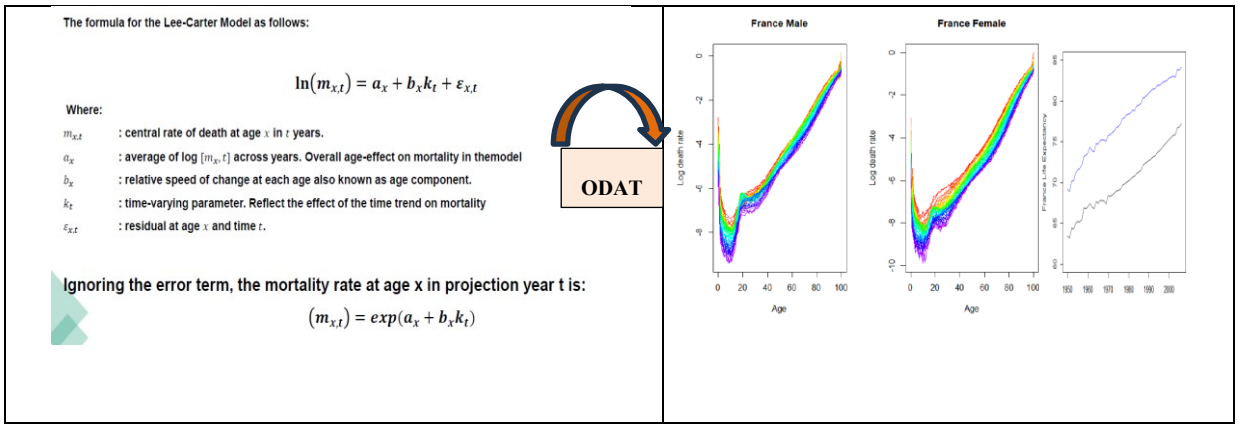


Figure 2: Illustration of how ODAT translated theoretical formulations of mortality models into practical solutions.

The survey questionnaires were divided into six sections including A) Students' Profile; B) Perceived usefulness of ODAT in enhancing students' understandings; C) Ease of use and navigation of ODAT D) Relevance of the data accessed through ODAT E) Integration of theoretical knowledge with practical applications F) Effectiveness of ODAT in visualizing data G) Overall satisfaction with the teaching approach.

Table 1: Demographic Information about Students' Profile-Analysis of Section A

		Female				Male				
Semester register	**Time taken**	**Beginner**	**Intermediate**	**Advanced**	**Total**	**Beginner**	**Intermediate**	**Advanced**	**Total**	**Grand Total**
5	1	22	28	2	52	8	9	2	19	71
	2	1	1	1	3	0	0	0	0	3
6	1	1	0	1	2	0	3	0	3	5
	2	0	0	0	0	0	0	0	0	0
7	1	0	0	0	0	0	0	0	0	0
	2	1	0	0	1	0	0	0	0	1
Grand Total		25	29	4	58	8	12	2	22	80

From Table 1, our dataset which included 80 respondents, revealed a diversified sample with 58 females (73%) and 22 males (27%). Results show that, the majority of female respondents (90%) are enrolled in their fifth semester, and a sizeable portion of them have intermediate-level R programming skills. Male participants make up 86% of the group, in the fifth semester and 41% of them have intermediate R programming skills. These findings highlight the importance of adapting instructional strategies to different levels of prior programming experience, especially for students in their fifth semester. Such revelations highlight the necessity of inclusive teaching practises that consider both programming ability, enabling optimal learning environments in this academic setting.

The findings of the analysis in Figure 3, akin to the intricate strands of a spider's web, reveal intriguing insights into the perceptions of female and male respondents across five critical categories (Sections B to F): Perceived Use, Ease of Use, Relevancy, Practicality, and Effectiveness. Notably, female respondents assigned robust scores, with an average of between 4.0 to 4.4 for Relevancy, Practicality, and Effectiveness, indicating a high level of recognition for the tool's utility and applicability. Additionally, they rated Perceived Use, Ease of Use at 3.7 and 3.9, respectively, reflecting a slightly lower but still positive assessment. In contrast, male respondents exhibited consistently strong scores, averaging around 4 in all categories. These findings highlight a shared appreciation for the Open Data Access Tool (ODAT) among both genders,

Overall satisfaction with the teaching approach is evaluated using a scale ranging from 1 (very unsatisfied) to 10 (very satisfied). Most female and male respondents chose scale 7 and above, indicating satisfaction with the unique teaching approach applied in the Survival Model course (ASC550).

Conclusion

This paper proposes an innovative teaching tool for the Survival Model subject by seamlessly integrating open data access into the framework. This approach not only provides a distinctive avenue for educators to enhance teaching methodologies but also empowers students with practical data analytical skills Based on the surveys, The study analyzed 80 respondents, primarily females with the majority of students acquiring intermediate-level R programming skills. The Open Data Access Tool (ODAT) was assessed in five critical categories: Perceived Use, Ease of Use, Relevancy, Practicality, and Effectiveness. Female respondents scored high in Perceived Use and Practicality, while male respondents scored high in Ease of Use and Relevance. Overall satisfaction with the teaching approach

was high, with most respondents choosing a scale of 7 and above. This approach aligns perfectly with the Actuarial professional body of the Institute and Faculty of Actuaries (IFoA), which aims to equip students with not just statistical knowledge but also the ability to apply these ideas using analytical tools. Furthermore, we embrace the principles of Industry 4.0, which is reflected in our commitment to preparing graduates with digital and technological skills. For future development, the integration of open data access tools in teaching the Survival Model course can be even more dynamic by incorporating not only one source of data but also multiple open-access mortality datasets, such as those available on the Kaggle platform

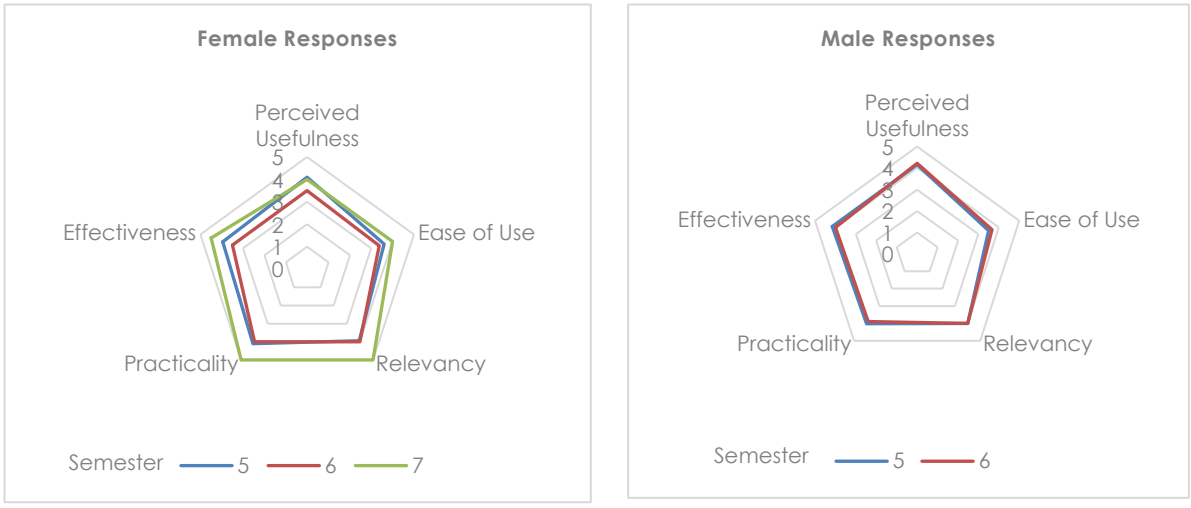


Figure 3: Overall Responses Analysis of Section B to F

Publication, Award, and Intellectual Property

Related Publications:

Shair, S., Purcal, S., & Parr, N. (2017). Evaluating extensions to coherent mortality forecasting models. *Risks Journal*, 5(1),16. doi: 10.3390/risks5010016

Shair, S.N., Zolkifli, N.A., Zulkefli, N.F., & Mur, A. (2019). A functional data approach to the estimation of mortality and life expectancy at birth in developing countries. *Pertanika Journal of Science and Technology*, 27(2), 797-814.

Mokhtar, K., Shair, S.N., & Lazam, N.M. (2021). Evaluating the Performance of Selected Mortality Forecasting Models: A Malaysia Case Study. *Lecture Notes in Electrical Engineering*, 724, 127-138.

Shair, S.N., Lazam, N.M., Nasir, M.I.F.M., Niza, L.A., & Azman, M.A. (2023). The Three-Way Lee-Carter approach: Forecasting Malaysian sub-population mortality rates by states. AIP Conference Proceedings. 2500,020051.

Innovation Awards:

Lazam, N.M, Shair, S.N., Samsuddin, S., Yusof, A.Y., & Halim, M.H.A. (2021) Product Name: Civil Servant Mortality Calculator (CSMC). Karnival Inovasi UTeMEX 2021. Gold Medal.

Copyright: CRLY00025631. Civil Servant Mortality Calculator (2020)

References (Use APA format)

Meyer, C. (2022). Bringing the World to the Classroom: Teaching Statistics and Programming in a Project-Based Setting. PS: Political Science & Politics, 55(1), 193-197. DOI:10.1017/S1049096521001104

Neumann, D.L., Hood, M., & Neumann, M. M., (2013). Using Real-Life Data when Teaching Statistics: Student Perceptions of this Strategy in an Introductory Statistics Course. Statistics Education Research Journal, 12(2), 59-70.

Childers, A. F., & Taylor, D.G. (2021) Making Data Collection and Analysis Fun, Fast, and Flexible with Classroom Stats, PRIMUS, 31:1, 91-98, DOI: 10.1080/10511970.2020.1780534

Petrovskaya, A., Pavlenko, D., Feofanov, K., & Klimov, K. (2020). Computerization of learning management process as a means of improving the quality of the educational process and student motivation, Procedia Computer Science, 169, 656-661, DOI: 10.1016/j.procs.2020.02.194.

Konsep MI dalam pengkategorian golongan kata Bahasa Melayu PAK21

Prof. Dr. Vijayaletchumy Subramaniam, Pavitira Nagaraju, Prof. Madya Dr. Che Ibrahim Bin Salleh
Fakulti Bahasa Moden dan Komunikasi, Universiti Putra Malaysia, 43400 Serdang, Selangor[1,2,3]
vletchumy@upm.edu.my, pavitiranagaraju@gmail.com. cibrahim@upm.edu.my[1,2,3]

Abstrak: Kajian yang telah dilakukan selama dua tahun menghasilkan Konsep MI yang meliputi Lampu Isyarat Golongan Kata, Orang Adjektif, Teknik Piramid NAsKp dan Permainan Cam Kata untuk memudahkan pemahaman murid terhadap pengkategorian golongan kata yang berperanan sebagai asas dalam pembelajaran hukum tatabahasa yang lebih kompleks dan pembinaan ayat. Konsep MI dibangunkan berlandaskan pendekatan didik hibur dengan penggunaan aktiviti *berbantukan bahan* yang ditekankan dalam Dokumen Standard Kurikulum Pentaksiran Sekolah (DSKP) bagi menjayakan pembelajaran abad ke-21 (PAK21). Hasil pengujian dalam kalangan 492 orang murid dan 90 orang guru subjek Bahasa Melayu mendapati murid berjaya mengkategorikan golongan kata dengan betul dan membolehkan guru mengendalikan PdPc PAK21 dalam suasana yang lebih menyeronokkan.

Kata Kunci: Konsep MI; Piramid NAsKp; Permainan Cam Kata; PAK21

Pengenalan

Konsep MI merupakan satu kaedah yang mengetengahkan kriteria maksud dan imbuhan untuk membantu murid mengkategorikan perkataan dengan mudah. Konsep ini meliputi Lampu Isyarat Golongan Kata, Orang Adjektif, Teknik Piramid NAsKp dan Permainan Cam Kata. Konsep ini telah dibangunkan untuk menyelesaikan masalah pengenalpastian golongan kata sesuatu perkataan yang membanjiri murid dan guru. Murid menghadapi kesukaran untuk membezakan golongan kata, seperti perbezaan antara kata adjektif dengan kata nama dan kata nama dengan kata kerja (Tengku Nazatul Shima Tengku Paris & Rahmah Lob Yussof, 2012). Kelemahan aspek morfologi dan kebergantungan murid terhadap guru subjek Bahasa Melayu (Jamayah Bujang & Fariza Khalid (2019) menyebabkan murid sering mengalami kekeliruan untuk menentukan golongan kata sesuatu perkataan Vijayaletchumy Subramaniam & Sivaneswary Sivaratanam (2019). Hasil kajian rintis yang telah dijalankan dalam kalangan murid cemerlang membuktikan ketidakupayaan murid untuk mengkategorikan perkataan dalam tiga golongan kata yang utama, iaitu Kata Nama (KN), Kata Kerja (KK), dan Kata Adjektif (KA). Antara masalah yang amat menonjol ialah persepsi semua perkataan berimbuhan sebagai kata kerja, kekurangan perbendaharaan kata dari aspek kata adjektif dan kebergantungan terhadap maksud perkataan. Justeru, pendedahan yang betul tentang langkah penentuan golongan kata yang betul harus didedahkan kepada murid dari sekolah rendah agar mereka boleh menguasai golongan kata yang menjadi asas pembelajaran hukum tatabahasa yang lebih kompleks sebelum melangkah kaki ke alam persekolahan menengah.

Selain itu, Kurikulum Standard Sekolah Rendah (KSSR) Semakan 2017 menggariskan kepentingan murid untuk berkomunikasi dan menghasilkan penulisan yang berkualiti dalam bahasa Melayu dengan mengetengahkan aspek tatabahasa sebagai salah satu kemahiran bahasa utama yang perlu dicapai oleh seseorang murid semasa alam persekolahan rendah. Aspek yang ditekankan dalam tatabahasa adalah keupayaan murid untuk memahami dan menggunakan golongan kata dengan betul dalam komunikasi dan penulisan. Hal ini menunjukkan golongan kata memainkan peranan yang penting dalam penguasaan bahasa Melayu.

Oleh sebab itu, murid-murid dan guru memerlukan satu panduan khas untuk menentukan golongan kata sesuatu perkataan berdasarkan tahap perkembangan minda anak murid abad ke-21. Sehubungan dengan itu, inovasi Konsep MI yang digabungkan dengan aktiviti praktik berpusatkan bahan telah dibangunkan untuk menjadi satu panduan kepada anak murid dalam menentukan golongan kata sesuatu perkataan dengan lebih mudah. Tujuan utama pelaksanaan aktiviti praktik berpusatkan bahan kerana berupaya menjadikan fikiran murid-murid berkembang dengan baik serta dapat belajar dengan baik melalui pengalaman dan persekitaran mereka (Cooperstein dan Kocevar, 2004). Lebih-lebih lagi, Resource Area for Teaching (2013) mendapati 99% guru melaporkan murid-murid lebih suka melibatkan diri semasa melaksanakan aktiviti praktik berpusatkan bahan. Justeru, pembelajaran tentang pengkategorian golongan kata dengan menggunakan Konsep MI dimudahkan lagi dengan penyertaan aktiviti praktik berpusatkan bahan dan aktiviti lakaran seperti Orang Adjektif, Teknik Piramid NAsKp dan Permainan Cam Kata agar dapat memudahkan pemahaman murid.

Lebih-lebih lagi, novelti utama ini inovasi ini membuka ruang kepada pihak Bahagian Pembangunan Kurikulum untuk memperincikan standard pembelajaran aspek tatabahasa dalam Dokumen Standard Kurikulum dan Pentaksiran, DSKP (2021). Hal ini kerana dapatan kajian ini menunjukkan bahawa murid sering melakukan kesalahan mengkategorikan golongan kata terutamanya perkataan berimbuhan akibat kebergantungan terhadap maksud perkataan dan ketandusan ilmu tentang kewujudan jenis imbuhan yang boleh membentuk Kata Nama, Kata Kerja, dan Kata Adjektif. Sehubungan dengan itu, implikasi kajian ini membolehkan pihak Bahagian Pembangunan Kurikulum untuk memperincikan standard pembelajaran aspek tatabahasa dalam DSKP dengan memperincikan memahami dan menggunakan pelbagai kata berimbuhan mengikut konteks dengan menambahkan imbuhan Kata Nama, imbuhan Kata Kerja, dan imbuhan Kata Adjektif seperti yang ditunjukkan dalam jadual di bawah.

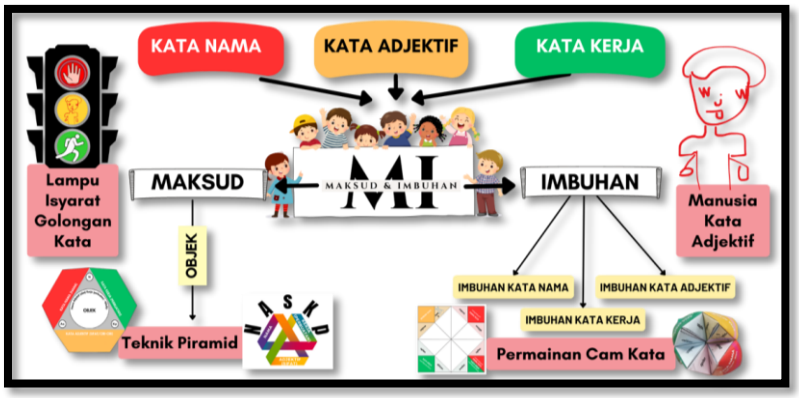
Jadual 1: Standard kandungan dan standard pembelajaran aspek tatabahasa dalam DSKP

Standard Kandungan Pendidikan Bahasa Melayu	
Standard Kandungan	Standard Pembelajaran
5.2 Memahami dan menggunakan perkataan berimbuhan mengikut konteks	5.2.1 Memahami dan menggunakan pelbagai kata berimbuhan mengikut konteks: i. Imbuhan Kata Nama ii. Imbuhan Kata Kerja iii. Imbuhan Kata Adjektif

Perincian standard pembelajaran dalam aspek tatabahasa membantu warga pendidik untuk mengendalikan PdPc berkaitan jenis imbuhan yang membantu dalam penggolongan kata agar murid boleh mengenal pasti golongan kata sesuatu perkataan dengan kehadiran jenis imbuhan.

Deskripsi Produk

Pelbagai kriteria yang telah diketengahkan untuk mengkategorikan sesuatu perkataan dalam satu golongan kata. Asmah Hj. Omar (1993), Abdullah Hassan (1973) dan Law Yock Fang (1967) misalnya menerapkan kriteria dalam aliran struktural, manakala Nik Safiah Karim (1995) dan Ramli Salleh (1995) menerapkan kriteria dalam transformasi generatif, khususnya berdasarkan kepada Teori Kuasaan dan Tambatan dan Teori X- Berpalang. Walaupun berbeza aliran, tetapi terdapat kesepakatan antara mereka, iaitu mereka beranggapan bahawa tidak ada kriteria tunggal yang digunakan sebagai kriteria penggolongan kata bahasa Melayu melainkan gabungan beberapa kriteria (Norliza Jamaluddin, 2008). Hal ini turut memberikan laluan kepada murid yang selalu bergantung kepada maksud perkataan untuk menggunakan imbuhan sebagai salah satu kriteria dalam mengkategorikan sesuatu perkataan dengan golongan kata yang betul. Sehubungan dengan itu, konsep MI yang meliputi dengan maksud dan imbuhan telah digunakan untuk membantu murid mengkategorikan perkataan dengan mudah. Konsep ini telah dikukuhkan dengan gabungan elemen Lampu Isyarat Golongan Kata, Orang Adjektif, Teknik Piramid NAsKp dan Permainan Cam Kata.



Rajah 1: Konsep MI

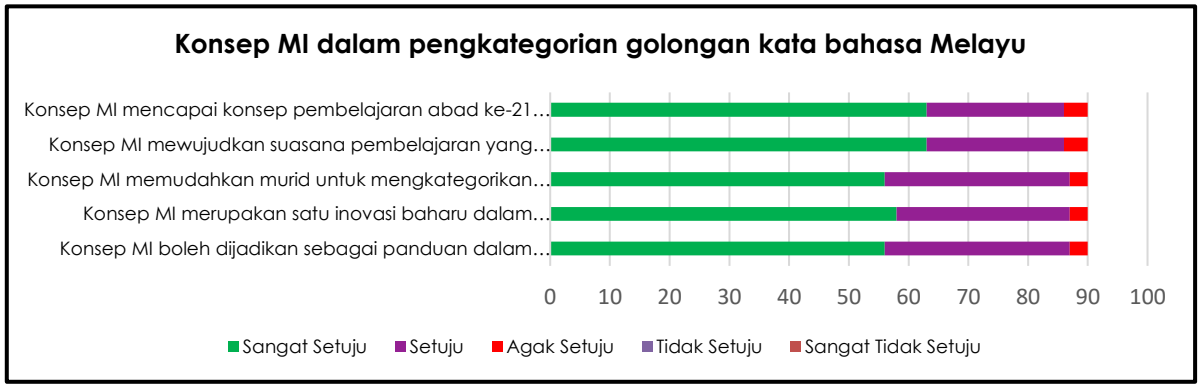
Lampu tanda isyarat digunakan untuk menerapkan konsep penggunaan KN, KK dan KA. Lampu warna merah yang melambangkan berhenti dan menggunakan simbol 5 jari yang merangkumi 5 jenis kata nama, iaitu orang, benda, tempat, haiwan, dan tumbuh-tumbuhan. Selain itu, warna kuning melambangkan kata adjektif iaitu sifat atau ciri yang boleh menerangkan nama dan perbuatan, manakala lampu warna hijau melambangkan pergerakan, iaitu kata kerja. Penggunaan lampu tanda isyarat telah dijadikan sebagai satu pengenalan untuk mengukuhkan fungsi penggunaan ketiga-tiga golongan kata utama tersebut dengan lebih efektif. Selain itu, satu penemuan baharu telah ditemukan untuk mengingati 9 jenis kata adjektif dalam bahasa Melayu melalui lakaran yang dikenali sebagai Orang Adjektif. Lukisan ini dibentuk berdasarkan huruf pertama daripada sembilan jenis kata adjektif untuk memudahkan ingatan murid terhadap 9 jenis kata adjektif yang wujud dalam Bahasa Melayu. Seterusnya, penggolongan kata berdasarkan maksud perkataan dilaksanakan melalui penggunaan Teknik Piramid NAsKp, iaitu huruf "N" mewakili kata nama, iaitu sesuatu objek boleh dinamakan, huruf As (Adjektif)(sifat) mewakili objek tersebut boleh dihuraikan dengan sifat atau ciri, manakala huruf "Kp" (Kerja)(perbuatan) merujuk perbuatan atau pergerakan objek tersebut. Selain itu, tujuan kata adjektif diletakkan di tengah kerana kata adjektif boleh menerangkan nama dan juga perbuatan. Teknik Piramid NAsKp bermaksud penggunaan objek di sekeliling dalam menentukan nama, perbuatan, dan sifat. Kita boleh nyatakan nama sesuatu objek dengan KN, boleh menjelaskan perbuatan yang boleh dilakukan atau menjelaskan pergerakan sesuatu objek tersebut dengan KK, dan menghuraikan ciri atau sifat objek tersebut dengan KA. Hal ini secara langsung membantu murid untuk memperkembangkan kosa kata masing-masing dan menguatkan pemahaman terhadap ketiga-tiga golongan kata tersebut. Aktiviti melabelkan objek berdasarkan Teknik Piramid NAsKp boleh dilaksanakan secara berkumpulan

untuk menepati salah satu ciri utama dalam pembelajaran abad ke-21 (PAK21), iaitu menerapkan elemen kolaboratif semasa pembelajaran. Pembelajaran secara kolaboratif membantu murid untuk meneroka pelbagai kosa kata yang merangkumi KN, KK, dan KA bersama-sama dengan ahli kumpulan. Akhirnya, murid akan melakukan permainan dengan menerapkan elemen imbuhan menerusi Permainan Cam Kata, iaitu aktiviti praktik berpusatkan bahan dengan menyenaraikan senarai imbuhan yang terlibat dalam membentuk KN, KK, dan KA. Kepelbagaian jenis imbuhan yang terdapat dalam bahasa Melayu membantu murid untuk mengkategorikan golongan kata sesuatu perkataan dengan lebih mudah.

Lebih-lebih lagi, salah satu impak melalui pengaplikasian Konsep MI dalam pembelajaran ialah pencapaian Kemahiran Berfikir Aras Tinggi (KBAT) yang membolehkan murid mengaplikasi, menganalisis, menilaia, dan mencipta melalui pengajaran yang disampaikan. Kemahiran belajar cara belajar yang ditekankan dalam DSKP juga dapat dicapai kerana murid telah didedahkan dengan suatu konsep baharu untuk mempelajari cara menentukan golongan kata sesuatu perkataan. Seterusnya, pendekatan didik hibur dan pendekatan pembelajaran berpusatkan murid boleh dicapai melalui aktiviti penghasilan Piramid NAsKp & Permainan Cam Kata yang melibatkan penggunaan aktiviti praktik berpusatkan bahan. Murid dapat mengalami pengalaman sendiri untuk melihat dan memegang proses yang berlaku semasa pengkategorian golongan kata. Guru hanya akan bertindak sebagai pembimbing dan murid boleh melakukan lakaran, menghasilkan Piramid NAsKp dan Permainan Cam Kata berdasarkan pengajaran yang diterima.

Dapatan dan Perbincangan

Konsep MI telah diuji keberksanan dalam kalangan 207 orang murid dan 90 orang Ketua Panitia Bahasa Melayu. Pengkaji telah menggunakan borang soal selidik sebagai instrumen untuk mendapatkan pandangan para pakar yang terdiri daripada Ketua Panitia Bahasa Melayu untuk mendapatkan pandangan mereka terhadap pengaplikasian Konsep MI dalam aspek pengkategorian golongan kata. Para guru yang terlibat dalam proses ini terdiri daripada 62.2% guru opsyen Bahasa Melayu, manakala 37.8% ialah guru bukan opsyen Bahasa Melayu yang mengajar subjek tersebut di sekolah. Selain itu, 38.9% guru mempunyai pengalaman mengajar subjek Bahasa Melayu lebih daripada 21 tahun dan 13.3% guru mempunyai pengalaman mengajar dalam lingkungan 16 hingga 20 tahun.



Rajah 2: Hasil pandangan guru terhadap pengaplikasian Konsep MI

Hasilnya mendapati 70% orang guru sangat bersetuju dan 34.4% orang guru setuju bahawa pengaplikasian Konsep MI mencapai konsep PAK21, membantu untuk mewujudkan suasana pembelajaran yang menyeronokkan, memudahkan pemahaman murid, merupakan satu inovasi baharu dan dapat dijadikan sebagai panduan semasa pengkategorian golongan kata. Seterusnya, perbandingan pembelajaran golongan kata secara konvensional dan pembelajaran menggunakan Konsep MI telah dilaksanakan berdasarkan Kajian Kuasi Eksperimental (Creswell, 2007). Murid telah dijuji berdasarkan ujian pra dan pasca yang disahkan oleh pakar dan dapatan kajian tersebut ditunjukkan dalam jadual di bawah.

Jadual 2: Hasil perbandingan pembelajaran secara konvensional dan pembelajaran melalui Konsep MI

		Pembelajaran secara Konvensional				**Pembelajaran Melalui Konsep MI**			
	n	**min**	**Sisihan Piawai**	**Nilai t**	**Tahap Signifikan**	**min**	**Sisihan Piawai**	**Nilai t**	**Tahap Signifikan**
Ujian Pra	207	26.33	3.536	-12.029	**0.181**	27.33	29.698	-25.807	**0.000**
Ujian Pasca		31.33				69.33			

Perbandingan telah dijalankan dalam kalangan dua kumpulan murid yang terdiri daripada kumpulan kawalan dan kumpulan rawatan. Keberkesanan akan diputuskan berdasarkan tahap signifikan yang diperolehi melalui dapatan ujian para dan pasca berdasarkan dua jenis pembelajaran. Menurut Chua (2012), tahap signifikan mesti kurang daripada 0.5. Hasilnya mendapati kumpulan kawalan yang mempelajari golongan kata

berdasarkan konvensional mencapai tahap signifikan yang tinggi, iaitu 0.181, manakala kumpulan rawatan yang mempelajari golongan kata berdasarkan Konsep MI mencapai tahap signifikan yang rendah, iaitu 0.000. Hal ini membuktikan keberkesanan penguasaan golongan kata melalui Konsep MI terbukti lebih berkesan berbanding dengan pembelajaran secara konvensional.

Kesimpulan

Kesimpulannya, Konsep MI yang meliputi Lampu Isyarat Golongan Kata, Orang Adjektif, Teknik Piramid NAsKp dan Permainan Cam Kata berjaya membawa perubahan dalam pengkategorian golongan kata dalam murid dan membantu warga pendidik untuk melaksanakan PdP ke arah PAK21. Elemen-elemen yang telah dimasukkan juga terbukti mewujudkan suasana pembelajaran yang menyeronokkan dan mengurangkan kesalahan murid dari aspek pengkategorian golongan kata. Penguasaan hukum ini dapat memudahkan pemahaman murid untuk mempelajari hukum tatabahasa yang lebih kompleks seperti Kata Nafi, Kata Pemeri, pemilihan objek dalam Kata Kerja Transitif, dan lain-lain lagi. Selain itu, inovasi ini juga akan dikembangkan lagi untuk kegunaan pelajar sekolah menengah dan institusi pengajian tinggi dengan menambahkan elemen baharu berdasarkan kesesuaian tahap pemikiran mereka. Konsep ini turut mendapat permintaan yang tinggi dalam kalangan warga pendidik dan akan disebarluaskan kepada semua sekolah di Malaysia supaya kita oleh menyeragamkan aspek pengkategorian golongan kata dalam bahasa Melayu dan mendapat pengiktirafan daripada Bahagian Pembangunan Kurikulum, Kementerian Pendidikan Malaysia.

Penerbitan, Anugerah dan Harta Intelek

Secara keseluruhannya, Konsep MI merupakan satu penemuan baharu dari aspek pengkategorian golongan kata. Pelbagai jenis masalah murid telah berjaya dapat dirungkaikan melalui pengaplikasian konsep ini semasa pembelajaran. Lebih-lebih lagi, elemen warna, lakaran, teknik dan permainan membolehkan warga pendidik mengendalikan PdPc ke arah PAK21 dan menepati kehendak generasi Z dan Alpha. Malahan, inovasi Konsep MI turut memenangi 1 pingat perak dan 2 pingat emas dalam anugerah pertandingan inovasi seperti International Science and Social Science Innovation Competition (i-SIC V 2023), Pertandingan Poster dalam Persidangan Tahunan Perpustakaan Malaysia, dan Hari Inovasi PdP PPAL anjuran Universiti Malaysia Terengganu (UMT). Hasil inovasi ini turut dijuji keberkesanan dalam kalangan murid di negeri Pahang, Kedah, Johor dan Selangor.

Selain itu, hasil dapatan Konsep MI telah berjaya dibentangkan dalam Kolokium Bahasa dan Sastera Melayu 2023 Peringkat Kebangsaan (anjuran Jabatan Pengajian Melayu IPGK Tun Abdul Razak) dan *International Conference on Languages, Education & Tourism* 2023 (ICLET 2023), anjuran *Kulliyah of Languages and Management, International Islamic University Malaysia*. Seterusnya, hasil kajian turut berjaya diterbitkan dalam jurnal yang berimpak tinggi, iaitu *Seybold Report* (https://seyboldreport.net/abstract-2023/5-82.html). Di samping itu, melalui hasil inovasi ini, pengkaji turut mengadakan kolaboratif dengan Pejabat Pendidikan Daerah (PPD) Muar, Pejabat Pendidikan Daerah (PPD) Kuala Selangor, dan Pejabat Pendidikan Daerah (PPD) Kuala Krai untuk berkongsi hasil inovasi melalui jemputan dan permintaan. Inovasi ini berjaya dihasilkan melalui sokongan Geran Putra IPS (GP-IPS/2021/9703200), Universiti Putra Malaysia (UPM).

Rujukan

Abdullah Hassan. (1973). "*Golongan-golongan Kata dalam Bahasa Melayu*", dlm. Dewan Bahasa. Jilid XVII. Bil. 8. Ogos. 368-377.

Asmah Haji Omar, (1993). *Bahasa dan alam pemikiran Melayu*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

Bahagian Pembangunan Kurikulum. (2021). Kurikulum Standard Sekolah Rendah Bahasa Melayu Sekolah Jenis Kebangsaan, Dokumen Standard Kurikulum dan Pentaksiran Tahun 6. Kementerian Pendidikan Malaysia.

Chua, Y.P. (2012). *Mastering research methods.* Mcgraw-Hill Education, Shah Alam. ISBN 978-967-5771-41-5.

Creswell, J. W. (2007). *Qualitative Inquiry and Research Design: Choosing among Five Approaches (2nd ed.)*. Thousand Oaks, CA: Sage Publications.

Cooperstein, S. E., & Kocevar-Weidinger, E. (2004). *Beyond active learning: A constructivist approach to learning*. Reference Services Review, 32(2),141-148.

Jamayah Bujang dan Fariza Khalid. (2019). Penguasaan morfologi Bahasa Melayu sebagai bahasa kedua dalam kalangan murid Melayu Sarawak. In: *Linguistik Bahasa dan Pendidikan*. Pusat Pengajian Ilmu Kemanusiaan, Pulau Pinang, Malaysia, pp. 172-184.

Nik Safiah Karim *et. al*. (1995). Tatabahasa Dewan. Kuala Lumpur: Dewan Bahasa & Pustaka.

Norliza Jamaluddin, (2008) Kriteria penggolongan kata: Bahasa Yunani, Inggeris & Melayu. MALIM: *Jurnal Pengajian Umum Asia Tenggara*, 9 pp. 139-162. ISSN 1511-8393.

Ramli Salleh. (1995). *Sintaksis Bahasa Melayu: Penerapan Teori Kuasaan & Tambatan*. Kuala Lumpur: Dewan Bahasa & Pustaka.

Tengku Nazatul Shima Tengku Pari & Rahmah Lob Yussof. (2012). Enhancing Grammar Using Board Game. *Procedia - Social and Behavioral Science*, (68), 213–221.

Yock Fang, Liaw. (1967). "*Ilmu bahasa dan penggolongan jenis kata dalam Bahasa Melayu*". dlm. Dewan Bahasa. Jilid XI. Bil. 7. Julai. 304-316.

Covid Cases Tracker Mobile Application

Teh Bin Han[1], Mohamad Nor Hassan[2]
Universiti Malaysia Terengganu, Kuala Nerus, Terengganu, Malaysia[1,2]
s59790@ocean.umt.edu.my, mohamadnor@umt.edu.my

Highlights:
Covid Cases Tracker Mobile Application (CCTMA) is a comprehensive mobile application that can run on both Android and IOS operating systems. It aims to provide tracking and tracing features for enhancing and simplifying the process of managing the current COVID-19 cases that occurred in the vicinity of UMT through simple User Interface(UI). To achieve its aim, CCTMA provides some functionalities to support the daily operations, including the registration of new infected cases, manage the registered cases, view daily COVID-19 cases, manage quarantine hostel room, and others.

Key words: UMT; COVID-19; Mobile Application; Tracking;

Introduction
During the outbreak of COVID-19, many issues and problems have arisen in Universiti Malaysia Terengganu (UMT). One of the issues is that the new infected COVID-19 cases that occurred in the surrounding UMT are difficult to track and trace. This is mainly because there was no proper and systematic system for managing COVID-19 cases among students. Besides that, the newly infected students were having difficulty registering and updating their daily COVID-19 status to the relevant authorities, Pusat Kesihatan Universiti (PKU), where the only way to do so is through phone calls or messages. As a result, the student's health condition and the potential symptoms were hard to be monitored by the PKU, which in turn hindered the record and trace processes of the actual number of new infected COVID-19 cases. In fact, some of the cases might have been omitted accidentally. Therefore, CCTMA is developed to address the issues and inconveniences in UMT.

Product Description
After the outbreak of COVID-19, numerous digital contact tracing apps have emerged as vital tools in the battle against COVID-19, such as MySejahtera, SELANGKAH, TraceTogether, and others. These apps have been proven to be the most effective means of tracking and curbing the spread of COVID-19 by utilizing the GPS data and Bluetooth signal to trace the movements and interactions of users. At UMT, the Pusat Kesihatan Universiti (PKU) serves as the university's health authority, they rely on the MySejahtera application to manage the COVID-19 cases that occurred in the surrounding of UMT. However, despite the usefulness of MySejahtera, several issues and inconveniences have arisen. For instance, PKU staff face difficulties in monitoring the daily condition of the infected students who stayed out of campus and accurately track the actual number of COVID-19 cases. Besides that, the daily COVID-19 cases at UMT were currently being recorded by the Health Inspector of PKU, which was ineffective and inconvenient. By observing these circumstances, an idea came to my mind: What if there was a system that could alleviate these issues and streamline every process related to COVID-19 in UMT? In the midst of seeking for the alternatives, the CCTMA was developed to address and assist PKU in resolving these challenges.

Results & Discussion
The CCTMA has made several contributions to UMT. As mentioned before, the main goal of CCTMA is to simplify and aid in the process of tracking and tracing COVID-19 cases in the vicinity of UMT. With the help of this application, infected students can register their cases with just one click, saving time and effort. Furthermore, infected patients can update their daily health status through the application, while PKU staff can monitor their conditions and assign them to a hostel room for quarantine if necessary. Besides that, the CCTMA can be further reused in others university community with the flexibility to accommodate a new requirement if required. Additionally, it offers a range of features, such as COVID-19 related information management, health-related functions, COVID-19 daily cases in Malaysia and at the university, and quarantine hostel room assignment. With the existence of this mobile application, the management of COVID-19 in UMT will become easier and more effective.

Conclusion
In conclusion, the CCTMA has been successfully constructed with completed functionalities based on the previously documented documentation and stakeholders' requirements and expectations.

Although the CCTMA is developed but it still has some constraints and weaknesses. Therefore, the extra effort must be put into improving and enhancing the overall functionality and performance. The proposed future work is as follows:

- Allow for web development of the back-end management system
- Enable the viewing of COVID-19 infected areas in UMT
- Enable to notify users when they are suspected to be infected
- Deploy the application as a cross-platform application for both iOS and Android
- Deploy the application and publish on the Google App Store and Apple Play Store
- Integrate the COVID-19 cases statistics with the government's database

Acknowledgement

My sincere acknowledgement and gratitude to my supervisor, Dr. Mohamad Nor Hassan, Final Year Project coordinator, Dr. Rabiei Mamat and Ts. Dr. Wan Nural Jawahir Hj Wan Yussof, HEPA UMT for sponsoring our team to participate in ICCE 2023, stakeholders, Dr. Daeng, Cik Ella, and Puan Azima, my family and friends for their encouragement and support.

References

Shahroz, M., Ahmad, W., Younis, M., Ahmad, N., Boulos, M. N. K., Vinuesa, R., & Qadir, J. (2021). COVID-19 digital contract tracing applications and techniques: A review post initial deployments. *Transportation Engineering*, 5, 100072.

Ahmed, N., Michelin, R. A., Xue, W., Ruj, S., Malaney, R., Kanhere, S. S., Seneviratne, A., Hu, W., Janicke, H., & Jha, S. (2020). A Survey of COVID-19 Contract Tracing Apps. *IEEE Access*, 8, 134577-134601.

Akinbi, A., Forshaw., M., & Blinkhorn, V. (2021). Contract tracing apps for the COVID-19 pandemic: a systematic literature review of challenges and future directions for neo-liberal societies. *Health Information Science and Systems, 9(1).*

Imbuhan Ria (IR)

Amirra Shazreena binti Aminul Razin[1], Vijayaletchumy Subramaniam[2]
Universiti Putra Malaysia, Seri Kembangan, Malaysia[1,2]
ashazreena93@gmail.com[1],vletchumy@upm.edu.my[2]

Abstrak:
Imbuhan Ria atau IR dibangunkan untuk membantu murid-murid yang mempelajari bahasa Melayu sebagai bahasa kedua memahami imbuhan apitan meN...i dan meN...kan iaitu salah satu masalah yang serius dalam topik bahasa Melayu yang dihadapi oleh murid-murid terutamanya dalam kertas penulisan. Oleh itu, kajian yang dijalankan selama dua tahun telah membuahkan idea untuk memudahkan pemahaman imbuhan apitan meN...i dan meN...kan dengan seronok tanpa rasa tertekan. Imbuhan Ria meliputi kaedah akrostik iaitu akronim untuk memudahkan murid-murid mengingati fungsi imbuhan apitan meN...i dan meN...kan. Di samping itu, permainan dadu dan papan imbuhan yang dijalankan secara berkumpulan dapat menjana idea murid dan merangkumi Dokumen Standard Kurikulum Pentaksiran Sekolah (DSKP) iaitu pembelajaran koperatif dan kemahiran berfikir aras tinggi (KBAT) seterusnya memahami imbuhan apitan meN...i dan meN...kan dengan mudah melalui didik hibur. Sistem ganjaran sebagai motivasi ekstrinsik dan meningkatkan semangat murid mempelajari bahasa Melayu juga digunakan dalam permainan inovasi ini. Permainan Inovasi ini telah dijalankan melibatkan 109 orang murid dan hasilnya menunjukkan murid-murid dapat memberikan fungsi imbuhan apitan meN...i dan meN...kan dengan baik di samping peningkatan markah dalam ujian pasca setelah menggunakan permainan Inovasi Imbuhan Ria. Selain itu juga, guru-guru dapat menjalankan PdPc dengan rasa gembira seterusnya mencapai usaha KPM dalam Program Transformasi sekolah 2025 (TS25) iaitu menjadikan persekitaran pembelajaran yang menyeronokkan.

Kata kunci: DSKP; Imbuhan; Inovasi; PAK21; TS25

Pengenalan

Dalam usaha menjayakan PAK21, pengetahuan pedagogi dalam kemahiran PAK21 dan penyampaian kandungan subjek secara interaktif memainkan peranan penting dalam melaksanakan PAK21. Menurut Goh dan Blake (2015), guru perlu bersedia dalam kemahiran pembelajaran Abad ke- 21 ini, beberapa perubahan perlu dilakukan dalam sistem pendidikan seperti kurikulum yang berlandaskan konteks Malaysia, meningkatkan latihan dan praktis serta membangunkan penempatan latihan. Selain itu itu, untuk melakukan perubahan sistem pendidikan ini, penambahbaikan perlu dilakukan dalam ketiga-tiga konteks ini. Menurut Sharifah (2015), sistem pendidikan mengalami inovasi dan transformasi secara holistik yang melibatkan perubahan kepada sistem pendidikan, kualiti kepimpinan sekolah, kualiti guru, kemenjadian murid, serta pemantapan tadbir urus yang lebih efisien. Setiap warga pendidik perlu melakukan anjakan pradigma dan memperkemaskan keterampilan serta ilmu pengetahuan untuk menghadapi transformasi pendidikan abad ini. Penandaarasan mutu pendidikan negara mempunyai kebergantungan kepada transformasi yang menelusuri pertautan dengan ilmu pengetahuan dan ledakan maklumat. Menurut Abdul Ghoni (2018), tranformasi dalam pendidikan merupakan satu kewajipan kerana kejayaan transformasi ekonomi amat bergantung kepada kejayaan pelan pendidikan yang bersifat futuristik.

Di samping itu, Program Transformasi Sekolah (TS25) merupakan salah satu usaha daripada Kementerian Pendidikan Malaysia dalam menjadikan sekolah yang berkualiti dan meningkatkan kemenjadian murid selaras dengan keperluan semasa pendidikan negara kita di samping menjadikan persekitaran pembelajaran yang menyeronokkan disokong oleh kepimpinan yang berkualiti dan berwawasan, guru yang beraspirasi tinggi dan kompeten serta komuniti yang padu. Di sampin itu, TS25 menerapkan amalan terbaik dalam pelaksanaan pengurusan dan kepimpinan serta pedagogi dalam Pembelajaran dan Pemudahcaraan (PdPc) selari dengan hasrat yang termaktub dalam Pelan Pembangunan Pendidikan Malaysia (PPPM) 2013 – 2025.

Ketiadaan teknik pengajaran yang menarik dan berkesan untuk menarik minat murid dan meningkatkan motivasi murid terutamanya murid yang mempelajari bahasa Melayu sebagai bahasa kedua akan menjadikan murid kurang minat dalam pengajaran dan pembelajaran dalam kalangan murid abad ke-21. Murid-murid juga akan kurang fokus jika terus menggunakan kaedah lama atau kaedah '*chalk and talk*'. Menurut Zamri (2016), teknik pengajaran yang menarik dapat melahirkan minat terhadap sesuatu pembelajaran dan pengajaran. Kenyataan ini telah disokong oleh Chew (2020), yang menyatakan dalam kajiannya iaitu pelaksanaan PdP mempunyai hubungan signifikan antara motivasi dan sikap guru untuk menjadikan pengajaran menarik.

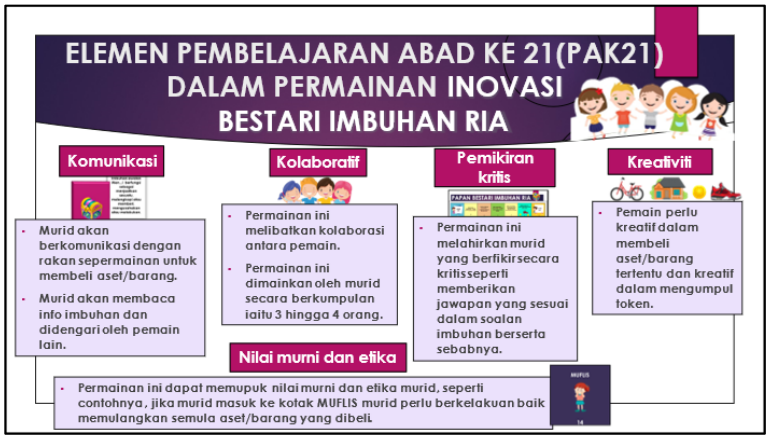
Rentetan itu, pengkaji telah mendirikan sebuah inovasi merangkumi pembelajaran abad ke-21 untuk menarik minat dan menjana minda murid dalam satu topik tatabahasa yang mempunyai permasalahan yang serius iaitu imbuhan apitan meN...i dan meN...kan. Permasalahan ini dibuktikan melalui keputusan peperiksaan UPSR Bahasa Melayu yang menunjukkan murid SJK yang belum mencapai tahap minimum iaitu kosa kata terhad dan

ayat tidak gramatis, sebanyak 12.26% berbanding hanya 4.67% sahaja dalam kalangan murid SK yang belum mencapai tahap minimum dalam kertas penulisan bahasa Melayu. Murid yang cemerlang dalam kertas penulisan bahasa Melayu SJK juga lebih sedikit berbanding SK iaitu SK sebanyak 29.39% murid cemerlang dan SJK 25.39% murid cemerlang walaupun aras kertas soalan peperiksaan bahasa Melayu antara SK dan SJK berbeza. Menurut Amirra dan Vijayaletchumy (2019), murid SJK(T) mempunyai permasalahan dalam asas imbuhan dan menjadikan mereka sukar untuk menguasai bahasa Melayu sepenuhnya. Pengimbuhan juga merupakan aspek yang wajib dikuasai oleh setiap murid kerana tanpa proses penerbitan, sesuatu ayat akan sukar untuk dibina (Anne dan Saidatul, 2021). Menurut Nik Safiah Karim *et.al*, (2015) ,imbuhan merupakan sesuatu unit bahasa yang tertentu dan ditambahkan pada bentuk lain dan berlaku perubahan makna sesuatu nahu. Oleh itu, dapat disimpulkan bahawa topik imbuhan dalam bahasa Melayu merupakan satu topik yang amat penting dan perlu dikuasai oleh murid berlandaskan DSKP yang telah dibina kerana dapat mengubah sesuatu makna atau maksud sesuatu perkataan.

Deskripsi produk

Produk ini telah dibina melalui Kaedah *Fuzzy Delphi* iaitu kesepakatan pakar dan konsesi pakar dalam bidang bahasa Melayu yang telah melebihi 5 tahun untuk membina kandungan inovasi ini secara terperinci. Menurut Imran (2007), Teknik *Fuzzy Delphi* merupakan kaedah untuk mendapatkan data secara berstruktur berasaskan kumpulan yang digunakan untuk meninjau dan mengumpulkan pendapat kesepakatan pakar. Produk ini juga telah menggunakan Model Qait Slavin (1994) yang terdiri daripada kualiti, kesesuaian, insentif dan masa. Dalam kajian ini, Inovasi melalui kaedah yang teratur dan sistematik merupakan proses dalam input kualiti. Selain itu, proses dalam input kesesuaian adalah dengan menyediakan pembelajaran berdasarkan buku teks yang telah dipelajari. Seterusnya, dalam input insentif, proses yang dijalankan adalah dengan memberikan ganjaran iaitu salah satu pengaruh motivasi ekstrinsik. Manakala, motivasi intrinsik seperti menerapkan keseronokan belajar dan yang terakhir, menguasai pembelajaran dengan cepat dan seronok merupakan satu proses dalam input masa. Melalui kaedah Model QAIT Slavin (1994), inovasi yang didirikan meliputi elemen yang lengkap selaras dengan pembelajaran Abad ke-21. Menurut Ni Komang (2021) *et.al* Model Qait Slavin (1994) dapat mengesan kualiti, kesesuaian, insentif dan masa dalam sesuatu pembelajaran. Pembelajaran abad ke-21 yang diterapkan dalam inovasi ini ialah komunikasi, kolaboratif, pemikiran kritis, kreativiti, nilai murni dan etika.

Rajah 1: Elemen pembelajaran abad ke-21 Imbuhan Ria.



Rajah 2: Panduan permainan dan alat permainan Imbuhan Ria

Keputusan & Perbincangan

Keputusan dalam jadual 1 menunjukkan min pasca ujian imbuhan apitan meN...i berlaku peningkatan sebanyak 3.30 iaitu 4.31 dalam ujian pra dan 7.61 dalam ujian pasca. Manakala sisihan piawaian pula menunjukkan penurunan kepada 3.548 dalam ujian pasca daripada 4.652. Perbezaan nilai dalam data ini menunjukkan terdapat peningkatan dalam penguasaan imbuhan apitan meN...i setelah menggunakan permainan Inovasi Imbuhan. Menurut Musyrifah dan Nurfaradila (2021), gaya pembelajaran yang lebih interaktif dan menarik lebih bersesuaian dengan gaya pembelajaran masa kini. Oleh itu, kaedah pembelajaran secara tradisional tidak lagi relevan untuk murid ke arah pembelajaran abad ke-21.

Jadual 1: Keputusan ujian imbuhan apitan meN...i

Imbuhan apitan meN...i	N	Min	Sisihan Piawaian
Ujian Pra	109	4.31	4.652
Ujian Pasca	109	7.61	3.548

Di samping itu, melalui data yang ditunjukkan dalam Jadual 2 iaitu imbuhan apitan meN...kan, sisihan piawaian setelah permainan Inovasi Imbuhan dijalankan menunjukkan penurunan daripada 4.638 dalam ujian pra kepada 3.216 iaitu perbezaan sebanyak 1.422 nilai sisihan piawaian. Selain itu itu, nilai min dalam ujian pasca berlaku peningkatan sebanyak 3.68 iaitu 8.30 nilai min dalam ujian pasca dan 4.62 dalam ujian pra. Melalui peningkatan nilai min dan penurunan nilai sisihan piawaian ini telah memperlihatkan keberkesanan penggunaan permainan Inovasi Imbuhan dalam penguasaan imbuhan apitan meN...kan.

Jadual 2: Keputusan ujian imbuhan apitan meN...kan

Imbuhan apitan meN...kan	N	Min	Sisihan Piawaian
Ujian Pra	109	4.62	4.638
Ujian Pasca	109	8.30	3.216

Terdapat peningkatan positif di antara ujian pra melibatkan imbuhan apitan meN...i dan meN...kan dengan ujian pasca imbuhan. Oleh itu, dapat disimpulkan bahawa Imbuhan Ria mampu membantu murid-murid yang mempelajari bahasa Melayu sebagai bahasa kedua memahami imbuhan apitan meN...i dan meN...kan. Di samping itu, ia juga berjaya menarik minat murid-murid mempelajari mata pelajaran bahasa Melayu dengan seronok dan cepat. Menurut Azlina *et. al* (2021), Permainan inovasi interaktif bukan sahaja memberikan hiburan, tetapi dapat meningkatkan kemahiran dan memberikan ilmu kepada murid-murid.

Kesimpulan

Inovasi imbuhan Ria (IR) akan diteruskan melalui beberapa fasa dan akan meliputi semua jenis imbuhan. Inovasi Imbuhan Ria juga akan dipasarkan ke seluruh sekolah dalam negara untuk meningkatkan penguasaan imbuhan murid-murid. Selain itu itu, produk Imbuhan Ria juga boleh dipasarkan untuk pelajar-pelajar asing yang mempelajari bahasa Melayu di institut pengajian tinggi. Di samping itu, Inovasi Imbuhan Ria (IR) juga akan dibentuk menggunakan permainan digital bersesuaian dengan pembelajaran masa kini iaitu generasi Alpha.

Anugerah

Pingat Perak Kategori Inovasi Pembelajaran dan Pengajaran (PDP) Pusat Pendidikan Asas dan Lanjutan UMT.

Rujukan

Amirra Shazreena Aminul Razin & Vijayaletchumy Subramaniam. (2019). Kesalahan penggunaan imbuhan awalan dan akhiran dalam kalangan murid Sekolah Jenis Kebangsaan Tamil berdasarkan Teori Analisis Kesalahan Corder (1973). *International Journal of the Malay World and Civilisation,* 7(1), 3-13.

Anne Jefrey dan Saidatul Nornis (2021). Penguasaan Murid Tentang Penggunaan Imbuhan MeN-, di- DAN BeR- dalam Penulisan Karangan Respons Terbuka. Jurnal Universiti Malaysia Sabah, Bil. 32 (2), 89 110, 2021.

Azlina Mohd Mydin, Siti Nurleena Abu Mansor, Wan Anisha Wan Mohammad, Mahanim Omar, Rafizah Kechil & Siti Mariam Saad (2021). InCeS : Pembelajaran Berasaskan Permainan. Universiti Teknologi MARA

Chew Fong Peng & Fikri Ismail. (2020). Pelaksanaan pendekatan bermain dalam pengajaran dan pembelajaran Bahasa Melayu murid prasekolah: The implementation of play approach in teaching and learning of Malay language for preschool students. *Jurnal Pendidikan Awal Kanak-Kanak Kebangsaan*, 9(1), 14–25. https://doi.org/10.37134/jpak.vol9.1.2.2020

Dokumen Standard Kurikulum dan Pentaksiran BM SJK Tahun 5. (2016). KPM: Bahagian Pembangunan Kurikulum.

Dokumen Standard Kurikulum dan Pentaksiran BM SJK Tahun 6. (2013). KPM: Bahagian Pembangunan Kurikulum.

Muhammad Imran Yousuf, (2007) "The Delphi Technique," *Jurnal Essays in Education*, Vol. 20: Iss. 1, Article 8.

Musyrifah Ismail & Nurfaradilla Mohamad Nasr (2021). Keberkesanan pendekatan gamifikasi dalam pembelajaran bahasa inggeris dari segi penglibatan murid dan pengekalan pembelajaran, *Jurnal Penyelidikan Sains Sosial (JOSSR)*, 4(10)

Ni Komang Arie Suwastini, I Made Drati Nalantha dan Gede Rasben Dantes (2021). The Effectiveness of Google Classroom Media in Teaching English for Tourism at a Tourism and Business Institute. *Indonesian Journal of English Education,* 8(2):259-280 DOI:10.15408/ijee.v8i2.21932

Nik Safiah Karim, Farid M. Onn, Hashim Haji Musa dan Abdul Hamid Mahmood (2015). *Tatabahasa Dewan Edisi Ketiga*. *Bahasa dan Pustaka.* Kuala Lumpur.

Robert E. Slavin. (1994). Quality, appropriateness, incentive,and time: A model of instructional effectiveness. *International Journal of Educational Research*, 21(2), 141-157. Retrieved May 27, 2020, from http://www.sciencedirect.com/science/article/pii/0883035594900299

Development of an e-learning module in abdominal ultrasound for radiography students

Nur Asiah Norhan 1, Iza Nurzawani Che Isa 2, Norhafidzah Mohamed Sharif 3, Nur Hayati Jasmin 4, Afifah Mohamedm 5

Centre for Diagnostic, Therapeutic, and Investigative Studies, Faculty of Health Sciences, Universiti Kebangsaan Malaysia, 50300 UKM Kuala Lumpur, WP Kuala Lumpur, Malaysia.[1,2,3,5]

School of Medical Imaging, Faculty of Health Sciences, Universiti Sultan Zainal Abidin, 20400 Kuala Terengganu, Terengganu Darul Iman, Malaysia.[4]

afifahmohamed@ukm.edu.my 5

Highlights: Ultrasound education for radiography students must emphasize scanning skills due to the growing need for scanning proficiency in clinical settings. This e-learning strategy could improve comprehension in several educational fields, meeting the needs of modern youth and the Fourth Industrial Revolution. Numerous studies have examined ultrasonography education progression. An accessible and cost-effective e-learning module is needed due to the rising demand for ultrasound scans and healthcare practitioners' involvement in ultrasonography. Thus, a specialized educational module is needed to guide inexperienced ultrasonic scanners in clinical practice. This research aims to create an e-learning package on abdominal ultrasound for diagnostic imaging-focused undergraduate radiography students.

Key words: E-learning; module; ultrasound education; radiography students; undergraduate education

Introduction

The Malaysian Ministry of Education (MOE) has implemented education models that are integrated with technology in response to the rapid pace of the fourth industrial revolution (IR 4.0). The utilisation of e-learning has become integral to the contemporary educational landscape, resulting in a transformative impact on the education system as a whole. Consequently, it has emerged as a prominent subject of academic discourse (Aljawarneh, 2020; Maatuk et al., 2022). According to Aljawarneh (2020), ubiquitous learning tools enhance context-aware learning and learning experiences by ensuring continuous accessibility irrespective of geographical location.

Ultrasound is widely employed as the primary imaging modality for abdominal pathology because it provides real-time data on intestinal motility, positional variations, and vascular perfusion. According to several authors, ultrasonography has been reported to be a valuable tool in the diagnosis of 56% of patients experiencing acute abdominal pain (Dhillon et al., 2002; Mazzei et al., 2013). The utilisation of abdominal ultrasonography in paediatric imaging has been prevalent for an extended duration due to its non-invasive nature, cost-effectiveness, and widespread accessibility (Elliott et al., 2018). Before residency, numerous medical schools had acknowledged the necessity of incorporating ultrasound training into their curriculum and had evaluated the effectiveness of student courses (Barnett et al., 2018). According to Uinarni et al. (2020), abdominal ultrasonography is a highly sought-after medical procedure in hospitals. Therefore, abdominal ultrasound is a crucial area of specialization that needs to be mastered by students.

The constraints on curriculum hours of ultrasound subjects in undergraduate medical imaging programmes have decreased the availability of sufficient clinical training opportunities for students (Prosch et al., 2020). Over time, this phenomenon results in a decrease in students' proficiency in conducting ultrasound scans. Given the escalating need for ultrasound scans and the expanded responsibilities of healthcare practitioners in the field of ultrasound (Harrison et al., 2021), it is imperative to develop an e-learning module that enables easy access and affordability. Despite the widespread availability of external resources, it is important to note that these resources are primarily intended for students specialising in medical imaging. Hence, the implementation of a dedicated educational module is necessary to provide comprehensive guidance for novice practitioners in conducting ultrasound scans on patients, particularly in the context of clinical settings.

Thus, this study aims to create and formulate an e-learning module focused on abdominal ultrasound, specifically tailored for undergraduate radiography students specialising in diagnostic imaging using a freely available software. The evaluation of a website's functionality, applicability, and effectiveness is conducted through the utilisation of the content validity index (CVI), which involves the assessment of the validity of its contents by a panel of experts. The development of this online learning module will enhance students' understanding and proficiency in abdominal ultrasound scanning in line with the rapid pace of the fourth industrial revolution (IR 4.0).

Product Description

The module encompassed content pertaining to the fundamental principles of ultrasound, ultrasound protocols, instructional videos, case-based learning materials, and a quiz

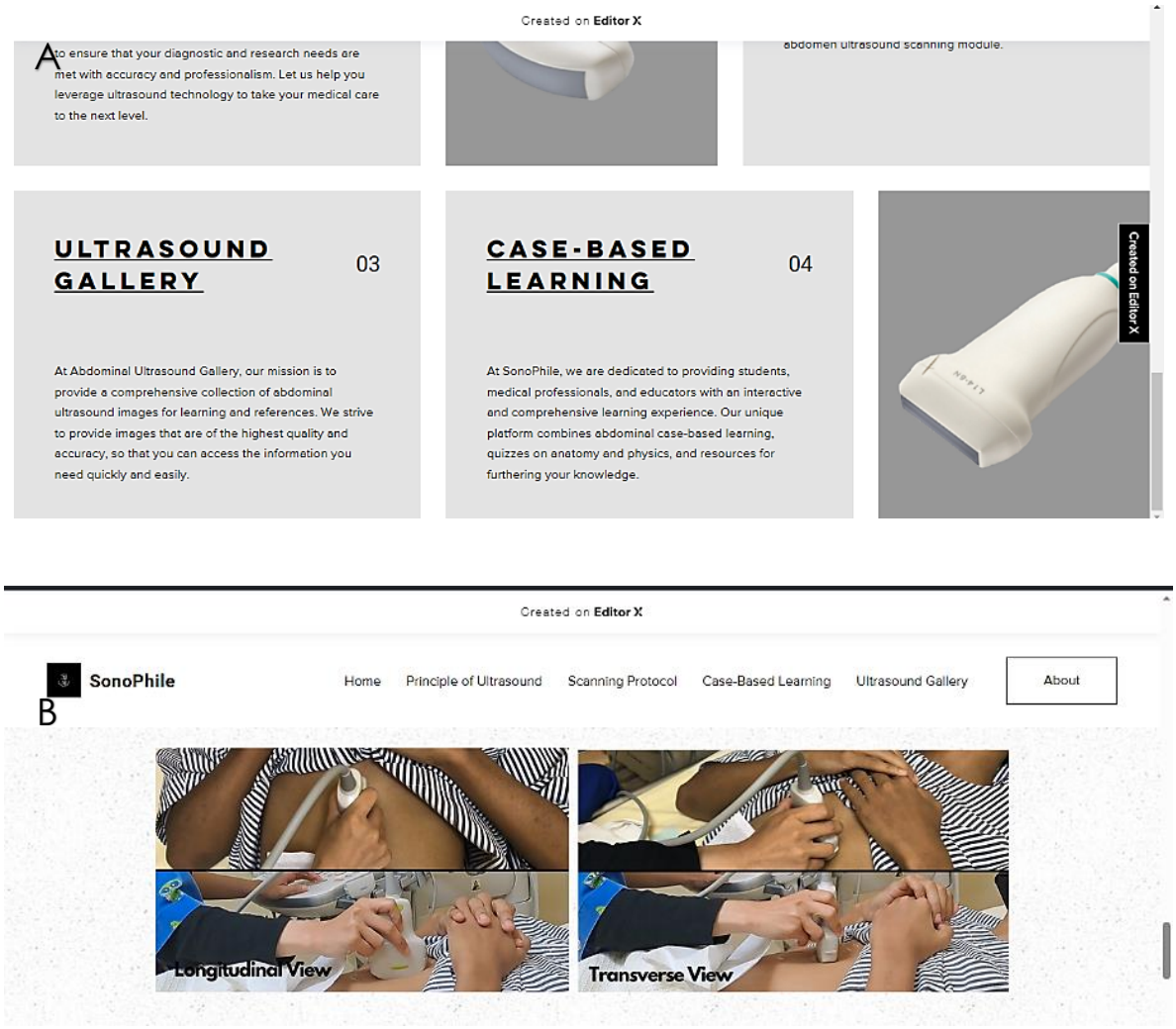


Figure1: Snapshot from the website A: SonoPhile Homepage B:Scanning Protocol Page

Results & Discussion

The sociodemographic characteristics of the ten-panel experts were examined. The average age of the panel experts was 34.6 years. Most of the experts were radiographers or sonographers with expertise in the ultrasound field. Each expert possesses at least three years of practical experience in their respective domains.

The experts evaluated 20 items. In relation to the content discussed in Items 1-5, it is evident from Table 4 that all five issues demonstrated a commendable level of performance, with a rating of 1, indicating excellence. The Content Validity Index (CVI) for the language, specifically for items 6 and 7, demonstrates excellent validity (S-CVI/Ave = 1). Regarding items 8-11, it can be observed that the I-CVI value falls within an acceptable range for each item, accompanied by a satisfactory S-CVI/Ave value of 1. Among the six items pertaining to the layout (Items 12-17), only two obtained unanimous consensus among the experts, resulting in an S-CVI/UA score of 0. However, the I-CVI value for each item is deemed acceptable, as the value exceeds the threshold of 0.78. Two items (Items 18-19) that assessed the website's motivation demonstrated a high level of content validity with an excellent S-CVI/Ave score of 1. The website's assessment of the final cultural item garnered unanimous consensus from a panel of ten experts.

The assessment of Cronbach's alpha, utilizing Cronbach's alpha, demonstrated a high level of reliability, as depicted in Table 1. According to Devon et al. (2007), a value greater than 0.70 for the alpha coefficient is considered suitable for assessing the internal consistency of a questionnaire.

Table 1: The mean, standard deviation, and Cronbach's alpha value of the e-learning module.

Reliability Analysis

Scale Reliability Statistics

	Mean	SD	Cronbach's α
scale	3.60	0.273	0.860

Integrating digital technologies into the educational setting has significantly facilitated the teaching and learning process (Saboia et al., 2019). SonoPhile provides a platform that facilitates self-regulated learning for undergraduate students seeking to enhance their proficiency in abdominal ultrasound. The purpose of this study is to conduct research aimed at the development and evaluation of a website to determine its suitability for use. The present study employed a combination of qualitative content validation research and quantitative inter-rater reliability research methodologies.

The present study evaluates the six constituent elements of an e-learning module that can be accessed through both desktop computers and mobile devices. Based on the findings, it can be inferred that the website possesses a strong appeal and offers substantial advantages to professionals within the industry. Furthermore, it posits that e-learning serves as an adjunctive tool that can enhance undergraduate radiography students' motivation to acquire proficiency in abdominal ultrasound skills. The present study provided evidence supporting the authenticity of the six elements and twenty items included in the e-learning module (SonoPhile) and the validity of the inventory's content, response process, and internal structure.

The content validity index was utilized to determine the expert opinions on six different aspects of the SonoPhile. Based on Lynn's (1986) study on the determination and quantification of content validity, it is recommended that a minimum of 80% of reviewers assign a rating of 3 or 4 to an item for it to be deemed valid. The calculation of the CVI encompassed various aspects pertaining to the e-learning module. These aspects included evaluating the content quality, which was assessed based on five specific items. Additionally, the language quality within the module was evaluated using two distinct criteria. The illustrations utilised in the module were also subjected to evaluation, with four specific items being considered. Furthermore, the layout of the website hosting the module was assessed based on six different items. The motivational aspects of the website were evaluated using two specific criteria. Lastly, the cultural elements incorporated within the module were assessed based on a single item. The 20-item SonoPhile demonstrated excellent content validity indices for each item.

The reliability of a questionnaire is a crucial factor in determining its validity and evaluating the consistency of responses to the stability of the e-learning module. Internal consistency is a fundamental aspect of reliability that is employed to assess the degree to which items effectively measure a common construct. According to Bolarinwa (2015), the Cronbach alpha coefficient is widely recognized as the primary indicator of internal consistency. The elevated Cronbach alpha value observed in this study suggests that the e-learning module website exhibits a high level of reliability in assessing various aspects such as content, language, illustration, layout, motivation, and culture within an e-learning module. The item statistics consistently demonstrate that the 20 items effectively assess the same construct, namely the usability of the e-learning module.

Ultrasound teaching has been delivered in many ways. Students learn ultrasound concepts, indications, limitations, picture capture, optimisation techniques, anatomical structures, and disease diagnosis using simulators and phantoms. Web-based modules and YouTube videos are often used for didactic education. Ultrasound skills are often developed through faculty supervised scanning of peers or patients, ultrasound simulator training, senior peer mentor guidance, and independent peer scanning (Tarique et al., 2018). Undergraduates can improve their academic performance with this self-paced electronic learning session. Chen et al. (2019) found that self-regulated learning practices improve students' academic performance. E-learning modules designed for medical students have improved results, according to recent studies. Khumrin et al. (2017) found that E-learning improved bedside clinical evaluations and diagnostic skills in medical education. E-learning modules can enhance traditional e-learning methods to give students a safe learning environment.

Conclusion

This study provided evidence to support the e-learning module's validity (SonoPhile) tool to help undergraduate students learn abdominal ultrasound. However, further investigation is needed to evaluate the students' perceptions of the e-learning module and its effectiveness both in theory and in their ultrasound scanning skills.

References

Aljawarneh, S. A. (2020). Reviewing and exploring innovative ubiquitous learning tools in higher education. *Journal of Computing in Higher Education*, *32*(1), 57-73. https://doi.org/10.1007/s12528-019-09207-0

Bolarinwa, O. A. (2015). Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. *Niger Postgrad Med J*, *22*(4), 195-201. https://doi.org/10.4103/1117-1936.173959

Harrison, G., Martins Dos Santos, R., Kraus, B., & Pedersen, M. R. V. (2021). Radiographers in ultrasound: Motivation and role expansion. A survey of European Federation of Radiographer Societies (EFRS). *Radiography (Lond)*, *27*(4), 1185-1191. https://doi.org/10.1016/j.radi.2021.07.003

Khumrin, P., Ryan, A., Judd, T., & Verspoor, K. (2017). Diagnostic Machine Learning Models for Acute Abdominal Pain: Towards an e-Learning Tool for Medical Students. *Stud Health Technol Inform*, *245*, 447-451.

Lynn, M. R. (1986). Determination and quantification of content validity. *Nurs Res*, *35*(6), 382-385.

Maatuk, A. M., Elberkawi, E. K., Aljawarneh, S., Rashaideh, H., & Alharbi, H. (2022). The COVID-19 pandemic and E-learning: challenges and opportunities from the perspective of students and instructors. *Journal of Computing in Higher Education*, *34*(1), 21-38. https://doi.org/10.1007/s12528-021-09274-2

Prosch, H., Radzina, M., Dietrich, C. F., Nielsen, M. B., Baumann, S., Ewertsen, C., Jenssen, C., Kabaalioglu, A., Kosiak, W., Kratzer, W., Lim, A., Popescu, A., Mitkov, V., Schiavone, C., Wohlin, M., Wustner, M., & Cantisani, V. (2020). Ultrasound Curricula of Student Education in Europe: Summary of the Experience. *Ultrasound Int Open*, *6*(1), E25-E33. https://doi.org/10.1055/a-1183-3009

Saboia, D. M., Vasconcelos, C. T. M., Oriá, M. O. B., de, C. B. K., Vasconcelos Neto, J. A., & de, M. L. M. H. B. (2019). Continence App: Construction and validation of a mobile application for postnatal urinary incontinence prevention. *Eur J Obstet Gynecol Reprod Biol*, *240*, 330-335. https://doi.org/10.1016/j.ejogrb.2019.07.026

Tarique, U., Tang, B., Singh, M., Kulasegaram, K. M., & Ailon, J. (2018). Ultrasound Curricula in Undergraduate Medical Education: A Scoping Review. *J Ultrasound Med*, *37*(1), 69-82. https://doi.org/10.1002/jum.14333

Interactive fiction: E-storybook to enhance reading interest among lower elementary students

Nurul Huda Hassan Bakri, Aina Yasmin Mohd Amin, Aini Syahira Jamaluddin,
School of Education and Human Sciences, Albukhary International University, Malaysia[1,2,3]
huda.bakri@aiu.edu.my, yasmin.amin@aiu.edu.my, aini.jamaluddin@aiu.edu.my, 1,2,3

Highlights:

The reading class consistently adheres to the utilization of printed textbooks as instructional resources to facilitate teaching and learning. It is imperative to provide young learners with interactive, enjoyable, imaginative, and innovative resources to facilitate their literacy development. This research examines the utilization of e-storybooks developed by pre-service teachers as instructional materials to support reading instruction in the classroom. A survey was administered to a sample of 31 pre-service teachers who included e-storybooks as a pedagogical tool for teaching reading. The study revealed that a significant proportion of the pre-service teachers held positive attitudes regarding the efficacy of e-storybooks as a tool to enhance their reading instruction in class.

Key words: E-storybooks; reading skills; pre-service teachers; young learners

Introduction

The use of digital technology in the field of English education has resulted in the emergence of innovative resources such as e-storybooks. The e-storybooks discussed below have been specifically created to cater to the needs of young learners, with the primary objective of enriching their reading experience and fostering the development of literacy skills (Bus, A. G et al., 2020). E-storybooks are loaded with interactive features, multimedia elements, and engaging features that provide a distinct and dynamic platform that captivates the imaginations of students in educational settings.

One notable benefit associated with e-storybooks is their capacity to enhance interactivity and immersion during the reading experience. E-storybooks are loaded with several engaging features, like animations and sound effects, which transform the act of reading from a passive endeavor into a captivating and multisensory experience, as discussed by Prasetya, D. D., and Hirashima, T., (2018). The use of interactive components in educational materials not only captures the interest of young learners but also facilitates the development of crucial skills such as vocabulary acquisition, understanding, and cognitive involvement (Abd Mutalib Embong et al., 2012). In addition, e-storybooks possess the capacity to accommodate a wide range of learning styles and skills, rendering them an inclusive instrument that can be customized to meet the unique requirements of individual students.

Product Description

The e-storybooks are created by the pre-service teachers, focusing on subject matter that aligns with the curriculum of the school. The pre-service teachers are responsible for designing the topic, storyline, writing, audio, and graphics. Tools such as Canva, Piscart, Imagine, and Capcut are employed as innovative means to generate e-storybooks. The e-storybooks are designed to impart valuable lessons to young learners while also aligning with the themes covered in their syllabus.

In the context of the subject matter 'Pollution', the pre-service educator proposed the concept of a narrative centered around a fish grappling with the adverse effects of water pollution within a lake. The e-storybook is entitled "The Journey of Little Ben." Besides Little Ben, the pre-service teachers also created the character of Toto, a little cat that wishes to travel the world, under the subject matter 'Travel'. There are a few more other characters that had been created and designed by the pre-service teachers in order to enhance interest among the students in reading.

Results

A survey was undertaken in Alor Setar, Kedah, involving a total of 31 pre-service teachers from 10 elementary schools. The researcher employed purposive sampling to pick the subjects. Each pre-service teacher is assigned to teach an English lesson for either Standard 1, 2, or 3 at their respective schools. The questionnaire consists of 9 questions and has been designed specifically for this research. The survey was adapted from Hera Nopiyanti (2018). It addressed usage, emotion, and assistance towards using e-storybooks in the classroom.

The results are presented in the table below. There are five scales, namely 1 for totally disagree, 2 for disagree, 3 for not sure, 4 for agree, and 5 for totally agree.

Most of the pre-service teachers do agree that e-storybooks are significant to the students. A majority of 48.4% agreed, while 9.7% were neutral.

The result shows that, a majority of 51.6% agreed that e-storybooks have replaced the use of paper storybooks in the learning process, on the other hand, 3.2% disagreed. This is primarily because the introduction of new gadgets is a commonplace occurrence in the current technological era, and the majority of students are already familiar with and exposed to such technology.

The majority of 51.6% of pre-service teachers agreed that e-storybooks cause students to pay attention during the teaching and learning process, while 6.5% disagreed and another 12.9% were not sure. This phenomenon may be attributed to the captivating interactive features that e-storybooks offer, which effectively engage students and extend their attention spans.

As the figure shows, most of the pre-service teachers agree that e-storybooks make the syllabus more interesting. 64.5% of the pre-service teachers agreed, and 12.9% were not sure. E-storybooks enable students to actively participate in the narrative through engaging animations and diverse voice characterizations, enhancing their overall reading experience.

Only 25.8% of the pre-service teachers agreed that the e-storybooks can lead to less focus in class, while 6.5% disagreed. The majority of the pre-service teachers were not sure about this.

45.2% of the pre-service teachers disagreed that e-storybooks are a waste of time, while 9.7% agreed. 16.1%, on the other hand, had no idea about it.

A majority of 38.7% disagreed that e-storybooks are not practical for young learners, while 12.9% agreed. At the same time, 6.5% slightly agreed about it, while 16.1% were not sure.

Most of the pre-service teachers agreed that the use of e-storybooks should be continued in the future. A majority of 67.7% agreed, 16.1% slightly agreed, 12.9% were neutral, and 3.2% disagreed.

A strong opinion of 80.6% agreed that they are happy with the use of e-storybooks in class, while 3.2% disagreed and 6.5% were not sure.

Table 1: Findings on Pre-service Teachers Perceptions on the use of E-storybooks as teaching material in the classroom

Items	Totally disagree	Disagree	Not sure	Agree	Totally Agree
E-storybooks are significant to the students	0	0	3 (9.7%)	15 (48.4%)	13 (41.9%)
E-storybooks have replaced the use of paper storybooks in the learning process	1 (3.2%)	0	6 (19.4%)	8 (25.8%)	16 (51.6%)
E-storybooks cause students to pay attention during teaching and learning process	0	2 (6.5%)	4 (12.9%)	9 (29%)	16 (51.6%)
E-storybooks make the syllabus more interesting	0	0	4 (12.9%)	7 (22.6%)	20 (64.5%)
E-storybooks can lead to less focus in class	1 (6.5%)	3 (9.7%)	12 (38.7%)	6 (19.4%)	8 (25.8%)
E-storybooks are a waste of time	14 (45.2%)	8 (25.8%)	5 (16.1%)	1 (3.2%)	3 (9.7%)
E-storybooks are not practical for young learners	12 (38.7%)	8 (25.8%)	5 (16.1%)	2 (6.5%)	4 (12.9%)
The use of e-storybooks should be	0	1 (3.2%)	4 (12.9%)	5 (16.1%)	21 (67.7%)

continued in future					
I am happy with e-storybooks	0	1 (3.2%)	2 (6.5%)	3 (9.7%)	25 (80.6%)

Discussion

Electronic books, or e-books, have the potential to serve as valuable teaching tools for educators, aiding them in the effective delivery of lessons to their students. However, it is important to acknowledge that e-storybooks can never fully replace the role of teachers. The rise of e-storybooks as instructional materials among schoolchildren necessitates that teachers consider how to adapt their teaching methods to incorporate e-books effectively. While e-storybooks are not expected to entirely replace traditional printed textbooks in the immediate future, they are likely to become a valuable complement to print resources. It is evident that teachers generally hold a favorable view of utilizing e-storybooks as educational materials. Within classrooms, both educators and students are increasingly recognizing the convenience and accessibility that e-storybooks offer. This represents a significant advancement in educational technology and signifies a promising development in fostering a highly literate society.

E-storybooks have the capacity to incorporate various forms of auditory and visual materials, encompassing speech, text, music, animations, photographs, and videos, among others. As pointed out by Casey (1994), e-books have the capability to seamlessly integrate different types of representations, such as linking images with audio, aligning oral readings with written text, combining videos with subtitles, or employing various reading modalities to enhance teaching and learning.

Conclusion

The findings revealed that a significant majority of these teachers held positive perceptions regarding the utilization of e-storybooks. The use of electronic books, commonly referred to as e-books, provides teachers with an engaging and diverse approach to learning, given the wide range of e-books tailored to accommodate students' varying levels of knowledge, characteristics, abilities, and interests.

Enhancing the effective use of e-storybooks in education can be achieved through the implementation of a structured framework, the development of classroom strategies, and clear delivery instructions. Given that pre-service teachers and educators may not possess sufficient training in conducting lessons with e-storybooks, it is advisable to consider the implementation of comprehensive training programs or workshops to equip them with the necessary skills. Moreover, it is essential to recognize that the successful integration of e-storybooks into the classroom is contingent upon the availability of appropriate technology. Schools must invest in the necessary technological infrastructure to support the use of e-storybooks as valuable learning materials.

References

Abd Mutalib Embong, Azelin M Noor, Razol Mahari M Ali, Zulqarnain Abu Bakar, and Abdur- Rahman Mohamed Amin (2012) Teachers' Perceptions on the Use of E-Books as Textbooks in the Classroom. International Journal of Educational and Pedagogical Sciences 6(10)

Bus, A. G., Roskos, K., & Burstein, K. (2020). Promising interactive functions in digital storybooks for young children. International perspectives on digital media and early literacy (pp. 7–26) Routledge.

Casey, J. (1994) Integrating Computers in the Primary Classroom. The Computing Teacher, 21, 33-36

Nopiyanti H, (2018), The Students and Teachers Views on the Use of E-textbooks in Reading Classroom: Journal of English Education, http://dx.doi.org/10.31327/jee.v4i1.859

Prasetya, D. D., & Hirashima, T. (2018). Design of Multimedia-based Digital Storybooks for Preschool Education. International Journal of Emerging Technologies in Learning, 13(2).

Waste to Energy ProjectG: Engaging Student to Improve SDGs 7 Affordable and Clean Energy

Baharudin Yusuf Haqiqi[1], Nur Ilmiah Sakinah[2], Nabila Tazkiyyatul Afifah[3], Rosyi Rahmawati[4], Fakhran Rozali Daulay[5]
Universitas Pendidikan Indonesia, Bandung, Indonesia[1,2,3,4,5]
baharudinyusuf@upi.edu[1]

Highlights: This research focuses on STEM-based project learning carried out by students to overcome environmental problems that occur in everyday life. The project carried out focuses on waste and renewable energy problems which are the main problems in this research. The research was carried out for a full month and focused on the fermentation process to produce biogas as a project carried out by students. This biogas project uses a fermentation process from organic waste and bacteria. Students focus on the biogas making project based on the steps contained in the Student Worksheet (*LKPD*). In this research, students carried out projects based on STEM learning steps, namely problem formulation, thinking, designing, creating, testing, and improving designs. The results of the research that has been carried out provide an illustration that students can find problems and can overcome problems using waste to energy projects.

Key words: *Waste to energy; STEM learning; Learning Project; Environmentally friendly energy sources*

Introduction

Energy and the environment have an important role for the sustainability of life in today's modern era. However, the usage of energy has challenges at the consumption stage (Pourarshad & Noorrollahi, 2022). According to the Southeast Asian Energy Outlook that was released in 2022, the energy demand post-pandemic has increased up to 429.7 Mtoe. On the other hand, the power plant that was installed in southeast asia was still dominated by fossil fuel sources up to 66.5% including the coal, gas and oil power plant (ASEAN Centre for Energy, 2021). The usage of these energy resources tends to have a negative impact on the environment because of their unsustainability (Ho et al., 2021). Environmentally friendly energy sources that can be used to replace fossil resources are known as renewable energy. Not only limited to solar, air or water power but it also can be biomass and biogas utilisation. In addition to its environmentally friendly nature, bioenergy tends to have biodegradable quality, able to reduce the greenhouse effect, and guaranteed continuity of raw materials. This biomass energy source supports the achievement of Sustainable Development Goals (SDGs) number 7 on Affordable and Clean Energy. One of the subgoals of SDGs number 7 emphasises the availability of sufficient and affordable modern energy for everyone.

As one of biomass resources, organic waste has the potential to be converted as energy. But, the utilisation of organic waste is not fully known by the people. This statement is supported by the fact that Indonesian people have low knowledge and awareness about waste that can be used as an environmentally friendly energy source by making biogas and this is still common information among the Indonesian people (Fitriatiet al., 2021). One of efforts that can be done to tackle this issue is by conducting a STEM-based Learning in School that is oriented to SDGs 7 Issues. STEM-based project learning emphasises students being able to think systematically to solve problems found through engineering and technological development (Gustiani et al., 2017; Luthfiyani et al., 2019; Widodo, 2021). The STEM learning model allows students to be involved in action and aware of their concern for protecting the environment. Apart from that, other research also states that STEM learning can provide conceptual explanations about environmental problems that occur in everyday life and can stimulate students to question the problems found and can collaborate to carry out mitigation plans (Gustianiet al., 2017). Based on the description above, this research will be focusing on the STEM project learning named "Waste to Energy" to support the SDGs program number 7 regarding Clean and Affordable Energy in School level.

Product Description

The main goal in this research is to develop a STEM- Project Learning framework that focuses on biogas context. The framework basically consists of learning stages and the student's or teacher activities for each stage. More detailed, the STEM learning step that was used in this research was adapted from Widodo (2021) as shown below.

Table 1.*STEM Learning Stages* (Widodo, 2021)

Learning Model Stages	Structure of Student Activities	Structure of Teacher Activities
Formulation of the problem	Identify environmental problems in the form of waste and renewable energy problems	Presents issues regarding waste and renewable energy
Thinking	Thinking about technological	Directing forms of technology that

	designs and forms of technology that can be developed to overcome waste and renewable energy problems	can be developed as solutions to waste and renewable energy problems
Designing	Plan technology that can be made through biogas plans using simple tools and materials	Guiding the creation of technological designs to develop biogas projects
Creating	Creating technology based on biogas designs that have been engineered	Guiding the creation of biogas technology that has been developed
Testing	Identify the advantages and disadvantages of biogas being developed	Direct students to evaluate the advantages and disadvantages of the biogas that has been made
Redesigning	Improve the biogas design that has been made based on test results	Guiding improvements to biogas designs that have been tested

Waste to energy project learning activities focus on the problem of organic waste that occurs surrounding students (Gustiana *et al.*, 2017; Luthfiyani *et al.*, 2019; Widodo, 2021). But not limited to finding a solution to a problem, this learning process also enables students to develop their project skills and awareness of the environment.

Results & Discussion

The first step of the learning process is to make observations in the surrounding environment to identify environmental problems that occur. After the problems are found, students focus to formulate the specific problem that can be done with engineering technology. The main focus of the problems discussed by students is the problem of organic waste and also renewable energy. These two main problems are linked with SDGs point number 7, namely Affordable and Clean Energy. In this step, students are expected to think about the technology that can help them to reach their project target. Furthermore, the students are designing their products according to the research that they have been looking for. One of the designs that was made by students can be seen in Figure 1 below.

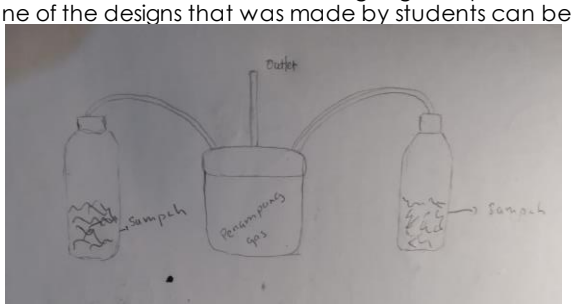


Figure 1. *Student Technology Design*

The waste problem discovered by students is organic waste from household waste. As a response to this problem, students are designing a solution to make biogas as environmentally friendly energy by utilising waste and bacteria. The next learning process is to create biogas technology based on the design that has been created. The technological results that have been created by students can be seen in Figure 2 below.

Figure 2. *Student Biogas*

Student's ability to analyse the problems and provide the solutions are shown in this learning stage. The next activity is to carry out tests on the biogas technology that has been created. The results of the first test did not produce a fire because there was a leak in the biogas digester. At this test stage students can identify problems with the biogas equipment that has been made. The question asked to students at this test stage is '*Has there been any damage to the biogas equipment that has been made so that the results are not as expected?*' The average student answer is:

> *"There are leaks in the equipment that is made, especially in the digester because the gas channel that is made has a hole that is not closed tightly."*

This shows that students are able to identify the shortcomings of the biogas design that have been made. At this test stage, one of them found a leak in the biogas equipment. After the student finds problems that occur, students

repair the tool and carry out the test again to identify problems with the tool that has been repaired. The repairment shows an improvement on biogas output where the fire can be seen after the testing.

Table 2. *Student Learning Process*

Learning Model Stages	Structure of Student Activities
Formulation of the problem	The problem formulation carried out by students is based on the results of observations made by students in the surrounding environment. The observation results show that students can determine the problems that occur by marking the completion of the Student Worksheet (LKPD). In completing the student worksheet, students write down several problems, namely flooding caused by accumulation of rubbish, air pollution due to motor vehicle fumes, and river pollution due to waste and rubbish.
Thinking	In the second STEM learning stage, students are required to think about solutions to problems that have been found. Students are focused on overcoming waste problems in the everyday environment and environmentally friendly energy problems. The solutions given by students to this problem are the use of solar power, making biogas or biomass, and a commitment to using environmentally friendly fuel.
Designing	The design made by students at this stage is making a biogas design as an effort that can be made to deal with the environmental problems found. Making biogas is a step in overcoming the problem of waste and renewable energy.
Creating	The stage of making biogas is carried out by maximising the tools and materials available around the students. Biogas production is carried out based on a planned tool design using organic waste as basic materials and the addition of bacteria the reactant. This process uses fermentation to produce gas in a gas storage tube. This production was carried out for a full day to maximise biogas production before testing.
Testing	The test stage was carried out after undergoing a fermentation process for 9 full days. Testing is carried out to check the condition of the tools and materials that have been made. Next, a biogas test is carried out by looking at the energy produced.
Redesign	The design improvement process is carried out by students to correct deficiencies in the tools that have been made. This process is carried out after testing and checking the tools and materials that have been made to evaluate errors that occur in the biogas making process.

This whole 'waste to energy' project is intended to formulate problems, develop technology, and produce solutions. The results of the research that has been carried out can provide an analysis of students' ability to overcome problems in everyday life. The learning process that has been carried out provides an overview of students' process skills to overcome problems with biogas technology engineering. The project carried out by students will support the project learning process in Indonesia which focuses on problem solving. In addition, the project carried out can be used as a reference to overcome the problems of SDGs point number 7 on Affordable and Clean Energy in School Level.

Conclusion

Based on the project that was carried out, the entire process shows student involvement to overcome problems in SDGs 7 regarding Affordable and Clean Energy by conducting 'waste to energy' projects. By the end of the project, there are several innovations that can be taken as a recommendation for future improvement. Firstly, regarding the project time that needs to be prolonged. Since the fermentation of organic waste needs to take a lot of time in order to produce a great number of biogas to be tested and used. Secondly, the need for improvement on engineering that is less seen on this project. Moreover about the measurement of gas that is produced. Lastly, the design or material that was used by the student tends to have a gas leak and needs a lot of attention and improvement. As for the future effort on this project can be taken as consideration for the school to implement this project in science or Biology class, on extracurricular activity or furthermore to be implemented as one of school projects that provide sustainable energy.

References

Fitriati, D., Nazarudin Ali, M., Arimbawa, I. M., Ahliana Rahmaniyah, F., Nurtsulutsiyah, N., Hidayatullah, H., Rosalina, A., Abdul Aziz Fajar, M., Dwinanda Nursoliha, T., Ainun Salsabila, Z., Susilowati, S., Isnan Khamil, A., Aliyya Isma, R., Lipuring Tyas, H., & Nashir Idham Kholid, M. (2021). Sosialisasi pemanfaatan limbah kotoran sapi menjadi biogas sebagai sumber energi alternatif di Desa Kemuning Lor, Jember. Unri Conference Series: Community Engagement, 3, 597–601. https://doi.org/10.31258/unricsce.3.597-601

Gustiani, I., Widodo, A., & Suwarma, I. R. (2017). Development and validation of science, technology, engineering and mathematics (STEM) based instructional material. AIP Conference Proceedings, 1848. https://doi.org/10.1063/1.4983969

Ho, C. M., Nguyen, L. T., Vo, A. T., & Vo, D. H. (2021). Urbanization and the Consumption of Fossil Energy Sources in the Emerging Southeast Asian Countries. Environment and Urbanization ASIA, 12(1), 90–103. https://doi.org/10.1177/0975425321990378

Luthfiyani, S. H., Widodo, A., & Rochintaniawati, D. (2019). Pengaruh Pembelajaran Biologi Berbasis STEM terhadap Literasi Teknologi dan Keterampilan Pengambilan Keputusan Siswa SMA. Assimilation: Indonesian Journal of Biology Education, 2(2), 77–82. https://doi.org/10.17509/aijbe.v2i2.19251

Pourarshad, M., & Noorollahi, Y. (2022). Reducing energy and environmental challenges by modelling clean electricity generation in oil-rich regions. https://doi.org/10.1177/0958305X221135056

Widodo, A. (2021). Pembelajaran Ilmu Pengetahuan Alam. In UPI Press (Vol. 53, Issue 9).

Keberkesanan Lajur Ampuh Membaca Bahasa Melayu (LAMBM) dalam proses pengajaran dan pembelajaran

Nadia Shuhada Abdan Nasir, Amirra Shazreena Aminul Razin, Vijayaletchumy Subramaniam, Che Ibrahim Salleh
Universiti Putra Malaysia, Selangor, Malaysia
Email addresses: ieyanadia819@gmail.com, ashazreena93@gmail.com, vletchumy@upm.edu.my, cibrahim@upm.edu.my

Abstrak:

Lajur Ampuh Membaca Bahasa Melayu (LAMBM) merupakan alat bantu mengajar (ABM) berinovasi bagi asas pembelajaran bahasa Melayu yang dihasilkan bertujuan membantu guru-guru menyelesaikan masalah tidak dapat membaca bahasa Melayu dalam kalangan murid-murid. Pendekatan pembelajaran asas suku kata ini menggunakan lima teknik pembelajaran dalam bentuk permainan sebagai alat bantu mengajar iaitu segmen bunyi, kad suku kata, papan asas lajur suku kata, papan pengukuhan suku kata dan poster suku kata. Dengan pendekatan LAMBM dalam proses pengajaran dan pembelajaran di dalam kelas, murid lemah mampu melibatkan diri secara aktif dalam permainan tersebut di samping dapat memantapkan penguasaan suku kata seterusnya meningkatkan kemahiran membaca.

Kata kunci: alat bantu; bahasa Melayu; membaca; suku kata

Pengenalan

Bahasa Melayu adalah mata pelajaran teras yang dipelajari sama ada di Sekolah Kebangsaan (SK) mahupun di Sekolah Jenis Kebangsaan (SJK). Status bahasa Melayu di SJK adalah sebagai bahasa kedua. Hari ini masih terdapat murid-murid di sekolah berkenaan yang masih tidak menguasai kemahiran membaca, menulis dan lisan dalam bahasa Melayu. Dapatan kajian penguasaan bahasa Melayu dalam kalangan murid lepasan SJK membuktikan bahawa sistem pembelajaran bahasa Melayu di sekolah berkenaan tidak berjaya menghasilkan murid bukan Melayu yang benar-benar menguasai bahasa kebangsaan. Penyelesaian bagi menangani masalah sifar membaca bahasa Melayu dan mengurangkan kadar buta huruf di SK mahupun di SJK perlu diberi perhatian. Teknik pengajaran yang pelbagai dan menarik perlu digunakan untuk menarik minat murid-murid tersebut. Oleh itu, satu inovasi telah dihasilkan, iaitu Lajur Ampuh Membaca Bahasa Melayu (LAMBM). Pendekatan pembelajaran asas suku kata ini menggunakan lima teknik pembelajaran dalam bentuk permainan sebagai alat pengajaran.

Menurut Kamus Pelajar Bahasa Melayu Dewan Edisi Kedua (2016), maksud kata lajur ialah baris-baris panjang dan bersinonim dengan kata deret, baris, leret atau jalur. Dalam kajian ini, lajur merujuk kepada bentuk alat bantu yang telah direka secara berbaris dan berjalur. Kata ampuh pula membawa maksud bertuah, mujarab atau sakti. Lanjutan daripada makna tersebut, boleh dikaitkan bahawa teknik LAMBM yang mampu memberi kesan mujarab dalam membantu murid-murid SJK menguasai kemahiran membaca bahasa Melayu dengan mudah.

Dalam kajian ini, ujian bacaan dilakukan untuk mengenal pasti secara terperinci masalah-masalah yang dihadapi oleh murid dalam pembacaan bahasa Melayu khususnya kepada murid sasaran, iaitu murid-murid berbangsa India di SJK(T). Selain itu, ujian diagnostik juga dapt mengenal pasti punca kegagalan murid untuk menguasai kemahiran membaca dalam bahasa Melayu. Melalui hasil daripada ujian ini, pengkaji dapat merancang dan membentuk satu inovasi sebagai alat bantu mengajar yang boleh digunakan dalam proses pengajaran dan pembelajaran bersesuaian mengikut tahap-tahap murid. Model QAIT Slavin (1994) menjadi asas dalam pembentukan LAMBM yang dipengaruhi oleh empat faktor, iaitu kualiti (*Quality*), kesesuaian (*Appropriateness*), insentif (*Incentive*) dan masa (*Time*). Model Slavin (1994) ini meliputi input-output. Dalam kajian ini, input berdasarkan model QAIT manakala output ialah peningkatan penguasaan kemahiran membaca bahasa Melayu dalam kalangan murid. Selain itu, proses pelaksanaan inovasi ini juga menggunakan pendekatan Penyelidikan Reka Bentuk dan Pembangunan (DDR) yang merangkumi empat fasa.

Jadual 1 : Proses pelaksanaan LAMBM menggunakan pendekatan DDR

Fasa	Keterangan
Fasa 1 : analisis keperluan	• Hasil ujian bacaan menunjukkan murid sasaran memerlukan teknik pengajaran baharu.
Fasa 2 : reka bentuk	• Reka bentuk alat bantu ialah berbentuk permainan.
Fasa 3 : pembangunan	• Pembangunan alat bantu terhasil melalui perbincangan dan maklum balas bersama pakar, penyelia dan guru-guru berpengalaman.

Fasa 4 : pengujian dan penilaian	• Pengujian : I. Murid Tahap 1 SJK(T) F.E.S. Serdang, Selangor. II. Murid Tahap 1 SJK(T) Ladang Sungai Choh, Rawang, Selangor. III. Murid Tahap 1 SJK (T) Batu Caves, Kuala Lumpur. • Penilaian : I. Guru-guru bahasa Melayu SJK(T) daerah-daerah negeri Pahang. II. Guru-guru bahasa Melayu SK daerah Sepang.

Penerangan Produk

Rajah 1 : Alat bantu mengajar LAMBM

Produk LAMBM merangkumi 5 permainan utama, iaitu :

1. Segmen bunyi
Segmen bunyi ialah satu video berkaitan pengenalan huruf vokal dan konsonan yang diiringi muzik serta nyanyian lagu. Video ini berfungsi sebagai satu set induksi sebelum memulakan kelas yang bertujuan menarik minat murid untuk mempelajari topik yang bakal dipelajari, seterusnya melatih murid membunyikan huruf-huruf sambil menyanyi.

2. Kad suku kata
Kad suku kata ialah kad-kad berwarna yang mengandungi suku kata terbuka KV (konsonan + vokal) yang berfungsi untuk memperkenalkan murid dengan suku kata KV. Kad ini melatih murid mengeja dan membunyikan suku kata melalui tunjuk ajar guru dan memperbetulkan kesilapan dalam sebutan suku kata KV melalui aktiviti pengulangan. Hal ini membantu murid untuk mengingati kombinasi bunyi KV mengikut kelas suku kata tertentu.

3. Papan asas lajur suku kata
Papan asas lajur suku kata berbentuk kotak-kotak lajur yang mempunyai suku kata-suku kata terbuka KV yang disusun secara rawak. Papan ini dimainkan seperti permainan dadu ular dan dimainkan secara berkumpulan. Pada setiap kotak yang dihentikan melalui gerakan dadu, murid perlu mengeja dan membunyikan suku kata daripada kotak suku kata awal sehingga kotak suku kata yang diberhentikan. Aktiviti ini membantu murid mengeja dan membunyikan semua suku kata secara berulang-ulang agar mereka lebih mengingati bacaan suku kata.

4. Papan pengukuhan suku kata
Papan pengukuhan suku kata berbentuk kotak-kotak lajur yang mempunyai suku kata terbuka KV yang disusun secara rawak dan cara bermain juga sama seperti papan asas lajur suku kata. Namun, papan ini mempunyai lebih banyak suku kata daripada papan asas lajur suku kata. Fungsinya adalah untuk memperkukuhkan lagi penguasaan sebutan murid terhadap suku kata. Aktiviti ini juga melatih murid bekerjasama antara rakan sebaya serta menarik minat murid meneruskan pembelajaran suku kata melalui aktiviti permainan yang lebih mencabar.

5. Poster suku kata
Poster ini berbentuk kotak-kotak lajur yang mempunyai suku kata-suku kata terbuka KV. Murid juga diberikan dadu bernombor dan kad suku kata untuk bermain. Dalam permainan ini, murid akan belajar untuk menggabungkan kombinasi dua suku kata (KVKV). Fungsi dadu bernombor adalah untuk pergerakan langkah di atas poster yang mewakili suku kata pertama dan murid perlu mencari suku kata kedua pada kad suku kata. Permainan ini membantu murid lebih mengingati dan menambahkan kosa kata bahasa Melayu dalam pengetahuan mereka.

Rajah 2 : Alat bantu tambahan

Dalam pada itu, produk LAMBM juga mempunyai tiga alat bantu tambahan, iaitu buku Kit Membaca Bahasa Melayu yang berfungsi untuk mengenal pasti tahap kemahiran membaca seseorang murid. Seterusnya, buku panduan sebagai rujukan pengguna seperti guru dan ibu bapa tentang pengenalan produk LAMBM dan cara mengendalikan setiap permainan. Buku pelekat pula berfungsi sebagai motivasi untuk merangsang minat murid belajar sambil bermain melalui sistem ganjaran.

Dapatan dan Perbincangan

Jadual 2 : Keputusan praujian dan pascaujian

Tahap bacaan	SJK(T) F.E.S. Serdang		SJK(T) Ladang Sungai Choh		SJK(T) Batu Caves	
	Praujian	Pascaujian	Praujian	Pascaujian	Praujian	Pascaujian
Buta huruf	22%	19%	30%	25%	23%	18%
Lemah	22%	17%	29%	20%	37%	32%
Baik	56%	44%	41%	33%	40%	31%
Amat baik	0	20%	0	22%	0	19%
Cemerlang	0	0	0	0	0	0

Selepas melaksanakan pengujian produk LAMBM dalam proses pengajaran dan pembelajaran di sekolah-sekolah SJK(T) yang terpilih, dapatan kajian di Jadual 2 menunjukkan peningkatan kemahiran membaca bagi murid-murid di ketiga-tiga buah sekolah. Secara keseluruhannya, murid-murid sasaran mampu membaca dengan lebih baik daripada sebelum menggunakan produk LAMBM. Mereka juga memberikan maklum balas yang positif melalui temu bual, iaitu berpendapat bahawa produk LAMBM telah berjaya menarik minat mereka untuk melibatkan diri secara aktif dan melalui aktiviti permainan mereka dapat belajar membaca dengan lebih cepat dan mudah. Selain itu, melalui pemerhatian, murid-murid menunjukkan sikap sukarela untuk menjawab pertanyaan, berani mencuba dan tidak takut untuk melakukan kesilapan, serta tidak menunjukkan emosi bosan atau tertekan untuk belajar kerana alat bantu mengajar ini menarik dan menyeronokkan. Melalui pemerhatian juga, kajian ini mendapati murid-murid sangat berminat terhadap alat bantu berbentuk objek kerana dapat meningkatkan rangsangan motorsensori mereka melalui sentuhan, pergerakan, penglihatan dan pendengaran semasa melakukan aktiviti walaupun ada diantara mereka tidak mengenali huruf tetapi masih mahu terlibat secara aktif. Pengkaji merumuskan bahawa pengaplikasian produk LAMBM dalam proses pengajaran dan pembelajaran mampu menarik minat dan membina keyakinan murid-murid lemah dan buta huruf untuk turut terlibat dalam setiap aktiviti seperti murid-murid lain.

Selain itu, guru-guru juga dijadikan sebagai sampel kajian dalam kajian ini. Guru-guru yang terlibat ialah guru-guru bahasa Melayu SJK(T) daerah-daerah negeri Pahang dan guru-guru bahasa Melayu SK daerah Sepang. Mereka diberi pendedahan tentang pengenalan produk LAMBM dan fungsinya dalam proses pengajaran dan pembelajaran. Pendedahan ini dilaksanakan dalam Program Guru Celik Bahasa (PGCB) Kebangsaan anjuran Pertubuhan Tulir Malaysia. Dalam program ini, produk LAMBM diberikan kepada guru-guru dan mereka menjalankan kelima-lima permainan LAMBM seperti murid-murid di sekolah. Selepas melakukan semua aktiviti, setiap guru diberi borang soal selidik untuk memberi maklum balas terhadap produk dan aktiviti-aktiviti yang dilakukan. Dalam borang tersebut, guru-guru akan menilai tahap keberkesanan produk LAMBM dalam proses pengajaran dan pembelajaran dan guru-guru juga diberi peluang untuk memberi komen dan cadangan penambahbaikan. Dalam pada itu, beberapa orang guru juga ditemu bual untuk mendapatkan maklum balas. Melalui analisis borang soal selidik, hasil dapatan mendapati bahawa guru-guru bersetuju produk LAMBM sebagai satu inovasi yang boleh digunakan dalam pengajaran dan pembelajaran di sekolah bagi menangani masalah buta huruf dalam kalangan murid-murid terutama di SJK(T) dari aspek membaca bahasa Melayu sebagai bahasa kedua mereka. Selain itu, guru-guru turut memberi harapan, komen-komen positif serta cadangan penambahbaikan yang sangat berguna bagi membantu pengkaji untuk memperbaiki serta memurnikan lagi produk LAMBM ke tahap yang lebih baik.

Kesimpulan

Tuntasnya, murid-murid di SJK(T) mengalami kesukaran dan kurang penguasaan kemahiran membaca dalam bahasa Melayu disebabkan oleh bahasa Melayu merupakan bahasa kedua mereka dan penggunaan bahasa Melayu dalam sehari-harian adalah kurang. Di sekolah-sekolah SJK(T) juga kebanyakkan guru yang mengajar subjek Bahasa Melayu adalah guru-guru berbangsa India dan mereka menggunakan bahasa ibunda mereka dalam pengajaran dan pembelajaran. Berdasarkan masalah ini, pengkaji berpeluang untuk membantu murid-murid dan guru-guru dengan menghasilkan produk LAMBM sebagai satu teknik pengajaran pembelajaran yang lebih kreatif dan menarik. Pengaplikasian produk LAMBM di dalam kelas menunjukkan keberkesanan yang baik dan mendapat maklum balas yang positif daripada murid-murid dan guru-guru.

Selain itu, maklum balas dan cadangan penambahbaikkan yang diberikan oleh guru-guru juga merupakan satu kelebihan kepada pengkaji untuk menggunakan penilaian tersebut untuk memperbaiki serta menambahbaik produk ke tahap yang lebih memberangsangkan. Guru-guru juga memberi pandangan dengan menyatakan bahawa produk LAMBM merupakan satu alat bantu mengajar yang berinovatif dan perlu diteruskan ke semua sekolah Tamil di Malaysia.

Oleh itu, kenyataan tersebut menjadikan satu kelebihan kepada pengkaji sebagai peluang untuk meneruskan lagi usaha mentransformasikan alat bantu mengajar yang mampu mengatasi masalah buta huruf terhadap bacaan

bahasa Melayu dalam kalangan murid-murid di SJK(T). Dalam pada itu, pengkaji juga mencadangkan untuk menggunakan produk LAMBM ini di sekolah-sekolah di seluruh Malaysia di bawah kelulusan Kementerian Pendidikan Malaysia. Hal ini kerana produk LAMBM mampu membawa satu inovasi kemenjadian bagi kemahiran membaca dalam proses pengajaran dan pembelajaran abad ke-2, bukan sahaja untuk murid-murid SJK(T), malah untuk murid-murid di semua jenis sekolah yang menghadapi kesukaran membaca dalam bahasa Melayu.

Penerbitan

Vijayaletchumy Subramaniam & Nadia Shuhada Abdan Nasir. (2018). *Lajur Ampuh Membaca Bahasa Melayu*. Majalah Dewan Bahasa. Disember 2018, Bil. 12 2018, pp. 20-24.

Vijayaletchumy Subramaniam, Nadia Shuhada Abdan Nasir & Amirra Shazreena Aminul Razin. (2018). Lajur Ampuh Membaca Bahasa Melayu (LAMBM) in The Teaching and Learning Process. *Advances in Social Science Research Journal*, Vol. 5, No.12 : 501 – 518.

Vijayaletchumy Subramaniam, Nadia Shuhada Abdan Nasir & Amirra Shazreena Aminul Razin. (2019). *Lajur Ampuh Membaca Bahasa Melayu (LAMBM) : Innovative Approach to Facilitate The Learning of Malay Language.* Rosmiza Bidin (Eds.), Synthesis, Issue 3/2019 (pp.10). Universiti Putra Malaysia Press.

Vijayaletchumy Subramaniam, Nadia Shuhada Abdan Nasir & Amirra Shazreena Aminul Razin. (2022). *Lajur Ampuh Membaca Bahasa Melayu (LAMBM) in The Teaching and Learning Process*. Mohamad Rahimi Mohamad Rosman (Eds.), APS Proceedings Volume 1 (pp. 117-128). Academica Press Solution.

Anugerah

2018

- Anugerah pingat emas dalam Pertandingan Putra InnoCreative Carnival in Teaching and Learning, Universiti Putra Malaysia.
- Anugerah pingat gangsa dalam Pertandingan Digitalising International Invention Inovation and Design, UiTM Johor.
- Anugerah 4 stars dalam Pertandingan Anugerah Inovasi Selangor (AINS), Majlis Perbandaran Subang Jaya.

2019

- Anugerah pingat perak dalam Pertandingan Inovasi Darul Aman peringkat kebangsaan, IPG Darul Aman Kedah.
- Anugerah pingat perak dalam Persidangan dan Ekspo Ciptaan Institusi Pengajian Tinggi Antarabangsa (PECIPTA), UTHM Johor.
- Anugerah 3 stars dalam Pertandingan Anugerah Inovasi Selangor (AINS), Majlis Perbandaran Subang Jaya.

2021

- Anugerah pingat perak dalam Pameran dan Pertandingan R&D Malaysia Technology Expo (MTE) Antarabangsa.

2022

- Anugerah pingat perak dalam Virtual Innovation Competition 2022 (VIC22) peringkat kebangsaan, UiTM Kelantan.

2023

- Anugerah pingat emas dalam Pertandingan Hari Inovasi PPAL peringkat kebangsaan, Universiti Teknologi Malaysia.

Harta Intelek

Jadual 3: Harta Intelek

Bil.	Tajuk hakcipta	No. Pemfailan hakcipta MYIPO	Tarikh pemfailan MYIPO
1.	Lajur Ampuh Membaca Bahasa Melayu (LAMBM) - grafik	AR2019003415	5 Julai 2019
2.	Lajur Ampuh Membaca Bahasa Melayu (LAMBM) - manual	LY2019003417	5 Julai 2019

Penghargaan

Kami ingin merakamkan setinggi-tinggi penghargaan dan terima kasih kepada pihak Pegawai Pendidikan Daerah negeri Pahang dan Selangor, guru besar-guru besar, pihak-pihak pentadbir, guru-guru dan murid-murid dari SJK(T) F.E.S. Serdang, SJK (T) Ladang Sungai Choh dan SJK (T) Batu Caves, serta guru-guru bahasa Melayu SJK(T) di daerah-daerah negeri Pahang dan guru-guru bahasa Melayu di SK daerah Sepang atas kerjasama, penglibatan dan sumbangan lain dalam melaksanakan dan menjayakan kajian ini.

Rujukan

Aziah Tajudin & Mohd. Fazli Tajuid. (2016). *Kamus Pelajar Bahasa Melayu Dewan Edisi Kedua*. Kuala Lumpur : Dewan Bahasa dan Pustaka.

Noor Lela Ahmad & Nur Afrina Haziqah Azman. (2020). Tahap Amalan Pengajaran Berkesan Guru Prinsip Perakaunan Berasaskan Model Slavin. *Jurnal Pendidikan Malaysia*, 45 (1). pp. 53-62.

Nurin Haziqah. (2022). Keberkesanan Pengajaran Guru Berasaskan Model Slavin dalam Perakaunan. Bangi : Univertiti Kebangsaan Malaysia.

Radha Tgandi, Mohd Ridzwan Che Rus & Suriani Muhamed. (2021). Pendekatan Penyelidikan Reka Bentuk dan Pembangunan (DDR) dalam Pembangunan Model Pemikiran Inventif Pelajar Mata Pelajaran Reka Cipta. Journal of Educational Research and Indigenous Studies, Vol.3 (1), pp , 143-155.

Ramlan, M. & Ghazali, D.(2018). *Aplikasi Kaedah Fuzzy Delphi dalam Penyelidikan Sains Sosial.* Kuala Lumpur: Penerbit Universiti Malaya.

Rita C. Richey & James D. Klein. (2014). *Design and Development Research : Methods, Strategies, and Issues.* New Jersey : Taylor & Francis.

Saedah Siraj, Muhammad Ridhuan Tony Lim Abdullah & Rozaini Muhamad Rozkee. (2021). *Pendekatan Penyelidikan Rekabentuk dan Pembangunan: Aplikasi Kepada Penyelidikan Pendidikan*. Tanjong Malim : Penerbit UPSI.

An Affordable Low-Cost Mobile VR/AR System Utilizing Smartphone for Interactive Teaching and Learning of Industrial Robotics

Bryan Keane, Zhi Min Lim, Ping Hao Kong, Osama Hisham Abusetta, Ahmed Rafat Elkilany
UCSI University, Kuala Lumpur, Malaysia[1,2,3,4,5,6]
1002059308@ucsiuniversity.edu.my, 1002059126@ucsiuniversity.edu.my, 1002060642@ucsiuniversity.edu.my,
1002058090@ucsiuniversity.edu.my, 1002059739@ucsiuniversity.edu.my

Highlights: The mobile VR/AR system for robotic simulation offers affordable platform to enrich learning experience of students. It aims to bridge the gap between knowledge and practical skills of students in the context of Industry 4.0. The technology easily accessible to students and foster creativity, digitalized information, industry-ready knowledge beyond classroom. The system can be operated remotely and linked to robot in real-life and as such applicable for professional guidance of technician in industry. This will promote the interest of students to further study in STEM courses and resolve the issue on lack of skilled labour currently faced in the country.

Key words: Industry 4.0; Education 4.0; Augmented Reality(AR); Virtual Reality (VR); Robotic Simulation; Interactive Training/Learning;

Introduction

In higher education, the number of student enrolments are slowly declining (Ho, 2023) which is supported by data from the Higher Education Report (Policy Planning and Research Division, 2022), showing a consistent decrease in the number of students enrolling in higher institutions. Asides the financial aftermath due to the pandemic, the declining is also linked to the drop of interest in studying STEM courses (Johnson and Johns). As we are situated in the era of Industry 4.0, almost all the future jobs will be related to science, technology, engineering, and mathematics (STEM). Particularly, skilled labour in automation is highly needed since most of the industries are utilizing robotic arm in the manufacturing line to perform various tasks such as pick and place, assembly, welding and so on. As a result, the future economic growth of the country and at the global stage will be strongly governed by the availability of the said skilled labour to readily fit into the fast-paced technologically driven work field.

At the same instance, navigation and programming of the movement of robotic arms requires the complex linkage between the transformation parameters of the individual joints to achieve the designated final position. During the malfunction of the robotic arm, skilled labour should be attending to the automation line to troubleshoot and resolve the problem. Without skilled labour, it is estimated that production downtime could lead to losses of over millions. Moreover, the commercially available robots are continuously upgraded to incorporate with much advanced technologies such as artificial intelligence (AI), internet-of things (IoT), big data, digital twin, cloud computing and so on to improve the productivity. Indirectly, the operators in-charged for the production are require to up-skill themselves to stay proficient and competence in executing the task.

On the other hand, there is always an interest for the manufacturers to improve yield of production by reducing number of defects and consequently conserving the resources of material. Through digital twin and proper simulation technologies, the trajectory of robot can be simulated in advanced (Tao et al., 2022). Any obstacles, physical clashing, damages, production cycle time will be projected in the simulation to help prevent possible loss of production time, sustainable usage of raw material and facilitate the fabrication of quality products (Uhlemann et al., 2017). At the same instance, such simulation technologies could also help to train the operators for robotic guidance and learning the principle of robotics movement. As such, there is an urgency to formulate the related technologies to help improve the production, student interest in pursuing STEM and ultimately addressing the shortage of skilled labour currently encountered in the country.

In view of the aforementioned issues, we proposed the development of a dedicated virtual reality/augmented reality (VR/AR) system for interactive teaching or learning of industrial robots. The developed application is constructed using free open-source development platform which can be installed on all the ubiquitous devices operated with Android. After loaded the application, the ubiquitous devices such as smartphone can then be mounted onto a VR headset. The users are to navigate throughout the interface and manipulate a virtual robot in executing training tasks with the aid of a Bluetooth controller. Aside the smartphone, the headset and Bluetooth controller only cost around $10 USD. Using the proposed system, users can opt to perform the training remotely outside the work field or classroom without the risk of possible physical hazards. Table 1 shows high institution student enrolment in Malaysia declining (Policy Planning and Research Division, 2022) while the market size of AR/VR is growing (AR &VR - Malaysia, 2023).

Table 1: High Institution Student Enrolment vs Market Size of VR/AR Market Size from 2017 to 2021

Year	High Institution Student Enrolment	VR/AR Market (Million USD)
2017	1,325,699	18.47
2018	1,343,830	23.30
2019	1,323,449	30.18
2020	1,224,098	40.86
2021	1,207,131	53.16

Product Description

The VR/AR system provides a realistic robotic simulation environment to users such as students, operators and technicians for interactive learning and guidance. The developed application is packaged into an android installer kit and can be installed to all the available Android phones, tablets, and similar ubiquitous devices. The virtual robot serves as digital twin assimilating the operation of the actual physical robot in real-life and can be manipulated using a low-cost Bluetooth controller. As such, the users are free to navigate the robot without experiencing hazard risk and omitting the need to maintain and troubleshoot the robotic arm. Since the system can be navigated remotely, users can then perform the training outside of the work field and potentially be incorporated as remote tool to perform practical laboratory. It is worth noting that, the parameters to move the particular robotic joint can be saved into an internal database and hence with proper web API, the parameters can then be migrated to external database server. Subsequently, if the programmable logic controller (PLC) of the robot in real-life is configured to retrieve the data saved in the server, we can then control the actual physical robot with our developed system and therefore introducing an immersive mixed reality (MR) learning experience. Overall, beside the smartphone from users, the system only requires a headset and a Bluetooth controller which only amounted to around $10 USD as indicated from the online store. Therefore, our approach is affordable to most of the users and even be bought to the primary school students.

The users will first be brought to the main interface and prompted to select between actual simulation or the tutorial scene for control guidance. The user interface is very straightforward and is designed in accordance with the usability principle of human computer interaction. For the tutorial scene, a series of testing instructions are projected to brief users the method of manipulating the robotic arm with a Bluetooth controller. For the actual simulation, the virtual robotic arm replicates the behaviour and functionality of the actual robotic arms, including tasks like picking and dropping objects. To achieve this, the application incorporated slider controls with clear labels for each control, informing users which joint or axis of the robotic arm they are manipulating. The robotic arm consists of six joints assimilating the actual robotic arm used in the industry, each resembles the human-like motions for simulating various manufacturing applications. These joints include the upper arm, base, lower arm, end rotation, gear, and gripper.

To achieve an interactive learning session, we have included a simple pick and place scenarios for the users to execute in which the users are to control the virtual robots to pick up objects and placed in ordered fashion into a virtual container. From the navigation, the users can observe the joint parameters which are needed to transform the robotic arm from initial position to the desired position and indirectly correlate the movement to basic trajectory and kinematics of robots. During the simulation, we asked the participants, who are the students in our evaluation study to pick and place the product or objects and arranged in various settings such as the objects on top of each other, in line with each other and so on while placing them in the virtual container. The navigation can be performed without limitation and that the students are able to work out the task by trial and error till the objectives are achieved. This provides them a fun and interesting learning experience to boost their interest and motivation in studying the related course. Importantly, students without prior knowledge of industrial robotics or those just starting to learn were able to grasp the concept of transformation matrices for robotic joints in relation to specific positions (Chu and Chang, 2021). This fundamental insight is crucial for subsequent calculations and programming of robotic movements. At the same instance, the task given will challenge the student to analyse the situation, plan the movement and think for solution to accomplish the objectives. Under this context, the students are the constructivists and knowledge connectors who can access the learning with minimum supervision from the instructor. As such, the developed application is suitable to be integrated into syllabus and applicable for major learning practices such as experiential learning, blended learning and flipped learning beyond the traditional theory-based classroom conduct.

As a whole, our system is capable to serve as the platform for implementing Education 4.0 and is aligned with the sustainable development goal (SDG) such as quality education (SDG 4) and industry, innovation and infrastructure (SDG 9) as envisioned by our country (Abdul Rahim Hasim, 2017) and the United Nations (*Sustainable Development*, 2023).

Results & Discussion

VR/AR application

In this study, the AR application is constructed using Unity 3D with the Vuforia Engine development kit. The application will eventually be packaged for the Android platform, making it suitable for installation on smartphones, which can then be placed into a virtual reality headset for actual deployment. A specific image target is set as the ground plane during development to project augmented contents. As a result, when the headset's field of vision is directed at the target image, the projected motor, along with virtual buttons, will align on top of the image. Users can then control it using a joystick. The development software designed is free for personal and educational purposes. Figure 1 illustrates the virtual robotic arm in the Unity development scene.

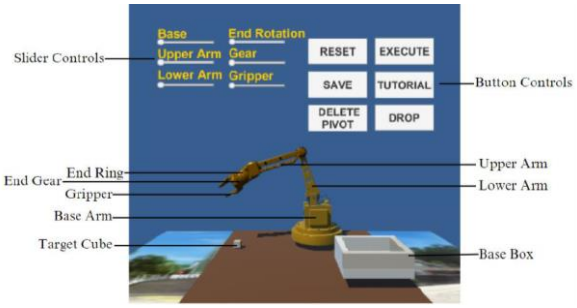


Figure 1: The virtual robotic arm and the corresponding settings in the Unity development environment.

Participants

During this prototyping stage, we have invited around 10 participants in which majority of them are students who aged between 17 to 23 years. The students are meant to provide evaluation of the developed VR/AR system in conformance to the usability principles of software engineering and to provide valuable feedback to the learning experience and possible improvements of the proposed approach. All of the participating students do not have any prior experience in using any of the similar VR/AR application. Figure 2 shows the participants testing on the developed application remotely outside of the classroom.

Figure 2: The volunteering participants testing the developed system at home(Left) and outdoor (Right).

Evaluation Survey

Table 2 shows the results of the evaluation survey. In this study, the 3 categories of usability domain examined are ease of use, ease of learning and satisfaction. Each of the surveys consists of 5 individual questionnaires which are addressed based on Likert-scale ranged from 1 (strongly disagree) to 5 (strongly agree). The mean score correspondence to the individual questionnaire is computed based on the average value of the survey given by all the participants whereas the final score of the examined usability domain is calculated based on the average value of all the encompassed questionnaire in the same category. Based on the results, the developed application is evaluated to have achieved satisfactory performance for ease of use (Mean = 4.68), ease of learning (Mean = 4.22) and the students are satisfied with the learning experience offered (Mean = 4.66).

Table 2: Survey results for usability evaluation of the developed system.

Questionnaire	Mean	Final Score
Ease of Use		
It is easy to navigate from Menu Page to the Robotic Arm Simulation.	4.7	4.68
It is very direct to navigate from the tutorial scene to the Robotic Arm Simulation	4.8	
I am able to manipulate the virtual Robotic Arm with ease in picking up the target object to the box.	4.5	
I am able to navigate and interact with the Robotic Arm Simulation application proficiently without requiring assistance or guidance from others.	4.7	
I found this application user friendly.	4.7	
Ease of Learning		
1. I needed to learn the operation of Robotic Arm in real life before using this simulation application.	3.1	4.22
2. The built-in tutorial in the application helps me to learn how to use the system.	4.5	
3. I learned to use it smoothly.	4.7	
4. I easily remember how to use the application.	4.4	
5. I quickly master the use of the system.	4.4	
Satisfaction		
1. I am satisfied with the overall experience of using the AR/VR application for robotic arm simulation.	4.5	4.66

2.	The robotic arm simulation is realistic and representable to the real environment	4.7
3.	I will recommend this AR/VR application to others interested in the study of robotic field	4.8
4.	I am comfortable with the handling of controllers and the VR headset	4.5
5.	I found it comfortable manipulating the virtual robot through the user interface of the application.	4.8

Conclusion

The work presented an affordable and low-cost mobile VR/AR system for interactive learning of industrial robotics to undergraduate students. Based on the surveys conducted, the developed system is evaluated with positive usability and is said to enrich the learning experience of students in the operation of industrial graded robotic arm. The robotic simulation application has included the function to save the specific transformation parameters of the robotic joints to the internal database system. Since the parameters can be saved in database, any industrial robots accompanied with the appropriate web API can then receive the instruction from the database and indirectly realizing remote control of industrial robots with our developed VR/AR system. As such, the system can act as digital twin for fault simulation and to perform practical laboratory on a physical robot remotely at home or outside the workspace in which suits the best of both worlds of industrial and education.

Currently, we are looking forward for collaboration in development of the said API customized for specific Programmable Logic Controller (PLC) brand such as OMRON, Mitsubishi, Siemens etc. Once completed, we can then upgrade the VR/AR system into a mixed reality platform to control the physical robots in real life. In the future, to account for the disabled users or students, we will also include some other interaction modals into the system such as speech recognition-based navigation and movement tracking to interact with the developed application. For much advanced training and guidance, some challenging scenarios or tasks will be incorporated for the users to complete accompanied with expected navigation answer and final scoring board to inform the competency of the users. To standardize the use of such application in the education field, we are also looking forward to drafting some examination graded questions for students and evaluate the academic performance of students after using the developed system. In the future, the questions and laboratory tests could be mapped to the corresponding course learning outcome (CLO) and programme learning outcome (PLO) for official integration into the syllabus.

References

Abdul Rahid Hashim. (2017). *Preparing graduates for the 4th Industrial Revolution.* Plenatry forum presented at the 7th World Engineering Education Forum 2017, Kuala Lumpur, Malaysia

AR &VR - Malaysia. (2023, August). Statista. https://www.statista.com/outlook/amo/ar-vr/malaysia

Chu, Y. B., & Chang, C. W. (2021). A mobile augmented reality interface on additive manufacturing. In Lecture notes in electrical engineering. https://doi.org/10.1007/978-981-33-6490-5_1

Ho, J. W. (2023, June 18). STEM-ming the decline. The Star. https://www.thestar.com.my/news/education/2023/06/18/stem-ming-the-decline

Johnson and John. Declining Interest in Engineering Studies at a Time of Increased Business Need. Webpage. https://www.worldexpertise.com/Declining_Interest_in_Engineering_Studies_at_a_Time_of_Increased_Business_Needs.htm

Policy Planning and Research Division. (2022). Higher Education Report: [MALAYSIA]. UNESCO World Higher Education Conference. https://whec2022.net/resources/Country%20report%20-%20Malaysia.pdf

Sustainable Development. (2023, Sep). United Nations. https://sdgs.un.org/goals

Tao, F., Xiao, B., Qi, Q., Cheng, J., & Ji, P. (2022). Digital twin modeling. Journal of Manufacturing Systems, 64, 372–389. https://doi.org/10.1016/j.jmsy.2022.06.015

Uhlemann, T. H., Schock, C., Lehmann, C. W., Freiberger, S., & Steinhilper, R. (2017). The Digital Twin: demonstrating the potential of real time data acquisition in production systems. Procedia Manufacturing, 9, 113–120. https://doi.org/10.1016/j.promfg.2017.04.043

Keberkesanan Modul Arif Huruf dalam Kata Nama Am dan Kata Nama Khas

Usha Nagasundram, Vijayaletchumy Subramaniam
Universiti Putra Malaysia, Serdang, Selangor[1,2]
ushanagasundram@gmail.com, vletchumy@upm.edu.my

Abstrak: Modul Arif Huruf dalam Kata Nama Am dan Kata Nama Khas merupakan satu modul yang dihasilkan bagi mengatasi masalah murid bukan penutur jati bahasa Melayu dalam aspek penulisan. Idea pembinaan modul mengaplikasikan kaedah Reka Bentuk dan Pembangunan (*Design and development Research Approach*) yang diasaskan oleh Richey dan Klien (2007) melibatkan tiga fasa, iaitu fasa keperluan, fasa pembangunan dan fasa keberkesanan. Hasil kajian menunjukkan pembangunan modul berupaya digunakan sebagai bahan rujukan dalam meningkatkan penguasaan kata nama am dan kata nama khas dalam kalangan 40 orang murid di SJK(T) Kajang. Oleh yang demikian, golongan pendidik berupaya menggunakan modul ini sebagai bahan alternatif semasa PdPc.

Kata Kunci: huruf; kata nama am; kata nama khas; modul; bahasa Melayu

Pendahuluan

Kemahiran bertutur dan kemahiran menulis merupakan kemahiran yang sangat penting dalam aspek berkomunikasi secara lisan mahupun tulisan. Tujuan utama untuk menguasai kedua-dua kemahiran ini adalah untuk menyampaikan maklumat atau mesej dengan jelas. Penerapan kemahiran bertutur dan kemahiran menulis dapat dilihat dalam Dokumen Standard Kurikulum dan Pembelajaran (DSKP) bermula di pra sekolah sehingga institusi pengajian tinggi (IPT). Dalam kajian ini, fokus utama diberikan pada kemahiran menulis dalam pembelajaran bahasa Melayu sebagai bahasa kedua dalam kalangan murid yang mempelajari bahasa Melayu sebagai bahasa kedua. DSKP menyenaraikan sistem bahasa yang terdiri daripada tatabahasa, sistem ejaan, sebutan dan intonasi, kosa kata dan peribahasa yang harus dikuasai oleh seseorang murid supaya membolehkan mereka menggunakan dan mengamalkan bahasa Melayu baku. Di samping itu, golongan kata yang terdiri daripada kata nama, kata kerja, kata adjektif dan kata tugas turut termasuk dalam senarai tersebut. Tanda baca yang meliputi noktah, koma, koma bernoktah, noktak bertindih, sempang, tanda soal, tanda seru, tanda petik, tanda kurung, termasuk huruf kecil, huruf besar dan italik penting untuk dikuasai dalam komunikasi tulisan dan bacaan mekanis bagi memastikan keberkesanan penyampaian mesej dan makna dengan tepat. Oleh yang demikian, usaha membentuk murid yang berkemahiran dalam penulisan bertitik tolak daripada kemahiran menulis ayat dalam perenggan secara mekanis serta berupaya mengedit dan memurnikan perenggan dari aspek ejaan, tanda baca, penggunaan imbuhan, penggunaan kata, dan struktur ayat. Justeru, kemahiran ini harus dititikberatkan oleh para pendidik dalam melahirkan generasi yang berkemahiran menyampaikan mesej secara jelas dan konsisten manakala murid-murid pula harus berkebolehan dalam menulis ayat secara gramatis dengan memahami sistem bahasa yang meliputi morfologi dan sintaksis dengan baik.

Walaupun Ujian Pentaksiran Sekolah Rendah (UPSR) telah dimansuhkan namun ia masih dijadikan sebagai satu elemen dalam Pelaporan Pentaksiran Sekolah Rendah (PPSR) yang mula diperkenalkan sejak tahun 2018. Tujuan utama pengamalan PPSR adalah untuk mentafsir pencapaian semua murid secara holistik malahan bukan hanya berasaskan akademik semata-mata dengan mengejar gred A dalam semua mata pelajaran. Oleh yang demikian, kemahiran bahasa masih dinilai berdasarkan kemahiran mendengar dan bertutur, membaca, dan juga menulis seperti yang disenaraikan dan dijelaskan dalam DSKP. Namun demikian, PPSR pada tahun 2018 dan 2019 (Kementerian Pendidikan Malaysia, 2019) menunjukkan kadar peratusan murid bukan penutur jati bahasa Melayu mencapai gred A dan B adalah rendah berbanding gred C dan D. Manakala murid yang kecundang dalam penulisan masih dalam peratusan 12 hingga 13 daripada jumlah keseluruhan. Hal ini menunjukkan murid bukan natif bahasa Melayu masih kurang menguasai kemahiran menulis terutamanya dalam bahasa Melayu. Keupayaan bagi seseorang untuk menguasai sesuatu bahasa yang tidak kerap digunakan dalam kehidupan seharian merupakan satu cabaran yang besar dan mempengaruhi pencapaian akademik seperti yang dinyatakan oleh Angela dan Zamri (2019) dan Savitry dan Norasmah (2022). Malahan, isu murid tidak dapat menghasilkan karangan yang baik walaupun mereka telah mempelajari bahasa Melayu dan cara membina ayat untuk tempoh masa yang lama turut dipertikaikan oleh segolongan pendidik. Selain itu, kekeliruan dan sikap pelajar yang kurang memberi keutamaan kepada penggunaan huruf besar dan huruf kecil yang betul dalam penulisan turut menyumbang kepada faktor kelemahan dalam penulisan, walhal penggunaan huruf telah diterapkan dalam pembelajaran bahasa, Dokumen Standard Kurikulum dan Pentaksiran (2019).

Kesalahan penggunaan huruf kesalahan ortografi yang mencakupi analisis kesalahan huruf dalam kalangan pelajar sekolah menengah dan pelajar universiti masih ketara dibuktikan dalam kebanyakan kajian-kajian lepas seperti Wafiqah Asnola et al. (2022), Aman Shah et al. (2021), Ugartini et al. (2021), dan Isabella Jali (2021). Rentetan daripada itu, keupayaan murid kurang arif dalam huruf kecil dan huruf besar juga menyebabkan murid membuat kesilapan dalam kata nama am dan kata nama khas. Murid-murid tidak memahami konsep kata nama dengan jelas malah mereka tidak dapat membezakan penggunaan huruf besar dan huruf kecil dalam sesuatu ayat dengan tepat. Secara tidak langsung, permasalahan ini memberikan kesan yang kurang memuaskan dalam aspek pemarkahan bahasa Melayu (Usha et al., 2022). Pendedahan yang kurang menitikberatkan penggunaan huruf besar dan huruf kecil serta konsep kata nama yang betul menyebabkan murid-murid tidak dapat menghasilkan penulisan yang berkesan dan cemerlang. Hal ini kerana, murid-murid kurang pengetahuan dalam aspek kosa kata.

Walaupun terdapat banyak kajian lepas yang mengetengahkan isu kesalahan huruf besar dan kecil dan kurang penguasaan dalam kemahiran menulis, tetapi tidak ada cadangan atau inisiatif yang diambil untuk mengatasi masalah ini. Maka, kelompangan dalam kajian-kajian ini memberi laluan kepada kepada penulis untuk menghasilkan satu inovasi dalam bentuk modul dan permainan sebagai langkah untuk membantu murid menguasai penggunaan huruf besar dan huruf kecil.

Deskripsi Produk

Kajian ini secara amnya menggunakan kaedah kuantitatif berasaskan pendekatan Penyelidikan Reka Bentuk dan Pembangunan (Design and Development Research, DDR). Pendekatan DDR yang diperkenalkan oleh Richey dan Klein (2007) ini melibatkan proses analisis keperluan, reka bentuk dan pembangunan serta penilaian penggunaan. Sampel dalam kajian ini melibatkan 40 orang murid darjah 5 di Sekolah Jenis Kebangsaan Tamil Kajang. Ujian penulisan dan borang soal selidik digunakan sebagai alat kajian dalam proses pengumpulan data. Hasil kajian dianalisis menggunakan statistik deskriptif.

Bagi fasa kedua, iaitu reka bentuk dan pembangunan modul, pengkaji menghasilkan sebuah modul berasaskan Teori Elaborasi (Reigeluth dan Stein, 1983). Teori Elaborasi merupakan teori reka bentuk instruksional yang bertujuan untuk membantu dalam penyusunan dan penstrukturan kandungan bahan PdP dalam mengoptimumkan pencapaian matlamat pembelajaran. Kandungan modul disusun berdasarkan komponen strategi Teori Elaborasi yang terdiri daripada i. urutan elaboratif; ii. urutan prasyarat belajar; iii. ringkasan; iv. sintesis; v. analogi; vi. strategi kognitif; v. kawalan belajar.

Di samping itu, dalam usaha untuk memantapkan penggunaan huruf dalam kata nama am dan kata nama khas, konsep didik hibur yang menepati PAK21 turut diaplikasi dalam bentuk permainan. Terdapat empat langkah dalam proses pemantapan ini. Langkah 1 merupakan membaca dan langkah 2 memahami. Pada kedua-dua langkah ini murid-murid diberikan pendedahan tentang konsep huruf besar dan huruf kecil dalam bentuk formula. Seterusnya, langkah 3 merupakan mengingati. Pada peringkat ini, murid-murid akan menghasilkan sebuah kad yang dinamakan sebagai kad KaNAK. Kad ini merupakan satu inovasi yang membantu murid untuk mengingati konsep dan formula huruf besar dan huruf kecil dalam kata nama am dan kata nama khas dengan mudah. Langkah keempat merupakan aktiviti bermain bersama-sama inovasi yang dinamakan sebagai Jenga KaNAK. Inovasi ini merupakan permainan dalam kumpulan yang menerapkan elemen komunikasi, kolaboratif, pemikiran kritis, kreativiti, dan nilai murni seperti yang diketengahkan dalam PAK21.

Hasil Kajian & Perbincangan

Tahap penguasaan murid terhadap penggunaan huruf besar dan huruf kecil dalam kata nama am dan kata nama khas diuji dengan menggunakan ujian pra dan pasca. Dapatan kajian seperti yang ditunjukkan berikut.

Jadual 1: Penguasaan Murid terhadap Kata Nama Am dan Kata Nama Khas

Kata nama	Komponen kata nama	Min	
		Ujian Pra	Ujian Pasca
Kata Nama Am	5	16.6	39
Kata Nama Khas	4	11.3	38

Keputusan ujian menunjukkan bahasa skor min bagi ujian pra dan pasca bagi kata nama am ialah 16.6 dan 39. Manakala skor min bagi ujian pra dan pasca bagi kata nama khas ialah 11.25 dan 38. Didapati skor min bagi kata nama am dan kata nama khas menunjukkan peningkatan pada ujian pasca berbanding ujian pra. Walau bagaimanapun, perbezaan skor min kata nama am ialah 22.4. Nilai perbezaan skor min kata nama khas ialah 26.7. Namun, perbezaan dari segi nilai min pada ujian pasca bagi kata nama am dan kata nama khas adalah berdasarkan komponen kata nama yang diberikan dalam ujian. Komponen kata nama am terbahagi kepada 5, iaitu orang, binatang, benda, tempat dan tumbuhan. Manakala, komponen bagi kata nama khas hanya terdiri daripada 4 komponen, iaitu orang, binatang, benda dan tempat. Dapatan kajian menunjukkan bahawa penggunaan Modul Arif Huruf dalam Kata Nama memberikan signifikan yang tinggi dalam pembelajaran dan penguasaan huruf dalam kata nama.

Seterusnya, maklum balas murid tahun 5 terhadap kad KaNAK yang diperkenalkan menunjukkan peratusan pencapaian yang sangat memuaskan. Analisis bagi hasil maklum balas dijelaskan dalam angka peratus seperti yang ditunjukkan pada jadual 2.

Jadual 2: Maklum Balas Murid terhadap Inovasi Kad KaNAK

No	**Pernyataan**	**Skala**	
		Setuju	Sangat setuju
1	Kad kanak memudahkan saya memahami KNA dan KNK	20%	80%
2	Kad KaNAK membantu saya untuk mengingati kna dan KNK dengan mudah	0%	100%
3	Kad KaNAK boleh dijadikan sebagai nota.	25%	75%
4	Kad KaNAK menggalakkan saya untuk belajar kna dan KNK.	12.50%	87.50%
5	Kad KaNAK mudah digunakan.	0%	100%

Analisis dalam jadual 2 menunjukkan bahawa semua responden murid berpersepsi positif terhadap inovasi kad KaNAK yang diperkenalkan untuk mengingati konsep bagi penggunaan huruf dalam kata nama am dan kata

nama khas. Pernyataan bagi kad KaNAK memudahkan saya memahami KNA dan KNK mencapai peratus pencapaian sebanyak 20% setuju dan 80% sangat setuju. Kesemua 40 orang murid, iaitu bersamaan dengan 100% sangat setuju bahawa kad KaNAK membantu saya untuk mengingati KNA dan KNK dengan mudah. Seterusnya, sebanyak 25% daripada jumlah keseluruhan bersetuju bahawa kad KaNAK boleh dijadikan sebagai nota, manakala selebihnya 75% sangat setuju dengan pernyataan ini. Kad KaNAK menggalakan saya untuk belajar KNA dan KNK menunjukkan pencapaian sebanyak 12.50% setuju dan 87.50% menyatakan sangat setuju. Akhirnya, 100% daripada jumlah keseluruhan sangat setuju bahawa kad KaNAK mudah untuk digunakan.

Dapatan ini menunjukkan bahawa, murid-murid sangat tertarik dengan inovasi kad KaNAK yang diperkenalkan. Melalui aktiviti membuat kad KaNAK juga mendapati bahawa murid-murid berseronok dalam pengajaran dan pembelajaran kata nama am dan kata nama khas. Inovasi kad KaNAK merupakan aktiviti pengaplikasian konsep didik hibur yang berpusatkan murid. Oleh yang demikian, implementasi Modul Arif Huruf dalam Kata Nama dan inovasi kad KaNAK dapat membantu warga pendidik dalam memberikan pendedahan konsep kata nama am dan kata nama khas dengan berkesan. Modul ini juga bermanfaat dalam meningkatkan keberkesanan pembelajaran kendiri, malah murid dapat mengetahui kelemahan atau tahap penguasaan masing-masing. Selain itu, para guru juga dapat menggunakan modul ini sebagai salah satu rujukan dalam PdPc masing-masing dalam usaha untuk mengurangkan kekeliruan murid-murid terhadap penggunaan huruf dalam kata nama am dan kata nama khas. Secara tidak langsung, penguasaan murid-murid dalam kemahiran menulis dapat memperlihatkan pencapaian yang baik.

Kesimpulan

Kesimpulannya, penggunaan huruf besar dan huruf kecil menjadi satu permasalahan dalam kalangan murid yang mempelajari bahasa Melayu sebagai bahasa kedua. Salah satu faktor utama yang menyumbang kepada pemasalahan ini ialah pengaruh bahasa pertama. Hal ini adalah kerana penggunaan huruf tidak diaplikasi dalam penulisan bahasa utama bukan penutur jati bahasa Melayu, iaitu bahasa Cina dan bahasa Tamil. Maka, secara tidak langsung murid-murid turut kurang memberikan perhatian dalam penggunaan huruf besar dan huruf kecil dalam kata nama am dan kata nama khas dalam bahasa Melayu. Dalam usaha untuk mengatasi masalah ini, inovasi Modul Arif Huruf dalam Kata Nama dapat menjelaskan penggunaan huruf dalam kata nama am dan kata nama khas serta membantu dalam pembinaan ayat yang sempurna. Modul ini boleh dijadikan sebagai bahan rujukan atau bahan tambahan di peringkat sekolah rendah dalam usaha untuk menjalankan PdPc yang berkesan. Tambahan pula, inovasi yang dihasilkan harus diimplementasi bermula di pra sekolah supaya masalah penggunaan huruf dapat dibendung sejak kecil lagi. Oleh yang demikian, kajian seterusnya boleh difokuskan pada inovasi untuk menguasai huruf kecil dan huruf besar boleh dipertimbangkan di peringkat pra sekolah. Maka pemudah cara bagi inovasi ini dalam pengenalpastian huruf besar dan huruf kecil boleh dilakukan supaya menepati konstruk pembelajaran pra sekolah.

Penerbitan, Anugerah, dan Harta Intelek

Pingat Gangsa: Jenga KaNAK
Usha Nagasundram dan Vijalaletchumy Subramaniam
Hari Inovasi PdP Pusat Pendidikan Asas dan Lanjutan (PPAL) 2023 bertemakan Budaya Inovasi Menyemarakkan Kualiti PDP, anjuran Universiti Malaysia Terengganu.

Rujukan

Alessandra, A. J., O'Connor, M. J., & Van Dyke, J. (1994). People Smarts: Bending the Golden Rule to Give Others what They Want. Pfeiffer.

Aman Shah Syed Ali, Zamri Mahamod & Mohammed Azlan Mis. (2021). Masalah penulisan karangan bahasa Melayu dalam kalangan murid bukan penutur natif di sekolah rendah. Kertas Kerja yang Dibentangkan dalam Konvensyen Bahasa Melayu.

Angela Pamela Singi & Zamri mahamod. (2019). Penggunaan cerita kartun untuk meningkatkan pencapaian kemahiran menulis jenis cerita murid Kenyah. *Proceeding: International Conference on Education, Language and Psychology (ICELP 2019)*: 167-178.

Burleson, B. R., Holmstrom, A. J., & Gilstrap, C. M. (2005). "Guys Can't Say That to Guys" Communication Monographs, 72(4), 468-501.

Isabella Jali. (2021). Analysing grammar errors in Malay language learning. Journal of Cognitive Sciences and Human Development, 7(1), 72-85. *Journal of Cognitive Sciences and Human Development*, *7*(1), 72-85. https://doi.org/10.33736/jcshd.3050.2021

Kurikulum Standard Sekolah Rendah. Dokumen Standard Kurikulum dan Pentaksiran Bahasa Meayu Sekolah Jenis Kebangsaan Tahun 5. (2019). Kementerian Pendidikan Malaysia.

Reigeluth, C. M., & Stein, R. (1983). Elaboration Theory. Instructional-Design Theories and Models: An Overview of their current status, 335-381.

Richey, R. C. & Klein, J. D. (2007). Design and Development Research: Methods, strategies, and issues. London: Erbium.

Savitry Chelliah & Norasmah Othman. (2022). Tahap penguasaan bahasa Melayu dengan pencapaian prestasi mata pelajaran perniagaan murid bukan Melayu. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, *7*(5), 1-16. https://doi.org/10.47405/mjssh.v7i5.1509

Ugartini Magesvaren, Zamri mahamod, Irma Mahad & Intan Nur Syuhada. (2021). Analisis kesalahan bahasa dalam penulisan karangan bahasa Melayu dalam kalangan pelajar tingkatan 3 di Sekolah Menengah San Min (Suwa) Teluk Intan (Sekolah Persendirian Cina). *International Conference on Business Studies and Education (ICBE)*, 44-60.

Usha Nagasundram, Mohamed Nadzri Mohamed Sharif, Rozaini Ahmad, Yazilmiwati Yaacob & Vijayaletchumy Subramaniam. (2022). Kesalahan ortografi dalam penulisan karangan pelajar Sunway Kolej, Kuala Lumpur: Satu Analisis. e-Prosiding Seminar Mata Pelajaran Umum Peringkat Kebangsaan Siri 2, 159-173. https://anyflip.com/exczs/stzc/

Wafiqah Asnola, Elmy Maswandi & Zulfadzlee Zulkiflee. (2022). Analisis kesalahan bahasa dalam karangan bahasa Melayu pelajar menengah bawah di Negara Brunei Darussalam. *Melayu: Jurnal Antarabangsa Dunia Melayu 15*(2), 261-282.

Developing guidelines to educators in using video assignment as assessment tools among social science students in higher learning institution

Jefri Khairil Bin Zabri
Center for Foundation Studies, IIUM, Gambang, Malaysia
jefrikhairil@iium.edu.my

Highlights: Technology has become an integral part of 21st century teaching and learning. Educators and students must equip themselves with not only the "know what" of the new trend, but also the "know how" to use the technology. In assessing the students' academic understandings, educators must make efforts to shift from conventional to more modernized approaches to cope with the rapid technological wave. One of the popular methods of assessments is video assessment. Multiple studies have demonstrated the effectiveness of utilizing video as lecture for students, yet only a few studies have been done to see how video assignment can foster students learning, as part of *assessment for learning* (AFL). Hence this paper seeks to explore whether the video assessment benefits students in their learning experience and shed educators of higher learning institutions with insights into issues and challenges faced by students. The quantitative method will be employed whereby survey will be given to students and the data will be analysed using Statistical Package for the Social Sciences (SPSS) software.

Key words: mathematics glossary; multilingual translation; translate mathematical terms.

Introduction

In today's rapidly evolving world, students find themselves in a distinctly different environment compared to the past. Given the pervasive use of technology, educators are compelled to adopt various approaches to evaluate their students' grasp of the subjects taught in their courses. Assessment is vital in education. The nature of video assignment is assessment for learning whereby students are required to submit the assessment not only to test their understanding of the class materials, but also provide an avenue to learn during the process. Jones (2005) implies that assessment for learning improved meaning to teachers and value to learners where the learners are the primary benefactors.

In assessing the usage of educational video, Brame (2016) demonstrated that it provides an important content-delivery tool in many classes where it can enhance cognitive load, student engagement, and active learning. Alternatively, students video assignments can serve as an important method for evaluating their grasp of course materials while fostering a more engaging and participatory learning environment. Moreover, Indrawati et al., (2022) found that video project assignment as attractive, encouraging and received positive response from students in learning local language.

The question whether video assessment offer effective learning experience need to be addressed. Lumpkin (2020) outlined five (5) sequential steps for effective teaching and learning of which the step four is for the educators to reinforce learning through assessment. This implies that in assigning students with video assignment, educators must ensure that the students always relate with the course materials. The usage of technology in the teaching and learning not only vital to equip the students with current needs, "technology can also offer the means for learner control where students have greater flexibility and self-determination to construct their own meaning and acquire active knowledge." (Koppi, Lublin, & Chaloupka, 1997)

This study holds significance in evaluating the effectiveness of implementing video assignments for social science students, as perceived by the students themselves. The results of this research will also provide valuable insights for educators in crafting clear and comprehensible instructions and assessment criteria. Such instructions will enable students to create high-quality videos, ultimately benefiting them not only during the assignment but also in terms of long-term learning outcomes.

Product Description

The research has found the perception of students on the effectiveness of video assignments towards their learning experiences. It also provides valuable insights to the educators on clear methodology to conduct the video assignment in various stages, instruction, monitoring, feedback, and overall improvement in pedagogical practices.

Result & discussion

The sample consisted of 47 students, including both foundation and undergraduate levels, who were given questionnaires through Google Forms. The questionnaires contained a mix of closed-ended and open-

ended questions aimed at soliciting suggestions on how educators can enhance their support to help students achieve the learning outcomes. Subsequently, the collected data was tabulated and analyzed using SPSS, focusing on descriptive statistics.

I find video assignments to be a valuable tool.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly disagree	2	4.3	4.3	4.3
Neutral	16	34.0	34.0	38.3
Valid Agree	22	46.8	46.8	85.1
Strongly agree	7	14.9	14.9	100.0
Total	47	100.0	100.0	

The findings indicate that over 60% of students find video assignments to be a valuable learning tool, with 34% holding a neutral perspective. In response to another question, more than 74% of students agree that video assignments enhance their engagement with course materials, but only 40% find them enjoyable to complete. Regarding the time required to complete video assignments, as anticipated, 55% of students consider them to be more time-consuming, while 38% maintain a neutral stance. These results align with prior research, such as the study conducted by Indrawati et al. (2022), which highlighted the interesting and positively received nature of video assignments among students.

There are a few suggestions given by students to improve their learning experience through video assignments, which are:

1. Clearer guidelines
2. Aid and trainings.
3. Flexibility with deadlines
4. Selection of engaging topics that can boost their motivations.

Conclusion

It is important to note that each assessment that is given to students are in line with the learning outcomes that were designed beforehand. Whether it's video assignments or any other conventional forms of assessment, it's essential to give careful thought to various factors. One of these factors' worth considering is the students' preparedness to utilize the available technology effectively. While it can be argued that they belong to a generation immersed in technology, it's important to note that not all of them possess the necessary skills for video recording and editing. Hence, it is suggested that they are given adequate trainings or introduction to video editing tools. This measure aims at preventing unequal assessment whereby those who are already proficient in video editing might have an advantage while those lacking that skills might be at a disadvantage. It can also be suggested that the proportion of marks with respect to technical aspect of using the technology is minimized while the focus is given to the contents that relate to the course materials.

In addition to the students' suggestions, it is essential for the instructor to provide a sample of a high-quality video that students can refer to as a model. This helps prevent any ambiguity or unclear instructions, ensuring that students understand what is expected of them. Clear rubrics or grading criteria can also enhance clarity. Regarding the assignment's timeline, it is important to allow some flexibility for students regarding deadlines, while still maintaining a reasonable timeframe for instructors to provide feedback. Additionally, instructors can consider starting the video assignment earlier in the semester by adjusting the course plan. This adjustment would provide students with more time to prepare and work on their assignments. Furthermore, it is worth noting that future research can explore the potential contributions of emerging technologies, such as augmented reality or virtual reality, to this type of assessment.

References

Brame, C. J. (2016). Effective Educational Videos: Principles and Guidelines for Maximizing Student Learning from Video Content. *CBE Life Sci Educ.*

Indrawati, D., Balontia, M. J., & Benny, B. (2022). The Effectiveness of Video Project Assignment in Local Language Class. *5th International Conference on Education Technology Management,* (pp. 375-382).

Jones, C. A. (2005). *Assessment for learning.* Newnorth Ltd: www.LSDA.org.uk.

Koppi, A. J., Lublin, J. R., & Chaloupka, M. J. (1997). Effective Teaching and Learning in a High-tech Environment. *Innovations in Education and Training International, 34*(4), 245-251. doi:10.1080/1355800970340402

Predict-Observe-Explain-Visualization (POEV) Module: Reducing Students' Misconception in the Topic of Chemical Bonding

Nurulhuda Bt A. Ghani[1], Corrienna Abdul Talib[2], Nurul Hanani Rusli[3], Mohd Nashriq Taufik Abu Bakar[4], Maizatul Nabila Mohd Suratin[5]
Faculty of Social Science and Humanities[1,2,3,5]
Universiti Teknologi Malaysia
Fakulti Pengajian Jarak Jauh (PACE)[4]
Universiti Utara Malaysia

Nurulhuda86@graduate.utm.my[1], Corrienna@utm.my[2], Nurul.hanani@graduate.utm.my[3]

Abstract: In chemistry, chemical bonding is a difficult topic for students to understand, which can result in misunderstandings. This is because chemical bonding is the topic that involves the use of models. These models can be simple or complicated abstract models with a great deal of mathematical complexity. Students frequently find this subject to be difficult and form a variety of alternate views. Meanwhile, integrating POEV module could enhance students' understanding and reduce misconceptions of the topic chemical bonding. This research investigates the effects of POEV module on enhancing conceptual understanding and reducing misconceptions in the topic of chemical bonding. A teaching and learning module based on the POEV learning strategy (known as POEV module) was built as a guide for teachers to implement this strategy. Learning video that disseminated through TikTok platform was developed and integrated into the module. A quasi -experimental study was designed with a sample of 93 students divided into control and experimental groups. The control group used a teaching and learning module integrated with POE learning strategy meanwhile experimental group used teaching and learning module designed with POEV learning strategy (with learning video through TikTok application). Pre-test and Post test by using three tier diagnostic test of chemical bonding were used in this study. The data collection with 13 three tier multiple choice diagnostic test and analysis student's level of understanding the concept using the Certainty of Responses Index (CRI) technique. The result showed that understanding concept of chemical bond was very low at 25.6% and misconception at 67.80% in the high category for the control group. Meanwhile the data for the experimental group showed that understanding concept is high at 70.80 % and misconception is at 25.90% is at low category. This study supports using POEV module significantly improve the conceptual understanding and reduce misconception in the topic of chemical bonding.

Key words: POE Learning Strategy (;) misconception (;)Chemical bonding (;)Visualization

Introduction

Chemistry is the scientific study of matter in terms of properties, structure, composition, and changes, reactions, and interactions between substances. The concept of chemistry is an abstract one that involves a cognitive link between three levels of representation, namely the macroscopic, sub microscopic, and symbolic levels (Gkitzia *et al.*, 2020). Not only in Malaysia, but also globally, chemistry is one of the compulsory elective subjects for upper secondary students in the pure science stream. However, most students say that chemistry is a subject that contains many abstract concepts that are difficult to learn (Üce and Ceyhan, 2019). One of the topics in chemistry that is difficult for students to understand is chemical bonds (Mellyzar, 2021). Because the subject of chemical bonds is a crucial one for understanding chemistry, failure to master it makes it more challenging for students to master other topics. (Aliyu *et al.*, 2020).

Conceptual understanding can be acquired through learning activities conducted by the teachers in the classroom. Student understanding can be improved by using an interactive teaching strategy and innovative lesson designs (Nur Aqilah and Noor Dayana, 2020). If students can effectively communicate the information they have or are studying, then it can be argued that they have understood the topic. However, many students struggle to grasp the fundamental ideas during the learning process, particularly in chemistry (Kirbulut and Geban, 2014; Kurniawan and Suhandi, 2015; Cetin-Dindar and Geban, 2011). This has a significant impact on how the subsequent learning will proceed. Students experience conceptual blunders or misconceptions as a result of persistent inaccuracies on chemical ideas (Thahir *et al.*, 2020; Lin and Wu, 2021) The main challenge for chemistry teachers is to visualize abstract chemistry concepts in the minds of students, especially microscopic level phenomena (Kuit and Osman, 2021). One of the learning strategies that can be practiced is predict, observe, and explain (POE) which was founded by White and Gunston in 1992. POE learning strategy is more effective, simple, and practical for learning based on concepts and facts compared to 5E learning strategies. However, existing learning strategies give less emphasis to visualization elements (Aliyu *et al.*, 2020). Therefore, in this study, the researcher integrates visualization elements in a guided way in the POE learning strategy so that this strategy is more practical and interesting to use. The visualization aids used in this study are learning videos uploaded on the TikTok application. Among many type of visualization aids, learning videos

are the best materials and easy to practice in classroom (Jung and C, 2019). The TikTok application was chosen as a medium for disseminating learning videos to students because this application is preferred by students and is easy to access (Hight *et al.*, 2021).

The method used was quasi-experimental research with a Pre-test – post-test control group design. Pre-test and Post-test that used in this study contain 13 multiple choice three tier diagnostic test of chemical bonding. The number of samples is 93 form 4 students who took chemistry subject that selected by purposive sampling. The sample is divided into two groups which is an experimental group (47 students) and control group (46 students). The experimental group was using POEV module (with guided learning video through TikTok). Meanwhile the control group is using POE module (without learning video through TikTok.

It used the method of gauging student confidence in their ability to respond to each question using CRI (Certainty of Responses Index) to categorize students into understanding the concept (FKY), not understanding concepts (TFK), understanding but less confidence (FKTY) and misconceptions (M). The scale provided for each question showed the degree of student confidence. Descriptive analysis is used to analyse the data.

Product Description

The main idea of this innovation is to improve the existing learning strategy by integrating visualization elements. The POE learning strategy was developed by White and Gunstone (1992) to uncover individual students' predictions and their reason for making these about a specific event. However, this strategy does not emphasize the visualization elements. So that, the researcher took the initiative to emphasize the visualization element in POE learning strategies. The POEV module was developed as a guide to chemistry teachers to get some idea to conduct active learning. This module was developed by using ADDIE design. The unique of this module is the learning video that disseminated through TikTok platform was developed and integrated into the POEV module. The series of videos in this module were very simple and short videos, easy to understand, used clear animations and relaxing music which was in line with Multimedia Cognitive Learning Theory. Other than that, there were many fun learning activities in the module such as fill in the blank, mind mapping, crossword puzzle, true and false and PAK 21 group work activity such as think pair and share, gallery walk, and build a creative model. All these activities fulfil the theory of Constructivist Learning Theory which states that every student activates the mind to receive new knowledge by relating it to existing knowledge. These learning activities also can stimulate student creative and creative thinking skills.

Results & Discussion

The data obtained from the test regarding the use of the POEV module (experimental group) and POE module (control group). Table 1 show the percentage of conceptual understanding and misconceptions of control group and experimental group.

Table 1: Percentage of Conceptual Understanding and misconceptions of control group (using POE) and experimental group (using POEV) in the topic of chemical bonding.

	Percentage of each category (%)			
Group	**FKY**	**TFK**	**FKTY**	**M**
Control Group	25.6	2.32	4.28	67.80
Experimental group	70.80	0	3.67	25.53

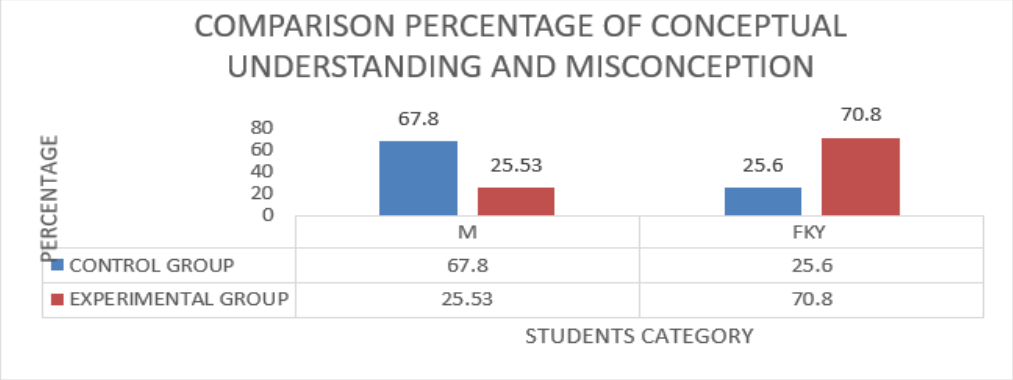


Figure 1: Shows the bar chart of percentage of conceptual understanding (FKY) and misconception (M) between control group and experimental group.

The highest misconception occurs in the subtopic covalent bond which is 50.4% in control group while 25.6% for experimental group. The main reason is that students fail to choose then which elements combine to form covalent bonds (Aziz and Chin, 2010). Students also confuse how many electron that involve in sharing electron and cannot explain the process of sharing electron briefly (Selamat *et al.*, 2014). The lowest misconception is in the subtopic basic formation of bond which is 15.9%. for control group and 10.2% for experimental group.

The impact of this innovation can attract and motivate students to learn chemistry in a fun learning environment, can provide an up-to-date learning material in teaching chemistry to students through social media, encourage the use of technology in learning chemistry and giving an insight and ideas to teachers in developing creative learning materials for chemistry.

Conclusion

Based on the results of research and data analysis, the researchers concluded that there are differences in the effectiveness of learning chemistry using POEV module in improving students' conceptual understanding. The POEV learning approach is more effective than POE learning in reducing misconception and enhancing conceptual understanding among students in the topic of chemical bonding. It can be concluded that the differences in student learning outcomes can be used to determine the increase of conceptual understanding between POEV learning module and POE learning module. Hopefully this innovation can apply to other topic in chemistry subject.

References

Aliyu, F. et al., 2020. A Preliminary Study for Designing and Developing Augmented Reality-Based Module for Teaching Chemical Bonding in Nigerian Secondary Schools. *Solid State Technology*, 63(1s).

Aziz, N. and Chin, M.T., 2010. Pemahamaan Konsep Pelajar Tingkatan Empat Dalam Tajuk Ikatan Kimia Di Skudai + minat. *Unpublished*, pp.1–10. Available at: http://eprints.utm.my/id/eprint/11251/.

Cetin-Dindar, A. and Geban, O., 2011. Development of a three-tier test to assess high school students' understanding of acids and bases. *Procedia - Social and Behavioral Sciences*, 15, pp.600–604. Available at: http://dx.doi.org/10.1016/j.sbspro.2011.03.147.

Gkitzia, V., Salta, K. and Tzougraki, C., 2020. Students' competence in translating between different types of chemical representations. *Chemistry Education Research and Practice*, 21(1).

Hight, M.O., Nguyen, N.Q. and Su, T.A., 2021. Chemical Anthropomorphism: Acting out General Chemistry Concepts in Social Media Videos Facilitates Student-Centered Learning and Public Engagement. *Journal of Chemical Education*, 98(4).

Jung, H. and C, 2019. Learning and Sharing Creative Skills with Short Videos: A Case Study of User Behavior in TikTok and Bilibili. *International Association of Societies of Design Research Conference*, (10), pp.25–50. Available at: https://www.researchgate.net/publication/335335984.

Kirbulut, Z.D. and Geban, O., 2014. Using three-tier diagnostic test to assess students' misconceptions of states of matter. *Eurasia Journal of Mathematics, Science and Technology Education*, 10(5), pp.509–521.

Kuit, V.K. and Osman, K., 2021. CHEMBOND3D e-Module Effectiveness in Enhancing Students ' Knowledge of Chemical Bonding Concept and Visual-spatial Skills. , 9(4), pp.252–264.

Kurniawan, Y. and Suhandi, A., 2015. The Three Tier-Test for Identification The Quantity of Student's Miskonseption on Newton's First Laws. *Journal Global Illuminators Publishing*, 2(2).

Lin, C.Y. and Wu, H.K., 2021. Effects of different ways of using visualizations on high school students' electrochemistry conceptual understanding and motivation towards chemistry learning. *Chemistry Education Research and Practice*, 22(3), pp.786–801.

Mellyzar, M., 2021. Analysis of Students Understanding of Chemical Bonds Concept Using Three Tier Multiple Choice. *Journal of Educational Chemistry (JEC)*, 3(1), pp.53–66.

Nur Aqilah, R. and Noor Dayana, A.H., 2020. Kesan Pembelajaran Berasaskan Inkuiri Dengan Integrasi Video Terhadap Pencapaian Pelajar Dalam Pembelajaran Matematik. *Innovative Teaching and Learning Journal*, 3(2), pp.42–60.

Selamat, M., Ibrahim, N.H. and Surif, J., 2014. Pembinaan Modul Kimia ` UM ` Untuk Meningkatkan Kefahaman Konsep. *Konvensyen Antarabangsa Jiwa Pendidik 2014*.

Thahir, A. et al., 2020. The Effectiveness of STEM Learning: Scientific Attitudes and Students' Conceptual Understanding. *Journal of Physics: Conference Series*, 1467(1).

Üce, M. and Ceyhan, İ., 2019. Misconception in Chemistry Education and Practices to Eliminate Them: Literature Analysis. *Journal of Education and Training Studies*, 7(3), p.202.

Title: The Integration of IoT in SMILE (Smart Air Filtering) Based PjBL-STEAM to Train Creativity Supporting SDGs

Eva Maulidia[1], Himawan Ganjar Prabowo[2], Widi Sandjaya[3], Yora Aulia Afandi[4], Yulia Camalinda Sari[5]
Universitas Negeri Malang, Malang, Indonesia[1345]
Universitas Muhammadiyah Jember, Jember, Indonesia[,2]
eva.maulidia.2003516@students.um.ac.id, himawan@unmuhjember.ac.id,
widi.sandjaya.2003516@students.um.ac.id, yora.aulia.2003516@students.um.ac.id
yulia.camalinda.2003516@students.um.ac.id,

Highlights: The problem we raised was air pollution at SMPN 2 Bululawang. Therefore, an innovative IoT-based KIT SMILE "Smart Air Filter" learning media with aromatherapy was developed which is designed for high-pollution environments. The method used by the product is the ADDIE development model which consists of Analysis, Design, Development, implementation and Evaluation. The aim of this research is to increase students' creativity related to SDGs in solving problems that exist around them based on PjBL-STEAM. The impact of the results of this learning media innovation will be felt by all school members, especially students and teachers who are able to provide learning experiences and also the benefits of media for the school environment.

Key words: *air filter, creativity, IoT, PjBL-STEAM, SDGs*

Introduction

The junior high school where we did Teaching Assistance was filled with a lot of pollution. This pollution comes from the New Krebet sugar industry which is located in front of SMPN 2 Bululawang, which has a negative impact on the residents of SMPN 2 Bululawang, namely in the form of unclean air conditions and dust coming out of factory chimney emissions. Worse air conditions lead to higher levels of health complaints. Health complaints can be seen from data on the health conditions of residents of SMPN 2 Bululawang, namely the increase in people suffering from diseases caused by polluted air, such as respiratory problems. Carbon monoxide (CO) gas can cause irritation to the throat and is considered a pollutant that is dangerous to health. Therefore, sugar factory waste needs to be handled carefully and seriously so as not to pollute the environment. So, in order to avoid pollution to the environment, sugar mill waste needs to be controlled carefully and seriously.

The condition makes students' learning less than optimal. One of them is creativity. students' creativity is limited. This is also proven by global creativity index data which states that Indonesia is ranked 115th out of 139 countries. This shows that creativity in Indonesia is still lacking (Richard, 2015). Therefore, if problems arise around them, students at SMPN 2 Bululawang can increase their creativity by innovating to solve existing air pollution problems.

Therefore, we as teachers train students to solve problems by innovating to create a product that is integrated into P5. P5 is a Project for Strengthening the Profile of Pancasila Students. P5 is cross-disciplinary learning to observe and think about solutions to problems in the environment around students. P5 uses a project-based learning approach that is different from classroom learning in general. Therefore, to support these learning activities, we use a PjBL-STEAM based learning model (Santi, 2022). The reason for using this learning model is that through the use of the PjBL model combined with STEAM learning, there are various kinds of innovations that are connected to everyday life. Students become problem solvers and their creativity will increase (Oktavia, Haryanto, 2022). According to (Oktavia et al., 2022) the PjBL-STEAM model has a significant effect on students' creative thinking abilities, accompanied by increased understanding of concepts.

One of the problems that arises is air pollution caused by the presence of the New Krebet Sugar Factory. This is related to the Sustainable Development Goals (SDGs), namely goals number 3, 9 and 13. Goal number 3, the target to be achieved globally, is to ensure a healthy life. Goal number 9, the target to be achieved globally, is to encourage innovation. Meanwhile, goal number 13, the target to be achieved globally, is to take quick action to overcome climate change and its impact (Icuk Rangga Bawono, 2018). The problems we raise are closely related to the three SDGs goals above. This is supported by the analysis data that we have taken regarding needs analysis data. From the background and needs analysis data above, a solution is needed to the problems faced. As part of the problem solving, an innovative IoT-based Arduino air filter with aromatherapy was developed designed for high-pollution environments.

Product Description

The "Smart Air Filtering" Kit learning resource is a piece of media that supports scientific instruction at the junior high school (SMP) level. Quality media are required to solve this issue, according to the findings of a case that happened in the SMPN 2 Bululawang school environment, which is next to the Baru Krebet Sugar industrial and produced respiratory issues as a result of industrial burning waste. By putting together a "Smart Air Filter" kit that works as predicted, students in the project-based learning program Edukit Smart Air Filter "Smile" can solve a problem that actually arises in the real world. With worksheets comprising practice questions, data collecting, and a handbook book describing how to use the smile-kit.

The Smile-KIT product specifications include a mist maker to disperse essential oils (aroma therapy), an air sensor to measure the degree of air pollution in the area, a water filter to remove particles from the air, a double fan to draw in and push out air while dispersing essential oils, and an LCD display to show indicators of how clean or dirty the air has become.

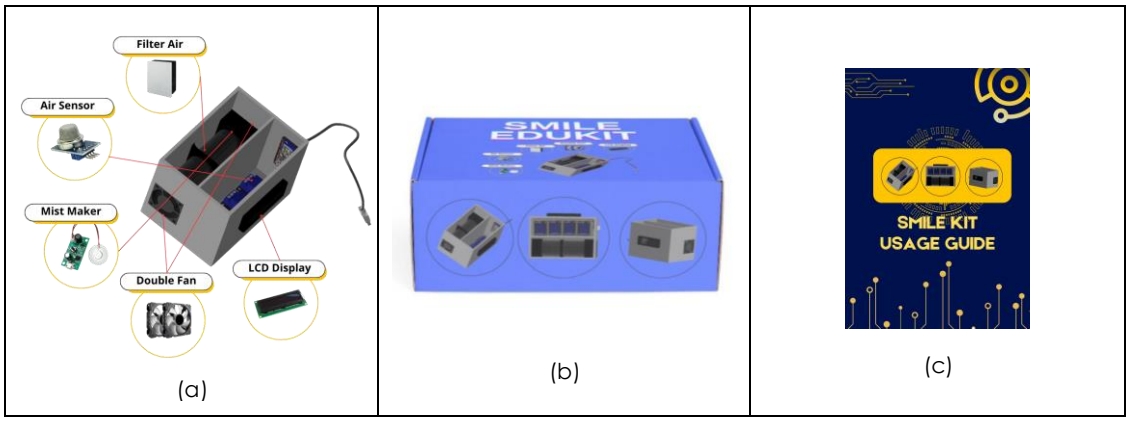
The "Smart Air Filtering" Kit has a novelty or product innovation that is different from products on the market which can only filter small particles such as dust. The smile kit is a tool for filtering carbon monoxide (CO) particles or dust originating from sugar factories. Apart from that, it is also equipped with essential oils or aromatherapy which can be refilled according to the user's taste. The working principle of this "Smart Air Filter Kit" is that it is equipped with an air pollution sensor, where when the sensor identifies pollution, the fan will turn on to absorb dirty air, then it will enter the pipe and be filtered, then clean air will come out in the aromatic damper. This media is integrated using

Arduino uno, proximity capacitive sensor, and infrared sensor. This media is also equipped with 2 servo motors to sweep garbage from the river into the reservoir. The way this tool works is when there is garbage carried by the river flow will pass through proximity capacitive sensors to be sorted, where organic waste will be washed away and Enter the first reservoir. Furthermore, garbage that does not match the qualifications will pass through the second sensor, namely the infrared sensor, so that it can be swept into the second reservoir, this infrared (IR) sensor works to detect all objects in front of it so that all until h that passes through the sensor will be swept away. Therefore, after going through the sensor, the water will be free of waste. It is hoped that when the waste has been sorted, the river water can be cleaner and free of waste, and can maintain the ecosystem in the river.

For the product gap, namely the product only has a dust particle filter, then a product was created that has a particle filter, especially carbon monoxide (CO), which is equipped with aromatherapy (essential oil) which can be replaced and refilled according to the wishes of the product owner. The quality of the SMILE Kit is better than that of other current tools. Products for air filters now on the market only filter air and only generate steam to humidify the space. While the SMILE KIT can function in two ways simultaneously, purifying the air and dispensing aromatherapy through several wind channels. Aromatherapy in the SMILE kit product can be operated automatically. This product is used to filter carbon monoxide (CO) particles placed indoors so that the indoor air is clean of particles that can make us comfortable in the room.

Smile KIT products can train students' creativity in assembling product components. Creativity in assembling can be seen from choosing to use appropriate filter variations so that carbon monoxide particles can be filtered well. Apart from that, another creativity is the technique of selecting the appropriate fan so that the wind can enter and exit according to the duct used.

The next stage is design. The results of the design stage, namely teaching module design, LKPD design, PjBL-STEAM based SMILE KIT guidebook design, packaging planning and SMILE KIT design can be seen in figure 1.



(a) (b) (c)

Figure 1. KIT Design (a). KIT SMILE Design from top view (b). Packaging KIT SMILE Design (c). SMILE KIT usage guide

Meanwhile, in PjBL-STEAM based LKPD there is an aspect of "let's read" students are asked to read the text containing the case so that students are motivated to solve the case, "let's write" students are asked to write the solution to the case in various ways, "let's draw" students are asked to draw a design air filter to be assembled, "let's be creative" students are asked to assemble the air filter by trial and error until they produce a functioning air filter, and "let's test" students are asked to test the robot and demonstrate it. These aspects aim to increase student creativity when learning by using PjBL-STEAM based air filter education. The KIT SMILE student worksheet and the manual for using the PjBL-STEAM KIT SMILE can be seen in Figure 2.

Table 1. Design of the Edukit Bridge Simulator Approach

Science	• Explore and solve problems (problem solving) issues or events in daily life related to air pollution that are conceptualised in SMILE products.
Technology	• A carbon monoxide (CO) gas pollution filter and an Arduino-based Internet of Issues are used to develop students' creative thinking skills in conjunction with worksheets.
Engineering	• Identify the suitable kit-smile product form (smart air filter). • Mention the tools and materials that are used in the design of the kit-smile product. • To demonstrate the problem-solving capabilities of Kit-Smile products, compare product results with variations between filters and connectors.
Art	• Make or choose essential oils to be applied to products as aromas
Mathematics	• Calculate the pipe's width as a path for air and pollutants • Calculate how much material will be used if the manufacturing scale is increased

A learning instrument with a STEAM (Science, Technology, Engineering, Art, and Mathematics) learning approach, Edukit Smart Air Filter "Smile-Kit" can help students at SMPN 2 Bululawang solve problems. One of the primary objectives of P5, which provides opportunities for students to experience knowledge as a process of character formation and an opportunity to learn from the surrounding environment, is to help students explore and find solutions to problems related to their current environment.

Students can take a specific step to solve the issues in relation to this. Meanwhile, the engineering concept uses an Internet of Things (IoT) system based on Arduino IDE and is connected to student worksheets while also including a filter to reduce carbon monoxide (CO) gas pollution and train students' creativity.

To show the problem-solving capability of the product, the engineering concept is subsequently applied to construct the correct shape of the Kit-Smile product (smart air filter) and to identify the many types of filters and connectors it contains. The art concept then implies that students choose the essential oil to be used based on their preferences. Students also calculate the pipe's width to account for the admission and exit of pollutants and air as part of the mathematical concept. For students to simulate creating a smart air filter kit, the instructional component uses dust or pollutants as the simulation material.

Results & Discussion

The method used by the product is the ADDIE development model which consists of Analysis, Design, Development, implementation and Evaluation. This model is an innovative learning model because it provides a systematic, effective learning process and can develop scientific processes. At this analysis stage, a needs analysis is carried out on the school community, namely students and teachers, regarding a questionnaire on air conditions, behaviour and the level of knowledge of the community regarding air pollution. At the design stage, namely determining the Project Based Learning (PjBL)-STEAM learning strategy and determining the environment as a learning resource. In the Development stage, namely developing the smile-KIT product for learning activities. Then, at the implementation stage, the smile-KIT product is tested directly in learning activities. And finally, at the evaluation stage, input and criticism are submitted for further product development.

These three aspects, including air quality, habits and quantity of awareness of school residents regarding pollutants in the school environment, were assessed based on the results of a needs analysis questionnaire filled out by 30 respondents, namely teachers and students in junior high schools. There were 7 questions related to air conditioning, and 80.95% of respondents agreed that air pollution in the school environment was very high. This pollution includes motor vehicle fumes, strong odors, ash to brownish color, acid rain, and dust from combustion that is often found in the air. In 15 questions related to habits, 55.55% of respondents stated that they had taken actions that reduced air pollutants in the school environment. These actions include using masks outdoors, planting plants to reduce pollution, frequently cleaning the place that will be used as a place to study, and much more. There were 5 questions regarding the general public's level of knowledge, and the result was that 86% of respondents agreed that there were facilities to minimize air pollution. Based on the findings of the needs analysis, it is necessary to have equipment or facilities that can reduce air pollution, especially in the school environment so that it does not interfere with educational activities.

The results of respondents' questionnaires regarding how to use the SMILE KIT also support the product's suitable use, with an average of 89,16% of respondents saying that the product is suitable for use based on a number of assessment factors. A score of 81.25% for efficiency and quality indicates that the product is simple to construct and use. 87.55% of respondents felt that the product's materials and assembly process provided good levels of occupational safety. Aesthetics or product form led 87.5% to the conclusion that the product's look and indication displays were pleasing to the eye and functional. 87.5% of people who evaluated the product's usability thought it was simple to use anywhere. Developing the Pancasila Student Profile Project's P5 component found that 91.66% of the items may be used in P5, which is in line with the autonomous curriculum. 95.83% of the PjBL criteria were fulfilled, indicating that the product may be used to train users in project completion, particularly in problem-solving for the SDGs.

Table 2. The SMILE "Smart Air Filter" KIT survey results

Aspect	Result
Efficiency and standards of quality	Easy to assemble and use
Aspect of safety	Safety at work of materials and assembly of products is beneficial
Aesthetic feature or product design	The product display and indication displays are appealing and functional.
According to use	The product is simple to use in a variety of situations.
Aspect of P5	It is suitable to implementation in P5 and supports the independent curriculum
Aspect of PjBL	The product can be used to train people in executing project operations, especially for solving problems for the Sustainable Development Goals (SDGs)

Based on the research results, in general students are able to solve a problem. However, many students are not used to it and are not optimal in thinking creatively to solve problems. This is because the learning carried out is still mostly theoretical and not supported by the development of creativity through learning projects. According to Thorndike's learning theory, namely behavioristic theory, the learning process is a relationship between stimulus and response (Karadut, 2012). This learning process emphasizes repetitive behavior (Law of Practice), the more frequently the stimulus and repetition are trained, the greater the impact or response will be (Amsari, 2018).

The implementation results show that students support media development because they have never applied technology, especially IoT, in learning and can solve problems in the school environment. Apart from that, the students were very enthusiastic in trying to use the SMILE KIT media, it can be seen from the trials they carried out

that they wanted to complete the experiment both by selecting various types of filters and placing other components so that the media worked well. Media implementation can be seen in Figure 2.

(a)

(b)

Figure 2. Implementation KIT Smile (a). Students assemble the kit by selecting various filters (b). Students test the SMILE KIT that has been created

Therefore, there is a need for learning by training creative thinking skills so that students' creative thinking abilities can increase. One of these lessons is by using the SMILE "Smart Air Filter" KIT media based on PjBL-STEAM. The results of respondents show that the SMILE "Smart Air Filter" KIT is suitable for use, easy to use, attractive, safe and practical to use in various environments. Apart from that, the advantages of PjBL-STEAM-based learning media in KIT SMILE are that it can train students' creative thinking processes, is equipped with complete learning tools and can follow learning developments in line with the independent curriculum which is part of P5 (efforts to increase independence). Pancasila student profile) and towards achieving the SDGs. The impact of the results of this learning media innovation will be felt by all school members, especially students and teachers who are able to provide learning experiences and also the benefits of media for the school environment.

Conclusion

Educational development through PjBL-STEAM-based learning innovation can train student creativity, which is one of the demands of the Pancasila student profile in the independent curriculum that students must have. The development carried out produces learning media products through media needs analysis, media validation, readability tests by teachers and students. The results of the media needs analysis stated that the PjBL-STEAM based learning media being developed had moderate criteria so that the media needed to be developed as a learning media. The results of validation and readability tests state that learning media is effectively used in training students' creativity to solve problems towards the SDGs.

To perfect SMILE KIT, we will carry out ongoing investigations regarding product innovation to address sustainable living problems integrated with educational development. One of the innovations provided can be added in terms of tool functionality, namely the addition of more air sensors so that the results of air pollution readings will be more accurate. It is also hoped that in the future it can be realized for actual needs by increasing its size and strength. Apart from that, it is hoped that students can be more creative in assembling education so that they can provide experience in solving problems for the development of sustainable living.

References

Icuk Rangga Bawono. 2018. "Sustainable Development Goals SDGs Pengantar."

Karadut, A. P. (2012). Effects of E. L. Thorndike's Theory of Connectionism Rudiments on Developing Cello Playing Skills for Beginners. Procedia - Social and Behavioral Sciences, 69(Iceepsy), 298–305. https://doi.org/10.1016/j.sbspro.2012.11.413.

Kurniasari, Heni Dwi, Rahilla Apria Fatma, and Janser Aldomoro S R. 2019. "Analisis Karakteristik Limbah Pabrik Gula (Blotong) Dalam Produksi Bahan Bakar Gas (Bbg) Dengan Teknologi Anaerob Biodigester Sebagai Sumber Energi Alternatif Nasional." *Jurnal Sains &Teknologi Lingkungan* 11 (2): 102–13. https://doi.org/10.20885/jstl.vol11.iss2.art2.

Mukrimaa, Syifa S., Nurdyansyah, Eni Fariyatul Fahyuni, ANIS YULIA CITRA, Nathaniel David Schulz, غسان د., Tukiran Taniredja, Efi Miftah. Faridli, and Sri Harmianto. 2016. "Pengelolaan Limbah Cair Industri Gula Tebu Pada PT. X Di Jawa Timur." *Jurnal Penelitian Pendidikan Guru Sekolah Dasar* 6 (August): 128.

Oktavia, N E, H Haryanto, and ... 2022. "Pengaruh Model PjBL-Steam Terhadap Kreativitas Siswa Ditinjau Dari Pemahaman Konsep Kimia Pada Materi Sel Volta Di SMA N 2 Tanjung Jabung Timur." *Cakrawala Repositori IMWI* 5 (2): 303–11. http://cakrawala.imwi.ac.id/index.php/cakrawala/article/view/134.

Richard. 2015. Global Creativity Indeks. *Toronto: Martin Prosperity Institute*, 47.

Santi, Ella Laras. 2022. "Pendekatan STEAM Pada Project Based Learning Mewujudkan Merdeka Belajar Untuk Meningkatkan Kreativitas Siswa." *Jurnal Pendidikan Dasar* 3 (2): 77–81. http://jurnal.umpwr.ac.id/index.php/jpd/article/view/2240.

Redefining Frugal Alternative Assessment for Online Collaborative Project in Requirements Engineering Course: Adapting to the Pandemic Era

Noraini Ibrahim[1], **Shahliza Abd Halim**[2], **Johanna Ahmad**[3]
Faculty of Computing, Universiti Teknologi Malaysia, Skudai Johor, Malaysia [1,2,3]
noraini_ib@utm.my, shahliza@utm.my, johanna@utm.my

Highlights: Amidst the global COVID-19 pandemic, this article introduces an innovative approach to alternative assessment (AA) within the Requirements Engineering course. It focuses on online collaborative projects as a means of team project evaluation. The frugal AA methodology was carefully aligned with defined learning objectives and teaching and learning (TnL) activities to ensure the successful execution of these projects in the online environment. This adaptation is essential as student assessment shifts from traditional face-to-face instruction to emergency remote learning. It outlines how AA facilitates effective evaluation during these challenging times, promoting a constructive approach to learning outcomes and project-based assessments.

Key words: Alternative Assessment (AA); Requirements Engineering (RE); Collaborative Project; COVID-19

Introduction

The global COVID-19 pandemic has ushered in a slew of challenges, including significant disruptions to the education system worldwide. In response, educators worldwide must embrace and adapt to the most effective practices to maintain the quality and significance of the teaching and learning (TnL) environment. This is particularly relevant within the context of Malaysia's Outcome-based Education (OBE) system, where the principles of constructive alignment, encompassing intended learning outcomes, instructional activities, and assessment tasks, need to be reconfigured. This adaptation is essential to accommodate the shift from conventional in-person course delivery to the emergent remote (online) approach (Malaysian Qualifications Agency, Ministry of Higher Education Malaysia, 2020).

In the realm of higher education, alternative assessment encompasses a wide array of non-traditional evaluation techniques that diverge from conventional standardized testing methods. These innovative assessment approaches aim to gauge students' mastery of learning objectives and competencies through diverse means such as projects, portfolios, group collaborations, presentations, and other unconventional formats. Unlike traditional assessments, the focus here lies on appraising students' comprehension, application, and critical thinking abilities, providing a more holistic and authentic evaluation of their academic progress and capabilities in the higher education landscape. (Ministry of Higher Education Malaysia, 2021).

Amidst the unprecedented global challenge posed by the COVID-19 pandemic, this article presents a groundbreaking approach to education in the Requirements Engineering (RE) course. It delves into the design and execution of a resource-efficient alternative assessment (AA) system tailored to online teaching and learning. This innovative AA methodology is intricately aligned with the intended learning outcomes and the dynamics of effective teaching and learning (TnL) activities. Significantly, this realignment becomes pivotal, given the necessity to adapt assessment tasks from their traditional in-person format to the emergent realm of emergency remote (online) learning. This pioneering approach underscores the adaptability and ingenuity demanded by the current global educational landscape.

This RE course offers students a comprehensive exploration of the requirement engineering phase within software development life cycles, with a particular focus on software modeling activities. The course places a strong emphasis on various facets of requirements, including types of requirements, elicitation techniques, specifications (utilizing both text-based and model-based approaches), validation, negotiation, and effective requirements management. By the culmination of this course, students will have acquired the proficiency to navigate the requirements engineering process for diverse application domains, employing suitable techniques guided by established documentation and specification principles.

Product Description

A practical handbook on AA in higher education delineates eight key components: integrated, authentic, profiling, personalized, performance-based, challenge-based, contemporary, and real-time. These elements are deemed crucial and should be incorporated into various AA strategies, whether they involve written assessments, observations, or presentations. (Ministry of Higher Education Malaysia, 2021).

Figure 1 unveils an innovative idea, presenting the frugal AA framework for the RE course. This framework represents a departure from the previous Software Engineering (SE) Project-oriented Problem-based Learning (PoPbL) approach (Ibrahim & Abd Halim, 2014) (Ibrahim & Abd Halim, 2021). The introduction of this frugal AA framework occurred within the School of Computing at the Faculty of Engineering, Universiti Teknologi Malaysia. Remarkably, this frugal AA framework was not only successfully launched but also thrived during two consecutive semesters—semester 2, 2020/2021, and semester 2, 2021/2022—spanning a challenging two-year period marked by the global COVID-19 pandemic crisis. This pioneering AA framework fostered innovation by involving students in online collaborative team projects that provided them with invaluable real-world problem-solving experiences. It encompassed most AA components, excluding the challenge-based element. Throughout this innovative approach, students were exposed to industry-relevant case studies and simulations, enabling them to develop industry-standard software development documents (portfolios) using predefined checklists (templates). Additionally, students were equipped with teaching

videos to facilitate the implementation of AA strategies. This innovative framework and hands-on approach to alternative assessment in the face of the pandemic crisis have redefined the learning experience, promoting creativity, critical thinking, and practical application of knowledge.

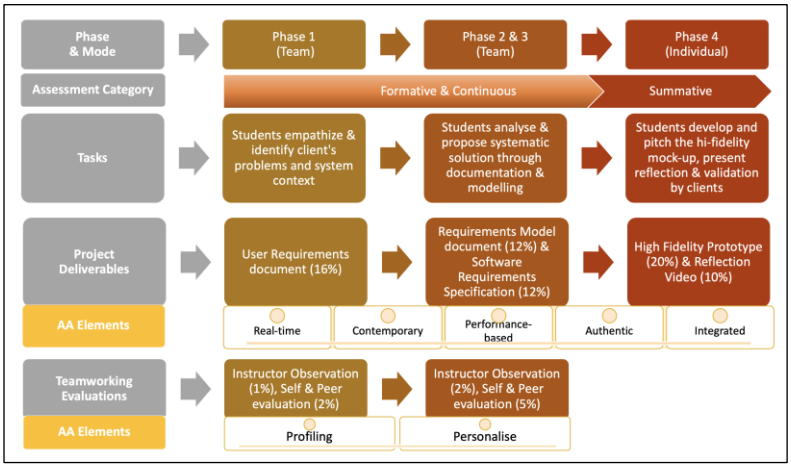


Figure 1: AA Framework in RE course

In phase 1, students were organized into teams of 3 to 4 members and tasked with analyzing case studies presented by industry stakeholders. This involved delving into the stakeholder's business domain and understanding the current system context. Leveraging design thinking techniques, students conducted online workshops and closed interviews with clients to elicit requirements effectively. These experiences not only fostered active listening and empathy but also equipped students to propose systematic solutions for improving the client's existing business processes.

In subsequent phases 2 and 3, students delved into the analysis and documentation of alternative solutions. They employed the Unified Modeling Language (UML) for visualizing system design models from data, behavioral, and structural perspectives—a widely accepted industry practice. Furthermore, students meticulously documented requirements specifications using text-based formats compliant with industry standards, such as the IEEE Std. 830-1993 template.

The final phase 4 required individual presentations and pitches of high-fidelity prototypes, showcasing mock-up system features aligned with the analysis model, specifically the use case diagram. These presentations served not only to validate the theories and concepts learned throughout the semester but also provided students with a platform for discussing their findings and experiences, further enriching their understanding of the course's content.

Results & Discussion

During the transition to online Teaching and Learning (TnL) due to the COVID-19 pandemic, a significant redesign of assessment tasks for the RE course took place. These revisions were strategically crafted to align with predefined learning outcomes and instructional activities, detailed in Table 1.

Table 1: Constructive alignment matrix for RE course delivery during Online TnL

CLO No.	Description	TnL Activities	Assessment Methods	Course Marks
CLO1	Analyze the different types of requirements for various domains of application systems during requirements engineering process.	• KWL chart • Jigsaw-activity • Mind-mapping • In-class problem solving	Problem solving	Formative & Individual: 5%
			Online Test	Formative & Individual: 15%
CLO2	Validate both text-based and model-based requirements according to the defined documentation and specification guidelines.	• Team collaboration • Think-Pair-Share • Project/case study (design thinking)	Phase 1 report (URD)	Formative & Team: 16%
			Phase 2 report (Req.model)	Formative & Team: 12%
			Phase 3 report (SRS)	Formative & Team: 12%
			Phase 4 prototype & reflection	Summative & Individual: 30%
CLO3	Ability to do work effectively in a team and able to present orally the deliverables for	• Instructor observation • Self & Peers reflection	Peer assessments (Phase 1-3)	Summative & Individual: 10%

requirements engineering process.

One of the primary focuses was on achieving Course Learning Outcome 1 (CLO1), which emphasizes students' individual technical proficiency in analyzing fundamental RE concepts and their practical application across various domains. This objective was addressed through two distinct formative and individual assessment methods—namely, in-class problem-solving and tests—contributing approximately 20% towards the overall course evaluation.

The implementation of the frugal Alternative Assessment (AA) method primarily targeted Course Learning Outcome 2 (CLO2), which constitutes a substantial portion of nearly 70% of the total course marks. Under this approach, students engaged in a collaborative online project, spanning from phase 1 to phase 3 in a continuous formative assessment format. S

Subsequently, during phase 4, students undertook summative assessment tasks individually. The course also aimed to foster learners' generic skills, particularly in teamwork and oral communication through presentations. This preparation for future software engineers involved hands-on experiences in simulated learning environments during online and remote project development and progress monitoring.

To facilitate peer learning and assessment, students were trained to provide feedback on their peers' work concerning team project quality. In the RE course, peer assessments accounted for 10% of the coursework evaluation and were conducted using the TeamXplore application, which employed customized criteria for teamworking rubrics. The auto-rating system within TeamXplore was based on the method outlined by Kaufman, Richard, and Hugh (2000).

To guarantee the validity and reliability of the alternative assessment tasks, detailed instructions for all four phases were provided in a project summary supplemented with evaluation criteria rubrics, as presented in Figure 2. Figure 2a illustrates an example of a project overview summary, while Figure 2b shows the given template or checklist, Figure 2c presents the rubrics employed for assessing students' deliverables during phase 4, which included the high-fidelity prototype and the reflection video presentation. The design and implementation of Alternative Assessment (AA) were crafted to promote the integration of various written and technical skill measurements. Figure 2d provides evidence of learners' submissions for the development of high-fidelity prototypes and video presentations in phase 4. This authentic assessment approach within the RE course demonstrates that learners, as future software engineers, are not only trained but also exposed to real-world scenarios. They apply the knowledge and technical skills acquired throughout the semester to develop end-products that address client needs and solve real-world problems, thus preparing them effectively for their future roles.

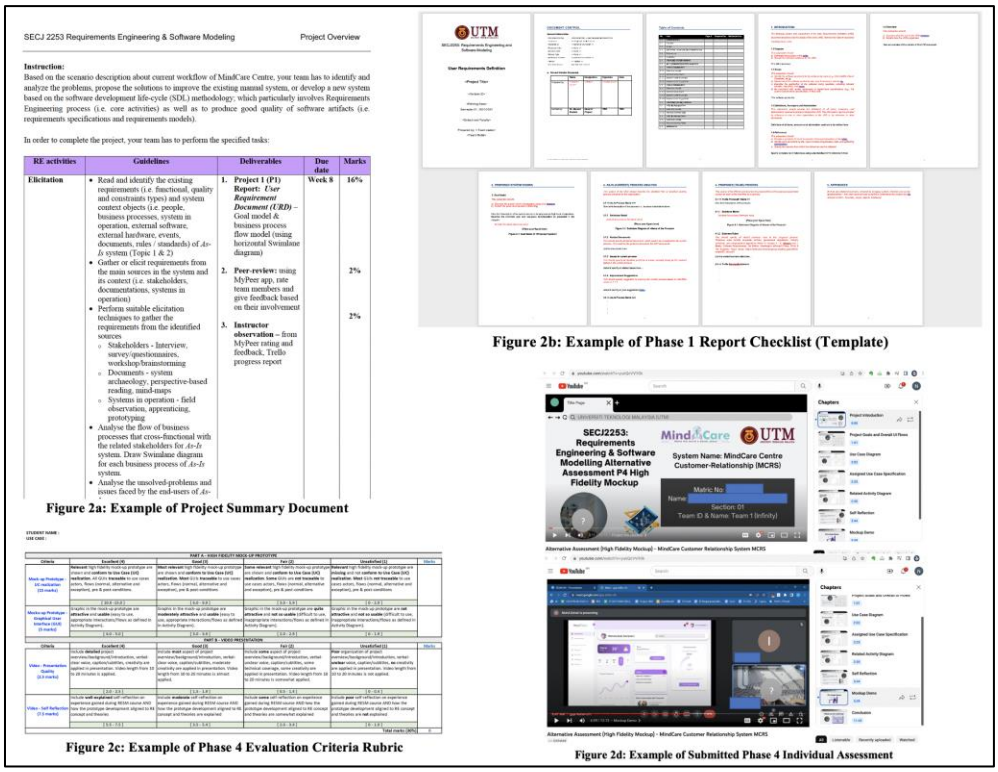


Figure 2: Example of AA Design and Implementation in RE Course

Table 2 reveals a noteworthy outcome derived from a brief survey conducted among students in both 2021 and 2022, focusing on the implemented AA framework in RE course previously illustrated in Figure 1. The perspective of the first group of students underscores their appreciation for the incorporation of contemporary case studies within the chosen application domain. In 2021, students engaged with RCE Iskandar (Sustainable and Low Carbon Schools Exhibition Management System) and UTM Centre of Sustainability UTMCS (Green Leaf 2020: Sustainability Awards Management System). Meanwhile, in 2022, students grappled with real-world challenges presented by MindCare Occupational Therapy Centre (Customer Relationship Management System) and UTM Counselling & Career Centre (Appointment Management System).

From the viewpoint of the second group of students, it becomes evident that they recognize the presence of essential AA elements, particularly in terms of performance-based assessments and the inherent complexity of real-

world problems presented to them. Furthermore, the survey conducted in 2022 underscores the authenticity of the AA implementation, aligning with the framework's design, as duly acknowledged by students engaged in collaborative team projects. These results stand as a significant testament to the effectiveness and relevance of the applied AA framework.

Table 2: General Students Feedback on AA Implementation

	Student Perspective	**Sem. 02, 2020/2021** (116 responses)		**02, 2021/2022** (124 responses)	
1.	Understanding towards project case study application (environment, functionality	Well	24.1%	Well	17.7%
		Moderate	61.2%	Moderate	51.6%
		Fair	14.7%	Fair	30.6%
		Poor	-	Poor	-
		No	-	No	-
2.	Real-world problem (complexity)	Very Difficult	8.6%	Very Difficult	2.4%
		Difficult	53.4%	Difficult	25.8%
		Average	37.1%	Average	69.4%
		Easy	0.9%	Easy	1.6%
		Very Easy	-	Very Easy	0.8%
3.	Real-world integrated (authenticity)	Strongly Agree	-	Strongly Agree	22.6%
		Agree	-	Agree	60.5%
		Neutral	-	Neutral	16.9%
		Disagree	-	Disagree	-
		Strongly Disagree	-	Strongly Disagree	-

Conclusion

In conclusion, the frugal Alternative Assessment (AA) framework has proven effective in achieving constructive alignment with the specified learning outcomes in the Requirements Engineering (RE) course, particularly in the context of online collaborative team-based projects. Moving forward, it is essential to conduct a comprehensive analysis of the two-year implementation of this framework (2021-2022) during the COVID-19 pandemic, encompassing both quantitative and qualitative aspects. This analysis will serve as the foundation for future enhancements.

Furthermore, it is crucial to assess the adjustments made to the AA framework for the post-pandemic year (2023) due to notable changes. These revisions include the reintegration of physical face-to-face final examinations and a shift to team-based presentations during phase 4. Additionally, the introduction of the challenge-based element during phase 4, where top-performing teams will pitch their high-fidelity prototypes to real stakeholders in a competitive setting, calls for thorough evaluation. These future efforts aim to continually refine and optimize the innovative AA approach.

Publication

1. **Noraini Ibrahim**, Shahliza Abd Halim, Zaharah Johari (2021). *Online Requirements Engineering Collaborative Project During Emergency Remote (ER) Teaching and Learning.* 1st Online Teaching Enhancement And Learning Innovation Carnival (eTELIC) Book Series: Nurturing New Norms in E-Assessment (Book 1) (pp. 29 – 36). Kelantan, Malaysia: Center for Academic Excellence and Development (CAED, Universiti Malaysia Kelantan (UMK).
2. Zaharah Johari, Mastura Shafinaz, **Noraini Ibrahim**, Mohd Fairus, Fatin Aliah Phang (2021). *Managing Asyncronous Learning Using E-Learning Lesson Activity In Electronic System Course: Exploration Of Student Perception* .1st Online Teaching Enhancement And Learning Innovation Carnival (eTELIC) Book Series: Embracing New Norms With Asynchronous Learning (pp. 23-30). Kelantan, Malaysia: Center for Academic Excellence and Development (CAED, Universiti Malaysia Kelantan (UMK).
3. **Noraini Ibrahim**, Shahliza Abd Halim. Implementation of Integrated Project and Online Collaborative Learning for Computing Courses during Emergency Remote (ER) Teaching and Learning. In Proceedings of the International University Carnival on eLearning (IUCEL) 2021. Kedah, Malaysia. University Teaching and Learning Center (UTLC) Universiti Utara Malaysia (UUM).
4. Sharin Hazlin Huspi, **Noraini Ibrahim**, Muhammad Aliif Ahmad. Implementation of Integrated Project and Online Collaborative Learning for Computing Courses during Emergency Remote (ER) Teaching and Learning. In Proceedings of the International University Carnival on eLearning (IUCEL) 2021. Kedah, Malaysia. University Teaching and Learning Center (UTLC) Universiti Utara Malaysia (UUM).
5. **Noraini Ibrahim**, Shahliza Abd Halim. Re-designing the Design Thinking Implementation in Software Engineering Courses during COVID-19 Emergency Remote Teaching and Learning. In Proceedings of the International University Carnival on eLearning (IUCEL) 2021. Kedah, Malaysia. University Teaching and Learning Center (UTLC) Universiti Utara Malaysia (UUM).

6. **Noraini Ibrahim**, Shahliza Abd Halim, Nor Azizah Saadon. *Learners Reflection on Collaborative Project in Project-Oriented Problem-Based Learning for Software Engineering Courses*. The Regional Conference in Engineering Education (RCEE) & Research in Higher Education (RHEd) 2020. Johor, Malaysia: AIP Publishing.
7. Zaharah Johari, Mastura Shafinaz, Mohd Fairus, Fatin Aliah Phang, **Noraini Ibrahim**. Design Of Asynchronous Active Learning Class Using Bookend Approach in Moodle Lesson Activity. In Proceedings of New Academia Learning Innovation (NALI) NALI2020 Exhibition and Competition. Skudai Johor, Malaysia: UTM Academic Leadership (UTMLead), Universiti Teknologi Malaysia.
8. **Noraini Ibrahim**, Shahliza Abd Halim. Aligning and Mapping Skills of 21st Century Learning and Software Engineering Professional via Collaborative Projects. In Proceedings of New Academia Learning Innovation (NALI) NALI2019 Exhibition and Competition. Skudai Johor, Malaysia: UTM Academic Leadership (UTMLead), Universiti Teknologi Malaysia.
9. **Noraini Ibrahim**, Shahliza Abd Halim, Nor Azizah Saadon. Embedding Design Thinking in Project-oriented Problem-based Learning Approach in Software Engineering Courses. In Proceedings of New Academia Learning Innovation (NALI) NALI2018 Exhibition and Competition. Skudai Johor, Malaysia: UTM Academic Leadership (UTMLead), Universiti Teknologi Malaysia.
10. **Noraini Ibrahim**, Shahliza Abd Halim, Nor Azizah Saadon, Radziah Mohamad. Incorporation of Collaborative Project in Project-Oriented Problem-Based Learning for Software Engineering Courses. In Proceedings of New Academia Learning Innovation (NALI) Symposium 2018 (pp. 63–66). Skudai Johor, Malaysia: UTM Academic Leadership (UTMLead), Universiti Teknologi Malaysia.
11. **Noraini Ibrahim**, Shahliza Abd. Halim, Masitah Ghazali. Integrating Collaborative Case Study in Project-Oriented Problem-Based Learning Approach for Software Engineering Courses. The 4th International Innovative Practices in Higher Education Expo (I-PHEX 2017), 16 November 2017, Kuala Lumpur Malaysia.
12. Dayang N. A. Jawawi, **Noraini Ibrahim**, Rosbi Mamat, Shahliza Abd.Halim, Norhidawani Mohamed, Rooster Tumeng. *Adaptation of Project-Oriented Problem-Based Framework for Teaching Computer Programming*. The 7th World Engineering Education Forum 2017 (WEEF'17), November 2017, Kuala Lumpur Malaysia (IEEE Publication)
13. **Noraini Ibrahim**, Radziah Mohamad, Shahliza Abd. Halim, Masitah Ghazali, Jumail Taliba. Incorporation of Generic Project-Oriented Problem-Based Learning (PoPbL) Framework into Software Engineering (Se) Education. The 3rd International Innovative Practices in Higher Education Expo (I-PHEX 2016), 10 August 2016, Kuala Lumpur Malaysia.
14. **Noraini Ibrahim**, Shahliza Abd.Halim. *Generic Framework Design of Project-Oriented Problem-Based Learning (POPBL) for Software Engineering Courses*. The 8th Malaysian Software Engineering Conference (MySEC'14), 23-24 September 2014,Langkawi Malaysia (IEEE Publication)

Award

1. **Best Paper Award**, Sustainable & Integrated Engineering International Conference 2022. *Student Engagement Level during Emergency Remote Learning: K-Means Clustering*
2. **Gold Medal,** 1st Online Teaching Enhancement And Learning Innovation Carnival (eTELIC). *Online Requirements Engineering Collaborative Project During Emergency Remote (ER) Teaching and Learning.*
3. **Gold Medal,** 1st Online Teaching Enhancement And Learning Innovation Carnival (eTELIC). *Managing Asynchronous Learning Using E-Learning Lesson Activity In Electronic System Course: Exploration Of Student Perception.*
4. **Gold Medal**, International University Carnival on eLearning (IUCEL) 2021. *Re-designing the Design Thinking Implementation in Software Engineering Courses during COVID-19 Emergency Remote Teaching and Learning*
5. **Silver Medal**, International University Carnival on eLearning (IUCEL) 2021. *Exploring Student Perception on Implementation of Cooperative Learning for Asynchronous Online Class Using Moodle Database Activity*
6. **Bronze Medal**, International University Carnival on eLearning (IUCEL) 2021. *Implementation of Integrated Project and Online Collaborative Learning for Computing Courses during Emergency Remote (ER) Teaching and Learning*
7. **Silver Medal**, New Academia Learning Innovation (NALI) 2020 (Exhibition And Competition). *Design Of Asynchronous Active Learning Class Using Bookend Approach in Moodle Lesson Activity*
8. **Gold Medal**, New Academia Learning Innovation (NALI) 2019 (Exhibition And Competition). *Aligning and Mapping 21st Century Learning Skills with Software Engineering Professional Skills via Collaborative Projects*
9. **Gold Medal**, New Academia Learning Innovation (NALI) 2018 (Exhibition And Competition). *Embedding Design Thinking in Project-Oriented Problem-based Learning in Software Engineering Courses*
10. **Gold Medal,** The 4th International Innovative Practices in Higher Education Expo (I-PHEX 2017). *Integrating Collaborative Case Study in Project-Oriented Problem-Based Learning Approach for Software Engineering Courses*
11. **Best of the Best Innovation Award,** The 4th International Innovative Practices in Higher Education Expo (I-PHEX 2017). *Integrating Collaborative Case Study in Project-Oriented Problem-Based Learning Approach for Software Engineering Courses*
12. **Teaching Award,** Science and Technology Category, Majlis Citra Karisma Anugerah Kecemerlangan & Penghargaan UTM 2016
13. **Bronze Medal,** The 3rd International Innovative Practices in Higher Education Expo (I-PHEX 2016). *Incorporation of Generic Project-Oriented Problem-Based Learning (POPBL) Framework into Software Engineering Education*

Intellectual Property

1. Project-oriented Problem-based Learning for Software Engineering Courses. (IP/CR/2016/0894)
2. Integrated Collaborative Project for Software Engineering SE- Project-oriented Problem-based Learning (PoPbL) Approach (LY2019008989)
3. Generic Project-oriented Problem-based Learning (PoPbL) Framework for Software Engineering Education (IP/CR/2016/0894)
4. Multiple Choices Questions (MCQ) Bank for Undergraduate Requirements Engineering Course based on Outcome-Based Education (OBE) (Filed IP/CR/00907)
5. Course Information Development System (CIDS) (Filed IP/CR/02461)
6. Online Modules for Outcome-Based Education (OBE) Training for Academic Staff (IP/CR/01083)

References

Malaysian Qualifications Agency, Ministry of Higher Education Malaysia. (2020, May 30). *Guidelines And Announcements Of MQA During And Post-Covid-19 Crisis*. Retrieved from https://www.mqa.gov.my/pv4/mqa_covid19.cfm

Ministry of Higher Education Malaysia (2021), Alternative Assessment in Higher Education: A Practical Guide To Assessing Learning, Putrajaya, Malaysia.

Ibrahim, N., & Abd Halim (2021). Re-designing the Design Thinking Implementation in Software Engineering Courses during COVID-19 Emergency Remote Teaching and Learning. 2021 International University Carnival on E-Learning (IUCEL 2021). Universiti Utara Malaysia.

Ibrahim, N., & Abd Halim, S. (2014). Generic Framework Design of Project-Oriented Problem-Based Learning (POPBL) for Software Engineering Courses. The IEEE 8th Malaysian Software Engineering Conference (MySEC2014) (pp. 359–364). Malaysia

IEEE Guide for Software Requirements Specifications, in *IEEE Std 830-1984* , vol., no., pp.1-26, 10 Feb. 1984, doi: 10.1109/IEEESTD.1984.119205. (https://ieeexplore.ieee.org/document/278253)

TeamXplore (2021) (https://www.teamxplore.com/mypeer/)

Kaufman, D. B., Richard, M. F., & Hugh, F. (2000). Accounting for individual effort in cooperative learning teams. *Journal of Engineering Education*, 89, no. 2 (pages 133-140).

AUGMENTED REALITY FOR INTERACTIVE MATHEMATICS LEARNING

Nor Edayu Abd Ghani, Dini Safia Mansor, Syazwani Abd Ghani, Norbahyah Abdul Rahman and Hanin Abdul Rahman
Mathematics Department, INTEC Education College

Highlights:

Augmented Reality (AR) is gaining widespread adoption in global education. It enhances learning by blending real objects with virtual information, increasing student interaction with the physical environment. Research has shown that AR improves the effectiveness and engagement of learning processes. In the context of mathematics education, where visualizing complex problems can be challenging, educators have integrated AR, using tools like the Geogebra application. A study with foundation-level students evaluated AR's accessibility, effectiveness, and excitement. The results were largely positive, demonstrating that AR holds promise as a valuable tool for enhancing the learning experience in mathematics.

Key words: augmented reality, learning, mathematics.

Introduction

The growing use of digital tools in compulsory education has placed new demands on teachers to design innovative learning environments while capitalising on the wealth of digital resources available (Napal, Mendioroz Lacambra and Penalva, 2020). Despite the availability of digital tools, teachers remain at the core of instructional practices. Thus, research in education must prioritise the utilisation of these tools to enhance the learning process.

One such tool is Augmented Reality (AR) technology, which when integrated into compulsory education, has the potential to revolutionize learning by improving engagement, motivation, and cognitive development. Traditional teaching methods in subjects like mathematics, particularly vector geometry and complex numbers, often rely on abstract approaches, limiting students' ability to visualize and interact with three-dimensional problems. This abstraction can hinder student understanding, leading to reduced interest and motivation in the subject.

Emerging research suggests that AR game-based tools hold significant educational promise, impacting students' attendance, knowledge transfer, skill acquisition, hands-on digital experiences, and fostering positive attitudes toward learning (Schmitz, Specht and Klemke, 2012; Shin et al, 2012; Pellas et al, 2019). Moreover, digital learning tools and AR games have the potential learning outcomes beyond traditional goals, promoting problem-solving skills, critical thinking, and creativity, all crucial for 21st century education (Videnovik at al, 2020).

AR technology overlays virtual elements onto the real world, creating an immersive and interactive learning experience. It has the potential to bridge the gap between abstract mathematical concepts and tangible understanding, especially in interactive learning environments. This study aims to explore the effectiveness integration of AR into mathematics education, assessing its impact on students' engagement, comprehension, and overall performance in mathematics. AR holds the promise of making mathematics more accessible and enjoyable for students, revolutionising traditional teaching methods in the process (Azuma RT, 1997).

Product Description

When learning with AR, students need to be given instructor guidance and feedback to foster improved learning achievements and motivation, while also reducing their cognitive load (Chu, Chen, Hwang, & Chen, 2017). Activities where both the usage of AR in parallel with traditional methods have been shown to be effective (Liarokapis & Anderson, 2010).

GeoGebra was chosen because it can be used for problem-oriented learning, encouraging students to interact and experiment with tools that can aid their visualisation (Majerek, 2014). GeoGebra also satisfies the conditions of being an ideal educational AR system in that it is: simple and robust, presents information clearly, has easy interaction, makes complex procedures clear for both instructors and students, and is cost effective and easily extensible (Liarokapis & Anderson, 2010).

Where AR, GeoGebra and our course learning goals align are for topics that rely heavily on students being able to visualise their learning, where they can enhance their mathematical literacy

when the subject requires some abstract relational thinking (Lai & Cheong, 2022), hence topics vector geometry and complex numbers were chosen as the focus. GeoGebra will be used as a learning aid to improve their visualisation and a medium with which to "bring to life" problems found in their assignments, where otherwise would simply be meaningless numbers and static diagrams.
Such learning activities that were designed include:

- students recreating 3D objects in AR to further explore and analyse,
- students using tools to accurately visualise elements to help solve problems,
- instructors demonstrating with a dynamic AR visualization of complex spatial concepts,
- instructors converting repetitive exercises and real-world problems into an AR environment for a more student-centred exploration.

These allow students and instructors to pose questions and analyse and interact with problems, encouraging collaboration and discussion while written calculations are being done in parallel.

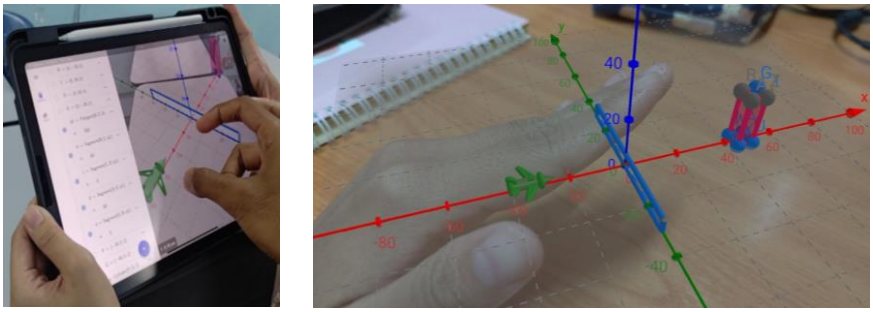


Figure 1: A plane's trajectory over a barrier and building.

Figure 2: Vector equation of straight line.

Results and Analysis

Google Forms was used as an online tool for data collection. The data gathered from the questionnaires were subsequently exported and analyzed using Microsoft Excel, along with its data analysis tools.

As shown in Table 1, the mean scores for the ease of using and learning the software (4.16), the effectiveness of using the software (4.25), and the excitement of using the software (4.14) were statistically high. This suggests that the use of AR software in the classroom can enhance the effectiveness and enjoyment of learning mathematics.

Table 1. Analysis summary using mean and standard deviation values.

Sections	Mean Score	Standard Deviation
The ease of using and learning the software.	4.16	0.8179
The effectiveness of using the software.	4.25	0.6610

The excitement of using the software.	4.14	0.9859

Further analyses were conducted to support the result obtained by using average score. Based on Table 2, since the test statistic value (2.481) is greater than the critical value (1.659) then the null hypothesis, H_0: Less students agree that the use of AR in mathematical learning is more engaging, effective, and accessible, is rejected.

Additional analyses were performed to corroborate the results obtained through average scores. Based on the data in Table 2, the test statistic value (2.481) surpasses the critical value (1.659), leading to the rejection of the null hypothesis, H0, which posited that fewer students would agree that the use of AR in mathematical learning is more engaging, effective, and accessible.

Table 2. Analysis summary using paired t-test results.

Sections	Result
Test statistic value	2.481046
Critical Value	1.658953

Discussion

AR applications render the augmented object on the screen and play 3D examples of concepts that allow students to learn and engage. The application can capture the image of objects from the real environment and provide a detailed description of the object. Students can also create their own eLearning application enabled with AR with a unique concept. Besides that, AR can make education more accessible for students with disabilities by providing alternative ways to interact with content. It also allows students to gain knowledge through rich visuals and immersion into the subject matter (Sinha S., 2021).

AR can provide educators with innovative tools to create more engaging lessons. They can use AR apps to demonstrate complex concepts and make lessons more interactive. AR can replace textbooks, physical forms, posters, and printed brochures. This mode of mobile learning also reduces the cost of learning materials and makes it easy for everyone to access. Using modern technology, each teacher may build their curriculum and support materials, employing their most creative side to personalise learning. Education has become much more accessible, with a wide choice of learning techniques and degree options available. Students who learn using technology can build skills that will help them succeed in the future (Haleem, Abid, et al, 2022).

Lack of quality content focused on education, rather than entertainment, is a noted concern among teachers hesitant to use augmented reality in education. However, existing AR technology enables teachers to create immersive educational experiences on their own to help ensure their students understand curriculum content. Moreover, as AR content is digital, it is easily shared.A collaborative learning environment provides students with increased motivation to learn because they are actively engaged in the educational content creation process. (Maryville University, 2021)

Conclusion

The results obtained provide significant evidence to infer that most students agree that AR can enhance engagement, improve their understanding of mathematics, and is easy to manage.
These combined results furnish compelling evidence that the majority of students acknowledge the benefits of AR technology, affirming its potential to augment engagement, deepen understanding of mathematical concepts, and offer a user-friendly experience within the educational context.

References (Use APA format)

Chu, H.-C., Chen, J.-M., Hwang, G.-J., & Chen, T.-W. (2017). Effects of formative assessment in an augmented reality approach to conducting ubiquitous learning activities for architecture courses. Universal Access in the Information Society, 221–230.

Haleem, Abid, et al. "Understanding the Role of Digital Technologies in Education: A Review." Sustainable Operations and Computers, vol. 3, no. 3, May 2022, pp. 275–285, www.sciencedirect.com/science/article/pii/S2666412722000137, https://doi.org/10.1016/j.susoc.2022.05.004.

Lai, J. W., & Cheong, K. H. (2022). Adoption of Virtual and Augmented Reality for Mathematics Education: A Scoping Review. IEEE Access, 13693-13703.

Liarokapis, F., & Anderson, E. F. (2010). Using Augmented Reality as a Medium to Assist Teaching in Higher Education. Retrieved 9 5, 2023, from http://eprints.bournemouth.ac.uk/20907/1/eg_eduar10.pdf

Majerek, D. (2014). Application of GeoGebra for Teaching Mathematics. Advances in Science and Technology, 51–54.

Maryville University. (2021, March 12). Augmented Reality in Education: Interactive Classrooms. Maryville Online. https://online.maryville.edu/blog/augmented-reality-in-education/

Sinha, S. (2021, January 2). Augmented Reality In Education. ELearning Industry. https://elearningindustry.com/augmented-reality-in-education-staggering-insight-into-future

Napal, M., Mendióroz-Lacambra, A. M., & Peñalva, A. (2020) 'Sustainability Teaching Tools in the Digital Age'.

Schmitz, B., Specht, M., & Klemke, R. (2012) 'An Analysis of the Educational Potential of Augmented Reality Games for Learning'.

Pellas, N., Fotaris, P., Kazanidis, I., & Wells, D. (2019) 'Augmenting the learning experience in primary and secondary school education: A systematic review of recent trends in augmented reality game-based learning'.

Shin, N., Sutherland, L. M., Norris, C. A., & Soloway, E. (2012) 'Effects of game technology on elementary student learning in mathematics'.

Videnovik, M., Trajkovik, V., Kiønig, L. V., & Vold, T. (2020) 'Increasing quality of learning experience using augmented reality educational games'.

Azuma, R. T. (1997) 'A survey of augmented reality'.

YASIN HAFAZAN GAME (YHG) FOR CTU101 SUBJECT

Dr Syaimak Ismail[1], Dr Syahidah Mohamad Noor[2], Dr Azhar Abdul Rahman[3], Dr Mahfuzah Mohamed Zabidi[4]
UiTM Perlis, UiTM Kedah, UiTM Kedah, UiTM Perlis[1,2,3]
syaimak@uitm.edu.my,[1] noorsyahidah9177@uitm.edu.my,[2] azharabdulrahman@uitm.edu.my[3],
mahfuzah3051@uitm.edu.my[4]

Abstract: Yasin *Hafazan* Game (YHG) is an interactive memorization game that is able to assist students in order to complete their *hafazan* assessment. Fundamental of Islam course with code CTU101 is a compulsory subject that must be taken by all diploma students at UiTM. This subject must be passed for students to obtain graduation. To get a good carry mark, students need to memorize 20 verses of Surah Yasin to get 20 additional marks. Although the marks are not much, there are still many students who fail to score because of weakness to memorize the surah. The failure to memorize the verses are for several reasons. First, short memorization time. Second, not mastering the Qur'an well. Third, consider this assessment trivial. To overcome this problem, researchers have created an interactive game to test students' memorization and make it easier for them to quickly memorize with this YHG. Based on the survey conducted, many students managed to remember the memorization well because this game application is simple and helps increase the quality of the student's memorization.

Key words: Yasin, *Hafazan,* Game, CTU101

Introduction

Fundamental of Islam course with code CTU101 is a core subject of university that compulsory to be taken by all diploma students at UiTM. To achieve carry mark, one of the assessments is to memorize 1-20 verses of Surah Yasin for acquiring 20 marks. However, it is quite difficult for students to fulfill this assessment due to weak memorization of surah and it happens for several reasons; first, time restriction to complete the task within seven weeks, second, students are not considered as a huffaz. It is due to their background not directly related with Islamic courses such as Art Design, Business Administration, Information Management, Science Computer, Accounting etc. Third, students considered this assessment as an obstacle due to lack of knowledge on hukum *tajwid* and reciting the Quran is poorly executed. As supported by Ahmadi, Bahriii, Mohd Ashmir, Wongiii, Ahmad Ismail & Saimanv (2022), Ismail, A., Osman, K., and Hassan, N.H. (2021), Hashim, A., Tamuri, A. H, and Misnan Jemali, (2013) indicated the findings, students are lack of time to complete the task, less motivation, as well as lack of skills in memorizing the Quran.

Product Description

Researchers have created an interactive game to test students' memorization and make it easier for them to improve the *hafazan*. YHG was introduced to overcome the students' problem in memorization of 20 verses of Surah Yasin. Before meeting with the lecturer for *hafazan,* students can practice memorizing Yasin by playing games. They can continue to practice memorizing the surah by playing YHG. The idea behind this game is that students must pass the first sentence before moving on to the next verse. In this regard, this game emphasizes remembering each verse from Surah Yasin because students usually forget the beginning of a verse.

Results & Discussion

YHG can be accessed in various ways. A specific website for subjects with code CTU101 has been set up for students. They just need to access the website of CTU-Easy Access Centre to get the game link to practice their *hafazan*. Students also can play YHG through a QR code and a link sent on telegram by the lecturer. The Novelty and uniqueness of this products, this tool is a fun game memorization and applicable for students' *hafazan* assessment. It also enhances a new method of *hafazan* which is radically out of norms from the traditional approach through YHG. YHG is very easy to access and very comprehensive in improving students' assessment in *hafazan.*

In terms of commercialization and marketability, the proposed product is targeted to be commercialized to the universities that have courses based on memorizing the Qur'an. YHG can be applied as a basic game to start memorization and it is very easy to practice at any time. It is marketable to share, apply, adopt, and develop in other organizations with the same interest.

This method of memorization is useful because it assists the lecturer in assessing the performance of students in *hafazan* assessment. At the same time, it captures, analyzes, and then visualizes the real time score on students while using YHG and it monitors students' assessment for *hafazan.*

Conclusion

The research group plans to upgrade this game to a stable system by improving the quality of the game in the form of an easy-to-access application that can be downloaded from the Playstore. This project can provide many benefits to Muslim students who are involved with Quran hafazan such as *tahfiz* students under the Plus Tahfiz Club of UiTM. This application will help Muslims society to increase the quality of memorization and improve their hafazan.

Publication, Award, and Intellectual Property

Publication on proceeding with topic title 'Attractive Method for Memorization of Al-Quran Kareem' and received Bronze Medal in International Teaching Ad Competition 2023 ITAC organized by UiTM Johor. YHG has been registered in IP under UiTM. 97% of students are satisfied with YHG.

References

Ahmad, M. R., Bahri, S., Ashmir Wong, M. S., & Ismail, A. TT. (2022). The Issues and Challenges of Plus Tahfiz Students in Maintaining the Memorisation of The Quran in UiTM. *Journal of Fatwa Management and Research*, *27*(2), 27-36. https://doi.org/10.33102/jfatwa.vol27no2.435

Ismail, A., Osman, K., & Hassan, N.H. (2021). Cabaran Pengajaran dan Pembelajaran Tasmik Hafazan al-Quran Secara atas Talian Sewaktu Pandemik Covid-19. Bicara Dakwah kali ke 21: Dakwah dalam Talian Semasa Pandemik

Hashim, A., Tamuri, A. H, & Misnan Jemali, (2013). Latar Belakang Guru Tahfiz dan Amalan Kaedah Pengajaran Tahfiz Al-Quran di Malaysia. The Online Journal of Islamic Education. Vol. 1 (1): 28-39.

GeoGebra dalam Pembelajaran Bentuk dan Ruang di Sekolah Rendah

Hadi Shafien Udin[1], Norulhuda Ismail[2], Najua Syuhada Ahmad Alhassora[3]
Sekolah Pendidikan, Fakulti Sains Sosial dan Kemanusiaan, Universiti Teknologi Malaysia[123]
hadishafien@graduate.utm.my[1], p-norulhuda@utm.my[2], najuasyuhada@utm.my[3]

Abstrak: Kajian kuasi-eksperimental ini dijalankan bagi menilai keberkesanan penggunaan modul pembelajaran geometri berasaskan GeoGebra dalam meningkatkan tahap pemikiran geometri murid Tahun Lima. Modul ini dibina menggunakan kurikulum matematik Tahun Lima bagi topik pengukuran bentuk dan ruang gabungan manakala aktiviti pembelajaran dilaksanakan menggunakan applet GeoGebra dan disusun mengikut Fasa Pembelajaran van Hiele. Pembinaan modul pembelajaran geometri berasaskan GeoGebra ini diharapkan dapat membantu murid mempelajari dan mengukuhkan konsep geometri asas dengan baik menggunakan teknologi terkini seterusnya mengaplikasikan suasana pembelajaran tanpa sempadan.

Kata kunci: GeoGebra; modul pembelajaran; bentuk dan ruang; sekolah rendah

Pengenalan

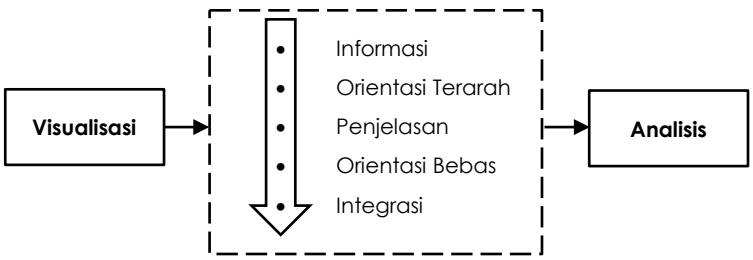
Geometri merupakan salah satu bidang yang diuji dalam penilaian *Trends in Mathematics and Science Study* (TIMSS). Hasil analisis yang dilakukan oleh Kementerian Pendidikan Malaysia (KPM) terhadap laporan keputusan penilaian TIMSS 2019 mendapati bahawa Malaysia memperoleh 466 mata bagi bidang geometri, dengan peningkatan 11 mata dari TIMSS 2015 (KPM, 2021). Namun begitu, jika dilihat dengan lebih menyeluruh melalui data skala penandaarasan seperti yang ditunjukkan dalam Jadual 1, pencapaian Malaysia masih berada pada tahap yang membimbangkan di mana 25% peserta berada pada tahap yang tidak mencapai standard, 27% pada tahap rendah dan 24% pada tahap sederhana (KPM, 2021).

Jadual 1: Pencapaian Malaysia bagi bidang geometri dalam TIMSS 2019

Skor	Kategori	Peratus (%)
0 – 399	Tidak Capai	25
400 – 474	Rendah	27
475 – 549	Sederhana	24
550 – 624	Tinggi	13
625 ke atas	Tertinggi	5

Walaupun peserta TIMSS 2019 terdiri daripada murid Tingkatan Dua, perkara ini menunjukkan bahawa penguasaan konsep geometri masih tidak berada pada tahap yang baik. Pembelajaran konsep geometri telah bermula sejak Tahun Satu di sekolah rendah manakala pembelajaran pengukuran bentuk dan ruang pula bermula pada Tahun Empat (KPM, 2015; 2018). Antara tajuk yang dibincangkan merangkumi pengukuran perimeter, luas, dan isi padu bentuk pepejal (KPM, 2018; 2019; 2020). Bentuk-bentuk yang terlibat dalam pembelajaran ini adalah poligon asas dan poligon sekata seperti segi tiga, segi empat, kubus, dan kuboid. Hal ini menunjukkan bahawa sekiranya konsep asas tidak difahami dan tidak dikuasai dari peringkat awal, murid akan mengalami kesukaran dalam pembelajaran pada peringkat yang lebih tinggi (Abdullah et al., 2020; Aspari & Hartono, 2021; Bedada & Mechaba, 2022).

Dalam pembelajaran bidang geometri, Teori van Hiele sering digunakan untuk mengukur tahap pemahaman murid terhadap pembelajaran bidang tersebut (Md Yunos et al, 2019; Tan, 2016). Teori ini memperkenalkan dua elemen penting iaitu Tahap Pemikiran Geometri van Hiele (TPGvH) dan Fasa Pembelajaran van Hiele (FPvH) (Burger & Shaughnessy, 1986; Chew & Idris, 2012; Md Yunos et al, 2019; Tan, 2016; Usiskin, 1982). Terdapat lima tahap dalam TPGvH iaitu visualisasi, analisis, deduksi informal, deduksi formal, dan rigor manakala dalam FPvH, juga terdapat lima fasa yang dikenali sebagai penerangan, orientasi terarah, penjelasan, orientasi bebas, dan integrasi. Salah satu sifat unik teori ini iaitu murid tidak boleh bertukar ke tahap pemikiran seterusnya menjadikan penggunaan teori ini sangat dipercayai dan meningkatkan kualiti pembelajaran murid dalam bidang geometri (Usiskin, 1982). Penggunaan FPvH dalam pembelajaran dapat dilihat dalam Rajah 1.



Rajah 1: Perubahan tahap pemikiran geometri melalui penggunaan FPvH

Umum mengetahui bahawa murid-murid sekolah rendah hari ini tergolong dalam kalangan Generasi Z di mana gaya pembelajaran mereka lebih terarah kepada penggunaan teknologi semasa (Shorey et al., 2021). Walau bagaimanapun, selepas Kurikulum Standard Sekolah Rendah (Semakan 2017) dilaksanakan, masih terlalu sedikit bahan bantu belajar yang berasaskan teknologi semasa dihasilkan (Abd Rahman, 2014, Aspari & Hartono, 2021; Subramaniam, 2017). Sedar akan kekurangan ini, pengkaji telah menjalankan analisis terhadap beberapa kajian awal berkaitan keberkesanan penggunaan perisian GeoGebra, iaitu salah satu perisian dinamik geometri (DGS) yang popular dalam pembelajaran bidang geometri di sekolah (Joshi, 2020; Mazlan, 2020; Musa et al., 2021; Putra et al., 2021; Tomaš et al, 2019).

Pendigitalan pembelajaran geometri terhasil dengan pembangunan beberapa perisian dinamik matematik (DMS) seperti *Geometer's SketchPad* (GSP), Cabri, dan *SketchUp*. Pada tahun 2002, Mark Hoehnwarter telah membangunkan perisian GeoGebra (Azizah et al., 2021; Condori et al., 2020) yang merupakan sebuah perisian yang boleh digunakan dan dimuat turun secara percuma (Kramarenko et al, 2021; Pamungkas et al., 2020). Perisian ini telah terbukti berkesan dalam membantu murid dalam pembelajaran konsep geometri, dan salah satunya adalah pengukuran bentuk dan ruang (Joshi, 2020; Putra et al., 2021; Tomaš et al, 2019).

Penerangan Produk

Dalam kajian ini, pengkaji telah menghasilkan sebuah modul pembelajaran yang diintegrasikan dengan penggunaan perisian GeoGebra dan FPvH. Kandungan pembelajaran yang dipilih adalah pengukuran bentuk dan ruang gabungan yang terkandung dalam topik keenam kurikulum matematik Tahun Lima. Aktiviti-aktiviti pembelajaran di dalam modul ini disusun menggunakan lima fasa berdasarkan FPvH. Dengan menggunakan FPvH, guru dapat merancang pelaksanaan sesi pembelajaran dengan baik dan tersusun agar murid dapat belajar, mengintegrasi idea pembelajaran asal dan baharu, seterusnya membina satu pengetahuan baharu yang lebih baik. Contoh susunan sesi pembelajaran ditunjukkan dalam Rajah 2.

Rajah 2: Contoh pelaksanaan sesi pembelajaran menggunakan FPvH

Daripada penghasilan modul berasaskan perisian GeoGebra ini, pengkaji menyasarkan perubahan suasana pembelajaran dari gaya pembelajaran berpusatkan guru kepada gaya pembelajaran berpusatkan murid di mana murid tidak bergantung sepenuhnya kepada guru untuk mempelajari topik tersebut. Perubahan ini akan membantu murid untuk meneroka dengan lebih luas pembelajaran konsep pengukuran secara kendiri manakala guru hanya bertindak sebagai pembimbing.

Selain itu, melalui penghasilan modul pembelajaran geometri berasaskan GeoGebra ini, pengkaji ingin menimbulkan suasana pembelajaran yang menggunakan teknologi sebagai medium utama dalam pelaksanaan sesi pembelajaran murid. Aktiviti-aktiviti pembelajaran yang dihasilkan di dalam modul pembelajaran dilaksanakan menerusi penggunaan perisian dan applet GeoGebra yang boleh diakses secara dalam dan luar talian. Pelaksanaan pembelajaran tersebut juga dapat mengoptimumkan penggunaan pelantar DELIMa yang dapat diakses di tanpa mengira tempat dan waktu, seterusnya mewujudkan suasana pembelajaran tanpa sempadan dan fleksibel. Bukan itu sahaja, perisian GeoGebra turut mewujudkan fungsi perkongsian bahan dan applet di seluruh dunia. Oleh itu, murid dapat berkolaborasi dengan rakan-rakan dan guru di dalam dan luar negara bagi mendapatkan bahan pembelajaran dan latihan tambahan untuk digunakan.

Dapatan & Perbincangan

Pembinaan modul pembelajaran geometri berasaskan GeoGebra ini bertujuan meningkatkan tahap pemikiran geometri murid selaras dengan lima Tahap Pemikiran Geometri van Hiele yang digunakan secara meluas dalam kajian pembelajaran bidang geometri. Murid yang dapat mencapai tahap pemikiran geometri yang sepadan dengan peringkat pembelajaran mereka tidak akan mempunyai masalah dalam mempelajari konsep-konsep geometri (Burger & Shaughnessy, 1986; Chew & Idris, 2012; Md Yunos et al, 2019; Tan, 2016; Usiskin, 1982; Yi et al., 2020). Penggunaan lima Fasa Pembelajaran van Hiele dalam penghasilan modul ini membantu murid menjalani aktiviti pembelajaran dengan lebih teratur dan tersusun bagi mengukuhkan konsep-konsep geometri yang dipelajari. Pergerakan tahap pemikiran geometri murid hanya akan berlaku setelah lengkap pelaksanaan kelima-lima Fasa Pembelajaran van Hiele menjadikan pembelajaran lebih berkualiti.

Penggunaan modul pembelajaran geometri berasaskan GeoGebra ini akan dapat membantu murid mengukuhkan pemahaman konsep asas geometri sebelum mempelajari konsep geometri lain yang lebih kompleks (Abdullah et al., 2020; Aspari & Hartono, 2021; Ikram & Rosidah, 2020; George, 2020). Pemahaman konsep yang baik juga dapat membantu murid meningkatkan kemahiran penyelesaian masalah geometri (Harisman et al., 2020;

Pavlovičová et al., 2022) melalui aktiviti yang dijalankan menggunakan perisian GeoGebra. Pemahaman konsep yang baik akan membantu murid untuk belajar dengan lancar dan mudah pada peringkat yang lebih tinggi (Yorulmaz & Uysal, 2021) di samping membantu mereka meningkatkan pencapaian (Aspari & Hartono, 2021; Bedada & Mechaba, 2022) dalam pelbagai penilaian dalam dan luar negara seperti Sijil Pelajaran Malaysia (SPM) dan TIMSS.

Pembinaan modul pembelajaran geometri berasaskan GeoGebra ini juga bertujuan untuk mengubah penetapan minda (*mindset*) dan ketakutan murid dalam mempelajari matematik. Penggunaan perisian GeoGebra membolehkan murid untuk menyerlahkan kreativiti dan bakat mereka dalam pelbagai aspek di mana selain belajar, mereka juga dapat memanipulasi bahan yang dipelajari mengikut kehendak mereka seperti pembinaan sesebuah bangunan daripada cantuman bentuk-bentuk geometri. Melalui pembinaan bangunan tersebut, mereka dapat mengenal pasti tahap kestabilan daripada pengiraan dan pengukuran yang telah dipelajari pada awal sesi pembelajaran. Aktiviti seperti ini akan menyerlahkan lagi keindahan matematik.

Kesimpulan

Bagi menyahut seruan pendigitalan pendidikan yang dijalankan di serata dunia pada masa ini, diharapkan agar modul pembelajaran geometri berasaskan GeoGebra ini dapat membantu murid-murid Tahap Dua di sekolah rendah mempelajari topik pengukuran bentuk dan ruang dengan lebih baik menggunakan teknologi terkini. Di samping itu, dengan penghasilan modul pembelajaran geometri berasaskan GeoGebra ini juga, pengkaji mengharapkan agar tahap pemikiran geometri murid dapat ditingkatkan dan ditambah baik.

Modul pembelajaran geometri berasaskan GeoGebra yang dihasilkan masih berada dalam peringkat analisis kesahan pakar. Kajian rintis bagi menguji keberkesanan produk akan dilaksanakan dalam masa terdekat. Selain itu, pendaftaran *intellectual property* juga akan dijalankan selepas proses kesahan selesai. Penambahbaikan juga akan sentiasa dilakukan bagi memastikan modul pembelajaran geometri berasaskan GeoGebra ini sentiasa dapat digunakan dengan baik dan selaras dengan kehendak kurikulum semasa. Penambahan aktiviti dan fungsi seperti realiti terimbuh (AR) akan dilaksanakan dari semasa ke semasa.

Rujukan

Abd Rahman, S. N. (2014). Keberkesanan pembelajaran matematik menggunakan GeoGebra terhadap pembentukan pemikiran geometri murid. [Tesis sarjana tidak diterbitkan]. Universiti Teknologi Malaysia.

Abdullah, A. H., Misrom, N. S., Abdul Kohar, U. H., Hamzah, M. H., Mohamad Ashari, Z., Ali, D. F., Abu Samah, N., Mohd Tahir, L., & Abd Rahman, S. N. S. (2020). The effect of an inductive reasoning learning strategy assisted by the GeoGebra software on students' motivation for the functional graph II topic. *IEEE Access, 8*, 143848 – 143861. https://doi.org/10.1109/ACCESS.2020.3014202

Aspari, D. C. & Hartono, M. (2021). The effectiveness of module and GeoGebra based learning media to improve mathematics learning outcome of Grade IV students. *2021 7th International Conference on Education and Technology (ICET)*. https://doi.org/10.1109/ICET53279.2021.9575088

Azizah, A. N., Kusmayadi, T. A., & Fitriana, L. (2021). The Effectiveness of Software GeoGebra to Improve Visual Representation Ability. *IOP Conference Series: Earth and Environmental Science, 1808*(1). https://doi.org/10.1088/1742-6596/1808/1/012059

Bedada, T. B. & Machaba, M. F. (2022). The effect of GeoGebra on students' abilities to study calculus. *Hindawi: Education Research International, 2022*, 1 – 14. https://doi.org/10.1155/2022/4400024

Burger, W. F. & Shaughnessy, J. M. (1986). Characterizing the Van Hiele levels of development in geometry. *Journal for Research in Mathematics Education, 17*(1), 31 – 48.

Chew, C.M., & Idris, N., (2012). Enhancing students' geometric thinking and achievement in solid geometry. *Journal of Mathematics Education. 5*(1), 15-33

Condori, A. P., Velazco, D. J. M. & Fernández, R. A. (2020). GeoGebra as a technological tool in the process of teaching and learning geometry. Dalam Morales, G. R., Fonseca, C. E. R., Salgado, J. P., Pérez-Gosende, P., Cordero, M. O. & Berrezueta, S. (Eds), *Information and Communication Technologies*, (pp. 258 – 271), Springer Cham. https://doi.org/10.1007/978-3-030-62833-8

George, M. L. (2020). Effective Teaching and Examination Strategies for Undergraduate Learning During COVID-19 School Restrictions. *Journal of Educational Technology Systems, 49*(1), 23–48. https://doi.org /10.1177/0047239520934017

Harisman, Y., Noto, M. S., & Hidayat, W. (2020). Experience student background and their behavior in problem solving. *Infinity Journal,* 9(1), 59 – 68. https://doi.org/10.22460/infinity.v9i1.p59-68

Ikram, F. Z. & Rosidah (2020). Rural vs urban: Teachers' obstacles and strategies in mathematics learning during COVID-19 pandemic. *Southeast Asian Mathematics Education Journal, 10*(2), 69 – 74.

Joshi, J. R. (2020) Effectiveness of GeoGebra in teaching mensuration. [Tesis sarjana tidak diterbitkan]. Tribhuvan University.

Kementerian Pendidikan Malaysia (2015). *Dokumen Standard Sekolah Rendah Matematik Tahun 1 Kurikulum Standard Sekolah Rendah (Semakan 2017)*. Kementerian Pendidikan Malaysia.

Kementerian Pendidikan Malaysia (2018). *Dokumen Standard Sekolah Rendah Matematik Tahun 4 Kurikulum Standard Sekolah Rendah (Semakan 2017)*. Kementerian Pendidikan Malaysia.

Kementerian Pendidikan Malaysia (2019). *Dokumen Standard Sekolah Rendah Matematik Tahun 5 Kurikulum Standard Sekolah Rendah (Semakan 2017)*. Kementerian Pendidikan Malaysia.

Kementerian Pendidikan Malaysia (2020). *Buku Teks Matematik Tahun 5 Sekolah Kebangsaan*. Kementerian Pendidikan Malaysia.

Kementerian Pendidikan Malaysia (2021). *Laporan Analisis Item Matematik TIMSS 2019*. Kementerian Pendidikan Malaysia.

Kramarenko, T. H., Pylypenko, O. S., & Serdiuk, O. Y. (2021). Digital technologies in specialized mathematics education: application of GeoGebra in Stereometry teaching. *AET 2020: Symposium on Advances in Educational Technology*, 627–647. https://kdpu.edu.ua/personal/ tkramarenko.html

Mazlan, Z. Z. (2020). Analyzing Year 2 DLP pupils' motivation in learning the topic of shape and space by using ARCS model instruction incorporating GeoGebra. *Jurnal Penyelidikan Pendidikan Guru, 15*. 1 – 16.

Md Yunus, A. S., Ayub, A. F. M., & Hock, T. T. (2019). Geometric thinking of Malaysian elementary school students. *International Journal of Instruction, 12*(1), 1095–1112. https://doi.org/10.29333/iji.2019.12170a

Musa, M., Mamat, Y., & Ghazali, M. (2021). Teachers' Status of GeoGebra Use in The Teaching of Geometric Transformation. *Turkish Journal of Computer and Mathematics Education, 12*(14), 4326–4332.

Pamungkas, M. D., Rahmawati, F., & Dinara, H. A. (2020). Integrating GeoGebra into Space Geometry in College. *3rd International Conference on Learning Innovation and Quality Education, 397 (Icliqe 2019)*, 999–1006. https://doi.org/10.2991/assehr.k.200129.123

Pavlovičová, G., Bočková, V., & Laššová, K. (2022). Spatial ability and geometric thinking of the students of teacher training for primary education. *TEM Journal, 11*(1), 388 – 395. https://doi.org/10.18421/TEM111-49

Putra, Z. H., Hermita, N., Alim, J. A., Dahnilsyah, & Hidayat, R. (2021). GeoGebra integration in elementary initial teacher training: The case of 3D shapes. *International Journal of Interactive Mobile Technologies, 15*(19), 21 – 32. https://doi.org/10/3991/ijim.v15i19.23773

Shorey, S., Chan, V., Rajendran, P. & Ang, E. (2021). Learning styles, preferences and needs of generation Z healthcare students: Scoping review. *Nurse Education in Practice, 57*(103247), 1 – 11

Subramaniam, M. (2017). Pemahaman murid tahun lima tentang luas segi empat. [Tesis kedoktoran tidak diterbitkan]. Universiti Malaya.

Tan, T. H. (2016). Effects of van Hiele's phases of learning and theory of geometry thinking on geometry learning of Malaysian Year Five students. [Tesis Doktor Falsafah tidak diterbitkan]. Universiti Putra Malaysia.

Tomaš, S., Jurić, J., & Paradžik, M. (2019). GeoGebra appliance in the teaching of mathematics in lower grades of elementary school. *Metodički Obzori,13*(1(25)), 101 – 120.

Usiskin, Z. (1982). *van Hiele Levels and Achievement in Secondary School Geometry*. The University of Chicago.

Yi, M. J., Flores, R., & Wang, J. (2020). Examining the influence of van Hiele theory-based instructional activities on elementary preservice teachers' geometry knowledge for teaching 2-D shapes. *Teaching and Teacher Education, 91*(103038), 1 – 12. https://doi.org/10.1016/j.tate.2020.103038

Yorulmaz, A. & Uysal, H. (2021). Identifying concepts created for geometric objects: Mind map. *Shanlax International Journal of Education, 9*(4), 309-324. https://doi.org/10.34293/education.v9i4.4179

Collaborative Inquiry-Based Learning Model for Entrepreneurial and Lateral Thinking Empowerment Among Postgraduate Students

Noorlizawati Abd Rahim
Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia
noorlizawati@utm.my

Highlights: The collaborative inquiry-based learning model addresses the challenge of enhancing entrepreneurial and lateral thinking among diverse, working postgraduate students. By fostering collaboration and practical relevance, it empowers learners to innovate within limited time frames. Integrating inquiry-based learning and diverse case studies, the model nurtures skills applicable to their work contexts. It facilitates idea generation, problem-solving, and validation, fostering a mindset adaptable to real-world challenges. This uniqueness propels learners towards acquiring essential skills for future professional success, distinguishing it from conventional teaching methods.

Key words: collaborative learning; entrepreneurial thinking; inquiry-based learning lateral thinking; postgraduate education, working students.

Introduction

Empowering entrepreneurial and lateral thinking remains relevant at the postgraduate level, even for working students, for several reasons. Entrepreneurial thinking encourages individuals to tackle challenges with inventive solutions (Kirb, 2004), while lateral thinking involves exploring unconventional pathways for problem-solving and idea generation (Vogel, 2014). Employees who can think entrepreneurially and laterally bring a unique perspective to their works. They are more likely to identify untapped opportunities, propose disruptive ideas, and contribute to a company's competitive advantage (Tseng & Tseng, 2019). Indeed, they make great leaders, as entrepreneurial thinking fosters leadership skills by encouraging individuals to take initiative, think critically, and seize opportunities. Lateral thinking enhances leadership (Sloane, 2017) by enabling individuals to consider diverse viewpoints and navigate complex challenges.

While students may have acquired these foundational skills during their undergraduate studies and work experiences, postgraduate education aims to deepen and refine these abilities, fostering a higher level of critical and innovative thought. Furthermore, professional environments continually evolve, demanding adaptability and creative problem-solving (Basadur et al., 2014; Johnstone & Wilson-Prangley, 2021; Lengnick-Hall & Beck, 2016) that might not have been fully developed earlier (Belski & Belski, 2018). Therefore, cultivating entrepreneurial and lateral thinking at the postgraduate level serves to augment the practical and intellectual capacity of working students, enabling them to excel in an ever-changing professional landscape.

Nonetheless, educators face multifaceted challenges in cultivating entrepreneurial and lateral thinking among postgraduate students with diverse academic and professional backgrounds. Striking a balance between achieving optimal learning outcomes within limited timeframes of academic term is crucial. Firstly, working postgraduate students often have limited time due to their job commitments (Beatson, 2021). Traditional methods might not be suitable given their packed schedules (Carriger, 2016). Secondly, the challenge lies in making the learning experience relevant to the students' work context (Cervantes & Cooper, 2022). If they can't see a direct link between the concepts they are learning and their professional responsibilities, they might struggle to engage fully. Thirdly, many traditional teaching methods involve instructors delivering content to passive learner. However, for entrepreneurial and lateral thinking, a more student-centered, participatory approach is often more effective (Duron et al., 2006) and requires educators to design a learning model that maximizes outcomes within a limited time window.

Product Description

This extended abstract presents a 5-step collaborative inquiry-based learning model designed for the course "Creativity and Innovation Management" targeting working professionals in the field of Engineering Business Management. The objective is to foster entrepreneurial and lateral thinking skills among the postgraduate students, equipping them with the necessary tools to drive innovation within their organizations. This model aims to create an engaging and dynamic learning environment that encourages active participation, and innovation in problem-solving.

The proposed model recognizes the unique needs and characteristics of the target audience, consisting of working professionals enrolled as part timers in a taught course master's degree program. These individuals bring practical industry experience, diverse perspectives, and a desire to enhance their innovation capabilities. The model leverages their existing knowledge and provides a platform for collaborative learning and exchange of ideas.

As shown in Figure 1, the collaborative inquiry-based learning model comprises five key stages. In implementing instructional strategies within the model, the initial step involves selecting a real-world case study from an engineering-based industry, which aligns with the crucial process of problem identification. Through this contextual

foundation, students proceed to identify pivotal challenges and opportunities intrinsic to the chosen case study. Subsequently, students delve into research, gathering pertinent data and analysing the context in which creativity and innovation were applied within the industry or organization. This phase not only nurtures analytical skills but also paves the way for informed insights.

The model then introduces the stage of brainstorming and idea generation. Here, the application of creativity tools like SCAMPER (Eberle, 1972) and design thinking approach (Todd & Stewart, 2023) drives students to go beyond conventional boundaries, generating innovative ideas and novel approaches that address the specific challenges posed by the selected case study. This phase acts as a dynamic catalyst, prompting students to explore uncharted territories of thought (Chulvi et al., 2013; Gu et al., 2022).

As the process evolves, students enter the prototyping and experimentation stage. Based on their generated ideas, students create and test prototypes (or propose conceptual) of ingenious solutions. Drawing from concepts such as blue ocean strategy (Kim, 2005) and ambidextrous organization (Durisin & Todorova,2012), they navigate the innovative problem-solving, aiming to effectively address the challenges presented by the real-world case study.

Finally, students are tasked with presenting their comprehensive findings, innovative strategies, and profound insights to the class. This platform not only fosters collaborative discussions but also facilitates the cross-pollination of ideas among the diverse groups. Emphasizing the practical applicability of the model, the reflective component reinforces the alignment between ideas and actions. By promoting an active reflection on the presented strategies, the model ensures that innovative ideas are not only conceptualized but also can be effectively put into action, bridging the gap between theory and real-world implementation.

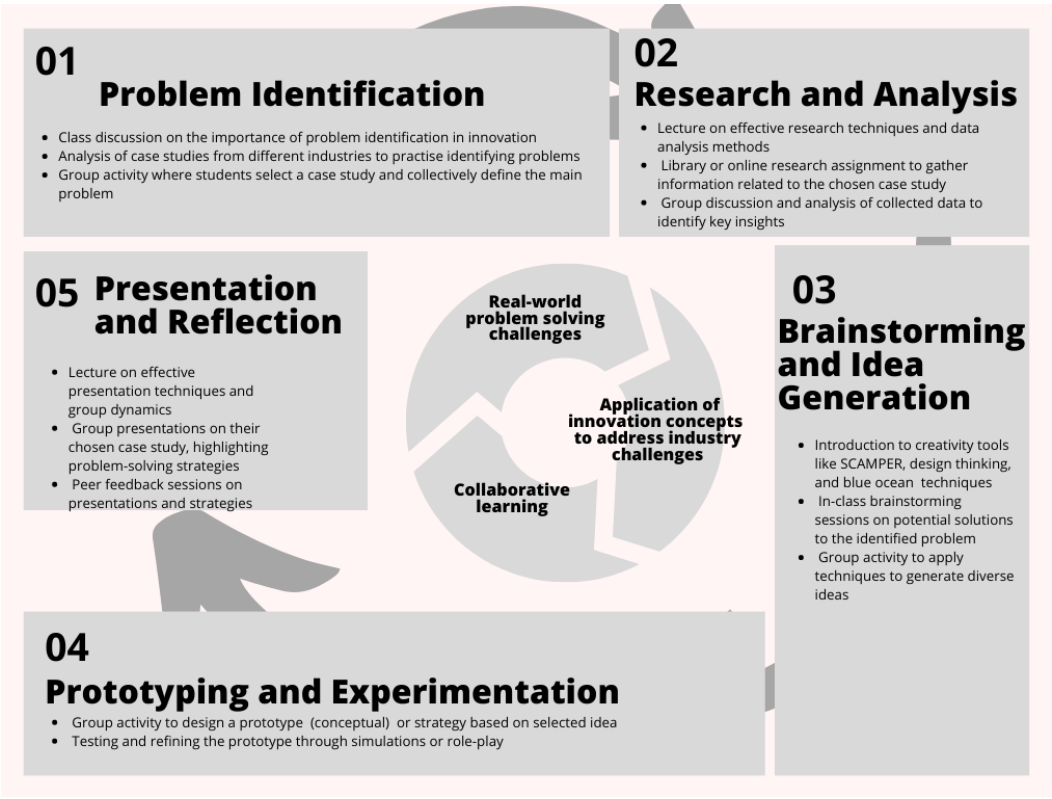


Figure 1. A 5-Step Model for Entrepreneurial and Lateral Thinking Empowerment

Unlike traditional methods that often involve one-way lectures and standardized assessments, the uniqueness of this model is that it redefines the learning experience. It replaces passive listening to lectures with active problem-solving. Instead of isolated tasks, it encourages collaborative exploration. Rather than rote memorization, it nurtures critical thinking and creativity.

In contrast to conventional approaches, where students often tackle hypothetical scenarios, this model immerses them in real-world challenges, igniting a sense of relevance and urgency. By integrating creativity tools like SCAMPER (Wu and Wu, 2020), blue ocean strategy, ambidextrous innovation, and bridging theory with practice, it bridges the gap between classroom learning and practical application, fostering adaptable and innovative thinkers. The emphasis on group collaboration mirrors the dynamics of modern workplaces, empowering students for the collaborative realities of the professional world.

While traditional models often focus on a linear sequence of instruction, the model embraces an iterative process. It requires students to identify problems, gather insights, generate ideas, test them, and reflect on outcomes, mirroring the actual cycles of innovation and problem-solving.

Ultimately, the model's innovativeness lies in its ability to create a dynamic, immersive, and practical learning journey that specifically addresses the unique constraints faced by working postgraduates. This targeted approach is tailored to optimize learning outcomes within limited time frames while ensuring that the learning experience remains meaningful and applicable to their jobs. By guiding students through a structured 5-step process, the model maximizes efficiency and relevance. As active participants in their education, students not only acquire knowledge but also develop crucial skills and mindsets necessary to excel in an ever-evolving world. This approach not only promotes innovative problem-solving but also instils the confidence to apply acquired knowledge directly to their job roles.

Results & Discussion

The potential impact of the 5-step collaborative inquiry-based learning model on education stakeholders can be observed through the insights shared by students based on their responses to specific questions as tabulated in Table 1. These insights underscore the model's multifaceted influence, ranging from application in practical contexts to fostering collaboration, motivation, and engagement.

The first question, which focuses on the application of acquired knowledge and skills, highlights the model's potential to bridge theory and practice. By implementing the concepts of ambidextrous, SCAMPER methodology, and design thinking, individuals are empowered to apply innovative techniques within their organizations and personal endeavours. This application extends to strategic explorations, problem-solving, and even promoting a culture of creativity and innovation within departments. The model thus equips working postgraduate students with actionable tools that address real-world challenges and opportunities.

The second question delves into the enhancement of creative thinking and innovative problem-solving. The responses reflect a shift in perspective and the adoption of innovative concepts. The application of design thinking to validate solutions from multiple viewpoints fosters an inclusive and collaborative approach to problem-solving. Concepts like blue ocean strategy also empower individuals to explore untapped opportunities, contributing to organizational growth. This showcases the model's potential to shape the mindset and strategies of postgraduate students, enabling them to approach challenges with innovative perspectives.

The third question focuses on collaboration and knowledge sharing, highlighting the model's efficacy in fostering an interactive learning environment. The testimonials affirm the model's success in promoting group cohesion, value exchange, and open discussions. The model facilitates collaborative problem-solving and provides a platform for diverse viewpoints, mirroring the collaborative dynamics of modern workplaces. This demonstrates the model's potential to prepare graduates for collaborative and diverse professional scenarios.

The fourth question examines engagement and motivation throughout the course. The responses affirm that the model's engaging pedagogy, interactive discussions, and supportive learning atmosphere contribute to sustained motivation. The role of enthusiastic instructors and engaging course mates underscores the model's potential to cultivate a positive learning environment, thereby enhancing the overall learning experience.

Conclusion

In conclusion, through real-world application and interactive learning, the collaborative inquiry-based learning model creates educational experience that bridges the gap between theory and practice, ultimately propelling working postgraduate students towards success and impact in their respective fields. By enabling practical application, enhancing entrepreneurial and lateral thinking, fostering collaboration, and sustaining engagement, the model empowers students with the skills, mindset, and approaches required to thrive in evolving professional contexts. Moving forward, the model can be further enhanced by incorporating emerging technologies, such as virtual collaboration platforms, to facilitate seamless interaction among diverse groups of working postgraduate students, regardless of location. Additionally, regular reviews and updates of the model's content to integrate the latest creative thinking methodologies will ensure its continuous alignment with the dynamic demands of the professional sphere. This commitment to refinement will amplify the model's impact and ensure its significance in innovative education for future generations.

Table 1: Feedback on students' experiences, learning outcomes, and application of acquired knowledge in real-world settings

Respondent /Question	**Can you provide examples of how you have applied the acquired knowledge and skills from the course in your professional or personal life?**	**Did the course enhance your ability to think creatively and approach problems from an innovative perspective? If so, please provide specific examples?**	**Reflecting on the group activities and discussions, how effectively did the course foster collaboration and knowledge sharing among students?**	**Did you feel actively engaged and motivated throughout the course? Please elaborate on the factors that contributed to your level of engagement.**
1	Sometimes I have ideas but got rejected by people around me. So, I try to weigh the pros and cons of the idea, the costs and find the best way to persuade people to accept it	Yes. My perspective definitely has changed after taking the course but as of now, I can't think of any recent examples.	Everyone worked together and played their part.	Yes. The group discussion and presentation sessions encouraged us to ask questions and give our opinions as well. The enthusiasm of the lecturer and students' participation also made me eager to learn and not feeling bored.
2	The brainstorming in the risk assessments and how to solve the problems by innovations	Yes, the concept of SCAMPERS and Kaizen are crucial when monitoring our plan and must create the new innovations in developing the procedures, and technologies.	The discussion required full contribution from all . The creativity had been demonstrated when the practices of open discussions and value every single idea that was encouraged to arise in this course	Yes, creativity is not only by genetically born. It can be expressed and elaborated by the methods, engagements and practices as per the lesson had made into recommendations.
3	Thinking about what can be combined or substituted (SCAMPER) to reduce rejection product	As for now, it is not clearly seen yet but I want to be brave to inform my manager by giving ideas and promote creativity in my department.	My groupmates are very nice and very supportive when we do group activities. We can share ideas without bashing each other and it is a very good experience.	Yes, I feel motivated to go to class. The factors are the lecturer is also motivated and very encouraging and make it fun to attend the class. Plus, the course mates are very engaging in asking questions, making me also influenced to ask even though my English is not very good.
4	I have been using the design thinking method without realised before. After full understanding of it, I can apply it more systematic and effective to have better result. Design thinking can be used in troubleshooting and continuous improvement. On day-to-day operation, there are challenges to maintain plant reliability, hence, this approach able us to digging on the root cause and come out with the reasonable and innovative solution considered time, cost and safety in place	Absolutely yes! As been asked in class, how to avoid giving that we ourselves think it is adaptable and effective, but not from others' perspectives. Thru design thinking tools, validation is the best step to evaluate our solution is adaptable to all and give value to others or it just for our own satisfaction and benefit.	I like the case study assessment and presentation. From here, we know more about other companies and how they run then business. I also learnt new things from other case studies	Yes! Openness by the lecturer and the colleague. No judgemental and able to accept different point of view, opinion, and perspective.
5	Recently my company selected myself to be a part of creativity and innovation of the organization. It is more on exploration of the business. For that I need to prepare some essay and I am grateful I took this subject cause I have ideas on the strategies of creativity and able to apply those tools	Yes, for an example blue ocean strategy. In company we all moving in the same direction and maybe this is a time to explore untapped market and be more innovative.	Each of my groupmates share their knowledge and it is always an entire group decision on the content of presentation. We learn from each other also.	Absolutely, I feel so motivated in the class because the instructor's teaching approach is very straight forward. Whatever we learn, we apply that by brainstorming among group and convey it through presentation. It helps us to learn more about the topic and while doing Post Module Assessment we can actually understand what we studied and can relate to our real life.

6	I can apply all my knowledge of creative and innovation management to my career field, as well as employ logical thinking to enhance my future business. I can generate ideas, demonstrate critical thinking in problem-solving, and effectively utilize acquired knowledge for continuous improvement in terms of product/services development, entrepreneurship, and business innovation.	Yes. I can say that all the knowledge gained in this course is new to me, and I am glad to be a part of this class. This subject always encourages students to link with real-world experience sharing, and it is the best example to give understanding to the students.	My team members always strive to do their best in group work. Everyone is excited and takes their own initiative by diligently seeking input to answer the given questions. We then combine all the information together, brainstorm, and discuss before producing the end result for presentation purposes.	Yes, the instructor always asked students to share their opinions and encouraged questions to foster critical thinking and enhance understanding of the discussed subjects
7	With knowledge in this course, it gives me some idea of innovation and provide me knowledge to use the relevant tool for me either using in PETRONAS or any future business.	I have successfully implemented the concept of "idea ambidexterity" within my organization. I established a team to lead the innovation structure, promoting departmental growth and aligning it with management's objectives. For instance, I employed brainstorming tools along with the business canvas model and other ambidextrous techniques. Before these changes, I shared foundational knowledge of innovation and creativity to facilitate their implementation in my department.	During group discussions, I gained insights into managing teams from diverse industries and backgrounds. The class participants actively engaged in sharing ideas and their expertise, although occasional contradictions and resistance to my ideas occurred. Another challenge was dealing with team members' egos and a lack of cooperation in sharing ideas and maintaining work quality. Aligning such individuals with the team's direction proved to be a significant challenge. At times, the team decided to streamline ideas for presentations, which might not have met everyone's satisfaction, especially if their idea wasn't highlighted on the slides. However, we aimed to ensure timely and simplified presentations to effectively convey the content.	yes, I'm able to express and share my experience in class. Lecturer giving the opportunity and forces everybody in class giving their talk and sharing.
8	The ambidextrous way in personal life, while maintaining the current life, meanwhile need to explore more knowledge for career and personal growth.	Yes. Everything we see a thing; we will try to think of at least one example of the thing or product that can be innovated. Especially using SCAMPER	Very effective. Every group give and has its own mindset or way to see a thing. We can see various points angle of view for every case study. It is like connecting the dots in our knowledge and mindset.	Discussion with group and class. Everyone gives feedback and share experience in the context of this subject

Publication, Award and Intellectual Property

Submission to IEEE Technology and Engineering Management Society Conference: Asia-Pacific TEMSCON-ASPAC 2023 (December 2023)- Paper entitled 'Innovative Problem-Solving Skill Development among Engineering Business Management Students Through Collaborative Inquiry-Based Learning Experience.'

References

Basadur, M., Gelade, G., & Basadur, T. (2014). Creative problem-solving process styles, cognitive work demands, and organizational adaptability. The journal of applied behavioral science, 50(1), 80-115.

Beatson, N. J., De Lange, P., & Oosthuizen, H. (2021). A question of balance: study–work–life, perspectives from accounting students. Pacific Accounting Review, 33(3), 257-273.

Belski, I., & Belski, R. (2018, December). Are We Fit To Graduate Creative Professionals?. In 2018 IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE) (pp. 365-371). IEEE.

Cervantes, C. V., & Cooper, R. (2022). Labor market implications of education mismatch. European Economic Review, 148, 104179.

Chulvi, V., González-Cruz, M. C., Mulet, E., & Aguilar-Zambrano, J. (2013). Influence of the type of idea-generation method on the creativity of solutions. Research in Engineering Design, 24, 33-41.

Durisin, B., & Todorova, G. (2012). A study of the performativity of the "ambidextrous organizations" theory: Neither lost in nor lost before translation. Journal of Product Innovation Management, 29, 53-75.

Duron, R., Limbach, B., & Waugh, W. (2006). Critical thinking framework for any discipline. International Journal of Teaching and Learning in Higher Education, 17(2), 160-166.

Eberle, R. F. (1972). Developing imagination through scamper. Journal of Creative Behavior, 6, 3, 199-203, 72.

Gu, X., Ritter, S. M., Delfmann, L. R., & Dijksterhuis, A. P. (2022). Stimulating creativity: Examining the effectiveness of four cognitive-based creativity training techniques. The Journal of Creative Behavior, 56(3), 312-327.

Johnstone, R., & Wilson-Prangley, A. (2021). The relationship between mindfulness and individual adaptability in dynamic work contexts.

Kim, W. C. (2005). Blue ocean strategy: from theory to practice. California management review, 47(3), 105-121.

Kirby, D. A. (2004). Entrepreneurship education: can business schools meet the challenge?. Education+ training, 46(8/9), 510-519.

Lengnick-Hall, C. A., & Beck, T. E. (2016). Resilience capacity and strategic agility: Prerequisites for thriving in a dynamic environment. In Resilience Engineering Perspectives, Volume 2 (pp. 61-92). CRC Press.

Sloane, P. (2017). The leader's guide to lateral thinking skills: unlock the creativity and innovation in you and your team. Kogan Page Publishers.

Todd, E. M., & Stewart, P. (2023). Guidelines for training design thinking in organizations. Industrial and Commercial Training, 55(3), 364-374.

Tseng, C., & Tseng, C. C. (2019). Corporate entrepreneurship as a strategic approach for internal innovation performance. Asia Pacific Journal of Innovation and Entrepreneurship, 13(1), 108-120.

Vogel, T. (2014). Breakthrough thinking: A guide to creative thinking and idea generation. Simon and Schuster.

Wu, T. T., & Wu, Y. T. (2020). Applying project-based learning and SCAMPER teaching strategies in engineering education to explore the influence of creativity on cognition, personal motivation, and personality traits. Thinking Skills and Creativity, 35, 100631.

Hybrid Learning Design to Develop Numeracy Literacy of Junior High School Students

Azizul Jabbar Mansyur[1, a)] , Nurul Hidayah[1, b)]
[1] Jurusan Matematika FMIPA Universitas Negeri Makassar, 90224
[a)] azizuljabbar08738@gmail.com
[b)] nurulhidayah54.nh@gmail.com

Highlights: This research aims to investigate the process and outcomes of hybrid learning design in enhancing the numeracy literacy skills of junior high school students. The research methodology employed in this study is design research, comprising preliminary analysis, experimentation, and retrospective analysis stages. The research was conducted at SMP Islam Athirah 2 Makassar, involving 25 students from class VIII 1. The research instruments utilized include student worksheets on linear equations, teacher and student observation sheets, and student response questionnaires. The findings of the study indicate that: (1) hybrid learning should consider several steps in its process to ensure effective learning; (2) the designed hybrid learning approach fulfills the validity criteria for student response questionnaires, with a percentage of 75.89%, and student tests, with a percentage of 82.53% meeting the minimum passing grade. There was a significant improvement in the average scores achieved in each session. Furthermore, students responded positively to hybrid learning, particularly regarding the use of technology and student interactions. Based on the results of this research, it can be concluded that the hybrid learning design can enhance the numeracy literacy skills of junior high school students.

Key words: Learning Design; Hybrid Learning; Numerical Literacy

Introduction

Dengan adanya virus covid-19 di Indonesia ini sangat berdampak bagi seluruh masyarakat, baik dari sektor ekonomi, pendidikan, sosial, dan pariwisata (Aldino, 2021). Hal ini juga berdampak pada lembaga pendidikan yang membuat pemerintah mengambil keputusan untuk tidak melakukan pembelajaran tatap muka untuk sementara waktu. Metode belajar secara daring diambil sebagai cara yang tepat untuk menyesuaikan keadaan yang sedang terjadi. Seiring berjalannya waktu, salah satu solusi yang hadir adalah dengan melaksanakan pembelajaran dengan metode Hybrid learning. Model pembelajaran hybrid learning merupakan suatu model pembelajaran yang didalamnya terdapat penggabungan pembelajaran secara tatap muka di kelas dan ditambah dengan pembelajaran dengan menggunakan komputer secara offline dan online (Jamaluddin, 2018). Pembelajaran matematika juga tak lepas dari metode hybrid learning. Hybrid learning muncul sebagai dampak dari pemanfaatan teknologi berbasis internet dalam bidang pendidikan. Internet menjanjikan kemudahan dan kemampuan masif dalam menyajikan materi. Internet mampu menawarkan perolehan informasi dengan cepat.

Pembelajaran matematika perlu diberikan untuk membantu siswa dalam memahami fakta-fakta, konsep-konsep, dan prinsip-prinsip pada matematika. Oleh karena itu, pendidikan matematika merupakan sarana yang digunakan untuk mempermudah integrasi peserta didik ke dalam dunia logika sehingga dapat menjadi manusia yang kritis dan kreatif dalam memecahkan masalah realitas kehidupan, serta dapat menemukan solusi untuk mengubah hidup mereka (Devi, 2020). Adapun kemampuan yang dapat menggunakan matematika dalam kehidupan sehari-hari disebut dengan literasi numerasi.

Berdasarkan observasi awal dari peneliti terdapat permasalahan dari siswa yang dimana beberapa siswa kurang dalam menyelesaikan masalah matematika yang berbasis literasi yang dimana soalnya berbentuk cerita dan berkaitan dengan keseharian mereka dan sulit memodelkan ke dalam bentuk matematika. Ditambah dengan hasil wawancara dengan salah satu guru Matematika SMP Islam Athirah 2 Makassar, pelaksanaan pembelajaran di sekolah dilaksanakan secara hybrid learning dan dilihat dari beberapa siswa yang ada di sekolah tersebut, terdapat beberapa siswa yang masih belum menerima metode pembelajaran hybrid learning dan ini menyebabkan adanya perbedaan kemampuan pada siswa dalam literasi numerasi mereka. Dengan pemaparan tersebut, peneliti tertarik untuk melakukan penelitian "Desain Hybrid learning untuk Meningkatkan Kemampuan Literasi Numerasi Siswa SMP Islam Athirah 2 Makassar".

Product Description

TABEL 1. HLT *Hybrid Learning*

Aktivitas	Tujuan
Menyelesaikan permasalahan 1	Siswa dapat menganalisis hubungan antara pasangan bilangan/kuantitas yang keduanya bisa berubah dan menyatakan ke dalam bentuk persamaan
Menyelesaikan permasalahan 2	Siswa dapat menentukan gradien dari satu persamaan garis lurus

Menyelesaikan permasalahan 3	Siswa dapat menemukan persamaan garis lurus dengan gradien dan titik koordinat

TABEL 2. Jadwal Pelaksanaan Pembelajaran (Penelitian)

Pertemuan Ke	Hari/Tanggal	Sub Materi
Pertemuan I	Jumat/20 Januari 2023	Hubungan antara pasangan bilangan/ kuantitas yang keduanya bisa berubah dan menyatakan ke dalam bentuk persamaan
Pertemuan II	Kamis/26 Januari 2023	Menentukan gradien dari satu persamaan garis lurus
Pertemuan III	Jumat/27 Januari 2023	Menemukan persamaan garis lurus dengan gradien dan titik koordinat

Result & discussion

Tahap *retrospective analysis* ini merupakan tahap terakhir, dari evaluasi setelah desain pembelajaran dengan metode *hybrid learning* di uji cobakan, sebanyak 25 orang siswa diminta untuk memberikan penilaian terhadap angket respon siswa yang diberikan pada akhir pertemuan.

Berdasarkan indikator lingkungan belajar, diperoleh bahwa siswa lebih nyaman berkomunikasi dan berdiskusi di lingkungan kelas dibandingkan dengan lingkungan online. Secara khusus, 77.8% siswa merasa nyaman berkomunikasi dengan instruktur/guru mereka di lingkungan kelas yang dimana didukung oleh teknologi. Sedangkan beberapa siswa merasa nyaman berkomunikasi dengan teman sekelasnya di lingkungan kelas.

Berdasarkan indikator tatap muka, diperoleh bahwa siswa secara keseluruhan setuju bahwa instruksi tatap muka adalah cara pembelajaran matematika yang lebih baik. Secara khusus, 84,25% siswa merasa bahwa instruksi tatap muka berbantuan teknologi membantu mereka belajar lebih baik dan siswa setuju bahwa mereka memahami konsep matematika lebih baik dengan instruksi tatap muka baik itu secara zoom maupun secara langsung. Sementara itu, siswa juga setuju bahwa komunikasi tatap muka meningkatkan kemampuan mereka dalam belajar matematika.

Berdasarkan indikator online/teknologi, diperoleh bahwa persentase siswa yang menyukai pembelajaran online lebih dari 43.5% dimana 82% siswa yang menghargai penggunaan teknologi dalam mata pelajaran matematika mereka. Selain itu, mereka setuju bahwa penggunaan teknologi tidak menjadi hambatan dalam menyelesaikan permasalahan dalam matematika mereka. Selanjutnya, persentase siswa yang setuju lebih mudah berkomunikasi dengan instruktur mereka di lingkungan online adalah 60% sedangkan persentase siswa yang setuju lebih mudah berkomunikasi dengan teman sekelasnya di lingkungan online adalah 76%. Sementara itu, persentase siswa yang setuju bahwa mereka mampu memahami konsep matematika dengan lebih baik di lingkungan online adalah 78%. meskipun siswa menemukan bahwa penggunaan teknologi menimbulkan hambatan dalam menyelesaikan kursus mereka, materi online meningkatkan kemampuan mereka untuk belajar matematika dan dengan demikian mereka menghargai penggunaan teknologi dalam kursus matematika masing-masing. Di sisi lain, ada sedikit kesepakatan bahwa menggunakan teknologi memfasilitasi komunikasi atau meningkatkan kemampuan belajar matematika mereka.

Temuan dari tiga konstruk sebelumnya menunjukkan bahwa siswa lebih memilih belajar matematika di kelas serta dengan bantuan teknologi ini dibuktikan dari perhitungan data yang ada. Selain itu, berdasarkan indikator preferensi, diperoleh bahwa analisis data untuk konstruk preferensi menunjukkan bahwa 86% siswa setuju bahwa mata pelajaran matematika harus diajarkan secara hibrida atau kombinasi dari pengajaran tatap muka dan online sesuai dengan pernyataan ke-16 pada angket respon siswa yang diberikan.

Data respon siswa terhadap pelaksanaan pembelajaran yang diikuti oleh 25 siswa yang mengisi angket respon siswa terlihat bahwa persentase respon siswa terhadap pelaksanaan kegiatan pembelajaran dengan menggunakan metode *hybrid learning* memiliki nilai 75.89%. Dengan demikian tingginya persentase siswa yang memberikan respon positif membuktikan bahwa desain pembelajaran dengan metode *hybrid learning* dapat dikatakan efektif. Persentase ini sejalan dengan teori yang didapatkan dari rujukan jurnal yang ditulis oleh Saras Krishnan dengan judul *Students' Perceptions of Learning Mode in Mathematics* (2018).

Pada hasil persentase di atas menunjukkan bahwa desain pembelajaran dengan metode *hybrid learning* yang dikembangkan memenuhi kategori efektif dari 25 orang siswa di kelas VIII 1 25 orang siswa yang mendapatkan nilai di atas KKM dengan presentasi 84,72% dengan begitu terlihat adanya kenaikan nilai yang membuktikan bahwa desain pembelajaran yang diterapkan berjalan dengan baik.

- Hasil Lembar Observasi Keterlaksanaan *Hybrid Learning*

TABEL 3. Hasil Lembar Observasi Keterlaksanaan *Hybrid Learning*

Pertemuan Ke	Persentase
Pertemuan I	89,42%
Pertemuan II	91,35%
Pertemuan III	92,31%

Pada Tabel 4, secara kuantitatif menunjukkan bahwa untuk skor rata-rata semua pertemuan yaitu 91,03%, berada pada interval (80% ≤ P < 100%). Maka dapat disimpulkan secara keseluruhan observasi terhadap keterlaksanaan model pembelajaran *Hybrid Learning* dikatakan "Baik Sekali". Berdasarkan hasil observasi pada setiap pertemuan dimulai

dari pertemuan pertama hingga pertemuan ketiga semua tahap pembelajaran yang telah dilaksanakan berdasarkan RPP yang ada. Pada pertemuan kedua dan pada pertemuan ketiga ada satu tahap pembelajaran yang diubah yakni dalam pembagian dalam kuantitas dalam kelompok siswa sehingga adanya peningkatan kelancaran dalam pembelajaran. Berdasarkan hal tersebut, maka disimpulkan bahwa proses pembelajaran yang dilaksanakan pada kelas eksperimen yang diajar dengan menggunakan model pembelajaran *Hybrid Learning* telah terlaksana sesuai dengan RPP yang ada.

Conclusion

Berdasarkan hasil dan pembahasan penelitian yang sudah dilaksanakan dapat disimpulkan bahwa terdapat perbedaan yang signifikan literasi numerasi siswa di setiap pertemuan. Pembelajaran *hybrid learning* berbantu gnomioo membuat pembelajaran lebih efektif dan flexible. Dengan ini dapat dikatakan model *hybrid learning* berbantuan website gnomioo dan beberapa instrument lainnya merupakan model yang efektif diterapkan dalam meningkatkan kemampuan literasi numerasi siswa sekolah menengah pertama.

References

Brame, C. J. (2016). Effective Educational Videos: Principles and Guidelines for Maximizing Student Learning from Video Content. *CBE Life Sci Educ.*

Indrawati, D., Balontia, M. J., & Benny, B. (2022). The Effectiveness of Video Project Assignment in Local Language Class. *5th International Conference on Education Technology Management*, (pp. 375-382).

Jones, C. A. (2005). *Assessment for learning.* Newnorth Ltd: www.LSDA.org.uk.

Koppi, A. J., Lublin, J. R., & Chaloupka, M. J. (1997). Effective Teaching and Learning in a High-tech Environment. *Innovations in Education and Training International, 34*(4), 245-251. doi:10.1080/1355800970340402

Usage of GeoGebra in Indonesia and Japan: Focusing on math classes in junior high school

Eka Kevin Alghiffari[1], Kanako Tanikawa[2], Deny Hadi Siswanto[3], Masako Limori[4], Dede Dwi Aprilia[5]
Ahmad Dahlan University, Yogyakarta, Indonesia[1,3,5]
Naruto University of Education, Tokushima, Japan[2,4]
2207050015@webmail.uad.ac.id

Highlights: The rapid growth of ICT in education, driven by interactive tools like GeoGebra, has transformed learning. However, challenges persist due to educators' and students' limited ICT skills. A comparative analysis of GeoGebra-based lesson plans in Indonesia and Japan explored students' perspectives on its application across various math topics. Despite hurdles, recent technological advancements offer exciting opportunities to enhance classroom learning with engaging and personalized experiences.

Key words: ICT; GeoGebra; Mathematics; Indonesia; Japan

Introduction

Information and Communication Technology (ICT) has become an integral part of modern society (Salazar, 2019). According to Roztocki et al. (2019), the rapid development in the field of ICT has had a significant impact on various sectors, including education, business, government, and daily life. In Indonesia, as a country with a large population and rapid economic growth, the advancement of ICT plays an increasingly vital role in improving the quality of life and driving the nation's progress (Kamilla et al., 2021). With the progress of ICT, Nash et al. (2018) revealed that access to information and digital services has become easier and faster, providing opportunities for people to access various knowledge and opportunities.

In recent years, Japan has experienced significant advancements in the utilization of ICT, which encompass advanced telecommunications networks, the development of Artificial Intelligence (AI), the Internet of Things (IoT), and the deployment of 5G technology The Japan Times (2021). In Japan, a country with a strong technological legacy, the progress in ICT usage has become a key driver for economic growth, enhancing efficiency, and fostering innovation Japan Times (2021).

The deployment of Information and Communication Technology (ICT) in Indonesia has shown rapid progress in several regions, particularly in the field of education (Swaramarinda, 2018). It is essential to link teaching and learning with mediums that align with students' interests (Supriyadi et al., 2022). According to Zen et al. (2022), ICT is used to enhance student engagement through interactive applications, project-based tasks, and video-based learning. Additionally, Widyastuti et al. (2023) stated that Indonesia has experienced significant advancements in education through the implementation and adaptation of ICT, with increased internet accessibility and the adoption of digital devices acting as catalysts for technological growth in the education sector. The use of ICT in learning is widespread across schools in the country, including the use of laptops, tablets, and smartphones as learning aids (Anshari et al., 2017).

In Japan, the use of ICT has changed the way students learn and teachers teach. Schools and universities have responded quickly by adopting online learning and e-learning platforms (MEXT,2021). Online learning platforms allow students to access course materials, assignments, and exams from home or outside the classroom. In addition, adaptive learning technologies that utilize artificial intelligence have been introduced in several educational institutions in Japan. This allows students to learn according to their skill level, thus maximizing understanding and retention of the subject matter.

The rapid advancements in educational technology, unfortunately, often go unnoticed due to the insufficient digital literacy and skills among educators and students in utilizing Information and Communication Technology (ICT). However, one notable application that has played a significant role in addressing this challenge is GeoGebra (Savic et al., 2018). GeoGebra serves as a powerful tool for designing effective learning experiences that leverage ICT.
Computer programs that combine algebraic and geometry capabilities are called Dynamic Geometry Software (DGS), such as GeoGebra (Supriyadi et al., 2022). The use of GeoGebra can enhance students' proficiency in utilizing Information and Communication Technology (ICT) (Kramarenko et al., 2020). Furthermore, educational software and learning media like GeoGebra have gained popularity among educators for enhancing the effectiveness and interactivity of the learning process.

GeoGebra is a highly beneficial mathematics software widely used in education, especially for Middle School students (Ziatdinov & Valles, 2022). According to Jelatu et al. (2018), GeoGebra's main function is to assist students in understanding and visualizing mathematical concepts more clearly through graphical and interactive representations. By using GeoGebra, students can create and manipulate graphical objects such as lines, planes, and geometric shapes. Additionally, this tool facilitates students in comprehending the relationships and properties of geometry, as well as algebraic concepts that are often challenging to grasp in regular text formats.

GeoGebra can be used to create simulations in various mathematical topics, such as statistics, probability, and trigonometry (Rahman & Puteh, 2016). According to Dahal et al. (2019), with the availability of simulations, students can engage in virtual experiments that help them better understand mathematical concepts in a more interesting and interactive way. By using GeoGebra in Middle School, it is expected that students will be more engaged in mathematics learning and develop a deeper understanding of various mathematical concepts they study, through more interactive and enjoyable visual representations.

GeoGebra is also beneficial for teachers. The availability of open GeoGebra applications from the GeoGebra community is crucial as it assists teachers in designing effective learning environments (Weinhandl et al., 2020). GeoGebra also helps teachers enhance their skills in presenting better and contemporary teaching aids and methodologies (Ziatdinov & Valles, 2022). The utilization of GeoGebra in education can also improve teachers' ability to enhance students' understanding of mathematical concepts and procedures (Kusumah et al., 2020). Moreover, GeoGebra contributes to increasing teachers' confidence in utilizing technology for teaching purposes (Ziatdinov & Valles, 2022). In general, GeoGebra has a positive impact on mathematics teachers in integrating technology in learning.

In Indonesia, geometry material gets a relatively large proportion, at the middle school level at least 38% of mathematics is in the form of geometry (Susanto & Mahmudi, 2021). Many geometry problems require the ability to construct, demonstrate, or visualize in the problem-solving process (Karakuş, 2022; Simbolon, 2020). Furthermore, In Indonesia, typically algebraic concepts are introduced at the Middle School, where students learn the basic concepts of algebra (Malasari & Afifaturrohmaniyyah, 2021). Where GeoGebra is generally used to study geometry and represent algebraic concepts.

Product Description

Analysis of lesson plans using GeoGebra between Indonesia and Japan in accordance with the curriculum in both countries. This learning will cover a wide range of topics such as algebra, geometry, functions, and statistics. We have collected lesson plans from the Internet, books, and Journals for using GeoGebra in second grade math in junior high school. Six lessons per country were collected and total of 12 lesson plans were analyzed. To see how student ways of thinking about the application of GeoGebra in mathematics lessons in each country, we used the perspective we created with reference to Arends (2012) & Emori et al (2016) and evaluated each class. Then, we get 5 categories as follows: experience by students themselves, discover/notice, explain the results, reflect, and develop.

Results & Discussion

The use of GeoGebra in mathematics learning has become popular all over the world. We analyzed twelve different lesson plans that integrated GeoGebra in mathematics learning in grades 8 junior high school, six from Indonesia and six from Japan. We compared students' thinking perspectives. We are analyzing students' perspectives on 6 mathematics subjects in both countries using the student perspective framework proposed by Arends (2012) and Emori (2016), which consists of:

1. Experience by students themselves (through individual, pair, and group work in activities such as manipulation and experimentation to tackle the task)
2. Discover/notice (students find their own questions through activities on the task)
3. Explain the results (through activities to communicate to others / to listen to others' opinions)
4. Reflect (deepen and summarize their own thinking)
5. Develop (discover new questions and further deepen students' own knowledge)

The results of the analysis of 6 lesson plans from Indonesia can be seen in the table below

Table 1: Analysis 6 lesson content in Indonesia.

	Experience	Discover	Explain the results	Reflect	Develop
Triangular Properties	◎		◎	◎	◎
Geometric transformation	◎	◎	◎	◎	◎
Matrix operation	◎		◎	◎	◎
Cylinder	◎		◎	◎	
Perform set operations	◎		◎	◎	
Different parts of a circle	◎	◎	◎	◎	◎

First lesson content is triangular properties, based on this table we found that student can experience, explain the result, reflect, and develop the lesson content of triangular properties by using GeoGebra but student can't discover the lesson content of triangular properties by using GeoGebra. The second lesson content is geometric transformation, based on this table we found that student can fulfill all of the perspective of student ways thinking. Next, third lesson content is matrix operation, based on this table we found that student can experience, explain the result, reflect, and develop the lesson content of matrix operation by using GeoGebra but student can't discover the lesson content of matrix operation by using GeoGebra. Fourth lesson content is cylinder, based on this table we found that student can experience, explain the result, and reflect the lesson content of cylinder by using GeoGebra but student can't discover and develop the lesson content of cylinder by using GeoGebra. Fifth lesson content is perform set operations, based on this table we found that student can experience, explain the result, and reflect the lesson content of perform set operations by using GeoGebra but student can't discover and develop the lesson content of perform set operations by using GeoGebra. And last lesson content is different parts of a circle, based on this table we found that student can fulfill all of the perspective of student ways thinking.

Based on the table we can see that experience, explain the results, and reflect were seen in all 6 lessons content this indicating that GeoGebra is actively integrated into the learning process to engage students in hands-on

exploration, explain mathematical concepts, and promote self-reflection. In line with that, Purnomo (2021) stated that it allows students to explore various mathematical concepts and gain a better experience through self-reflection. Furthermore, we found that GeoGebra is consistently used in various capacities within these math classes in Indonesia, enhancing student engagement and understanding through experiential learning, explanation, and reflection.

The results of the analysis of 6 lesson plans from Japan can be seen in the table below

Table 2: Analysis 6 lesson content in Japan.

	Experience	Discover	Explain the results	Reflect	Develop
Square roots		◎		◎	
Quadratic function	◎			◎	
Triangle similarity condition	◎		◎	◎	
Inverse of inscribed angle theorem	◎	◎	◎	◎	◎
Quadratic equation		◎		◎	
Theorem of three squares	◎			◎	

First lesson content is square roots, based on this table we found that student can discover and reflect the lesson content of square roots by using GeoGebra but student can't experience, explain the result, and develop the lesson content of square roots by using GeoGebra. The second lesson content is quadratic function, based on this table we found that student can experience and reflect the lesson content of quadratic function by using GeoGebra but student can't discover, explain the result, and develop the lesson content of quadratic function by using GeoGebra. Next, third lesson content is triangle similarity condition, based on this table we found that student can experience, explain the result, and reflect the lesson content of triangle similarity condition by using GeoGebra but student can't discover and develop the lesson content of triangle similarity condition by using GeoGebra. Fourth lesson content is inverse of inscribed angle theorem, based on this table we found that student can fulfill all of the perspective of student ways thinking. Fifth lesson content is quadratic equation, based on this table we found that student can discover and reflect the lesson content of quadratic equation by using GeoGebra but student can't experience, explain the result, and develop the lesson content of quadratic equation by using GeoGebra. And last lesson content is theorem of three squares, based on this table we found that student can experience and reflect the lesson content of theorem of three squares by using GeoGebra but student can't discover, explain the result, and develop the lesson content of theorem of three squares by using GeoGebra.

Based on the table we can see that reflect were seen in all 6 lessons content this means through the use of GeoGebra, students can more effectively reflect, understand, and internalize mathematical concepts as they can engage in visual, interactive, and exploratory experiences. Furthermore, we found that GeoGebra is mainly used in classes that are difficult to understand and that it is effective in helping students understand.

Conclusion

This comprehensive study provides an in-depth analysis of the utilization of GeoGebra in mathematics education in both Indonesia and Japan, highlighting the impact and potential benefits of integrating this dynamic geometry software into the classroom. Furthermore, the integration of GeoGebra into mathematics education in Indonesia and Japan demonstrates the potential to enhance students' learning experiences and teachers' instructional strategies. By providing interactive, visual, and exploratory opportunities, GeoGebra contributes to a deeper understanding of mathematics and fosters a culture of reflection and engagement in both countries.

References

Anshari, M., Almunawar, M. N., Shahrill, M., Wicaksono, D. K., & Huda, M. (2017). Smartphones usage in the classrooms: Learning aid or interference? *Education and Information Technologies*, *22*(6), 3063–3079. https://doi.org/10.1007/s10639-017-9572-7

Dahal, N., Pant, B. P., & Shrestha, D. (2019). Integration of Geogebra in Teaching and Learning Geometric Transformation. *Journal of Mathematics and Statistical Science*, *5*(December 2019), 323–332.

Jelatu, S., Sariyasa, & Made Ardana, I. (2018). Effect of GeoGebra-aided REACT strategy on understanding of geometry concepts. *International Journal of Instruction*, *11*(4), 325–336. https://doi.org/10.12973/iji.2018.11421a

Kamilla, S., Sasana, H., & Sugiharti, R. (2021). Pengaruh Teknologi Informasi dan Komunikasi terhadap Pertumbuhan Ekonomi di Indonesia Tahun 2012-2019. *Directory of Journal of Economic*, *3*(4), 619–631.

Karakuş, D. (2022). *Geogebra in the Correction and Understanding of Errors Regarding the Concept of Asymptote*. 67–79.

Kramarenko, T. H., Pylypenko, O. S., & Muzyka, I. O. (2020). Application of GeoGebra in Stereometry teaching. *CEUR Workshop Proceedings*, *2643*, 705–718. https://doi.org/10.55056/cte.418

Kusumah, Y. S., Kustiawati, D., & Herman, T. (2020). The effect of geogebra in three-dimensional geometry learning on students' mathematical communication ability. *International Journal of Instruction*, *13*(2), 895–908. https://doi.org/10.29333/iji.2020.13260a

Malasari, P. N., & Afifaturrohmaniyyah, N. (2021). The Challenges Faced by Teachers in Teaching Algebraic Concepts during the

Coronavirus Disease 2019 (Covid-19) Pandemic Era. *Jurnal Pendidikan Matematika (Kudus)*, *4*(1), 43. https://doi.org/10.21043/jmtk.v4i1.10083

Nash, C., Jarrahi, M. H., Sutherland, W., & Phillips, G. (2018). Digital nomads beyond the buzzword: Defining digital nomadic work and use of digital technologies. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *10766 LNCS*(February), 207–217. https://doi.org/10.1007/978-3-319-78105-1_25

Purnomo, J. (2021). Kebermanfaatan Penggunaan Geogebra dalam Pembelajaran Matematika. *Idealmathedu: Indonesian Digital Journal of Mathematics and Education*, *8*(1), 9–22. https://doi.org/10.53717/idealmathedu.v8i1.211

Rahman, M. H. A., & Puteh, M. (2016). Learning trigonometry using geogebra learning module: Are under achieve pupils motivated? *AIP Conference Proceedings*, *1750*. https://doi.org/10.1063/1.4954586

Roztocki, N., Soja, P., & Weistroffer, H. R. (2019). The role of information and communication technologies in socioeconomic development: towards a multi-dimensional framework*. *Information Technology for Development*, *25*(2), 171–183. https://doi.org/10.1080/02681102.2019.1596654

Savic, M., Bajcetic, J., & Milinkovic, D. (2018). Enhancing Mathematics Teaching and Learning through GeoGebra: A Systematic Review of Empirical Studies. *Eurasia Journal of Mathematics, Science, and Technology Education*, *14*(2), 637–653.

Simbolon, A. K. (2020). "The Use of GeoGebra Software in Enhancing Students'' Mathematical Abilities in Geometry Learning at SMPN2 Tanjung Morawa"." *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *4*(2), 1106–1114. https://doi.org/10.31004/cendekia.v4i2.351

Supriyadi, E., Septian, A., Dahlan, J. A., & Juandi, D. (2022). GeoGebra Research in Indonesia: A Bibliometric Analysis. *Prisma*, *11*(2), 559. https://doi.org/10.35194/jp.v11i2.2572

Susanto, S., & Mahmudi, A. (2021). The Geometric Thinking Levels of Junior High School Students Based on Van Hiele's Theory: A Review of Geometry Skills. *Jurnal Riset Pendidikan Matematika*, *8*(1), 106–116. https://doi.org/10.21831/jrpm.v8i1.17044

Swaramarinda, D. R. (2018). the Usefulness of Information and Communication Technology in Entrepreneurship Subject. *Journal of Entrepreneurship Education*, *21*(3), 1528–2651.

Weinhandl, R., Lavicza, Z., Hohenwarter, M., Enhancing, S., Weinhandl, R., Lavicza, Z., Hohenwarter, M., & Schallert, S. (2020). *Enhancing Flipped Mathematics Education by Utilising GeoGebra To cite this article : Enhancing Flipped Mathematics Education by Utilising GeoGebra*.

Widyastuti, D. A. R., Wahyuni, H. I., & Wastutiningsih, S. P. (2023). Creating a digital ecosystem for sustainable development: Insights from Indonesian micro, small and medium enterprises. *Kasetsart Journal of Social Sciences*, *44*(1), 27–38. https://doi.org/10.34044/j.kjss.2023.44.1.04

Zen, Z., Reflianto, Syamsuar, & Ariani, F. (2022). Academic achievement: the effect of project-based online learning method and student engagement. *Heliyon*, *8*(11). https://doi.org/10.1016/j.heliyon.2022.e11509

Ziatdinov, R., & Valles, J. R. (2022). Synthesis of Modeling, Visualization, and Programming in GeoGebra as an Effective Approach for Teaching and Learning STEM Topics. *Mathematics*, *10*(3). https://doi.org/10.3390/math10030398

Mobile apps of determine success rate under salvage maritime operation based on salvage convention and llyod open form

Nurul Anis Husna Ahamad Puzi[1], Mohammad Aizat Basir[2], Mohd Sharifuddin Ahmad[3]
Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia[1,2,3]
anispuzi211@gmail.com, aizat@umt.edu.my, mohdsharifuddin@umt.edu.my

Highlights: The Salvage Application Study is an innovative mobile application designed to revolutionize the learning process for salvage maritime subjects among students. Recognizing the inherent physical risks and challenges in comprehending complex terminologies, laws, and formulas, this app offers an interactive and comprehensive educational solution. It provides detailed ship type notes, ship details, SCOPIC, and reward calculation examples, enabling students to enhance their comprehension and practical application of theoretical knowledge. By leveraging interactive visuals and practical demonstrations, the app creates a safer, engaging, and effective learning experience, empowering students to confidently navigate real-world salvage maritime operations.

Key words: Mobile Apps; Salvage; Maritime Operations; Education; Interactive Learning

Introduction

A significant response to persistent problems in the field of maritime education is the "Mobile App of Determine Success Rate Under Salvage Maritime Operation," also known as the Salvage Application. The demands placed on students hoping to become experts in salvage operations increase as the maritime sector continues to develop. This progression has highlighted two pressing problems.

First off, the substantial physical threats involved in hands-on learning have made it difficult to study salvage operations practically. Traditional on-site salvage study models raise serious safety issues for both students and teachers. A new approach that can give a dynamic learning experience without jeopardizing safety is now required due to this worry. Second, the extensive terminologies, rules, and formulas that provide the theoretical foundation of salvage operations are frequently difficult for students to understand. It is quite difficult to navigate this complex web of knowledge just through textbooks and lectures. It is now clear that an additional tool is required to enable a more effective and efficient comprehension and application of these fundamental principle.

Recognizing these difficulties, the Salvage Application aims to provide a breakthrough solution that will improve educational accessibility while simultaneously guaranteeing student safety and comprehension in maritime salvage operations. This ground-breaking programmed aspires to go beyond the constraints of conventional learning techniques and offer aspiring maritime professionals a revolutionary educational experience by leveraging mobile technologies. In the dynamic world of maritime salvage operations, this software will act as a beacon, illuminating the way to a safer, more interesting, and ultimately more fruitful educational journey.

Product Description

Introducing the Salvage Application Study, a pioneering mobile application that stands at the forefront of maritime education and operational efficiency. This innovative platform is characterized by a wealth of ground-breaking ideas and inventive approaches, fundamentally reshaping how students engage with and comprehend salvage maritime subjects. It unravels complex terminologies, laws, and formulas, presenting them in an intuitive and easily digestible manner. This not only facilitates a level of comprehension that transcends traditional learning methods but also empowers students to navigate intricate concepts with newfound clarity.

A standout feature is the incorporation of dynamic interactive visuals, a powerful tool that static textbooks simply cannot replicate. By offering practical demonstrations and dynamic visualizations, the app bridges the gap between theory and practice. This results in a deeper and more intuitive understanding, revolutionizing the learning experience and enhancing the practical applicability of acquired knowledge. Safety is paramount, and the app embraces a safety-first approach. Recognizing the inherent risks associated with traditional salvage studies, the platform provides a virtual space for hands-on learning. Here, students can explore salvage scenarios without exposure to real-world hazards. This not only safeguards students but also cultivates a sense of confidence and competence in their abilities.

Furthermore, the app aligns seamlessly with international standards, incorporating the Salvage Convention and Lloyd Open Form (LOF). This commitment to upholding globally recognized metrics for success ensures that students not only gain a comprehensive understanding of salvage operations but also learn within a framework that holds weight on a global scale. Ultimately, the Salvage Application Study is more than just an app; it represents a paradigm shift in how we educate and prepare maritime professionals. It sets a new standard for quality, innovation, and effectiveness. With this platform, we are poised to shape the future of maritime education and equip the next generation of professionals with the skills and knowledge they need to excel in salvage maritime operations.

Results & Discussion

The Salvage Application Study has demonstrated commendable efficacy in enhancing maritime education and salvage operations. Students exhibited notable improvements in their grasp of salvage terminology, laws, and formulas, attributed to the app's innovative features and interactive approach. The incorporation of dynamic visuals proved particularly impactful, fostering higher engagement levels and deeper understanding compared to conventional methods. Additionally, the app's safety-centric design received positive feedback, providing students with a secure virtual environment to explore salvage scenarios. This not only instilled confidence but also elevated the overall learning experience. These results affirm the transformative potential of this app in addressing critical challenges in maritime education and equipping future professionals with practical skills and knowledge essential for success in salvage maritime operations. Figures below show an example of features in this application where Figure 1 contains some details of selected ship type, meanwhile Figure 2 shows a calculator tool that automatically calculate the salvage reward.

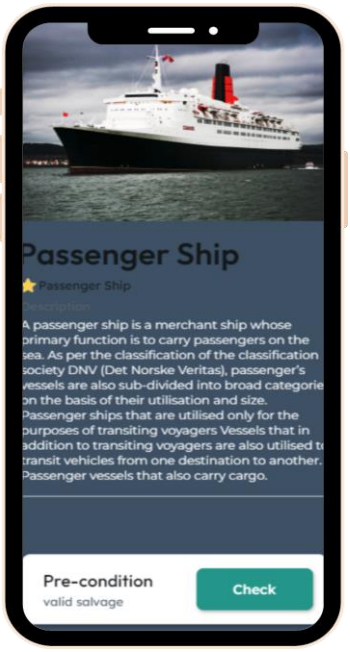


Figure 1: Ship details

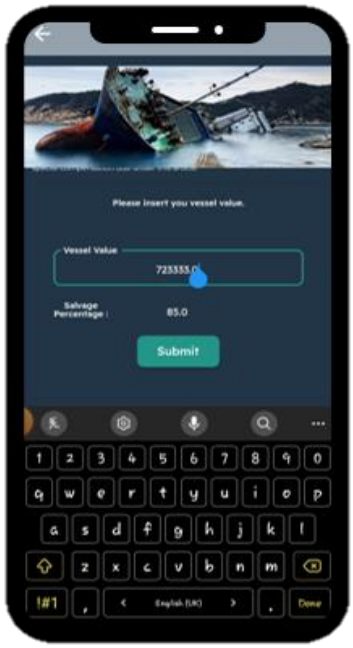


Figure 2: Calculator tools

Conclusion

The Salvage Application Study marks a significant leap forward in maritime education, addressing critical challenges and setting new standards for interactive learning. As we look to the future, there are several avenues for continued improvement and innovation. Firstly, ongoing updates to content and visuals will ensure that students receive the most up-to-date and comprehensive education in salvage operations. Additionally, exploring augmented reality (AR) and virtual reality (VR) integration could further enhance the immersive learning experience, allowing students to interact with salvage scenarios in an even more realistic and dynamic manner. Moreover, incorporating feedback from users and educators will be instrumental in refining the app's functionality and tailoring it to the specific needs of the maritime education community. Finally, expanding accessibility to a wider global audience and potentially translating the app into multiple languages will democratize access to this invaluable educational tool. By embracing these future endeavors, we aim to continuously advance the Salvage Application Study, ensuring that it remains at the forefront of maritime education and training for years to come.

References

Davies, M. (2009). Whatever Happened to the Salvage Convention 1989?. Journal of Maritime Law and Commerce. 39.

Djadjev, I. (2015). The SCOPIC clause as a major development in salvage law. 10.13140/RG.2.1.3645.5527.

Gerigk, M. (2010). A Method of Risk and Safety Assessment During the Ship Salvage Using the Hazard, Release and Consequence Analysis. Journal of Konbin. 13. 10.2478/v10040-008-0145-0.

Mudrić, M. (2010). Liability Salvage - Environmental Award: A New Name for an Old Concept. Comparative maritime law; Vol.49 No.164. 49.

Wright, R. (1917, September 15). Marine Salvage Operations. Scientific American, 84(2176supp), 170–171. https://doi.org/10.1038/scientificamerican09151917-170supp

1,2, 3 Tanam!: Fun Gardening for Any Thumb

Norazlina A. S[1], Nur Maizatul Idayu, O.[2], Siti Maisarah, M. H.[3], Nur Fazatunnisa, Z.[4] and Nur Balqish, M. N.[5]
Universiti Teknologi MARA Cawangan Melaka Kampus Jasin, Melaka, Malaysia[1,2,3,4,5]
Corresponding Author: norazlinaabusari@uitm.edu.my*

Highlights: 1, 2, 3 Tanam! is an interactive e-book for gardening activity that focus on the home gardening for the beginner. This beautifully illustrated guide is suitable for young reader who love to do the gardening and learn science that related to the activity. The book will guide the young explorer to growing plants, from planting preparation until yield harvesting. Clear step by step instruction with additional video guidance will help the young gardeners to start their very first gardening project. Additional feature of the book is the encouragement of agricultural sustainable practices by using recycle and organic materials for gardening.

Key words: e-book; e-learning; science; gardening; agriculture

Introduction

Home gardening can play an important role in advancing food and nutritional security during and after the Covid-19 pandemic. Many studies have reported the beneficial of this activity towards human health by reducing human stress level (Masashi et al., 2017) and improving their mental health (Yamashita et al., 2021). The physical fitness also improved when people are actively involved in the gardening activity such as carrying the wheelbarrow, pulling weeds, tilling the soil and watering the plant (Scott et al., 2020). Planting and consuming home-garden grown products also enhance food security, diversity and the microenvironment around the garden (Schreinemachers et al., 2020). Gardening has also been pointed out as having a positive impact on the climatic change through carbon sequestration (Lin et al., 2017). The feasibility of gardener to manage the plant themselves when applying organic practices or minimum chemical for their plant can help in conserving the environment and promoting healthy lifestyle. Home garden also can contribute to the accessibility of fresh and high nutritional values food products (Helen et al., 2010).

The benefits of gardening can be seen as an appealing activity for young generation particularly among the children and adolescents. When do this hands-on activity, children can activate their senses and motor skills. They also can learn and understand better on science that related to the soil and plant during the activity. The gardening also nurtures self-confidence by growing their own plants and promoting healthy diet habits. Therefore, early intervention needs to be implemented to attract young generation interest towards this health physical and mental promoters.

Electronic book (e-books) is one of the interactive ways to introduce the gardening activity to the new generation. In this technology era, most children have been exposed and interacted to the digital media through electronic devices at school and at home. Research has suggested many benefits of the e-books in promoting literacy for the children (Swanson et al., 2020; Reich et al., 2016; Salmon, 2013). Among the potential advantages of the e-books are easily accessible (Bus et al., 2020), interactive features and animations (Smeets and Bus; 2015), and improve reading acquisition (Dore et al., 2018). The lack of interactive information on the gardening activity especially in Malaysia which most of the book in English version in the market, might become a barrier in attracting this young generation especially the children to involve in the home gardening activity. Therefore, '1, 2, 3 tanam!' is a simple, interactive, and compact e-book that guide the young reader to do the home gardening especially for the beginner. By interacting with this e-book, all generations particularly the young explorer can grow their own food in their own garden and home at any times.

Product Description

1 , 2 , 3 tanam! is an interactive e-book that introduces the young generation or beginners to the joys of gardening. Readers will be interact to the nature through the gardening activities step by step. The home gardening expedition starts from the gardening preparation until yield harvesting. For each activity, assisted with a video for better view and understanding for the reader. The e-book also integrated with the science information that related to the activity such as plant science and soil science. This delightful book carefully illustrated with interactive figures and colourful wordings which able to attract the young readers to explore more the book. The fun in doing their first gardening also can be documented in the book. This e-book is specially designed to the children age range of 5 to 12 years old but also can be extended to 15 years old readers. This mobile guide book is advantageous for the reader to access the information at anywhere and anytime through electronic devices. This book have novelty features as first gardening book that produced in Bahasa Melayu language. It also nurtures the young generation to love the environment by proving tips and ideas to use organic and recycle products for gardening activities.

Results & Discussion

A survey was conducted with random selection of 84 participants from education stakeholders. The gender of participants that participate for the survey are majority are from male participants with 72.6%. The respondents age are ranging start from 5 years old to older than 40 years old with highest respondents from 18 to 29 years old, followed

by 30 to 39 years old and above 40 years old. Of the 84 respondents who responded to the survey, the majority (60.7%) are students, followed by educators (13.1%) and parents (11.9%). The perception respondents towards the benefits on the utilization of e-book in general and their perception on the 1, 2, 3 tanam! as a gardening e-book are shown in Figure 1 and Figure 2, respectively.

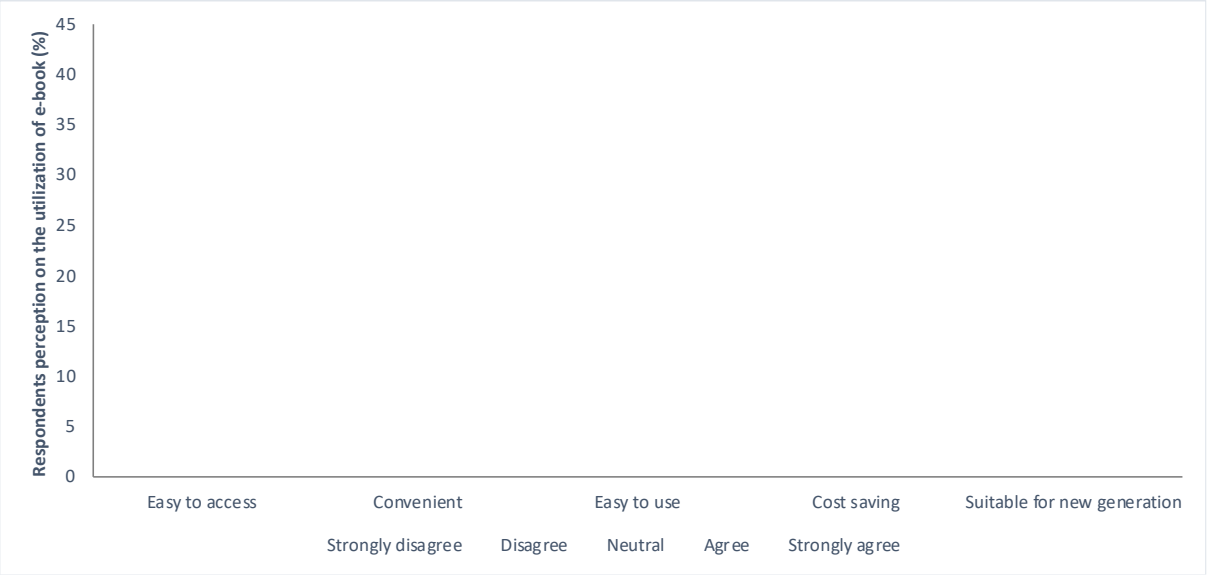


Figure 1: Respondents perception on the utilization of e-book (%)

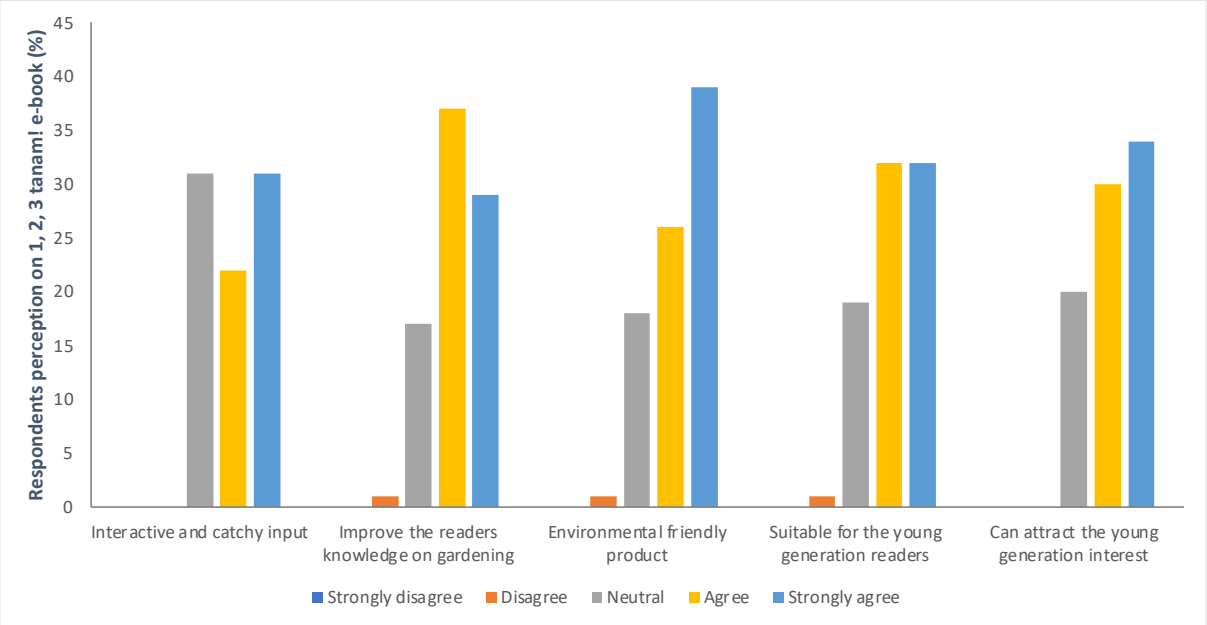


Figure 2: Respondents perception on 1, 2, 3 tanam! e-book (%)

Based on the survey that was conducted from the different types of educator stakeholders, majority are agree and strongly agree on the benefits of utilization of e-book for the young generation. The survey also shown the positive response towards this interactive gardening e-book to be used for the young readers.

Conclusion

This e-book is in the planning stage for commercialization into the market with the some improvement that were received from respondents feedbacks which are from the different background of education stakeholders. These include on the suggestion of additional numbers of pages, with more inputs and English version of the e-book.

Award

First place for the Product Pitching at the Virtual International e-Content Development Competition 2022.

Gold Award for the Product Pitching at the Virtual International e-Content Development Competition 2022.

References

Bus, A. G., Neuman, S. B., & Roskos, K. (2020). Screens, apps, and digital books for young children: The promise of multimedia. AERA Open. **6**doi: 10.1177/2332858420901494.

Dore, R. A., Hassinger-Das, B., Brezack, N., Valladares, T. L., Paller, A., Vu, L., Golinkoff, R. M., & Hirsh-Pasek K. (2018). The parent advantage in fostering children's e-book comprehension. Early Child. Res. Q. **44**:24–33. doi: 10.1016/j.ecresq.2018.02.002.

Helen Keller. (2010). International - Asia-Pacific: Homestead food production model contributes to improved household food security, nutrition and female empowerment – experience from scaling-up programs in Asia (Bangladesh, Cambodia, Nepal and Philippines). Nutr Bull. 8 (1): 1-8.

Lin, B., Egerer, M., Liere, H., Jha, S., Bichier, P., & Philpott, S. (2018). Local- and landscape-scale land cover affects microclimate and water use in urban gardens. Sci. Total Environ. **610–611**:570–575. doi: 10.1016/j.scitotenv.2017.08.091.

Reich, S. M., Yau, J. C., & Warschauer, M. (2016). Tablet-based ebooks for young children: What does the research say? J. Dev. Behav. Pediatr. **37**:585–591. doi: 10.1097/DBP.0000000000000335.

Salmon, L. G. (2013). Factors that affect emergent literacy development when engaging with electronic books. J. Fam. Econ. Issues. **42**:85–92. doi: 10.1007/s10643-013-0589-2.

Schreinemachers, P., Baliki, G., Shrestha, R. M., Bhattarai, D. R., Gautam, I.P., Ghimire, P.L., et al. (2020). Nudging children toward healthier food choices: An experiment combining school and home gardens. Glob Food Sec. 26:100454. https://doi.org/10.1016/j.gfs.2020.100454.

Scott T., Masser B., & Pachana N. (2020). Positive aging benefits of home and community gardening activities: Older adults report enhanced self-esteem, productive endeavours, social engagement and exercise. SAGE Open Med. **8**.

Smeets, D. J. H., & Bus, A. G. (2015). The interactive animated e-book as a word learning device for kindergartners. Appl. Psycholinguist. **36**:899–920. doi: 10.1017/S0142716413000556.

Swanson, E., Austin, C. R., Stewart, A. A., & Scammacca, N. (2020). A Meta-analysis examining the effect of e-book use on literacy outcomes for students in grades K–12. Read. Writ. Q. **36**:480–496. doi: 10.1080/10573569.2019.1696724.

Yamashita, R., Chen, C., Matsubara, T., Hagiwara, K., Inamura, M., Aga, K., Hirotsu, M., Seki, T., Takao, A., Nakagawa, E., et al.(2021). The mood-improving effect of viewing images of nature and its neural substrate. Int. J. Environ. Res. Public Health. **18**:5500.

Non-electrical fan

Chow Lai Kim[1], Sydney Tan Le Yi[2], Mohican Mehdi Bin Ghazali[3]
Perak Matriculation College, Gopeng, Perak, Malaysia[1,2,3]
bm-1444@moe-dl.moe.my[1], m-7500669@moe-dl.edu.my[2], m-ms2317119113@moe-dl.edu.my[3]

Highlights: This product is a non-electrical fan made out of ordinary objects which helps defines one of the most popular physics phenomena, inertia. It is made out of a bottle with its fan made out of plastics, a pull-system using a string, and some decorations. It revolves around a fan rotating from the pulling a string which continuously spins even after it was pulled, due to inertia. After the string is pulled, the string retracts and returns to the origin due to its tendency to resist change in motion.

Key words: Eco-Friendly; Green-Technology; Inertia; Creativity; Conservation/Conversion of energy

Introduction

In today's society, the youth of today doesn't have the urge to satisfy their curiosity. This is because nowadays, especially kids, are exposed to modern media which makes them less productive and less attentive to their surroundings. This makes children rather play the latest video games than wondering why and how things in the real-world works. Children who spend too much time using online media can be at risk for a type of additive behaviour called problematic internet use. Heavy video gamers are at risk for Internet gaming disorder. They spend most of their free time online and show less interest in offline or real-life relationships (Constantly Connected: How Media Use Can Affect Your Child, 2023). This unfortunately, is happening to many children all over the world. Where they would rather choose social media than spending time with their parents, focusing on school, and most important, staying curious. This prevents us from moulding a generation that can help stop major global issues such as waste pollution or even global warming.

Moreover, because they're so fixated with technology, not many of them are fully aware of their surroundings. Therefore, they would easily understand a concept or idea when presented visually, such as the concept of inertia.

The concept of inertia is a fundamental principle in physics, which describes an object's tendency to resist changes in its state of motion. Proposed by Sir Isaac Newton in the 17th century, this concept forms one of the cornerstones of classical mechanics. Inertia is commonly summarized by Newton's First Law of Motion, which states that "an object at rest tends to stay at rest, and an object in motion tends to stay in motion with the same speed and in the same direction unless acted upon by an unbalanced external force."
The significance of inertia is profound, as it underlies our understanding of motion, from the simplest actions of everyday objects to the complex dynamics of celestial bodies. It plays a crucial role in various aspects of physics, engineering, and our daily lives.

Apart from that, energy conversion, a fundamental concept in physics and engineering, underpins the functioning of numerous natural processes and technological advancements. This laboratory report embarks on a journey to unravel the intricate mechanisms governing the transformation of energy from one state to another. By delving into the principles and processes involved in energy conversion, we aim to deepen our understanding of how energy changes form and sustains various physical systems.
Energy conversion encompasses a wide array of phenomena, ranging from chemical reactions in our cells to the generation of electricity in power plants. This report will provide a comprehensive examination of energy conversion, elucidating the theoretical foundations, experimental methodologies, and practical applications of this essential concept. Understanding the dynamics of energy conversion not only advances our knowledge of the natural world but also fuels innovations that drive progress in various industries.

In this STEAM project, we will explore the concept of inertia and the conversion of energy through practical demonstrations and measurements. By observing the behaviour of objects under different conditions, we aim to gain a deeper understanding of how inertia influences motion and how it aligns with Newton's First Law and energy transformation. Apart from that, throughout this STEAM project, we will explore the key aspects of energy conversion, from the conservation of energy to the efficiency of different conversion processes. This exploration will not only serve to reinforce our understanding of this fundamental concept but also lay the groundwork for further investigations into the dynamics of objects in motion, and the role energy conversion plays in our everyday lives and its implications for the future of science and technology. Last but not least, in this STEAM project, we will also ensure that we change the negative mindset and attitude towards learning, and to show that learning doesn't only happen inside of classrooms. We also want to ensure that we can help children be more aware with how much they can reduce waste pollution by reusing old materials not only to make fans, but to make anything they want, improving creativity and even making them more considerate towards mother nature.

Background study

From Newton's first law of motion, it is clear that a body has a tendency to remain at rest or in uniform motion. This property of the body is known as inertia. Thus inertia is that property of a body due to which it opposes or resists any change in its state of rest or uniform motion.

The term inertia may be referred to as "the amount of resistance of an object to a change in velocity" or "resistance to change in motion." This includes changes in the speed of the object or the direction of motion. One aspect of this property is the tendency of things to continue to move in a straight line at a constant speed, when no forces are affecting them (20 Examples of Law of Inertia in Everyday Life - PraxiLabs, 2021). It is also related to newton's first law of motion [Newton's first law states that every object will remain at rest or in uniform motion in a straight line unless compelled to change its state by the action of an external force. Relating to our project, When the string on our fan is fully pulled, the fan continues to rotate. This is because the fan's blades are facing inertia where they are resistant to any change in motion.

The principle of energy conservation states that energy is neither created nor destroyed. It may transform from one type to another. Like the mass conservation principle, the validity of the conservation of energy relies on experimental observations; thus, it is an empirical law (Conservation of Energy Principle - an Overview | ScienceDirect Topics, n.d.). Energy can neither be created nor destroyed, it can only be transformed from one form to another. For example, Coal-fired Power Plant: During the process of combustion, the chemical energy in the coal gets converted into thermal energy. Then, through the heat exchanger, the thermal energy of the exhaust gases gets converted into the thermal energy of steam. After that in the turbine, the thermal energy of steam gets converted into mechanical energy. Finally, with the help of a generator, the mechanical energy gets converted into electrical energy (Energy Conversion & Law of Energy Conversion With Examples, n.d.). From our fan, the spinning blades of the fan has kinetic energy, this causes the air in the surrounding environment to move. That is the kinetic energy we feel as a breeze when we use the fan. Apart from that, conversion of energy can be seen from the kinetic energy of the spinning fan, to sound energy or even heat energy from the friction between the fan and the bottle.

Green technology, in short, is any type of technology designed to reduce the negative impact of human activity on the environment. Waste management systems, electric transportation, and products with environmentally friendly construction materials are a few examples of green technology. In this case, our project meets the criteria of being a type of green technology product as we are reusing items that were used, such as a plastic bottle and cardboard. Therefore, our product falls under the category of a green technology

Product Description

The concept of inertia is performed in this non-electrical fan when the keychain ring is pulled, the metal straw starts spinning and the string recoils. Inertia is generally known as the natural tendency to remain its state of rest or uniform motion unless acted upon by some external force. Therefore, the inertia of the metal straw tends to remain in its spinning motion and the string recoils despite no pulling force is applied anymore.

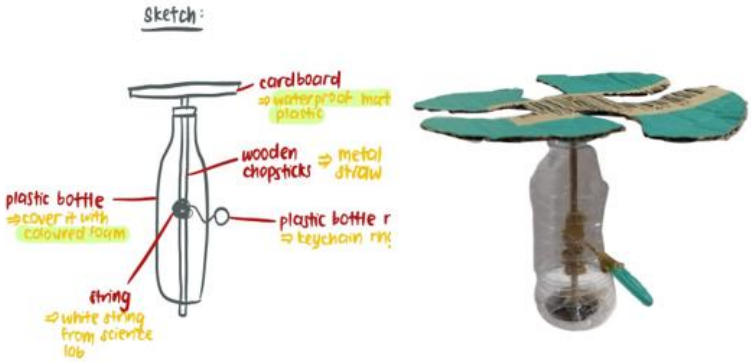
Furthermore, the principle of conservation energy could also be seen in our non-electrical fan. Energy could not be created, nor destroyed. Hence, the conversion of kinetic energy to wind energy occurs when we pull the string tied to the keychain ring and the metal straw spins in a rapid motion, resulting the production of wind energy from the fans made out of plastic.

For our non-electrical fan's appearance, we've decided to let our creativity run wild and paint its fan with acrylic paint. Floral patterns with different shades of yellow and green became our first choice because art is a unique form of expressing one's ideas and believe it or not, but the presence of art does help alleviate feelings of anxiety. It brings a sense of soothe and positivity. If you pay attention to the fan when it's spinning, you'll also notice the alphabet "O" showing in the middle.

This non-electrical fan has a firm structure compared to our first few prototypes, now that its materials and design has been improvised. Apart from that, it's a quick and easy project suitable for everyone to create even with recyclable items (our very first prototype) as long as it has the right fan shape and pull-system. It makes education fun and easier, especially for children at a young age who tends to absorb knowledge better with physical projects presented. Diagram 1 shows the framework of non-electrical fan and final product.

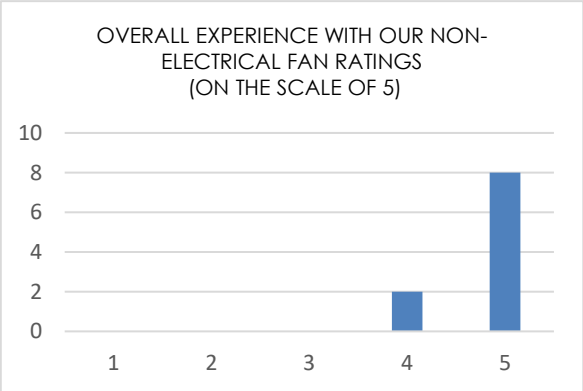
.

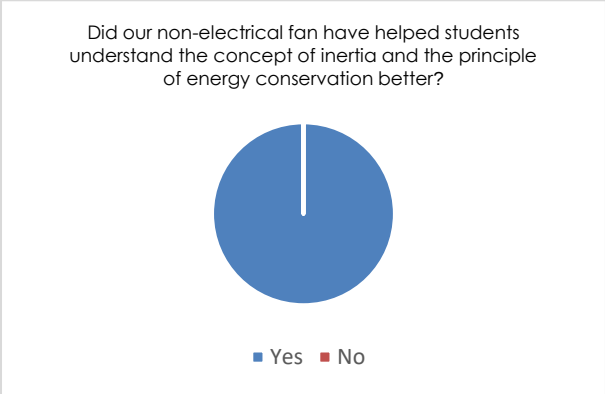
Diagram 1: Framework and final product



Results & Discussion

According to the mini survey we have conducted online via Google form on our non-electrical fan (our first prototype) presented during STEM week, we've managed to gather responses from 10 people from both science and accounting courses as shown in the pie chart and bar graph below.





The results interpreted in pie charts and bar graphs have proven that our innovation has indeed helped students and visitors during the STEM exhibition week understand the concept of inertia and the principle of energy conservation better. The bar graph distributed above has also shown that respondents think that it was an overall fun and worthwhile experience with our non-electrical fan, whether it's during our PowerPoint slide presentation or the STEM exhibition week.

Furthermore, some of the face-to-face responses we've received during our STEM exhibition week were visitors find our non-electrical fan's appearance amusing and different from others' innovations because it somehow seems like a toy and brings some sort of satisfaction to consumers. Besides, the fact that it relates to scientific concepts and principles is quite unexpected and a very unique innovation to many. We consider our innovation a success since we've had over a hundred guests who stopped by our station and had a bit of fun with our non-electrical fan whilst also learning the scientific concepts and principle involved.

Moreover, we have also included a suggestion section for the Google Form respondents where they could provide alternatives or state any flaws they've noticed in our innovation. The main purpose of this is to gain more opinions from different perspectives and expand our space for further improvement. One of the respondents have suggested us a switch of materials which is to replace our current materials with a higher quality wooden stick and thread considering our wooden stick bends easily when pulling force is applied, not to mention the string we've used in our first prototype broke after being pulled for several times.

Therefore, based on the responses received, we have decided to renew the materials used for our non-electrical fan. Instead of the recyclable items used in our first prototype, we are now using stronger materials to ensure that our non-electrical fan doesn't break easily and more wind could be produced when the fan spins. On top of that, we have also decorated our fan with painted floral patterns on the fan and if you look closely when the fan is spinning, you'll notice the alphabet "O" showing the middle.

Impact towards education

This non-electrical fan has a great impact on schools and higher institutions to use as an educational material. Students of any field could have a clearer idea of the concept of inertia and the principle of energy conservation. Besides, it also enhances active learning and allows students to practice teamwork among one another. Furthermore, it increases marketing opportunities and encourages the application of green technology in products used in today's age.

Conclusion

The main objective of this project is to introduce the concept of inertia and the principle of energy conservation in simpler terms to anyone from any age group by creating a fan which doesn't run on electricity.

Based on our final product and responses received from students of Perak Matriculation College, it can be concluded that our non-electrical fan has an indeed eye-catching appearance and it has also sparked a lot's curiosity on the relation of inertia in the aforementioned product. During our STEM exhibition in Perak Matriculation College, many visitors have taken an interest in our innovation since it brings some sort of satisfaction when the string is pulled and recoils on its own. With detailed explanation provided by our group members, they now have a clearer idea of what inertia is and how conservation of energy is related in our product as well. This proves that our objective has been successfully achieved.

For further efforts in improving our non-electrical fan, we're open to receiving more feedback and we plan on conducting another mini survey from the public. Besides, we plan on having a recorded interview with lecturers and students regarding our non-electrical fan. Continuous observation will also be carried out by the group members in the meantime to detect any visible and non-visible flaws of our innovation. We hope to minimise the disadvantages of our non-electrical fan and remove any existing flaws while educating the public regarding scientific concepts, namely inertia and conversion of energy.

References

20 Examples of Law of Inertia In Everyday Life - PraxiLabs. (2021, December 19). PraxiLabs. https://blog.praxilabs.com/2021/12/19/examples-of-law-of-inertia/

Energy Conversion & Law Of Energy Conversion with Examples. (n.d.). BYJUS. https://byjus.com/physics/energy-conversion/

Conservation of Energy Principle - an overview | ScienceDirect Topics. (n.d.). Conservation of Energy Principle - an Overview | ScienceDirect Topics. https://doi.org/10.1016/B978-0-12-417291-3.00012-8

E-maths glossary: a sustainable support tool for translating mathematical terms

Jacinta Johnny, Tan Yong Sing, Celine Lu Siew Che, Krubaa Nandini Nanthakumaran
Jabatan Matematik,Institut Pendidikan Guru Kampus Temenggong Ibrahim, Johor Bahru, Johor, Malaysia[1,2,3,4]
jacinta.johnny@ipgm.edu.my, tan14-805@epembelajaran.edu.my, celine14-812@epembelajaran.edu.my,
krubaa14-796@epembelajaran.edu.my

Highlights: An online application called e-Maths Glossary has been developed by a team from the Department of Mathematics at Institut Pendidikan Guru (IPG) Temenggong Ibrahim Campus. This application aims to provide an accessible, sustainable, and free digital resource aligned with the Malaysian mathematics curriculum to identify mathematical terms with their translations in the four major languages used in schools. e-Maths Glossary specifically aims to help both pre-service teachers and lecturers who use English as their medium of instruction to become familiar with mathematical terms in languages other than English while they undergo practicum or practicum supervision in various schools in Malaysia.

Key words: mathematics glossary; multilingual translation; translate mathematical terms

Introduction

The Malaysian mathematics curriculum, known as the Mathematics Standard-Based Curriculum for Primary School (KSSR) and Mathematics Standard-Based Curriculum for Secondary School (KSSM), may be taught in one of the four major languages, namely English, Malay, Mandarin, and Tamil, depending on the type of school or if a particular classroom adopts the Dual Language Programme (DLP). Pre-service teachers pursuing a degree in Primary Mathematics Education in IPG use English as the language of instruction. However, upon graduation, they would be posted for teaching placement either at the National Primary School or the National Type Primary School, depending on the option of their programme intake.

Therefore, these pre-service teachers require to undergo a series of teaching practicum in the same type of school in which they will be offered placement upon graduation. Although they are proficient in the main language of instruction based on their respective school types, some of them might find it challenging to shift mathematical terms and concepts from English to another language. In addition, the Mathematics lecturers who supervise these pre-service teachers during their practicum too may face some difficulties to thoroughly guide their students to the proper teaching concepts using the correct mathematical terms in the particular language.

Therefore, it is necessary to ensure that the correct mathematical terms are used in the mathematics classroom, regardless of the language of instruction. This concern led to the development of the e-Maths Glossary. The application aims to act as a support tool to easily provide translations in all four languages related to mathematical terms used in the Malaysian mathematics curriculum.

The e-Maths Glossary application has two main objectives as follow:

1. to identify the translations of mathematical terms used in the Malaysian mathematics curriculum in all four languages of instruction.
2. to develop a digital resource that provides translations of mathematical terms that is aligned with the Malaysian mathematics curriculum.

Product Description

Conventional mathematics dictionaries or glossaries available on the market usually focus on definitions of terms from the different areas in the field of mathematics and are usually translated bilingually. Teachers are generally familiar with the definitions or concepts of mathematical terms used at the primary and secondary levels. However, they may face difficulties in identifying the correct mathematical terms when teaching, possibly because they are unfamiliar with the terms in the particular language. The e-Maths Glossary is novel because it focuses specifically on the Malaysian mathematics curriculum. Moreover, the translations of these terms are related to the four major languages used in Malaysian mathematics education. Instead of searching for many sources to identify a particular term in a specific language, the e-Maths Glossary would serve as a one-stop resource to obtain the terms for all Mathematics educators in Malaysia. Besides that, due to its online digital design, the content of this application can be constantly updated to remain relevant.

This application would be applicable to the entire Malaysian mathematics curriculum, regardless of its language of instruction. The design of e-Maths Glossary allows this tool to be used on both computers and smartphones. Moreover, the application can be used in offline mode when no connection signal is available. Since this application was originally developed to help pre-service teachers and their supervising lecturers to adapt to mathematical terms in specific languages, the mobility of e-Maths Glossary would help the pre-service teachers to plan and deliver their lessons using correct terms, while supervising lecturers would be able to instantly access the application to check the terms used by their respective students during the practicum observations.

Results and Discussion

Since the e-Maths Glossary is still a prototype and required pilot testing, the application was only distributed internally to 24 pre-service teachers who underwent practicum, as well as, to five lecturers from the Mathematics Department of IPGKTI to receive feedback for further improvement on its usability. A short survey was conducted based on the adapted Nielsen's Model of Usability (2010).

Table 1: e-Maths Glossary Pilot Test Results.

Item	Scale Responses (%) Strongly disagree to Strongly agree					Median
	1	2	3	4	5	
Dimension: **Learnability** e-Maths Glossary is easy to use.	0.0	0.0	12.5	50.0	37.5	4.25
Dimension: **Learnability** The information provided in e-Maths Glossary is easy to understand.	0.0	0.0	8.3	58.3	33.3	4.25
Dimension: **Efficiency** I can easily find the translation that I'm looking for using e-Maths Glossary.	0.0	0.0	8.3	54.2	37.5	4.29
Dimension: **Efficiency** I am able to quickly complete my translation task using e-Maths Glossary.	0.0	4.2	12.5	50.0	33.3	4.12
Dimension: **Memorability** The organisation of information in e-Maths Glossary is clear.	0.0	0.0	4.2	54.2	41.7	4.38
Dimension: **Satisfaction** The e-Maths Glossary has a pleasant interface.	0.0	0.0	20.8	50.0	29.2	4.08
Dimension: **Satisfaction** The e-Maths Glossary has all the functions corresponding to my expectation.	0.0	0.0	12.5	50.0	37.5	4.25

The responses indicated that e-Maths Glossary has good elements of learnability and memorability. However, the efficiency and satisfaction level of the application could be further improved, specifically on the ability to quickly complete translation tasks and expected functions. These findings are consistent with the findings from the open-ended question that was posed to identify missing information and suggestions to improve the application. The open-ended question feedback highlighted the need to provide audio functionality to assist in the pronunciation of Mandarin and Tamil mathematical terms.

Conclusion

The e-Maths Glossary appeared to be beneficial to the pre-service teachers to experienced teaching practicum, as well as to the mathematics lecturers from the Mathematics Department of IPGKTI. However, the application can be further developed particularly on the audio functionality before it is disseminated to a wider group of educators.

References

Benmoussa, K., Laaziri, M., Khoulji, S., Kerkeb, M. L., & El Yamami, A. (2019). Evaluating the usability of a Moroccan University research management web platform. *Procedia Manufacturing*, 32, 1008-1016.

Harrison, R., Flood, D., & Duce, D. (2013). Usability of mobile applications: literature review and rationale for a new usability model. *Journal of Interaction Science*, 1, 1-16.

Velometer

Shazrina binti Ngatemin
Kolej Matrikulasi Kejuruteraan Johor
Email address bm_2102@moe-dl.edu.my

Highlights: *Velometer, a digital sensor, is introduced as an alternative apparatus to overcome timing inaccuracy in Experiment 4 of Rotational Motion. This study experimented with a control group using conventional apparatus and an experimental group using the Velometer. The result reveals an improvement of 10.78% after implementing the Velometer, with an 11.17% POD without the Velometer compared to 0.39% with its implementation. The findings report that the Velometer's data precision and versatility obtained a score of 100%. Its capability in saves time during setup and enhancing overall efficiency received a 98.8% score, with 97.6% concurred that Velometer fosters a deeper understanding of the concepts.*

Key words: Velometer; Rotational Motion; Digital sensor

Introduction

Rotational dynamics is one of the important topics in Semester One, One-Year Matriculation Programme which aimed to solve problems related to the moment of inertia of a uniform rigid body (Matriculation Division, 2022). Besides, the curriculum specification requires the students to apply the appropriate laboratory skills in the 'Rotational Motion of a Rigid Body' experiment to determine the moment of inertia of a flywheel. However, there are some problems experienced by the matriculation students every year in conducting Experiment 4 of 'Rotational Motion of a Rigid Body'. First, the accuracy and reliability of measuring reaction times with a stopwatch. Reaction times are influenced by the person operating the stopwatch in starting and stopping it at the exact moment when the slotted mass reaches the floor. It may have a slight delay or lag between pressing the start or stop button and the actual timing display. This lag can impact the accuracy of reaction time measurements. Second, the precision of stopwatch itself which has a low-quality mechanism and not correctly calibrated that further introduces errors in timing. Based on the observations during laboratory sessions and the reflection of teaching and learning, these two problems arise practically every year in almost all laboratory sessions led by various lecturers and students, and it is not just handled at the matriculation level, but also by other worldwide educational institutions (David, 2023).

Product Description

The concept of Velometer emerged to encounter the problems faced due to poor equipment in conventional experiment method and by the human error who anticipate the delayed response. The word Velometer is a combination of "velocity" and "meter". It is a digital time sensor used in rotational motion experiment for measuring velocity and time. It consists of a small box housing that contains an encoder module sensor and a shaft. The device is an innovation adapted from the Vernier Rotary Motion Sensor, developed by Vernier Software & Technology in Beaverton, USA. This adaptation incorporates novel enhancements such as additional features and versatile mounting options, enabling seamless integration with diverse experimental configurations (Figure 1). To the best of our knowledge, this is the first time that a digitalized tool has been introduced in the rotational motion topics in matriculation syllabus and any other secondary schools in Malaysia.

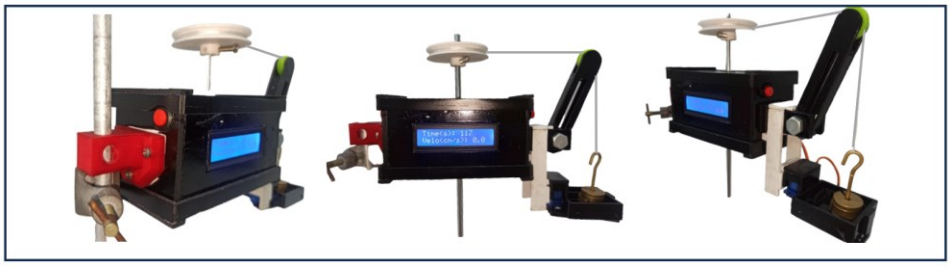


Figure 1: Design of Velometer and its components

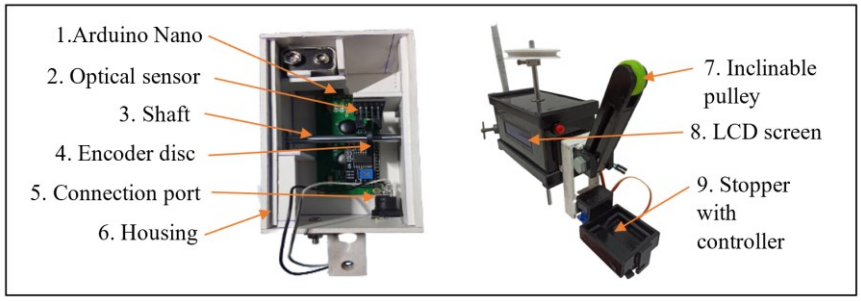


Figure 2: Design of Velometer and its components

In Experiment 4, students should be able to demonstrate manipulative skills during experiment to determine the moment of inertia of a flywheel. Two groups of four practical students from class M1P1 were chosen to demonstrate two different experimental setups of Experiment 4. The control group employed the conventional method, while the experimental group utilized the Velometer device (Figure 3).

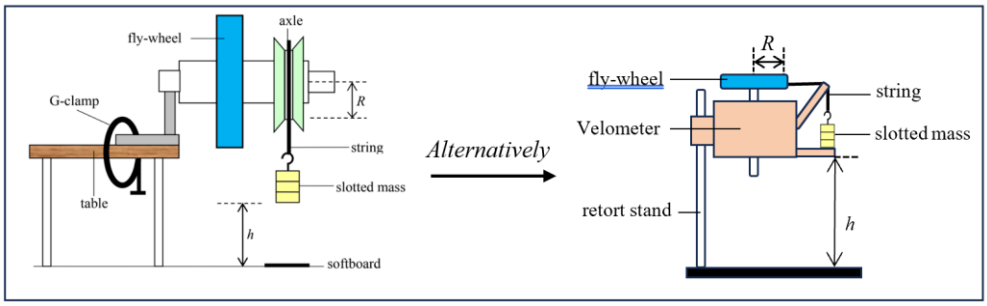


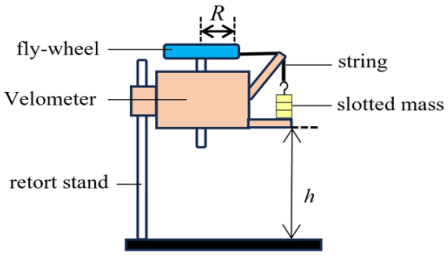
Figure 3: Improvisation of experiment setup from conventional method to utilizing Velometer

An alternative laboratory manual of Rotational Motion experiment is designed to improvise the existing manual book. The new setup replaces a stopwatch, an axle, a G-clamp, and plywood with the Velometer device. This device is an effort to address the problems related to the inaccuracy of timing measured using the conventional method.

Experiment 4: Rotational Motion of Rigid Body

Course Learning Objective: Demonstrate manipulative skills during experiments in rotational motion of rigid body in laboratory.
Learning Outcomes: At the end of this lesson, students should be able to determine the moment of inertia of a flywheel.
Apparatus: A Velometer device
A retort stand
A set of slotted mass with hook
A meter rule
A piece of inelastic string hangs the mass to the flywheel
A vernier calliper

Setup of apparatus:



Procedure:
1. Set up the apparatus as shown in figure above. Connect the Velometer device.
2. Measure the diameter, d, of the flywheel, and calculate its radius, R.
3. Choose a fixed point at a height, h, above the retort stand base. Record height, h.
4. Record the falling slotted mass, m.
5. Release the slotted mass, m, from the fixed height, h, after the string has been wound around the flywheel.
6. Record the time, t, for the slotted mass, m, to reach the floor.
7. Repeat steps (4) to (6) for at least six slotted masses, m.
8. Tabulate the data.
9. Plot a graph of angular acceleration against tensional force.
10. Determine the moment of inertia of the flywheel from the gradient of the graph.
11. Compare the flywheel's moment of inertia to the theoretical value. Write the comments.

Figure 4: Experiment 4

Results & Discussion

To make a clear difference and high impact on the Rotational Motion experiment before and after using the Velometer device, each set of data observed and collected is analysed based on their percentage of difference (% POD). The percentage of difference is the difference between the experimental values to their theoretical value. The accuracy of the data set is considered accurate when the value of % POD falls into (0 -10%) of accuracy and is considered less accurate if it falls beyond the range of percentage stated.

Table 1: Calculations for percentage of difference for Rotational Motion experiment.

Gradient of graph ($kg^{-1}\ m^{-1}$)	Theoretical Value (1/2*mass* square of radius) ($kg\ m^2$)	Experimental Value (radius/gradient) ($kg\ m^2$)	P.O.D (Percentage of Difference) $\%POD = \frac{\lvert I_{theory} - I_{experiment} \rvert}{I_{theory}}$
CALCULATION WITHOUT USING VELOMETER			
10.90	$I_{theory} = \frac{1}{2} \times 1.91 \times (0.0433)^2 = 1.79 \times 10^{-3}$	$I_{experiment} = \frac{0.0217}{10.90} = 1.99 \times 10^{-3}$	$\%POD = \frac{\lvert 1.79 \times 10^{-3} - 1.99 \times 10^{-3} \rvert}{1.79 \times 10^{-3}} = 11.17\%$
CALCULATION BY USING VELOMETER			
1187.16	$I_{theory} = \frac{1}{2} \times 0.056 \times (0.030)^2 = 2.52 \times 10^{-5}$	$I_{experiment} = \frac{0.030}{1187.16} = 2.53 \times 10^{-5}$	$\%POD = \frac{\lvert 2.52 \times 10^{-5} - 2.53 \times 10^{-5} \rvert}{2.52 \times 10^{-5}} = 0.39\%$

According to the calculations based on %POD, it is found that,
i) %POD = 11.17% without using the Velometer apparatus
ii) %POD = 0.39% with using the Velometer apparatus

There is a significant difference of 10.78% in the results before and after using the Velometer. Therefore, using the Velometer in the Rotational Motion experiment gives a set of data which is much more accurate and consistent compared to the data collected before using the Velometer.

To gather feedback and evidence about the benefits of the Velometer, a survey was conducted among 17 participants, including 8 students of class M1P1 and 9 physics lecturers. The survey was administered using *Typeform*, which consisted of a questionnaire comprising 5 Likert-scale questions. Online feedback was collected through *Miro*, a real-time visual collaboration, supported by post-experiment interviews with participating students. Survey findings for comparison of parameter percentages between conventional method and using the Velometer are shown below.

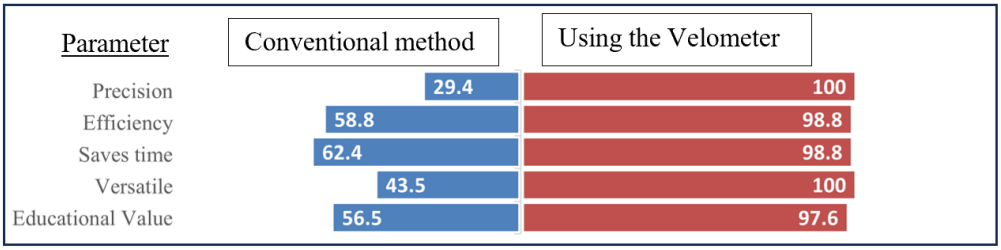


Figure 5: Benefits of Velometer

1. Improved precision: All respondents agreed that the Velometer offers more precision in data than the stopwatch, with a significant increase in percentage score from 29.4% to 100%. It provides high-precision time interval measurements between two points with an interface and data-collection software. The software supports tools for data analysis, resulting in more accurate and reliable data.

2. Increased efficiency: 98.8% of respondents agreed that the Velometer enhances the overall efficiency of the experiment compared to 58.8% in the conventional method. The device connection to data-collection software allows students to monitor and record time intervals in real-time during experiments easily.

3. Saves time: 98.8% of respondents agreed that the Velometer saves time to set up in contrast to conventional method of only 62.4%. It is often straightforward to set up, and their compatibility with standard laboratory apparatus makes it easy to integrate them into experimental setups. Therefore, students can more focus on the experiment rather than spending effort on equipment configuration.

4. Enhanced versatility: All respondents agreed that Velometer is versatile, in significant to a 43.5 percent score with the stopwatch, making it a valuable tool in physics and engineering education. It is suitable for a comprehensive range of experiments involving rotational motion, such as verifying the conservation of angular momentum or investigating the moment of inertia of point masses.

5. Educational value: 97.6% of respondents agreed that the Velometer promotes a deeper understanding of the concepts involved compared to only 56.5% in the conventional method. The Velometer apparatus provides a hands-on approach to understanding rotational motion and moment of inertia, where students can directly observe and analyze the effects of changing mass on the time measurements.

Conclusion

The integration of Velometer into experiment must consider its cost and the technical learning curve. Users who are new to this technology may face a learning curve to understand how the device operates and to calibrate it correctly. They need to ensure that the device is properly calibrated and maintained to obtain accurate and reliable data. Moreover, the production of Velometer may require an investment in hardware and software parts. It could be a potential cost implication for the educational institutional. It costs at 90MYR per device, in comparison to the existing Vernier Rotary Motion Sensors, with prices of USD261.00 from the United States supplier and AUD477.40 from the Australian distributor. It is considered an affordable alternative, that offers an excellent cost-to-performance ratio making it an optimal choice for cost-effective experimentation and data collection.

On top of that, Velometer device holds significant potential for commercialization and research, supported by numerous publications worldwide focusing on rotational motion. The device has received positive feedback, with a 100% recommendation rate for its application in the matriculation laboratory. It is practical for physics laboratory sessions and engineering workshops, such as Workshop 5 in the EE025 Electrical Engineering and Subtopic 2.3 and 3.4 in the EM025 Mechanical Engineering course. Efforts have been made to disseminate information about the Velometer through websites and *YouTube* platforms.

In conclusion, the Velometer has proven to be a valuable tool to enhance the accuracy and reliability of the experiment. As we continue to explore the possibilities of digital pedagogy, we are optimistic about the impact the Velometer will have in fostering a dynamic educational environment that equips students with creativity and innovative skills for future challenges.

Publication, Award and Intellectual Property

Velometer is currently undergoing evaluation for a copyright with *MyIPO*, as evidenced by its registration under license number LY2023J02586.

References

David. (2023). Developing Physics Teaching Aids on Moment of Inertia Material using Arduino Nano and TCRT5000 Sensor, Jurnal Ilmiah Pendidikan Fisika 7(1):10-21.

Matriculation Division Malaysia. (2022). Curriculum Specifications kursus Biologi, Fizik dan Kimia, Bahagian Matrikulasi.

Permainan papan bahasa – Brick Away

Farahdiba binti Md. Said, Mohamad Nazri bin Mokhtar, Siti Suhaila binti Samian, Mohamad Hamdan bin Abdul Ghani

Jabatan Pengajian Am Politeknik Ibrahim Sultan[1], Jabatan Kejuruteraan Mekanikal Politeknik Ibrahim Sultan[2], Jabatan Pelancongan dan Hospitaliti Politeknik Ibrahim Sultan[3], Jabatan Pengajian Am Politeknik Ibrahim Sultan[4]

farahdiba@pis.edu.my, mohamadnazri@pis.edu.my, sitisuhaila@pis.edu.my, m.hamdan@pis.edu.my

Abstrak: Kesukaran memahami perkataan, membuat ayat-ayat arahan serta melaksanakan arahan mendorong kepada inisiatif pelaksanaan inovasi dalam pengajaran dan pembelajaran (PdP). Aktiviti permainan bahasa, Brick Away, diperkenalkan bagi menangani isu yang timbul. Objektif inovasi adalah untuk meningkatkan kemahiran pelajar dalam memahami arahan serta menulis arahan selain meningkatkan motivasi belajar. Berdasarkan permainan bahasa ini, pelajar-pelajar mendapati bahawa Brick Away merupakan permainan yang mudah dengan arahan yang jelas dan dapat meningkatkan kemahiran mengenali perkataan-perkataan arahan selain memahami arahan serta dapat menulis ayat-ayat arahan berdasarkan penerangan yang jelas. Permainan ini boleh dikembangkan kepada pelajar-pelajar di peringkat sekolah rendah yang telah mempunyai asas pengetahuan dan pemahaman ayat-ayat arahan.

Kata kunci: Bahasa; motivasi, kemahiran

Pengenalan

Jabatan Pendidikan Politeknik menawarkan program Sijil Kemahiran di tiga politeknik Premier iaitu Politeknik Ungku Omar, Politeknik Sultan Salahuddin Abdul Aziz Shah dan Politeknik İbrahim Sultan kepada para pelajar berkeperluan khas khususnya pelajar pekak. Penawaran ini kemudiannya dikembangkan ke dua politeknik iaitu Politeknik Tuanku Syed Sirajuddin, Perlis dan Politeknik Kota Kinabalu, Sabah. Di Politeknik İbrahim Sultan, terdapat tiga disiplin ilmu yang ditawarkan untuk program Sijil Kemahiran ini iaitu Sijjl Kemahiran Hotel dan Katering, Sijil Kemahiran Rekaan Fesyen dan Pakaian, dan Sijil Kemahiran Rekabentuk Grafik.

Ketika di semester tiga, para pelajar akan mengikuti kursus Bahasa Inggeris iaitu kursus SUE3011- Bahasa Inggeris untuk Komunikasi 2. Dua daripada hasil pembelajaran bagi kursus ini (CLO) adalah seperti berikut:

1. Menghasilkan manual yang mudah difahami berdasarkan keperluan program pengajian pelajar.
2. Menunjukkan kaedah yang betul melakukan sesuatu berdasarkan manual dengan menggunakan alat bantu visual.

Pemerhatian pensyarah menunjukkan pelajar kurang bersemangat untuk menguasi pengetahuan yang ingin diterapkan ketika sesi penerangan, latihan dan aktiviti yang dilaksanakan secara rutin di dalam bilik kuliah. Justeru, pensyarah merasakan perlunya memberikan objektif yang lebih kukuh kepada pelajar bagi menguasai ilmu yang dihasratkan.

Inovasi ini memberi tumpuan kepada peningkatan kemahiran berbahasa Inggeris dalam kalangan pelajar pekak semester tiga yang mengambil kursus SUE3011, English for Communication2. Brick Away memastikan latihan pembelajaran dijalankan dalam bentuk pertandingan serta pelajar perlu mempraktikkan teknik kecepatan dalam menghasilkan jawapan memandangkan setiap pemain diberi tiga minit sahaja untuk memberi jawapan. Pengulangan permainan membantu mengukuhkan pengetahuan pelajar dalam bukan sahaja pemahaman malahan pembentukan ayat arahan.

Inovasi ini dihasilkan dengan tujuan meningkatkan motivasi pelajar dalam bilik kuliah bagi kursus berkaitan disamping meningkatkan kemahiran pelajar memahami serta menulis arahan. Inovasi ini kemudiannya dikembangkan bagi tujuan diaplikasikan kepada pelajar-pelajar tipikal dengan penambahan bahan inovasi dengan tujuan yang sama, malah dapat memenuhi keperluan dan menjadikan proses pengajaran dan pembelajaran di dalam bilik kuliah lebih menarik.

Rasional Pembangunan Produk

Tumpuan inovasi ini dihasilkan dalam PdP Bahasa Inggeris Komunikasi memberikan penekanan kepada para pelajar untuk menguasai kemahiran berbahasa terutamanya dalam pembentukan ayat-ayat arahan serta penguasaan perkataan yang sesuai digunakan bagi membentuk ayat-ayat tersebut. Antara masalah-masalah yang dikenalpasti antaranya:

1. Pelajar sukar untuk memahami ayat-ayat berbentuk arahan
2. Pelajar dengan kemahiran visual lebih gemarkan aktiviti secara kinestetik dan melibatkan psikomotor.
3. Sukar mencapai matlamat PdP secara individu.

Kaedah permainan ini mempraktikkan teknik imbas kembali bagi menguasai kemahiran berbahasa berbanding teknik menghafal yang biasanya dipraktikkan kepada pelajar lemah.

Penerangan Produk

Produk inovasi ini dipanggil BRICK AWAY – Language Board Game dan digunakan pada minggu-minggu terakhir sesi PdP kursus SUE3011 (English for Communication 2).

Antara objektif penghasilan bahan inovasi PdP ini adalah seperti berikut:

i. Meningkatkan penguasaan kemahiran berbahasa Inggeris dalam kalangan pelajar-pelajar pekak khususnya dalam memberi dan menulis arahan.
ii. Membangunkan kemahiran membaca dan menulis di dalam Bahasa Inggeris dalam kalangan pelajar-pelajar pekak;
iii. Mengaplikasi kemahiran berbahasa dalam jangka masa tertentu semasa penggunaan bahan inovasi PdP;
iv. Menggalakkan proses perbincangan secara berkumpulan; dan
v. Membina semangat berdaya saing dalam kalangan pelajar semasa permainan dijalankan.

Permainan bahasa ini dilaksanakan dengan cara berikut:

1. Permainan papan bahasa ini boleh dimainkan dengan dua cara: Brick Away dan Brick Build Up:
a. Bagi permainan Brick Away, pemain perlu memastikan brick tiada dalam simpanan. Setiap pemain dibekalkan dengan lapan brick. Pemain pertama yang dapat menghilangkan semua brick dalam simpanan adalah pemenang.
b. Bagi permainan Brick Build Up, pemain perlu mengumpulkan brick yang cukup untuk membentuk model yang dipaparkan pada Mission Card yang diperolehi. Setiap pemain dibekalkan dengan hanya dua brick yang mempunyai warna serupa dengan warna token pemain.

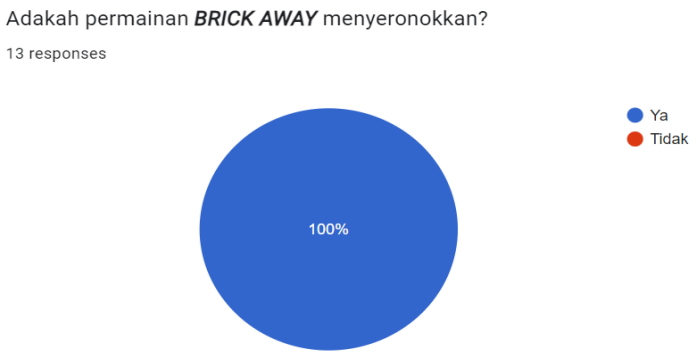
2. Set permainan papan bahasa ini dilengkapi dengan item-item seperti berikut:

i. Papan permainan;
ii. Empat jenis kad tugasan iaitu Risk, Chance, Challenge dan Opportunity. (Setiap kad mempunyai tugasan yang berbeza. Tugasan paling mencabar adalah daripada kad Risk dan tugasan paling mudah adalah kad Opportunity.)
iii. Tiga jenis kad jawapan bagi kad tugasan Risk, Chance dan Challenge.
iv. Mission Card direka khas bagi permainan Brick Build Up;
v. Buah dadu;
vi. Notepad;
vii. Pensel;
viii. Pemasa;
ix. Buku peraturan permainan;
x. Token pemain.

3. Permainan ini boleh dimainkan oleh tiga hingga lima orang pemain dengan seorang menjadi Store Keeper.

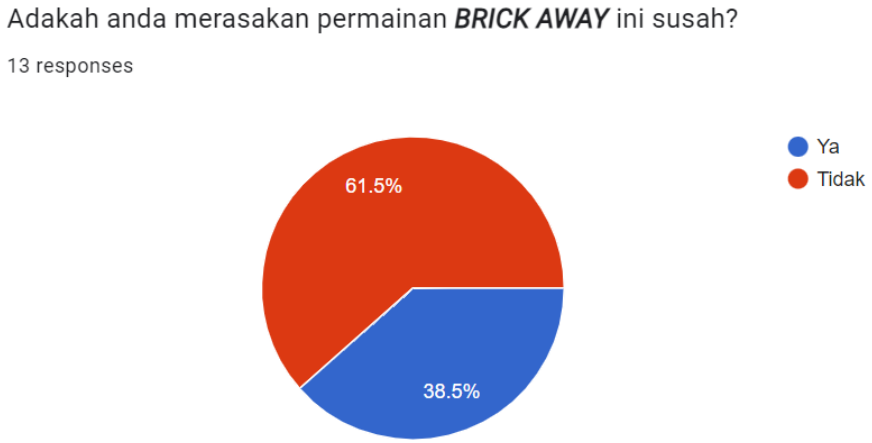
Dapatan dan Perbincangan

Semasa sesi pengajian akademik II 2022/2023, para pelajar pekak Politeknik Ibrahim Sultan yang mengambil kursus SUE3011 telah mengikuti satu pertandingan Brick Away di antara program. Pertandingan diadakan dalam dua peringkat. Peringkat pertama, pelajar bertanding dengan rakan dalam program yang sama. Pemenang bagi setiap program bertanding di peringkat akhir. Pada akhir pertandingan, pelajar diminta untuk menjawab soal-selidik.



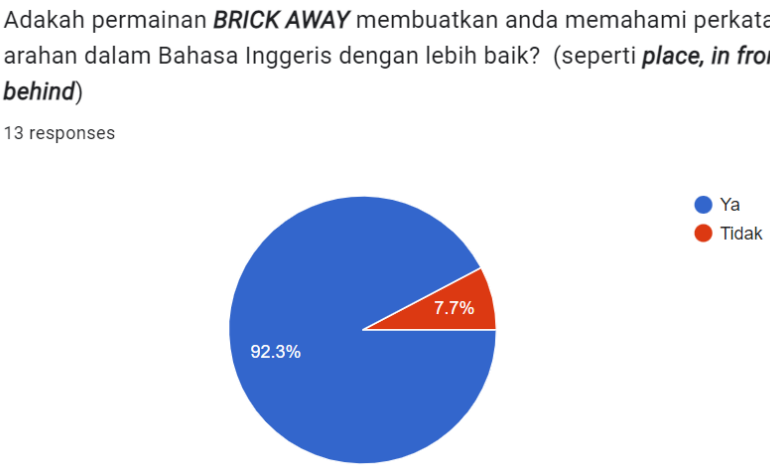
Rajah 1: Pendapat pelajar terhadap Brick Away-1

Kesemua peserta merasakan Brick Away adalah satu permainan yang menyeronokkan. Malahan, ada beberapa pelajar menyatakan hasrat untuk bermain permainan ini berulang kali.



Rajah 2: Pendapat pelajar terhadap Brick Away-2

61.5% pelajar merasakan bahawa permainan Brick Away bukanlah satu permainan yang susah. Namun, 38.5% pelajar merasakan ianya mencabar.



Rajah 3: Pendapat pelajar terhadap Brick Away-3

Impak Inovasi

1. Inovasi ini mampu mengatasi masalah pembelajaran dalam kursus Bahasa Inggeris Komunikasi. Walau bagaimanapun, kaedah permainan bahasa ini juga sesuai digunakan dalam semua kursus yang ditawarkan mengikut kesesuaian isi kandungan topik kursus yang diajar.

2. Selain itu, ia memberi ruang dan peluang kepada pensyarah untuk menjadi lebih kreatif dalam membentuk pengisian yang bersesuaian dengan topik dan kursus diajar.

3. Permainan ini bukan sahaja sesuai digunakan oleh pelajar-pelajar di peringkat IPT, malah sangat sesuai digunakan dari peringkat sekolah rendah dan menengah. Ini kerana ia pernah diuji kepada pelajar sekolah rendah di dalam sebuah pertandingan inovasi yang disertai pada tahun 2019, tahun 2021, serta di Karnival Kerjaya Murid Sukses 2023 dan maklum balas pelajar adalah sangat menggalakkan.

4. Ia juga memberi ruang kepada kajian dan penambahbaikan pada masa hadapan.

Rumusan

Secara keseluruhannya, inovasi ini bukan sahaja menarik minat malah mampu meningkatkan kefahaman dan kebolehan pelajar dalam membina ayat-ayat berbentuk arahan. Di samping itu, ia turut memberi kemudahan kepada pelajar untuk menggunakannya secara fleksibel. Pensyarah pula dapat mempelbagai teknik pengajaran daripada bersemuka kepada pengajaran berpusatkan pelajar dan bahan. Permainan ini merupakan idea baru yang mendatangkan banyak manfaat kepada guru, pelajar, serta membentuk persekitaran pembelajaran positif dalam kursus Bahasa Inggeris Komunikasi dan kursus-kursus lain juga.

Penerbitan, Anugerah Dan Harta Intelek

1. *The Use of Language Board Game to Support Hearing Impaired Language Skills*, *3rd International of Special Education: Elevating Innovations for Sustainable Development of Special Needs Education*, 13-15 Julai 2019, Shangri-La Hotel Surabaya, Indonesia E-ISBN:978-967-15154-2-6
2. Pembentangan poster *Reinforcing Reading and Writing Skills Through Brick Away Language* Game semasa *Malaysian English Language Teaching Association* pada 18 – 20 Ogos 2018 di Berjaya Waterfront Hotel, Johor Bahru.
3. Pingat Perak di *Education Carnivals*: *Transformation Towards Entrepreneurial Mindset* Peringkat Kebangsaan (EdNovac19), 10 April 2019 di Institut Pendidikan Guru Kampus Dato' Razali Ismail, Kuala Terengganu.
4. Pingat Perak di *International Innovation* ARSVOT MALAYSIA (IAM2021).
5. Notification Number: CRLY2023J00192 (*BRICK AWAY-LANGUAGE BOARD GAME*)

Sistem e-Outing V.1 IPGKS

[1]Hirawati binti Abdul Rahman, [2]Beranda Yii Ping Jin
[1,2]Institut Pendidikan Guru Kampus Sarawak, Jalan Bakam, 98009 Miri, Sarawak
[1]hirawati.ar@ipgm.edu.my, [2]beranda.yii@ipgm.edu.my

Highlights: Aplikasi mudah alih yang dikenali sebagai Sistem e-Outing V.1 IPGKS merupakan sebuah aplikasi mudah alih untuk digunakan pada peranti mudah alih seperti di telefon pintar dan tablet. Terdapat 2 modul pengguna utama, iaitu Guru Pelatih dan Warden. Kedua-dua modul pengguna terbahagi kepada 2 sub modul. Sub modul Warden adalah terdiri dari sub modul "Pengesahan Outing Warden" dan "Senarai Pengesahan Mengikut Blok". Bagi sub modul Guru Pelatih pula ialah "Daftar Outing Guru Pelatih" dan "Kelulusan Outing Guru Pelatih".

Kata kunci: Aplikasi mudah alih; Sistem e-Outing; guru pelatih; warden; Institut Pendidikan Guru

Pengenalan

Pengintegrasian telefon pintar semakin meluas dalam pelaksanaan dan penggunaan Teknologi Maklumat dan Komunikasi (ICT). Park & Lee (2012) mendapati bahawa responden purata dalam kajian tersebut telah menyatakan bahawa mereka mempunyai kira-kira 80 aplikasi mudah alih di telefon pintar mereka. Walau bagaimanapun, hanya 16% daripada aplikasi-aplikasi ini yang digunakan secara langsung untuk pembelajaran atau tujuan pengurusan yang berkaitan oleh para pengguna itu sendiri. Secara keseluruhannya, terdapat beberapa keperluan yang jelas untuk meningkatkan dan memanfaatkan sepenuhnya potensi sebenar aplikasi-aplikasi mudah alih ini di telefon pintar sebagai platform atau sumber untuk meningkatkan pembelajaran pelajar dan mengurus aktiviti. Telefon pintar adalah peranti yang canggih, serba boleh serta mudah alih yang memberi ruang kebebasan kepada pengguna untuk mengakses dan mengendalikan maklumat dengan mudah, tanpa mengira masa dan lokasi mereka (Al-Barashdi et al, 2015; Al-fawareh & Jusoh, 2014). Uys et al. (2012) menyatakan bahawa para pelajar dalam kajian mereka menghabiskan purata 16 jam sehari menggunakan telefon pintar. Namun begitu, kebanyakan masa digunakan untuk berinteraksi sosial dengan rakan-rakan dan tiada data dilaporkan mengenai penggunaan aplikasi selain daripada aplikasi media sosial. Dengan wujudnya pelbagai aplikasi di telefon pintar, ianya telah menjadi popular dalam kalangan pengguna, terutamanya untuk tujuan media sosial, kerana mereka mampu meningkatkan komunikasi (Hong et al., 2012). Dapatan dari kajian-kajian terdahulu juga menunjukkan bahawa terdapat minat yang tinggi dalam menggunakan telefon pintar untuk apa-apa tujuan yang diperlukan. Oleh sebab itu, ianya telah terbukti bahawa penggunaan telefon bimbit mempunyai impak positif dalam era masa kini.

Prosedur Operasi Standard (SOP) keluar masuk (outing) di institusi awam dan swasta memerlukan proses yang sistematik. Hasil dapatan kajian kami di Institut Pendidikan Guru Kampus Sarawak (IPGKS), perekodan secara manual menyebabkan guru-guru pelatih perlu beratur menunggu giliran untuk merekod di dalam Buku Log Outing di pondok keselamatan. Situasi ini juga menyebabkan kesesakan di pondok mengawal terutamanya pada waktu puncak outing guru-guru pelatih IPGKS. Prosedur yang agak merumitkan yang mana sekiranya guru-guru pelatih ingin pulang ke kampung atau mempunyai urusan penting di luar kawasan IPGKS melebihi masa sehari, mereka perlu mengisi borang yang memerlukan kelulusan warden asrama blok masing-masing. Proses meluluskan ini melibatkan tandatangan fizikal pihak warden dan keberadaan pihak warden tertakluk kepada aktiviti harian mereka masing-masing. Terdapat masalah pihak warden tidak dapat dihubungi dengan segera dan secara tidak langsung melambatkan proses kelulusan guru pelatih apabila melibatkan urusan kecemasan. Apabila kelulusan telah dibuat, warden asrama perlu memfailkan borang-borang tersebut secara manual untuk tujuan perekodan dan rujukan akan datang. Ini boleh menyebabkan kerja warden asrama akan bertambah dan ruang khas diperlukan untuk menyimpan fail-fail perekodan tersebut. Kos pihak pengurusan juga akan bertambah untuk membeli kertas dan fail serta mencetak borang yang diperlukan. Selain daripada itu, rekod-rekod yang terdahulu yang disimpan lambat laun akan dilupuskan kerana kawasan untuk menyimpan fail agak terhad kerana ruang berkenaan tidak dapat digunakan untuk ruang kerja. Ia sudah pasti menyebabkan pembaziran berlaku akibat pelupusan rekod-rekod lama tersebut.

Manakala dalam pengurusan Hal Ehwal Pelajar (HEP), IPGKS pula menghadapi kesukaran dalam membuat pelaporan kekerapan pergerakan guru-guru pelatih outing apabila pihak pengurusan tertinggi memerlukan data-data tersebut untuk digunakan berdasarkan atas beberapa tujuan tertentu. Masalah ketara yang dihadapi oleh pihak pengurusan adalah apabila menyisih (sort) dan mengasing (filter) data yang diperlukan dilakukan secara manual. Ia akan menyebabkan mengambil masa yang agak lama dan kebarangkalian pelaporan yang dihasilkan kurang tepat kerana mungkin akan ada yang terlepas pandang dengan senarai outing yang melibatkan helaian muka surat yang terlalu banyak atau rosak. Kadangkala, kesukaran untuk membaca tulisan nama guru pelatih sekiranya mereka menulis tulisan tidak kemas atau tulisan bersambung. Bukan itu sahaja, faktor cuaca seperti hujan yang lebat menyebabkan buku log outing guru pelatih akan terkena air hujan dan menyebabkan buku tersebut rosak serta tulisan dalam buku tersebut akan comot dan tidak dapat dibaca dengan baik. Oleh sebab itu, pembaziran kertas yang banyak mungkin akan berlaku disebabkan kecuaian semasa pengumpulan data dan sebagainya.

Deskripsi Produk

Pembangunan sistem ini adalah bertujuan untuk memudahkan proses pendaftaran keluar masuk (*outing*) guru pelatih di IPGKS di samping memudahkan para warden memberi kelulusan secara dalam talian tanpa memerlukan guru pelatih mengisi borang atau dalam buku log outing secara manual di pondok keselamatan dan sebagainya. Kumpulan iRus juga telah mengenal pasti kekangan dari pihak pengurusan Hal Ehwal Pelajar (HEP) IPGKS yang menghadapi kesukaran membuat pelaporan kekerapan pergerakan guru-guru pelatih keluar masuk dari IPGKS

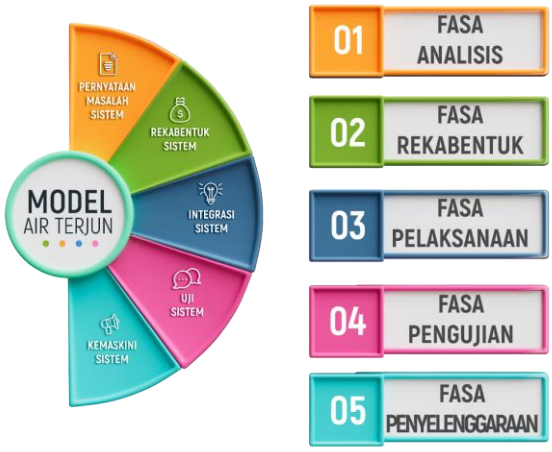
secara pantas kepada pihak pengurusan tertinggi Institut Pendidikan Guru Malaysia (IPGM) disebabkan perlu membuat pengiraan secara manual melalui buku log tersebut. Terdapat 3 aplikasi yang digunakan dalam pembangunan sistem ini, antaranya ialah *AppSheet* sebagai platform editor utama untuk antaramuka pengguna sistem, *Google Sheets* sebagai pangkalan data dan Google Data Studio sebagai paparan pelaporan untuk data yang diperlukan. Kesemua aplikasi ini adalah dari produk syarikat teknologi, *Google LLC* yang mana adalah percuma dan kaedah membangunkan sistem ini adalah secara dalam talian.

Aplikasi ini adalah bukan sahaja bersifat mesra pengguna malah juga dapat mengurangkan kos seperti membeli buku log untuk kegunaan guru pelatih mendaftar outing di pondok keselamatan dan mencetak borang pulang ke kampung; menjimatkan masa proses guru pelatih memohon kelulusan warden untuk pulang ke kampung. Manakala, dari segi faktor keselamatan data juga turut dilindungi daripada dicerobohi oleh pihak luar kerana sistem tersebut hanya boleh diakses oleh pengguna emel berdaftar dengan domain e-Pembelajaran IPGKS yang mana terdiri daripada semua guru pelatih dan staf-staf akademik IPGKS sahaja. Setelah itu, admin sistem akan memberi kelulusan untuk menginstalasi sistem. Pelaporan yang dijana boleh diasing (*filter*) atau disisih (*sort*) mengikut keperluan dan kehendak pihak HEP dan ianya boleh dimuat turun melalui "*Dashboard*" yang disediakan. Perisian ini telah mula diguna pakai secara rasminya sejak bulan April 2023 oleh kesemua guru pelatih, warden dan Unit HEP IPGKS sehinggalah sekarang. Setakat ini, penggunaan aplikasi mudah alih ini telah berfungsi dengan baik tanpa sebarang ralat dari sistem tersebut.

Metodologi yang digunakan untuk membangunkan sistem aplikasi mudah alih ini adalah *System Development Life Cycle* (SDLC) kerana ia merupakan pendekatan berstruktur untuk pembangunan perisian. Terdapat beberapa model SDLC diperkenalkan antaranya ialah Model Air Terjun (*Waterfall*). Model ini dipilih kerana pendekatan pembangunan perisian yang mengikuti kaedah linear dan berurutan untuk menyampaikan produk perisian. Model ini mempunyai pelbagai hasil dari setiap fasa. Antara kebaikan-kebaikan yang terdapat di dalam model ini ialah:

1. Ia dapat menjimatkan masa semasa pembangunan sistem kerana dapat mengenalpasti awal ralat yang berlaku.
2. Oleh kerana model berikut pendekatan linear, ia menjadi lebih mudah untuk diurus.
3. Setiap fasa dilaksanakan satu demi satu.
4. Ia lebih sesuai digunakan untuk projek bersaiz kecil.

Oleh sebab itu, model ini sangat sesuai digunakan apabila keperluan projek telah dikenalpasti dan jelas untuk menghasilkan produk yang stabil dan kukuh (Vallabhaneni, 2018). Terdapat lima fasa yang terlibat dalam model ini iaitu:



Rajah 1: Model Air Terjun (*Waterfall Model*)

Dapatan & Perbincangan

Kaedah kajian tinjauan menggunakan soal selidik juga digunakan bagi mengumpul data yang terperinci daripada populasi yang membenarkan kami menganalisis masalah secara lebih mendalam. Cua (2006) menjelaskan bahawa kajian tinjauan memiliki beberapa kelebihan iaitu antaranya permasalah atau isu yang berkaitan dapat dikaji dengan lebih menyeluruh, proses pengumpulan data yang lebih cepat, kemampuan menggunakan saiz sampel yang besar, serta kemampuan untuk membuat generalisasi yang melibatkan populasi kajian pada waktu yang singkat. Instrumen soal selidik mengandungi soalan-soalan untuk mendapatkan maklumat responden dari kategori jantina, etnik dan soalan-soalan berkaitan dengan isu yang dikaji. Data-data ini dianalisis dengan menggunakan pendekatan rekabentuk kajian kuantitatif. Menurut Hair et al. (2010) penilaian kebolehpercayaan instrumen kajian dilakukan untuk mengukur sejauh mana konsistensi internal setiap konstruk kajian dan ia merupakan pendekatan yang sesuai dalam konteks pendekatan kuantitatif.

Berdasarkan Jadual 1 menunjukkan demografi guru pelatih IPGKS sebagai responden berdasarkan jantina dan etnik. Daripada jumlah keseluruhan responden iaitu seramai 368 orang individu terlibat yang mana guru pelatih perempuan didapati mendominasi dengan nilai peratus sebanyak 75%, manakala peratus guru pelatih lelaki hanya sebanyak 25% sahaja.

Jadual 1: Guru Pelatih IPGKS

Pembolehubah	Kategori	Bilangan Responden	Peratus (%)
Jantina	Lelaki	92	25
	Perempuan	276	75
Etnik	Melayu	137	37.2
	Cina	51	13.9
	India	0	0
	Iban	79	21.5
	Orang Ulu	55	14.9
	Melanau	14	3.8
	Bidayuh	14	3.8
	Lain-lain	18	4.9

Demografi

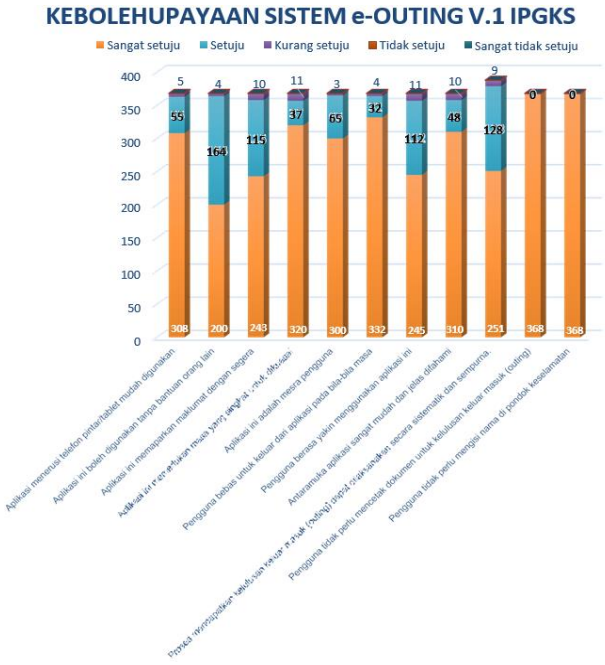
Impak keberkesanan penggunaan teknologi dalam talian dari sistem aplikasi ini terhadap pengguna berdasarkan dari hasil dapatan soal selidik dan tinjauan terhadap pengguna terbahagi kepada beberapa kategori. Antaranya adalah:

1. Aspek Sosial
   a. Guru-guru pelatih tidak lagi perlu beratur panjang menunggu giliran merekod pergerakan outing di buku log terutamanya masa kemuncak. Selain itu, mereka juga tidak perlu mencari warden bagi tujuan kelulusan secara fizikal untuk outing bermalam.
   b. Warden asrama tidak perlu lagi mengambil masa yang lama untuk tujuan memberi kelulusan outing bermalam kepada guru-guru pelatih.
   c. Pihak HEP IPGKS tidak perlu lagi bersusah payah mengumpul data kekerapan outing guru pelatih secara manual selain memudahkan membuat sisihan dan pengasingan (sorting and filter) dengan itu dapatlah menjimatkan masa dan tenaga.

2. Aspek Ekonomi
   a. Pihak pengurusan tidak perlu lagi mengeluarkan kos untuk pembelian buku log dan kertas serta katrij pencetak untuk tujuan perekodan outing guru-guru pelath.
   b. Tiada lagi aktiviti pelupusan rekod-rekod lama yang menyebabkan pembaziran kos yang ditanggung selama ini.

3. Aspek Persekitaran
   a. Tiada lagi lambakan kertas yang terdiri daripada borang-borang permohonan outing bermalam bagi guru-guru pelatih dan juga buku-buku log terpakai.
   b. Tiada lagi penggunaan ruang untuk menyimpan perekodan outing yang boleh menyebabkan ruang makin sempit dan terhad untuk digunakan.

Rajah 2 yang berbentuk graf pula menunjukkan penyataan soalan yang telah dikemukakan kepada responden melalui soal selidik yang dijalankan. Soalan yang dikemukakan ini meliputi soalan yang berkaitan dengan kebolehupayaan sistem aplikasi ini untuk memastikan adakah sistem tersebut menarik dan berguna untuk kegunaan pengguna. Skala penilaian dalam instrumen soal selidik ini menggunakan menggunakan darjah persetujuan skala lima likert, iaitu: 1 (sangat tidak setuju) hinggalah 5 (sangat setuju).



Rajah 2: Bilangan jawapan yang telah dijawab oleh responden

Setiap projek atau sistem yang dibangunkan perlu dinilai untuk memastikan bahawa kebolehupayaan aplikasi yang berkesan selepas digunakan oleh pengguna sistem. Berdasarkan soal selidik yang telah dibuat mengenai sistem aplikasi ini, kumpulan ini telah mengumpulkan beberapa jumlah dan analisis responden yang mengambil bahagian dalam menjawab soal selidik ini. Satu set soal selidik yang digunakan telah diubahsuai daripada alat ukur SERVQUAL yang dibangunkan oleh Parasuraman, Berry dan Zeithaml pada tahun 1988. Kami memilih model SERVQUAL kerana ia mampu mengenal pasti perbezaan di antara jangkaan dan persepsi dalam penyampaian perkhidmatan (Fadilah et al., 2014). Model ini juga dapat membantu memahami apa yang dijangkakan dan bagaimana pengguna dapat menilai kebolehgunaan sesuatu sistem aplikasi dan seterusnya membolehkan usaha peningkatan kualiti servis yang berterusan. Terdapat lima dimensi utama iaitu kebergantungan (reliability), jaminan (assurance), nyata (tangibles), empati (empathy) dan responsif (responsiveness). Responden kajian adalah terdiri daripada kesemua guru pelatih IPGKS iaitu seramai 368 individu terlibat di dalam soal selidik ini. Bagi mengenalpasti kebolehupayaan Sistem e-Outing V.1 IPGKS dari aspek pengurusan outing guru pelatih IPGKS berdasarkan lima dimensi SERVQUAL (kebergantungan, jaminan, nyata, empati dan responsif) data telah dianalisis secara deskriptif. Min dan sisihan piawai bagi setiap dimensi adalah ditunjukkan seperti di Jadual 2 berikut:

Jadual 2: Dapatan Min Keseluruhan

Dimensi	Komponen Soal Selidik	Min
1	Dimensi Kebergantungan	4.53
2	Dimensi Jaminan	4.64
3	Dimensi Nyata	4.86
4	Dimensi Empati	4.81
5	Dimensi Responsif	4.79
	Min Keseluruhan	4.73

Kesimpulan

Oleh hal yang demikian, adalah diharapkan Sistem e-Outing V.1 IPGKS dapat memberikan manfaat untuk para pengguna khususnya dalam pengurusan proses keluar masuk guru-guru pelatih di IPGKS di samping dapat memudahkan pihak pengurusan HEP IPGKS dalam mentadbir urus data outing guru-guru pelatih. Bahkan dapat mengadaptasi pengurusan data secara dalam talian tanpa menggunakan kaedah perekodan secara manual sekaligus memacu ke arah teknologi IR4.0 seiring dalam melestarikan amalan hijau. Ia juga dapat mengelakkan data-data daripada diceroboh oleh pihak yang tidak bertanggungjawab melalui kaedah mengehadkan identiti mengikut domain (restricting identities by domain). Selain itu, diharapkan juga sistem aplikasi ini dapat mempertingkatkan lagi mutunya dengan melakukan penambahbaikan yang telah dicadangkan sebelum ini supaya boleh dipasarkan dan dikomersialkan lebih luas lagi kerana aplikasi sebegini belum banyak dibangunkan lagi khususnya di Malaysia.

Penerbitan, Anugerah dan Harta Intelek

AKTA HAK CIPTA 1987
PERATURAN-PERATURAN HAK CIPTA (PEMBERITAHUAN SUKARELA) 2012

SIJIL PEMBERITAHUAN HAK CIPTA
[Subperaturan 8(2)]

No. Pemberitahuan : CRLY2023Q03189
Tajuk Karya : SISTEM E-OUTING V.1 IPGKS
Kategori Karya : SASTERA
Tarikh Permohonan : 25 JULAI 2023

Saya dengan ini mengesahkan di bawah Akta Hak Cipta 1987 [Akta 332] dan Peraturan-Peraturan Hak Cipta (Pemberitahuan Sukarela) 2012 bahawa karya hak cipta dengan No. Pemberitahuan seperti di atas bagi pemohon **INSTITUT PENDIDIKAN GURU KAMPUS SARAWAK (-), HIRAWATI BINTI ABDUL RAHMAN (820125085700)** sebagai **PEMUNYA** dan **HIRAWATI BINTI ABDUL RAHMAN (820125085700), BERANDA YII PING JIN (930909135670)** sebagai **PENCIPTA** telah didaftarkan ke dalam Daftar Hak Cipta menurut seksyen 26B Akta Hak Cipta 1987 [Akta 332].

KAMAL BIN KORMIN
PENGAWAL HAK CIPTA
MALAYSIA

(Agensi di bawah Kementerian Perdagangan Dalam Negeri dan Kos Sara Hidup)

Rujukan

Al-Barashdi, H.S., Buoazza, A. & Jabur, N.H. (2015). Smartphone addiction among university undergraduates: A literature review. *Journal of Scientific Research & Reports.* 4(3): 210-225.

Al-fawareh, H.M. & Jusoh, S. (2014). Smartphones Usage Among University Students: Najran University Case. *International Journal Of Academic Research.* 6(2): 321-326.

Chua, Y. P. 2011. Kaedah dan statistik penyelidikan: kaedah penyelidikan. Mcgraw-Hill Education.

Fadilah, M. N., Safura, A. S. & Khalid, K. (2014). Tahap Kepuasan Pelanggan Terhadap Kualiti Perkhidmatan Pengangkutan Awam Di Kuis. Proceeding of the 1st International Conference on Management and Muamalah 2014.

Hong, F.Y., Chiu, S.I. & Huang, D.H. (2012). A model of the relationship between psychological characteristics, mobile phone addiction and use of mobile phones by Taiwanese University female students. Computers in Human Behavior. 28: 2152 – 2159.

Jamalludian Harun dan Zaidatun Tasir. (2003). Multimedia dalam pendidikan. Pahang: PTS Publications & Distributors Sdn. Bhd

Park, N. & Lee, H. (2012). Social Implications of Smartphone Use: Korean College Students' Smartphone Use and Psychological Well-Being. CyberPsychology, Behavior & Social Networking. 15(9): 491-497.

Uys, W.A., Mia, G.J., Jansen, H.V., Schyff, M.A., Khusu, M., Gierdien, M., Luekes, N.A., Park, N. & Lee, H. (2012). Social Implications of Smartphone Use: Korean College Students' Smartphone Use and Psychological Well-Being. CyberPsychology.

The Impact of MD'Teknik Towards Year Four Students in Solving Division Problems

[1]Chin Jack Onn, [2]Seow Wen Qiang, [3]Afian Akhbar Mustam
[1,2,3,4,5]Institute of Teacher Education Technical Education, Campus Negeri Sembilan, Malaysia
[1] chin08-685@epembelajaran.edu.my, [2] seow08-665@epembelajaran.edu.my, [3] afianakhbar@ipgm.edu.my

Highlights: Division, which is considered the most difficult basic operation for primary school students has contributed to Malaysia's lower performance in international mathematics assessments, as proven after reviewing past studies. A quasi-experimental design with a quantitative approach was employed, involving 60 students at a primary school in the Seremban district, Negeri Sembilan to determine the impact of MD'Teknik. Findings showed that MD'Teknik has significantly improved the Year Your students' performance in solving division problems compared to the conventional method. The implications of this study proved MD'Teknik is beneficial to education stakeholders and should serve as an alternative in solving division problems.

Key words: Division; MD'Teknik; Performance; Education Stakeholders; Alternative

Introduction

In Malaysia, the mathematics Standard-Based Curriculum for Primary School (KSSR) is a core subject that must be undergone by all students who followed the National Education System (Ministry of Education Malaysia (MOE), 2017). The aim of the Primary School Standard Curriculum for Mathematics is to develop students' understanding of the concept of numbers, basic calculation skills, simple mathematical ideas and competency in applying mathematical knowledge and skills effectively in solving problems and making decisions in daily life. In 2013, Malaysia Education Blueprint 2013-2025 has an emphasis on improving the quality of teaching in Science, Technology, Engineering, and Mathematics (STEM) education to ensure that students are equipped with the skills needed to face the challenges of a changing world (MOE, 2013). Thus, it can be seen that mathematics subjects play an important role in the current Malaysian education system.

Malaysia has participated in two major assessments which are Program for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS). The latest result of PISA 2018 shows that Malaysian students are still not on par with their peers in the region and the rest of the world. Despite a slight improvement in PISA 2018 compared to PISA 2015, Malaysia still ranks in the lower part of the chart (Kok, 2020). This statement is in line with the report by Avvisati et al. (2019) which mentioned that Malaysian students scored lower than the average score in reading, mathematics and science in PISA 2018. Apart from that, in TIMSS 2019, Mullis et al. (2020) in their report have mentioned that the results of Malaysia students are also slightly decreasing compared to the results in previous assessment and still at a lower point compared to others country.

By referring to the results in both PISA and TIMSS assessments, Malaysia's education outcomes have fallen behind countries like Singapore, Chinese Taipei, Korea, Japan and Hong Kong. Alarmingly, the gap within Malaysian student outcomes is also widening (James et al., 2022). In 2020, the 2019 Primary School Assessment Report (PPSR) found that 16.87% of primary students have only scored grade E in the mathematics assessment in *Ujian Pencapaian Sekolah Rendah* (UPSR) 2019. This grade indicates that these students have not yet reached the minimum level in mathematics, and their mastery of basic mathematical knowledge and skills is at a low level (MOE, 2020a). In order to achieve a position in the top third in the TIMSS and PISA, MOE has set a target to achieve at least a score of 600 in the *Pencapaian Pentaksiran Kompetensi dan Literasi Sekolah Rendah* (PKLSR). However, in the annual report 2021 of Malaysia Education Blueprint 2013-2025, the author pointed out that score obtain by mathematics in the PKLSR is still not on target even though there was a significant improve compared to result in 2020 (*Unit Pelaksanaan dan Prestasi Pendidikan* (PADU), 2022).

This phenomenon is believed to be affected by one of the learning areas in mathematics, which is Numbers and Whole Numbers as it is the first learning area that students will learn since they start to learn mathematics. This statement is further supported by a journal that were published in the Cypriot Journal of Educational Science (Maamin et al., 2021), where they conclude that prior mathematical knowledge would affect their achievement in mathematics. Basic operations are the main focus in the learning area of numbers and whole numbers. There are four types of basic operations which include addition, subtraction, multiplication and division. In further studies, these calculation processes will be linked to all others mathematics topics such as fractions, decimals, percentages, money, time, measurement and so on (Manikabasagan, 2020). Among the basic operations which are addition, subtraction, multiplication and division, most students consider that division is a complex operation (Safiati et al., 2021). According to Incikabi et al. (2020), students often had difficulties in solving division problems. Therefore, it is important to ensure that students are able to solve the basic operations especially for the operation of division because if students fail to acquire the basic skills of operation, they will face problems in learning further mathematics topics.

To tackle the problems related to division, the MD'Teknik is innovated in hope to solve the struggles faced by the students in solving division problem through an alternative method.

Product Description

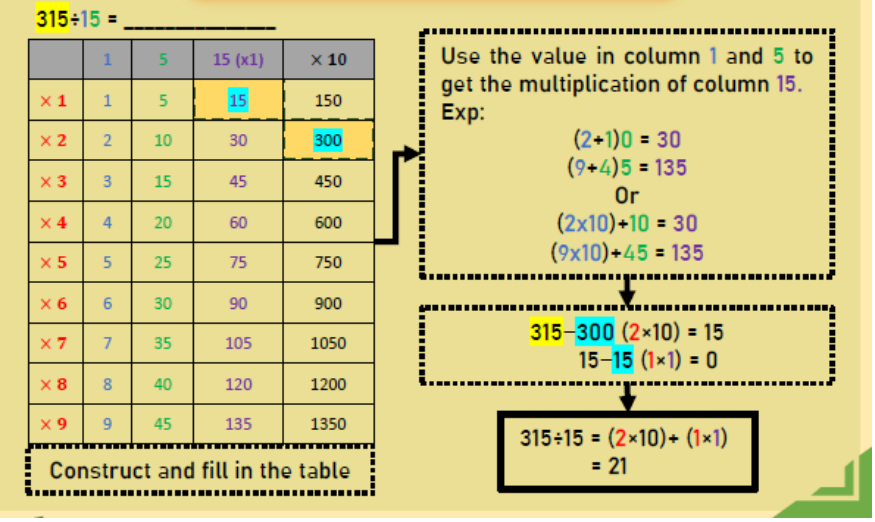


Figure 1: MD'Teknik

The MD'Teknik is a combination of the term's multiplication, division and technique. It is an alternative technique in solving multiplication and division problems using "Easy Column". In the context of this research, the development of the MD'Teknik aims to help students to solve division easily by connecting the operation of division with the other basic operation which is addition, subtraction and multiplication. This is because students struggled more in the operation of division compare to others operation. By connecting the operation of division with the students' previous knowledge and experience, which is the operation of addition, subtraction and multiplication, it may help students to solve division problems more easily and effectively. Figure 1 shows an overview on how to use the "Easy Column" to solve division problems. A detailed step is as showed below using an example of 315 divide by 15:

1. A table of the divisor, which is 15 in this example is constructed as shown in left side of Figure 1. The column 1 and 5 is written out first.
2. The column of 15 could be calculated by combining the column 1 and 5. There are two methods in combining them. The first one being by adding the ones for the column '1' and the tenth for the column '5'. After adding both numbers, we will first write the tenths from the '1' column, if the answer exceed 10 after adding, we will add it to this number as well. Then, we write the answer and lastly, we write the ones from the column '5'. For example, the 'x2' row, we add the ones from column '1' and the tenths from column '5', which is (2+1). Then we write the ones from column '5', which is 0. Thus, the result is (2+1)0 = 30. The second methos is by adding numbers where the '1' column starts from the tenth while the '5' column starts from ones. For example, in the 'x9' row, column '1' is placed as tenth by multiplying 10 and add it with column '5'. Thus, (9x10) + 45 = 135.
3. Next, we will add more column to the right where we multiple it by 10 each time we add a new column. We stop adding more column where the results have one more place value when compared to the question, in this case, we stop at 4 digits.
4. Then, we check the closest number to our remaining numbers by referring to the table we build. After we determine the number, we subtract the remaining number with the number that we found. The steps are repeated until no more steps can be made again. In this example, 315 – 300 = 15. Then we repeat it, 15 – 15 = 0.
5. We then highlight the numbers that were used which in this case were 300 and 15.
6. Lastly, we add the highlighted numbers in corresponding to their placement in the table. For example, the number 300 will represent (2x10) while the number 15 will represent (1x1).
7. The answer for the question will be calculated by adding both the numbers we got from referring to the table. In this example, it will be 20 + 1 = 21. Therefore, 315 divide by 15 would be 21.

Results & Discussion

Research has been conducted to test the impact of the innovation, MD'Teknik towards students' performance in solving division problems. The design of this study is based on a quasi-experimental design which involves a pre-test and post-test. A quantitative approach was used in this study because the instruments used in this study provide data in the form of numbers and can show comprehensive information, differences, and findings of effects. Two classes of 30 students each were selected from a Primary School in the Seremban district, Negeri Sembilan as the sample.

Respondents were separate into two groups which were control group and treatment group. Control group has gone through the teaching and learning (TnL) session by using conventional method while the treatment group has received the TnL session by using MD'Teknik in solving division problems. Before the intervention session started, respondents were exposed to the Pre-Test first. After that, the TnL process was conducted and lasted for two sessions for both groups and the duration of each TnL session was for one hour. After completing the intervention session, the respondents underwent a Post-Test to determine if there was a significant difference between the overall mean scores for the Pre-Test and Post-Test in both groups.

Both paired sample t-test and independent t-test was conducted with the assistance of the app Statistical Package for the Social Sciences (SPSS). Based on the results, it was found that the mean increase in Pre-Post Test performance for the treatment group (37.833%) was much higher when compared to the control group (12.567%).

Besides, the overall mean score in Post-Test for the treatment group was also being 15.90% higher than the control group. These results have shown that students' performance has been improved more significantly with MD'Teknik compared to the conventional methods in TnL of division.

The findings have shown that the utilization of MD'Teknik has a drastic positive impact towards Year Four students in solving division problems. Consequently, the application of MD'Teknik carries significant implications for various stakeholders, such as students, teachers, the Malaysian Institute of Teachers Education (IPGM), and the Ministry of Education (MOE).

The implications for students can be seen through the significant increase in students' mean scores between the Pre-Test and Post-Test for the treatment group. The results of the study show that the use MD'Teknik can help students in solving division problems more effectively. As noted by Hino & Kato (2019), proficiency in whole-number operations serves as a foundation for children's later conceptual development. Thus, the ability to solve division problems is crucial for students to tackle more challenging mathematical problems in the future.

Besides, this innovation also brings implications for the teacher. As highlighted by Safiati et al. (2021), there are still many specific problems in division that require the development of new techniques. This emphasizes the need for teachers to explore and implement various approaches, giving students multiple options for solving division problems. *Lembaga Peperiksaan* (2017) also advised that candidates have to learn various calculation techniques in solving each question. The findings of this study provide valuable insights to teachers regarding the impact of MD'Teknik on students' ability to solve division problems. The results indicated that the MD'Teknik demonstrated a drastic positive impact towards students in solving division problem and can be implemented in the classroom to help students in solving division problems.

This innovation serves as an important reminder to the IPGM regarding their role in cultivating proactive future teachers. It highlights the significance of equipping aspiring teachers with innovative methodologies, such as MD'Teknik, to enhance their teaching effectiveness and address students' learning needs. As mentioned by Ahida Suci et al. (2018), the implementation of appropriate methodology in the learning of mathematics can help students to improve their achievement. By emphasizing the importance of incorporating effective teaching methods, the study emphasizes the responsibility of IPGM in preparing teachers who are proactive, adaptable, and equipped with the necessary skills and knowledge to meet the evolving demands of education.

This innovation also brings implication for MOE to prioritizing the development and implementation of suitable methodologies in mathematics education. By emphasizing the use of appropriate methodologies, students' problem-solving abilities in mathematics can be improved. Through the adoption of appropriate methodologies, such as MD'Teknik, students are expected to engage in more effective and meaningful ways of learning mathematics. This can contribute to an increased level of interest towards mathematics, as well as learning. By placing emphasis on the development and implementation of appropriate methodologies in mathematics education, MOE can play a significant role in improving students' mathematical problem-solving skills and overall performance in international assessments such as TIMSS and PISA. This is significant in elevate the Malaysian students' mathematics performance and enhance their competitiveness on the global stage.

Conclusion

To conclude, this innovation, MD'Teknik has proven to be an effective alternative method to solve division problem. However, this innovation could be further improved by collecting more data. This innovation has only conducted its research on Year Four students in Malaysia. Therefore, future research may conduct on different level of students. This can provide a more comprehensive understanding about the impact of MD'Teknik towards different level of students. This innovation only includes 60 students as the sample. Therefore, future research may conduct with a larger sample size. This can provide a more comprehensive understanding about the impact of MD'Teknik towards students in solving division problems. This research only focuses on the impact of MD'Teknik in solving division problems. Therefore, future research may focus on others mathematics topic which involve of the operation of division such as decimals, times, money and measurement. This can provide a more comprehensive understanding about the impact of MD'Teknik towards different mathematic topics that involve the operation of division. This research only focuses on a primary school in Seremban district, Negeri Sembilan. Therefore, future research may focus on the sample from others school such as the rural area school, excellent cluster school and international school. This can provide a more comprehensive understanding about the impact of MD'Teknik towards the students from different areas. This research using a quaxi-experimental design with a quantitative approach to determine the impact of MD'Teknik towards Year Four students in solving division problems. Future research may use an action research design with a qualitative approach to evaluate the impact of MD'Teknik towards the students who are weak in the operation of division. This can provide a more in-depth understanding about the impact of MD'Teknik towards the students who are weak in the operation of division.

References

Ahida Suci, S. H., Rosyidah, E., Asitah, N., Aini, N., Murni, A. W., Anam, F., Purnomo, A., Sallu, S., Mulyaningsih, I., & Kuraesin, A. D. (2018). Learning from picture and picture action research: Enhancement of counting ability on division of numbers for primary school students. *Journal of Physics, 1114*(1). https://doi.org/10.1088/1742- 6596/1114/1/012044

Avvisati, F., Echazarra, A., Givord, P., & Schwabe, M. (2019). *Programme for International Student Assessment (PISA): Results from PISA 2018*. https://www.oecd.org/pisa/publications/PISA2018_CN_MYS.pdf

Hino, K., & Kato, H. (2019). Teaching whole-number multiplication to promote children's proportional reasoning: a practice-based perspective from Japan. *ZDM - Mathematics Education, 51*(1), 125–137. https://doi.org/10.1007/s11858-018-0993-6

Incikabi, L., Ayanoglu, P., & Uysal, R. (2020). Sixth-grade students' procedural and conceptual understandings of division operation in a real-life context. *International Electronic Journal of Elementary Education, 13*(1), 35–45. https://doi.org/10.26822/iejee.2020.171

James, J., Talin, R., & Bikar, S. S. (2022). Defining student's achievement based on the understanding of National Education Philosophy and Malaysia's Education Blueprint (2013 -2025). *Malaysian Journal of Social Sciences and Humanities (MJSSH), 7*(4). https://doi.org/10.47405/mjssh.v7i4.1401

Kok, K. H. (2020). PISA 2018 and Malaysia. *International Journal of Advanced Research in Education and Society, 2*(3), 12–18. http://myjms.moe.gov.my/index.php/ijares

Lembaga Peperiksaan. (2017). *Kupasa Mutu Jawapan UPSR 2017*. Ministry of Education Malaysia.

Maamin, M., Maat, S. M., & Iksan, Z. H. (2021). Analysis of the factors that influence mathematics achievement in the ASEAN countries. *Cypriot Journal of Educational Sciences, 16*(1), 371–389. https://doi.org/10.18844/cjes.v16i1.5535

Manikabasagan, K. (2020). MD Lego Meningkatkan kefahaman dan kemahiran murid dalam topik darab dan bahagi. *The 9th International Innovation, Invention and Design Competition 2020*, 233-234. https://ir.uitm.edu.my/id/eprint/68600

Ministry of Education Malaysia. (2013). *Pelan Pembangunan Pendidikan Malaysia 2013-2025*. https://www.moe.gov.my/muat-turun/penerbitan-dan-jurnal/1818-pelan-pembangunan-pendidikan-2013-2025

Ministry of Education Malaysia. (2017). *Matematik Tahun 3. Kurikulum Standard Sekolah Rendah (Semakan) – Dokumen Standard Kurikulum dan Pentaksiran*. Ministry of Education Malaysia.

Ministry of Education Malaysia. (2020). *Laporan kebangsaan TIMSS 2019.* https://www.moe.gov.my/muat-turun/penerbitan-dan-jurnal/rujukan-akademik/3918-buku-laporan-timss-2019

Mullis, I. V. S., Martin, Michael. O., Foy, P., Kelly, Dana. L., & Fishbein, B. (2020). *TIMSS 2019 international results in mathematics and science*. TIMSS & PIRLS International Study Center

Safiati, O. A., Dafik, & Prastiti, T. D. (2021). On division operation of any numbers: Introducing a new technique. *Journal of Physics: Conference Series, 1836*(1). https://doi.org/10.1088/1742-6596/1836/1/012055

Unit Pelaksanaan dan Prestasi Pendidikan (PADU). (2022). *Laporan tahunan 2021 pelan pembangunan pendidikan Malaysia 2013-2025*. https://www.padu.edu.my/wp-content/uploads/2022/09/PPPM_LT2021_BM_Final_compressed.pdf

Student merit system for PMM (SMS4PMM)

Ainul Azniza Ahmad Zaini[1], Rosmawati Jalal[2], Tc. Mohd Reza Md Tahir[3]
Politeknik Merlimau, Melaka, Malaysia[1]
Politeknik Tun Syed Nasir Syed Ismail, Johor, Malaysia[2,3]

ainul@pmm.edu.my[1], rosmawati@ptsn.edu.my[2], reza@ptsn.edu.my[3]

Abstrak: Student Merit System for PMM (SMS4PMM) merupakan satu sistem mata merit pelajar yang disimpan secara sistematik dan memudahkan pengurusan jabatan untuk mengekses dan mendapatkan maklumat aktiviti-aktiviti pelajar dengan mudah. Sistem ini dibangunkan dengan menggunakan aplikasi yang berasaskan web iaitu melalui Google Drive. Google Drive merupakan perisian storan yang disediakan oleh google untuk penggunanya. Perisian ini berasaskan 'Cloud Storage as a Service. Aplikasi web Ini memudahkan Ketua Jabatan, Ketua Program, Penasihat Akademik dan Pegawai Hal Ehwal Pelajar serta pelajar mengemaskini, menyemak dan mencapai data maklumat aktiviti pelajar dimana sahaja. Sistem ini dibangunkan dengan menggunakan Microsoft Visual Basic Version 6.0 dan simpanan data adalah dalam aplikasi Query Microsoft Access. Sistem ini mempunyai 2 modul utama iaitu pertama modul Staf dimana satu platform staf boleh menerima maklumat pencapaian pelajar, mencetak sijil pelajar serta boleh mengekses data merit pelajar dengan mudah. Modul kedua adalah pelajar dimana boleh memuatnaik sijil pencapaian, mencetak sijil dan mengakses mata merit. Penjimatan dari segi masa telah dibuat secara perbandingan carta alir proses kerja cara pencapaian merit pelajar bagi mengenal pasti pelajar yang cemerlang dan aktif didalam kurikulum. Dengan adanya SMS4PMM, segala data aktiviti-aktiviti pelajar seperti kokurikulum, sukan, atau penyertaan pelajar dari pelbagai peringkat sehingga peringkat yang tertinggi dapat di capai dengan mudah bagi mengenalpasti pelajar yang cemerlang dalam akademik dan kokurikulum dengan cepat. Sistem SMS4PMM merupakan satu sistem yang komprehensif dan dapat membantu melaksanakan tugas dengan mudah dan sistematik.

Kata kunci: SMS4PMM; merit; sistematik.

Pengenalan

Kehidupan seseorang pelajar di institusi pengajian tinggi pada hari ini tidak lagi terfokus kepada bidang akademik semata-mata, sebaliknya telah melangkaui pelbagai bidang dan sempadan yang luas. Sistem merit pelajar yang memberi banyak sumbangan dan terlibat secara aktif untuk menaikkan lagi nama politeknik ke peringkat yang lebih tinggi akan diberi markah merit yang tinggi. Bagi memastikan bakat, kemahiran dan kebolehan dalam diri pelajar tidak disia-siakan, pelbagai alternatif dan strategi dilakukan oleh pihak pengurusan politeknik. Menurut U.S Office or Personal Management (OPM), prinsip sistem merit ialah untuk menilai prestasi ahli secara berkesan. Melalui sistem merit, kualiti kerja, penugasan, tingkah laku dan tanggungjawab seseorang individu semakin meningkat. Dalam Dasar Pendidikan Kebangsaan sendiri ada menggariskan bahawa, kurikulum kebangsaan merupakan satu program pendidikan yang termasuk kurikulum dan kokurikulum yang merangkumi semua pengetahuan, kemahiran, norma, nilai, unsur kebudayaan dan kepercayaan (Kementerian Pelajaran Malaysia 2012). Selain membentuk jati diri dan moral, penglibatan aktif dengan kokurikulum turut membantu perkembangan pelajar dari segi jasmani, rohani, mental dan emosi serta menanam dan mempertingkatkan nilai moral yang diingini. Hubungan aktiviti kokurikulum amat jelas dapat menambah pengalaman penting dan memberi impak terhadap kemahiran dan pencapaian pelajar (Zainal Ariffin Zainuddin, et.al., 2016).

Pelajar yang terlibat dengan aktiviti kokurikulum membolehkan mereka menggunakan segala kemahiran yang ada bagi menjalankan sesuatu aktiviti dan ini secara tidak langsung akan membolehkan mereka mengetengahkan bakat dan potensi diri untuk digilap supaya menjadi lebih baik pada masa akan datang dan mampu bersaing dengan rakan sebaya yang mempunyai pengalaman serta pengetahuan yang berbeza di antara satu sama lain (Wardatul Aishah Musa, 2014).

Pencapaian cemerlang murid dalam bidang akademik dan kokurikulum memainkan peranan penting melahirkan individu kreatif, inovatif dan berketrampilan. Pelajar cemerlang juga boleh dikategori sebagai individu yang mempunyai keputusan akademik yang baik, berkesungguhan dalam bidang kokurikulum dan sukan, berdisiplin serta tidak mudah terjebak dalam kegiatan tidak sihat. Di samping itu penglibatan aktif dalam bidang kokurikulum akan memberikan kecergasan kepada sesorang murid semasa mengikuti sesi pembelajaran dalam kelas (Utusan Online, 2017).

Simpanan cloud telah menjadi trend terkini dalam menguruskan memori bagi data yang disimpan. Salah satu aplikasi yang biasa digunakan secara dalam talian adalah Google Drive. Google Drive adalah perkhidmatan storan yang dimiliki oleh Google. Buat masa sekarang Google Drive boleh digunakan secara percuma dan berbayar. Bagi perkhidmatan percuma, pengguna Google drive akan mendapatkan perkhidmatan simpanan percuma sebanyak 15 GB, dan boleh ditambah dengan bayaran tertentu. Dengan aplikasi Google Drive, kita boleh mengedit gambar dan video, faks dan menandatangani dokumen, menguruskan data, membuat carta aliran dan banyak lagi.

Penerangan Produk

1. Rekabentuk Pembangunan Sistem

a. Satu sistem yang dibangunkan bagi menyimpan data dan dapat secara sistematik dan memudahkan pengurusan jabatan untuk mengekses dan mendapatkan maklumat aktiviti-aktiviti pelajar dengan mudah. Pemilihan dapat di buat bagi pelajar yang cemerlang untuk dianugerah pelajar di majlis konvokesyen. Sistem ini mempunyai dua modul utama iaitu staf dan pelajar

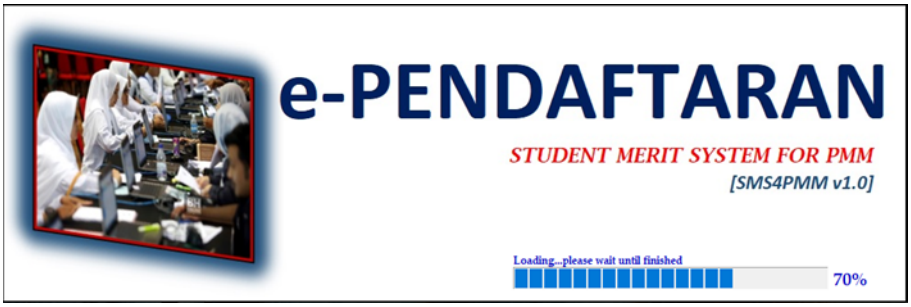
b. Bagi modul pertama iaitu Staf, satu platform staf boleh menerima maklumat pencapaian pelajar, mencetak sijil pelajar serta boleh mengekses data merit pelajar dengan mudah.

d. Fokus pembangunan system ini bagi mengatasi pemasalahan yang dapat diselesaikan dari aspek-aspek yang objektif pembangunan sistem. Perbandingan proses aliran kerja sebelum dan selepas di buat untuk membuat perbandingan keberkesanan sistem terhadap penjimatan masa bagi mencari pelajar cemerlang.

2. Rekabentuk Pembangunan Sistem Melalui Perbandingan Carta Alir Proses Kerja Sebelum Dan Selepas Sistem SMS4PMM
3. Pembangunan system ini bertujuan untuk mengkaji dan mengetahui penjimatan masa untuk membuat pemilihan pelajar cemerlang

Keputusan & Perbincangan

Rekabentuk Sistem



Rajah 1: Menu kemasukan ke SMS4PMM

Rajah 2: Menu utama SMS4PMM

Rajah 3: Menu daftar ID pengguna baru

Rajah 4: Menu reset katalaluan pengguna

Rajah 5: Menu kemasukan rekod pelajar

Rajah 6: Menu rekod keseluruhan pelajar

Rajah 7: Menu rekod pelajar mengikut pelbagai peringkat

Rajah 8: Menu rekod pelajar melalui pasukan beruniform

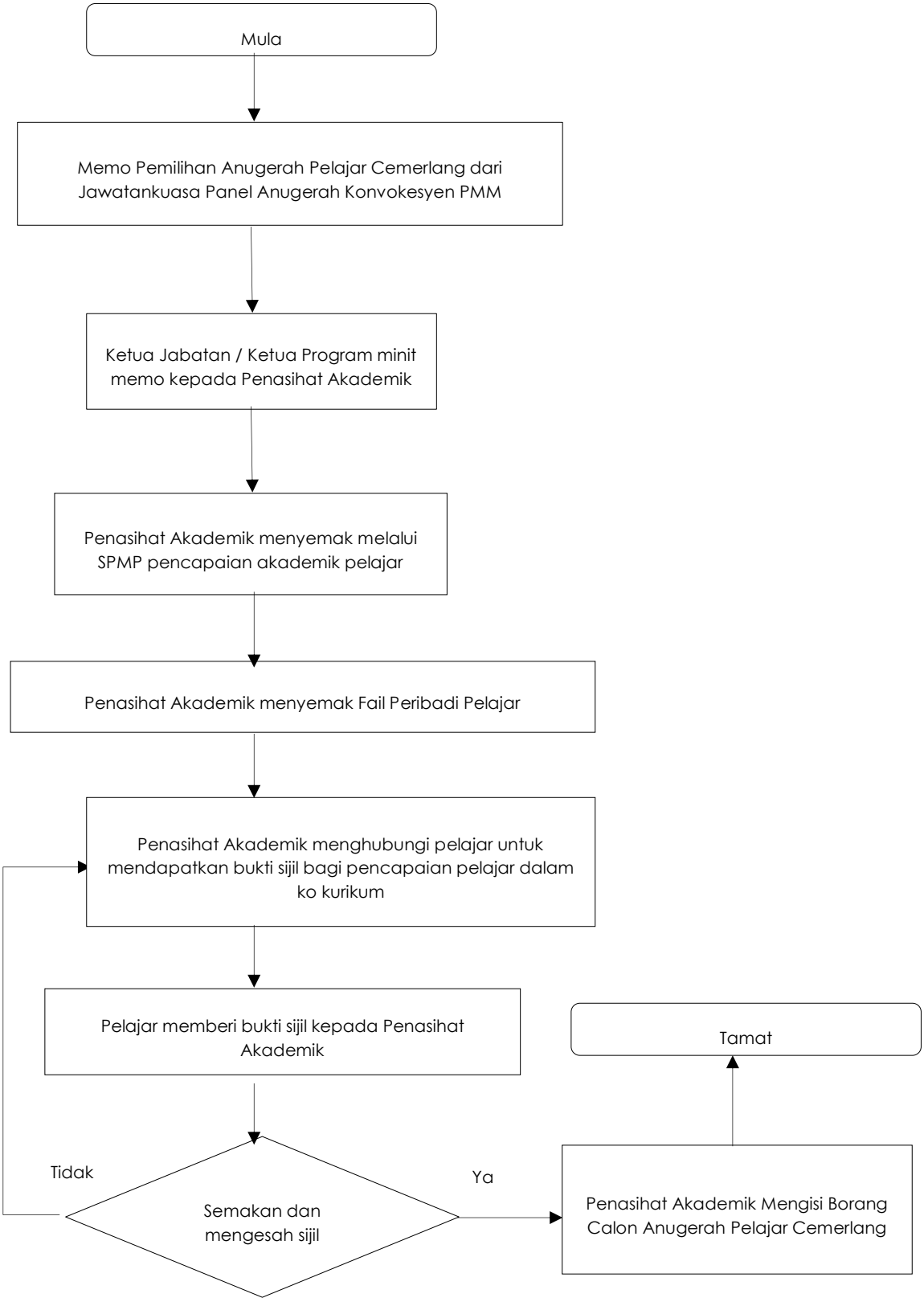
Rajah 9: Menu rekod markah pelajar

Rajah 10: Menu rekod aktiviti pelajar

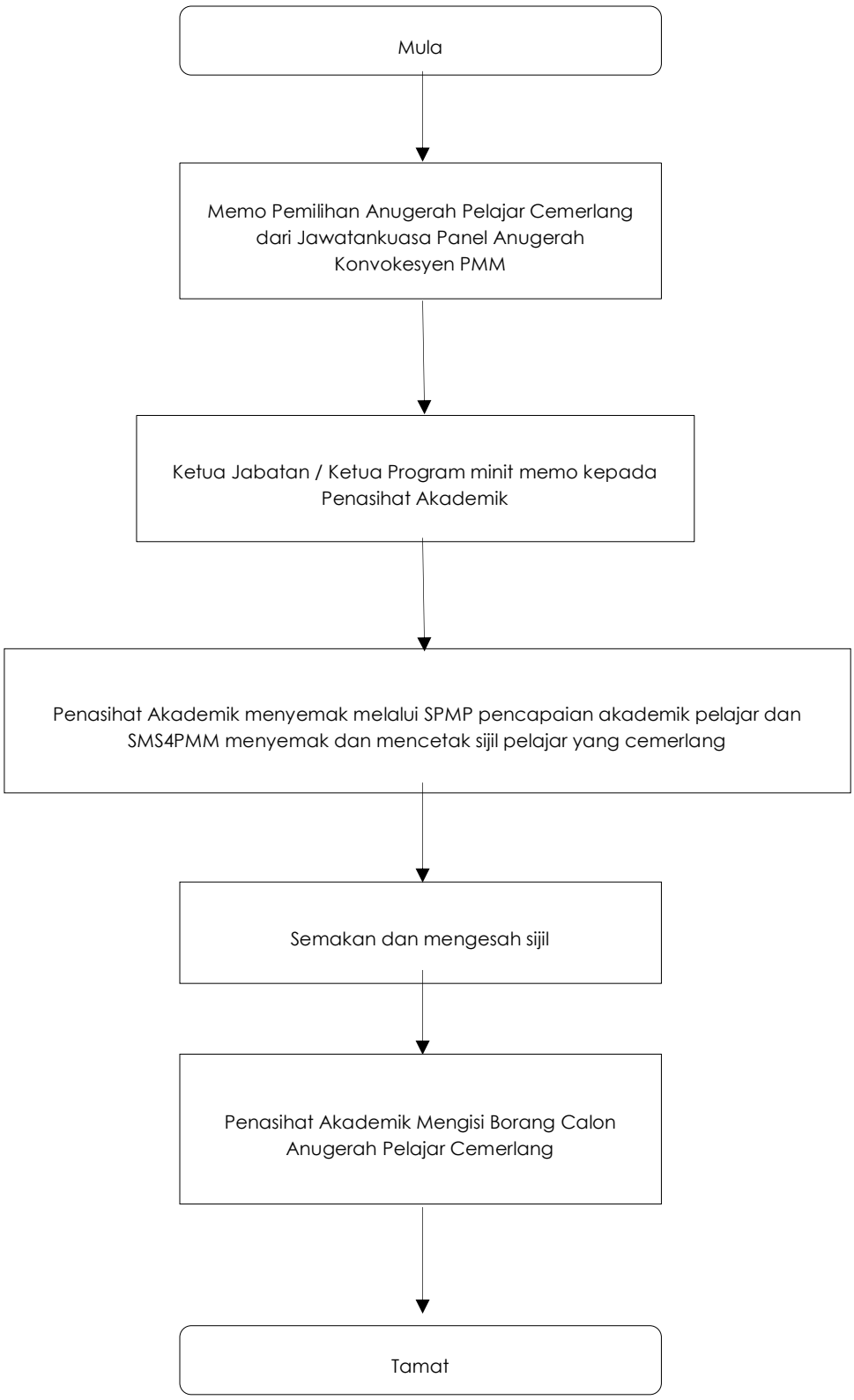
Rajah 11: Menu keluar sistem

Perbandingan Carta Alir Proses Kerja Sebelum dan Selepas sistem SMS4PMM

Carta Alir Proses Kerja Pemilihan Anugerah Pelajar Cemerlang di PMM



Rajah 12: Carta Alir Proses Kerja Pemilihan Pelajar Cemerlang Secara Manual



Rajah 13: Carta Alir Proses Kerja Pemilihan Pelajar Cemerlang Menggunakan Sistem SMS4PMM

Daripada Rajah 12, carta alir proses kerja Pemilihan Pelajar Cemerlang secara manual adalah lebih panjang berbanding pada Rajah 13. Rajah 13 menunjukan proses kerja yang ringkas dan mudah selepas menggunakan sistem SMS4PMM. Proses kerja yang ringkas ini dapat menjimatkan dari segi kos dan masa. Data dan bukti sijil bagi penyemakan dan pengesahan dokumen juga dapat dijalankan dengan cepat dan tepat.

Kesimpulan

Sistem yang dibangunkan ini bertujuan untuk memudahkan pihak pengurusan iaitu Ketua Jabatan, Ketua Program, Penasihat Akademik dan pegawai yang berkaitan dalam pencarian maklumat aktiviti-aktiviti pelajar dengan pantas. Sistem ini juga mudah dicapai melalui aplikasi yang berasaskan web iaitu melalui Google Drive. Daripada kajian ini dapat dibuktikan proses kerja menjadi lebih singkat iaitu daripada 10 langkah kepada 6 langkah sahaja. Maka daripada pengurangan langkah ini, dapat menjimatkan masa dan mengurangkan kos untuk menghubungi pelajar sekiranya maklumat dan dokumen yang diperlukan adalah tidak mencukupi. Secara umumnya dengan adanya SMS4PMM, segala aktiviti-aktiviti pelajar seperti kokurikulum, sukan, atau penyertaan pelajar dari pelbagai peringkat sehingga peringkat yang tertinggi dapat di capai dengan mudah bagi mengenalpasti pelajar yang cemerlang dalam akademik dan kokurikulum dengan cepat. Sistem SMS4PMM merupakan satu sistem yang komprehensif dan dapat membantu melaksanakan tugas dengan mudah dan sistematik. Sistem informasi dan pencapaian data SMS4PMM ini mudah digunakan dan diakses dimana sahaja dan kerana menggunakan sistem online.

Rujukan

Ahmad Esa, Mohd Khir Mohd Nor, Nawawi Jusoh, Norashidah Abd Rahman, & Zalinah Salehon. (2015). Citra Kokurikulum. (Penerbit UTHM, Ed.). Penerbit UTHM.

Hanks, M, & Eckland, B. (1976). Athletics and social participation in the educational attainment in the educational attainment process.Sociology of education, 49, 271-294.

Kementerian Pelajaran Malaysia. 2012. Dasar Pindidikan Kebangsaan. https://www.moe.gov. my/images/dasar-kpm/BUKU%20DASAR.pdf [Akses 14 Julai 2018].

Jamaludin Haji Badusah, Rosna Awang Hashim, Mohd Majid Konting, Turiman Suandi, Maria Salih & Norhafezah Yusof. (2009). Pembangunan Pelajar: Memperkasakan Kokurikulum Institusi Pengajian Tinggi. Penerbit Universiti Putra Malaysia. Selangor.

Newman, Wellner (1992). A Desk Supporting Computer-based Interaction with Paper Documents. Proceeding CHI '92 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.

Raghuraman, Kircher (n.d) .Computer Information and Office Systems.Joliet Junior College (1901)

Utusan Malaysia. 2017. Retrieved March 3,2017, https://www.utusanborneo.com.my/2017/03/03/fokus-pencapaianakademik-kokurikulum

S. Chotimah, M. Bernard, and S. M. Wulandari, "Contextual approach using VBA learning media to improve students' mathematical displacement and disposition ability Contextualapproach using VBA learning media to improve students' mathematical displacement anddisposition ability," J. Phys. Conf. Ser., vol. 948, no. 1, pp. 1–10, 2018.

Wardatul Aishah & Nooraini Othman. 2014. Kesedaran kendiri terhadap aktiviti kokurikulum dan keberkesanannya kepada remaja. eProceeding of the Social Sciences Research ICSSR 2014 (e-ISBN 978- 967-11768-7-0). 9-10 June 2014, Kota Kinabalu, Sabah, MALAYSIA. Organized by http://WorldConferences.net.

Zainal Ariffin Zainuddin, Yaakob Daud, dan Saiful Azmi Mohd Nor (2016). Pengurusan Kokurikulum Dan Tahap Penglibatan Pelajar Dalam Aktiviti Kokurikulum Di Sekolah Menengah Kebangsaan Daerah Kuala Terengganu. International Seminar on Generating Knowledge Through Research, UUM-UMSIDA, Universiti Utara Malaysia, Malaysia.

SiNamo 2.0

Zawiah Bahrom1, Dr. Ajurun Begum Ahamed2, Dr. Noorul Khairien Abdul Malek3, Ameerul Aswad Abd Aziz 4, Abd. Hadi Kudin5
Institut Pendidikan Guru Kampus Pendidikan Teknik, Bandar Enstek, Malaysia[1,2,3,4,5]
zawiah.bahrom@ipgm.edu.my[1]

Abstrak: Penulisan sajak dalam kalangan pelajar agak sukar untuk direalisasikan kerana melibatkan penggunaan kata-kata yang kreatif dan permainan emosi untuk mengungkapkan pemikiran dan perasaan seseorang. Untuk menangani masalah ini, inovasi ini bertujuan untuk mencari pendekatan yang terbaik bagi membantu pelajar mereka atau mencipta sajak dengan mudah menerusi akronim nama mereka. Pendekatan ini berupaya membantu kognitif pelajar dalam penciptaan sajak. Dalam era digital kini, inovasi dalam penulisan sajak menjadi semakin penting untuk menarik perhatian pembaca yang semakin luas. SiNamo 2.0 mengusulkan sebuah inovasi dalam penulisan sajak yang melibatkan penggunaan akronim nama. Inovasi ini memungkinkan pelajar mencipta karya yang unik dan bermakna dengan menggabungkan elemen personal dari akronim nama mereka atau orang yang terdekat dengan mereka lalu mengintegrasikannya melalui kreativiti masing-masing. Penggunaan akronim nama memberikan sentuhan peribadi dalam sajak, sementara eksplorasi bahasa memastikan bahwa mesej utama sajak yang akan disampaikan tetap terjaga. Dapatan menunjukkan bahawa pelajar dapat menghasilkan sajak dengan mudah menerusi akronim nama dalam aplikasi SiNamo 2.0. Hal ini juga memberi impak kepada pengajaran dan pembelajaran bahasa dan sastera iaitu pembelajaran lebih menarik dan menimbulkan rasa seronok dalam kalangan peljar apabila dapat menghasilkan sajak ciptaan sendiri fdengan mudah. Dapat dirumuskan bahawa inovasi ini akan memberi inspirasi kepada para pelajar dan penulis sajak untuk menghasilkan karya-karya yang lebih bermakna, asli, dan menarik perhatian pembaca. Melalui pendekatan yang berstruktur dan kreatif ini, penulisan sajak dapat terus berkembang sesuai dengan tuntutan zaman, dan dalam masa yang sama tetap mempertahankan inti pati dan nilai seni sajak itu sendiri.

Kata kunci: sajak; akronim nama; eksplorasi bahasa; kreativiti; kognitif

Pengenalan

Sajak ialah puisi Melayu moden yang berbentuk karangan berangkap, berbentuk bebas dan tidak terikat pada jumlah baris, perkataan sebaris, suku kata sebaris, rangkap, rima dan sebagainya. Sajak berfokus kepada penggunaan kata-kata yang dipilih dengan cermat untuk menciptakan kesan estetika, seperti permainan kata, rima, aliterasi, asonansi, dan sebagainya. Tujuan penulisan sajak adalah pelbagai antaranya menggambarkan keindahan alam, mengungkapkan perasaan pengkarya, kritikan sosial atau politik, hingga merangsang pemikiran. Dalam beberapa hal, sajak juga dapat memiliki struktur tertentu yang merangkumi bilangan bait, patah perkataan dan tema tertentu. Oleh itu, sajak memiliki dimensi estetika dan subjektiviti yang hebat, sehinggakan interpretasi dan pengalaman pembaca terhadap maksud sajak adalah berbeza-beza.

Penulisan sajak tetap relevan pada masa kini kerana sajak sebagai merupakan bentuk seni dan ekspresi bahasa yang memiliki daya tarikan dan nilai yang mendalam (Santosa, P. ,2000). Penulisan sajak secara tidak langsung dapat membicarakan pelbagai aspek manusia dan masyarakat. Karya sajak sering kali digunakan untuk merenungkan isu-isu sosial, budaya, politik, dan persekitaran. Para penyair dapat menggunakan sajak untuk menggambarkan realiti yang ada di sekitar mereka, memberikan sudut pandang baharu, dan menggerakkan perbincangan terhadap isu tersebut.

Dalam era informasi yang serba pantas, sajak menawarkan pengalaman membaca yang mudah dan penuh bermakna. Hal ini sepadan dengan gaya hidup moden yang sering terganggu oleh batas waktu. Pengaruh dunia digital telah membuka lembaran baharu kepada sajak. Media sosial dan platform multimedia telah membuka peluang alternatif kepada sajak untuk diperluas dan dicontohi. Sajak pendek dan padat sangat sesuai untuk dipersembahkan secara dalam talian agar menjangkau khalayak yang lebih luas. Oleh hal yang demikian, sajak tetap menjadi alat yang relevan untuk membicarakan pengalaman manusia, mendorong refleksi, dan menginspirasi perubahan. Meskipun dunia terus berubah, nilai-nilai yang diterapkan dalam sajak tetap relevan dan signifikan.

Menurut Kamus Dewan Edisi ke-4, akronim bermaksud kependekan yang terbentuk daripada gabungan huruf pertama atau suku kata beberapa perkataan yang boleh diujarkan sebagai satu perkataan. Nama dan akronim memiliki peranan penting dalam pelbagai aspek kehidupan kita, baik dalam komunikasi sehari-hari maupun dalam konteks profesional. Penggunaan nama atau akronim sebagai dasar untuk menulis sajak dapat menjanakan idea yang menarik. Hal ini kerana nama dan akronim memiliki makna atau nilai yang personal dan emosional bagi individu atau kelompok tertentu. Penggunaan elemen ini dalam penulisan sajak dapat membantu mencipta hubungan yang lebih mendalam dengan pembaca, kerana mereka dapat merasakan kesan emosi yang diterapkan dalam sajak berkenaan.

Penggunaan nama atau akronim dilihat sebagai inovasi dalam penggunaan bahasa. Hal ini kerana inovasi ini dapat mendorong penggunaan bahasa yang lebih inovatif dan eksperimental. Penyair mungkin mencuba pelbagai cara untuk menghubungkan erti kata-kata dalam nama atau akronim dengan tema, emosi, atau mesej dalam sajak. Selain itu, inovasi ini menawarkan kemudahan pengeditan yang memudahkan penulis sajak untuk mengedit dan mengatur format penulisan mereka dengan teratur. Hal ini termasuklah pembetulan ejaan,

tatabahasa, dan susun atur baris dalam sajak bagi memperlihatkan penghasilan sajak yang lebih kreatif. Selain itu, inovasi ini merupakan alat kreativiti yang menyediakan ciri permainan perkataan yang membantu pelajar dan penulis baharu dalam penciptaan sajak serta menawarkan kemudahan menyalin serta menyimpan sajak dengan mudah. SiNamo 2.0 boleh diaplikasi secara di luar talian dan tidak memerlukan akses internet.

Penerangan Produk

SiNamo 2.0 merupakan pecahan perkataan yang terdiri daripada suku kata 'Si' yang bermaksud singkatan dan 'Namo' yang bermaksud nama daripada dialek Negeri Sembilan. Nama ini diangkat agar bertepatan dengan ciri tempatan (lokaliti). SiNamo 2.0 ini direka khas untuk membantu pelajar mendapatkan idea mencipta sajak secara mudah. Di samping itu, inovasi ini turut dapat membantu pelajar belajar menggunakan bahan konkrit atau maujud melalui teknologi terkini (web based). Inovasi ini berbentuk akrostik abjad iaitu komposisi puisi iaitu huruf pertama setiap perkataan membentuk ayat mengikut susunan konvensionalnya. Selain itu, SiNamo 2.0 turut mempunyai kemudahan menyimpan fail sajak dan mencetak sajak. Keistimewaan yang lain, SiNamo 2.0 boleh diakses tanpa internet. Inovasi ini merupakan satu pembinaan alat bantu belajar dalam bentuk aktiviti penerokaan untuk pelajar serta satu bahan bantu mengajar untuk guru yang dirancang dan diilhamkan untuk guru mata pelajaran Bahasa Melayu dan Bahasa Inggeris

Latar Belakang Masalah

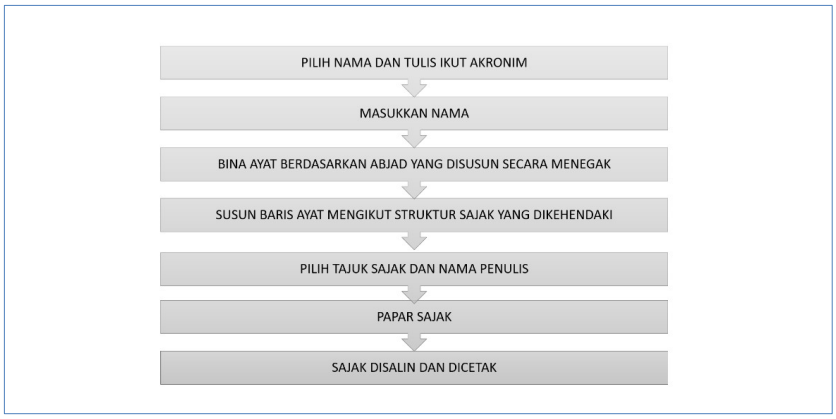
Pelajar sering kali mengalami masalah menulis sajak kerana ketandusan idea dan tidak tahu teknik menulis bait sajak dengan menggunakan ayat yang betul ,gramatis dan puitis. Selain itu, mereka terpaksa mengambil masa yang lama menulis sajak lantaran sukar mencari kosa kata dan perkataan yang sesuai. Mereka sukar membina ayat yang puitis serta menepati ciri sajak yang baik serta memperlihatkan estetika dalam penulisan sajak. Oleh itu, melalui inovasi ini pelajar didedahkan dengan teknik mencipta sajak dengan mudah malah membantu mereka mendapatkan idea untuk mencipta sajak. Hal ini juga memberi satu pembaharuan dalam teknik pengajaran kepada guru Bahasa Melayu dan Bahasa Inggeris.

Pembaharuan

Penggunaan akronim nama sebagai dasar penciptaan sajak boleh mencabar kreativiti yang mendorong seseorang pelajar berfikir di luar kotak dan melahirkan idea yang kreatif. Hal ini boleh terlihat melalui penghasilan pola dan struktur sajak yang unik. Penggunaan huruf awal dari setiap perkataan dalam nama dapat membentuk pola bunyi atau irama yang menarik. Selain itu, inovasi ini merupakan eksplorasi dimensi baharu dalam penciptaan sajak. Pelajar dapat menggunakan akronim nama untuk menggali pola bunyi atau makna, membuka ruang untuk eksperimen dan penemuan baharu dalam penulisan sajak. Pelajar dapat menggunakan akronim nama sebagai medium mengungkapkan makna atau mesej yang berkaitan dengan nama atau akronim tersebut. Hal ini merujuk kepada ungkapan perasaan, pemikiran, atau pandangan tertentu yang ingin disampaikan kepada pembaca. Setiap huruf dalam akronim nama mungkin memiliki erti atau makna tersembunyi yang dapat dieksplorasi melalui sajak. Hal ini membawa dimensi tambahan kepada sajak tersebut kerana membuat pembaca terlibat dalam mencari erti yang terkandung di dalamnya.

SiNamo 2.0 dapat memberikan ruang kepada peluang untuk menginterpretasi secara kreatif. Hal ini kerana pelajar dapat mengaitkan setiap huruf dengan perkataan atau frasa yang memiliki kaitan dengan tema atau mesej yang ingin disampaikan dalam sajak. Impaknya, hal ini akan memvisualkan dan mempertautkan emosi serta kenangan kepada penulis. Jika nama yang digunakan dalam akronim memiliki hubungan emosional atau kenangan tertentu, penggunaan ini dapat menambah dimensi emosional kepada sajak. Hal ini menjadikan penciptaan sajak begitu dekat dengan pembaca. Inovasi ini turut menemukan cara kreatif untuk menggabungkan huruf-huruf dalam akronim agar dapat menciptakan permainan perkataan yang menarik. Hal ini termasuklah pembentukan perkataan baharu dalam pembinaan sajak. Melihat dari perspektif pembaca, apabila mereka sedar bahawa sajak yang dibaca adalah daripada akronim nama, hal ini dapat menjadi faktor keterujaan yang menarik kepada mereka. Kekuatan keterujaan ini dapat memikat perhatian pembaca dan membuat mereka lebih tertarik untuk menjelajahi sajak secara lebih lanjut.

Jelaslah, Inovasi digital ini dapat menggalakkan pembelajaran pelajar secara aktif, interaktif dan mempunyai unsur didik hibur (Mardiyani et. al., 2021). Hal ini secara tidak langsung dapat meningkatkan daya imaginasi serta penerokaan pelajar dalam penciptaan sajak yang puitis. Penggunaan akronim nama dan inovasi ini contohnya nama pelajar sendiri menyebabkan inovasi ini dapat menarik minat mereka. Selain itu, SiNamo 2.0 boleh diubah suai berdasarkan tema-tema tertentu mengikut aras pemikiran pelajar. Rajah 1 menunjukkan manual penggunaan SiNamo 2.0.



Rajah 1 : Manual Penggunaan SiNamo 2.0

Inovatif

SiNamo 2.0 melibatkan pendekatan kreatif yang dapat mengintegrasikan elemen-elemen unik dari akronim dengan pembinaan struktur sajak yang menarik. Pelajar perlu mengenalpasti setiap huruf dalam akronim dan mencari perkataan yang dimulai dengan huruf tersebut. Kemudian, pelajar perlu menjelajahi makna atau konsep yang dapat dikaitkan dengan kata-kata tersebut.

Selain itu, pelajar terlibat dalam menjelajahi maksud emosional atau makna yang terkait dengan nama atau akronim. Fikirkan tentang perasaan atau pemikiran apa yang muncul saat melihat akronim tersebut. Seterusnya, perhatikan pola bunyi dalam akronim. Pelajar akan cuba mencari kata-kata yang memiliki rima atau kesamaan bunyi dengan huruf-huruf dalam akronim. Seterusnya, mereka akan menjelajahi tema umum atau konsep yang terkait dengan nama atau akronim. Mereka akan mengaitkan dengan tema yang relevan dalam membangunkan sajak dengan mesej yang konsisten.

Pelajar perlu memilih perkataan yang tepat, memiliki makna yang kuat dan relevan dalam konteks sajak. Perhatikan makna yang ingin disampaikan. Tentukan struktur sajak yang sesuai dengan mesej atau perasaan yang ingin disampaikan. Perhatikan bagaimana kata-kata dari akronim dapat diatur dalam struktur yang konsisten dan memiliki efek emosional. Uji berkali-kali penggunaan kata-kata dalam menghubungkan huruf-huruf akronim. Ulang berkali-kali penggunaan perkataan atau solek ayat agar dapat menggambarkan makna yang lebih mendalam dan meningkatkan konsistensi sajak.

Inovasi ini juga menggerakkan pelajar memastikan sajak memiliki mesej utama yang perlu difokuskan atau perasaan yang ingin disampaikan. Pastikan bahawa mesej ini berhubungan erat dengan akronim atau nama yang digunakan. Pelajar digalakkan berimprovisasi dan bermain dengan kata-kata, struktur, dan makna. Pendekatan bahasa seperti metafora dan personifikasi juga digunakan agar kata-kata akronim bergabung dengan elemen gaya bahasa sajak untuk menyampaikan mesej utama. Dengan menciptakan hubungan yang unik antara akronim dan mesej sajak, pelajar dapat menciptakan karya yang bermakna dan berkesan

Impak kepada Pihak Berkepentingan dalam Pendidikan

Inovasi ini dapat mendorong peningkatan kreativiti pelajar dalam mencipta sajak menggunakan akronim serta menggalakkan mereka untuk berfikir lebih kreatif dalam memilih perkataan yang sesuai dengan akronim yang diberikan. Hal ini sudah pasti dapat meningkatkan keterampilan mencipta sajak dalam kalangan pelajar. Bermain dengan akronim dapat membantu pelajar mengasah keterampilan menulis mereka kerana mereka perlu memcipta sajak yang bermakna dengan mematuhi batasan akronim. Di samping itu, proses mencari perkataan yang sesuai dengan akronim dalam mencipta sajak dapat membantu pelajar memahami makna dan penggunaan kata-kata dengan lebih baik.

Selain itu, SiNamo 2.0 menawarkan teknik pembelajaran yang fleksibel kepada para guru. Hal ini kerana inovasi ini dapat menjadi contoh teknik pembelajaran yang beradaptasi dengan gaya pembelajaran pelajar yang pelbagai. Selain itu, inovasi ini dapat mendorong pengintegrasian seni dan kreativiti dalam kurikulum, iaitu menghubungkan seni dan pendidikan akademik(Mufarrochah, M. ,2022). Secara keseluruhannya, Sinamo 2.0 memiliki potensi untuk memperkaya pengalaman belajar pelajar, merangsang kreativiti, dan meningkatkan apresiasi terhadap bahasa dan seni dalam konteks pendidikan.

SiNamo 2.0 turut memperlihatkan variasi teknik pengajaran dan pembelajaran (PdP). Inovasi ini sudah pasti membuatkan sesi pembelajaran lebih menarik dan interaktif. Selain itu, inovasi ini dapat membantu guru menilai kreativiti pelajar menulis sajak yang puitis. Proses maklum balas boleh berlaku antara guru dan pelajar melalui proses analisis yang dilakukan oleh guru terhadap pemilihan perkataan dan ayat yang dibina dalam penulisan sajak (Fahrurrozi, M. P., Edwita, M. P., & Bintoro, T.,2022). Pihak sekolah turut mempunyai reputasi yang tinggi dalam melahirkan pelajar yang kreatif dan mempunyai keterampilan bahasa. Secara tidak langsung, inovasi ini dapat

membantu memperkaya program literasi sekolah yang menggalakkan pelajar lebih aktif dalam aktiviti penulisan dan kebahasaan yang lain.

Meninjau dari perspektif industri pendidikan, pembelajaran menulis sajak yang berasaskan teknologi dapat menghubungkan jurang antara kaedah pendidikan tradisional dan teknologi moden. Selain itu, melalui inovasi ini potensi penulisan sajak dalam kalangan pelajar boleh dipergiat dan aktiviti penerbitan sajak boleh diperluas. Namun, apa yang penting, inovasi ini bukan sekadar menarik perhatian namun dalam masa yang sama mampu mempertahankan nilai dan substansi sajak itu sendiri

Kesimpulan

Kesimpulannya, SiNamo 2.0 muncul sebagai pendekatan yang merangsang kreativiti dan memperkaya pengalaman pembelajaran sajak. Dengan menggabungkan struktur akronim yang teratur dengan kebebasan kreatif dalam penciptaan sajak, inovasi ini membuka pintu bagi penemuan kata-kata baharu, makna yang mendalam, dan kemampuan eksplorasi emosional yang lebih mendalam. Lebih dari sekadar alat pendidikan, inovasi ini membawa memudahkan dan sebagai cabaran baharu kepada para pelajar serta memberi ilham kepada mereka untuk berfikir lebih kreatif dan berkomunikasi dengan lebih tepat. Dalam era komunikasi pantas dan efektif, inovasi ini menghubungkan kekuatan akronim dengan keindahan bahasa sajak, lalu membantu pelajar mengembangkan keterampilan berfikir secara kritis, berbahasa, dan berimaginasi.

Dengan demikian, melalui penggunaan akronim dalam penulisan sajak, kita tidak hanya merayakan kekayaan budaya sastera, tetapi juga memperbaharui cara kita memahami dan mengapresiasi keindahan bahasa. Inovasi ini mengajak kita untuk menjelajahi makna baharu, menemukan harmoni antara struktur dan kespontanan, serta membimbing kita kepada dimensi baharu dalam dunia sajak

Rujukan

Fahrurrozi, M. P., Edwita, M. P., & Bintoro, T. (2022). Model-Model Pembelajaran Kreatif dan Berpikir Kritis di Sekolah Dasar. UNJ PRESS.

Mardiyani, R., Supendi, D. A., & Suparman, F. (2021). Pengembangan Media Articulate Storyline dalam Pembelajaran Menulis Puisi pada Kelas X SMA Negeri 2 Sukabumi. GERAM, 9(2), 82-91

Mufarrochah, M. (2022). Teknik Akrostik Dalam Meningkatkan Menulis Puisi. Teacher: Jurnal Inovasi Karya Ilmiah Guru, 2(1), 92-99.

Noraini Mohamad., Mariam Abdul Majid.(2019). Dakwah Melalui Penulisan Puisi Melayu: Analisis Terhadap Karya Abham T.R. Jurnal Melayu, 18 (2), 294-295.

Santosa, P. (2000). Pengajaran sastra dalam era globalisasi. Bahasa indonesia, negara, 50.

Sew, J. W. (2023). Penerapan Pantun Kenangan Perpisahan dalam Penilaian Lisan sebagai Kesan Pembelajaran Teradun. Melayu: Jurnal Antarabangsa Dunia Melayu, 16(2), 287-314.

Zainal, A. (Ed.). (2007). Meningkatkan potensi minda. PTS Professional..

The Effectiveness Of iLibrary (UPA) among The Students At Kolej Komuniti Pasir Gudang

Nor Sarimah Binti Marjunid, Farhan Bin Fauzi, Miryati Binti Omar
Kolej Komuniti Pasir Gudang, Johor, Malaysia
sarimah@kkpg.edu.my, farhan@kkpg.edu.my, miryati@kkpg.edu.my

Abstract

The iLibrary for General Studies Unit (UPA) is an application utilized as a teaching aid in the instructional and learning processes at Pasir Gudang Community College. The idea of this innovation arose when students encountered difficulties in collecting and storing notes. The primary objective of this application is to assist students in accessing all notes for general studies courses through a single platform. This initiative is also to reduce paper usage and embrace digital elements. A survey to measure the effectiveness of this application was conducted and shows overall students provided positive feedback, highlighting that iLibrary UPA saves time and facilitates easy access to courses' notes.

Key words: *iLibrary UPA ; Instructional And Learning Processes ; Teaching Aid*

Introduction

The Education System has undergone a significant revolution in educational technology to keep up with the advancements of the current era. Technological progress in education worldwide has been the driving force behind the formation of knowledgeable and informed societies. Innovation can be seen as the birth of creative ideas that enhance quality and productivity. The combination of technology and innovation adds value to current outputs, transforms development, and brings about changes to existing practices. This occurs when mobile learning concepts are introduced for the convenience of students, particularly at Pasir Gudang Community College.

According to Little (2012) in his study on recent design innovations, money is now being invested in technology for educational purposes. Research findings indicate that norms, philosophies, and applications for integrating technology in education are all rapidly evolving. Moreover, students have greatly benefited from using technology for learning, as it connects them with the knowledge and skills they need, regardless of time or location. This is enabled by modern and mobile technology, such as mobile phones, which are user-friendly and easily operable. Consequently, using mobile devices allows learning to take place at any time and location, making it more convenient than using fragile and cumbersome note books.

The idea of mobile learning, especially the use of phones, is now indispensable. This is evidenced by Luan & Rahman, (2016) stating that mobile phones have significantly impacted our daily lives through technology and that it's challenging to function without them. Meanwhile, Hamdan, Din, & Abdul Manaf (2012) assert that mobile phones successfully capture the interest of the younger generation and play a crucial role in students' lives as communication tools. This clearly indicates that utilizing mobile learning in the classroom is more accessible, easier to approach, and aligned with the mindset of today's youth, who are keen on trying new experiences and learning new things.

Based on current technology and trends, the iLIBRARY UPA was developed. iLibrary UPA is a mobile application or access point for notes for all General Studies courses at Pasir Gudang Community College, including MPU13012 - Islamic Education, MPU13022 - Moral Education, MPU12022 - National Language A, MPU11012 - Malaysian Studies, MPU12012 - Entrepreneurship, SBC10012 - Computer Applications, SUE10011 - Communicative English, and SUE20021 - Workplace English.

Product Description

The innovation of this application solved a few problems gathered by the researchers. The problems identified were; difficulty in storing notes, excessive notes coupled with financial constraints for photocopying frequent damage, loss, tearing, and the like of notes and physical notes are often left behind in dormitories or rented rooms. This innovation is the answer for these difficulties.

Moreover, this innovation also supports contemporary learning which it is built using one of the latest technologies; flipbook method as an instructional medium for students. Plus, this innovation aligns with the ease of access and cost-effectiveness of mobile communication technology, which is readily available and economical for students to own, and can be used anywhere.

This innovation also to encourage the idea of Mobile learning (M-Learning). According to Nawi & Hamzah (2013), Mobile Learning (M-Learning) originates from Distance Learning (D-Learning) and Electronic Learning (E-Learning), both of which aim to make the learning process more adaptable and mobile. From th reasearch that conducted by Liu, (2016), researcher stated that Mobile technology offers learners a multitude of choices for educational settings and timetables. Through the use of mobile devices, learners have the flexibility to select the times and locations that suit them best. They can effortlessly access educational materials on their mobile phones, whether they are on the move or even while they are walking. Additionally, learners have the option to pause their

utilization of mobile devices for learning if they become disinterested. Furthermore, educators were urged to leverage mobile phones and technology to enhance the process of learning. Moreover, the result from research about eBook which was conducted by Glackin, Rodenhiser & Herzog (2014) found that a consistently high level of student engagement throughout the duration of the project where participated students displayed enthusiasm upon learning about the eBook format and gaining access to on-demand information. They expressed satisfaction with the provision of mobile devices for the entire semester and immediately began experimenting with and configuring these devices for personal use, such as setting up their email accounts. Most notably, students found it easy to locate and utilize library resources, and the integration of mobile devices introduced an element of excitement and discovery into the classroom environment, serving as a novel tool for exploration. The utilization of eBooks by project participants experienced a significant increase. In the same research, conversations with students indicated that they believed their participation in the study, along with exposure to mobile devices and eBooks, enhanced their learning. Although students initially exhibited varying levels of comfort and familiarity with technology, the overall consensus was that employing eBooks and mobile devices was productive, resulting in a positive impact on their educational experience. This is a significant finding that supports the innovation of iLibrary UPA.

Results & Discussion

This study employs a quantitative approach, utilizing a questionnaire instrument to identify the effectiveness of using iLIBRARY UPA at Pasir Gudang Community College. The participants consist of students from semester 1 to semester 3, totaling 74 individuals from Pasir Gudang Community College. The researcher employed a questionnaire that was analyzed using IBM Statistical Package for The Social Science (SPSS) version 23 to assess the effectiveness of using iLIBRARY UPA. The questionnaire employed a Likert scale, as illustrated in Table 1 below.

Table 1: Likert Scale

Responses	Score
Totally Agree	5
Agree	4
Neutral	3
Disagree	2
Totally Disagree	1

A total of 74 students from Pasir Gudang Community College participated as respondents in this study and completed the assessments. The collected data were analyzed using Microsoft Excel to calculate percentage values, aiming to obtain a clearer and more precise overview. Data collected illustrated in table 2 as below:

Table 1: Respondents' responses on ILibrary UPA

Questions / Items		Min Score
1)	I find iLibrary UPA user-friendly	4.70
2)	iLibrary UPA is easy to use	4.73
3)	iLibrary UPA can be accessed anytime and anywhere	4.74
4)	The use of iLibrary UPA helps me enhance my knowledge for courses within the General Studies Unit	4.66
5)	iLibrary UPA reduces photocopying or note printing costs	4.69
6)	The graphics used in iLibrary UPA greatly capture my interest	4.11
7)	I use iLibrary UPA to complete assignments assigned by instructors.	4.68
8)	I comprehend lessons better when using iLibrary UPA for learning	4.66
9)	I use iLibrary UPA to discuss with peers.	4.64
10)	iLibrary UPA saves time as I can easily access course notes.	4.76
	AVERAGE SCORE	4.64

Adapted from (Ibrahim & Mohammad, 2019)

Table 2 presents the data obtained from the analysis of respondents who utilized the iLIBRARY UPA application for General Studies courses at Pasir Gudang Community College. Overall, the average minimum score is 4.64, indicating a high level of satisfaction. All individual items scored above 3.9, signifying that students at Pasir Gudang Community College perceive iLIBRARY UPA as beneficial and advantageous to them.

There are several improvement suggestions that need to be implemented for the iLIBRARY UPA application to be used more effectively, as follows:

i. Making enhancements within iLIBRARY UPA, such as incorporating previous assessment examples as student guidelines.

ii. Offering the innovation in offline mode instead of online mode only

iii. As per result gathered from the survey, the lowest mean was for the graphics effectiveness in increasing students' interest. Hence, the future researchers could improve the graphics that being used in this application.

iv. The storage of the notes are also limited to courses under General Study Unity only, for future researchers, the research could be done for other unit at college community or other universities.

Conclusion

The findings of this study have elucidated that educational technology is not limited to the instructional techniques and methods employed by educators or lecturers (conventional methods). Instead, it has been artistically and interactively reimagined to sustain students' attention and facilitate their full engagement in the taught and learned lessons, especially through the development of the utilized application (ILIBRARY UPA). According to the research by Mulyawan & Budiman (2013), M-Learning represents a highly promising form of education characterized by a more prepared and effective learning comprehension. When this mobile learning application is employed, dedicated, enthusiastic, and engaged learners have a positively impactful influence on the classroom. Meanwhile this finding also support Auzar (2012) that claims both current educational techniques and mobile learning can be enjoyed due to their ability to be used anywhere without limitations of boundaries, location, or time. The creation of the unique, creative, and innovative iLibrary ensures continuous student engagement and equilibrium while using it. Consequently, the usability and satisfaction level of iLIBRARY UPA depend on its user-friendliness.

References

Auzar. (2012). Keberkesanan Penggunaan Perisian Asas Membaca. *GEMA Online™ Journal Of Language Studies*, 629-644.

Glackin, B. C., Rodenhiser, R. W., & Herzog, B. (2014). A Library and the Disciplines: A Collaborative Project Assessing. *The Journal of Academic Librarianship*, 299–306.

Hamdan, A., Din, R., & Abdul Manaf, S. Z. (2012). Penerimaam M-Pembelajaran dalam Sistem Pendidikan di Malaysia. The Unified Theory of Acceptance and Use of Technology (UTAUT): Satu Analisis Literatur. *Malaysia 1st International Conference on Mobil Learning, Applications, and services (mobilcase2012)*. UKM

Ibrahim, I. B., & Mohammad, A. B. (2019). PENGGUNAAN e-NOTE DALAM PENGAJARAN DAN PEMBELAJARAN KURSUS INTRODUCTION TO INDUSTRIALISED BUILDING SYSTEM (IBS). *Jurnal Penyelidikan Teknokrat II*.

Little, B. (2012). Effective and efficient mobile learning: issues and tips for developer. *Industrial and Commercial Training*, Vol. 44 No. 7, pp. 402-407.

Liu, P. L. (2016). Mobile English vocabulary learning based on concept-mapping strat-egy. *Language Learning & Technology*, 128–141.

Luan, C. W., & Rahman, M. J. (2016). Aplikasi Media Sosial Dalam Pengajaran Dan Pembelajaran Sejarah Sekolah Rendah (KSSR). . *Media Sosial: Pembelajaran Abad 21*.

Mulyawan, S., & Budiman, A. (2013). Perancangan aplikasi Pembelajaran Tentang Tindak Pidana Korupsi Berbasis Mobile. *Seminar Nasional Teknologi Informasi dan Komunikasi 2013 (SENTIKA 2013)*.

Nawi, A., & Hamzah, M. I. (2013). Tahap Penerimaan Penggunaan Telefon Bimbit Sebagai M-Pembelajaran dalam Pendidikan Islam. *Journal of Islamic and Arabic Education* .

AlphaPLAY 2

Valluwan a/l Mathivanen 1, Muhammad Amir Irfan Bin Aziz 2, Mohammad Khairul Faizi Bin Khairi 3, Rosnawati Binti Sa'ad 4, Arif Iswandy Bin Sazali 5

Institut Pendidikan Guru Kampus Bahasa Melayu, Kuala Lumpur, Malaysia.
g-ipgp21191561@moe-dl.edu.my [1], g-ipgp21191804@moe-dl.edu.my [2], g-ipgp21191698@moe-dl.edu.my [3], rosnawati@ipgkbm.edu.my [4], g-ipgp19200441@moe-dl.edu.my [5].

Abstrak: Inovasi AlphaPLAY 2 merupakan suatu kit inovasi unik yang mengandungi 10 jenis permainan kad dan permainan berpapan yang menerapkan elemen-elemen daripada Arena Pertarungan Atas Talian (MOBA) seperti 'Mobile Legends Bang Bang'. Kit ini tidak disediakan khusus kepada sesuatu subjek malah kandungannya boleh diubah dengan mudah mengikut keperluan pelbagai subjek dengan bantuan Kecerdasan Buatan (AI). Secara langsung inovasi AlphaPLAY 2 ini akan meningkatkan penglibatan aktif murid kerana memiliki unsur didik hibur selaras dengan Pembelajaran Abad ke-21 (PAK-21) serta meningkatkan budaya berinovasi dalam kalangan guru sesuai dengan slogan 'Guru Insani Pemangkin Generasi Madani'. Beberapa unit kit AlphaPLAY 2 telah dijual dengan harga RM 25.00 setelah diperiksa dengan menggunakan Model Proses Kreatif Terarah.

Kata Kunci: AlphaPLAY 2; Mobile Legends Bang Bang; Artificial Intelligence(AI); Didik Hibur; Budaya Inovasi

Pengenalan

Kumpulan ALPHA mendapati minat para guru terhadap inovasi pendidikan masih tidak dapat mencapai sasaran yang diletakkan oleh Kementerian Pendidikan Malaysia (KPM). Hal ini demikian kerana guru-guru masih tidak mendapat ilmu atau pendedahan yang secukupnya untuk memulakan sesuatu inovasi itu. Hal ini menyebabkan sistem pendidikan di Malaysia masih ketinggalan berbanding negara-negara yang lain seperti Singapura dan Finland.

Kumpulan ALPHA sangat mengambil berat tentang masalah ini, maka Inovasi AlphaPLAY 2 telah dicipta dan dinaiktaraf beberapa kali. Inovasi ini akan menjadi panduan kepada guru-guru. Para guru akan belajar menginovasikan sesi penyampaiannya dengan menggunakan kit ini sehingga mereka berjaya membentuk kit atas konsep inovasi pendidikan tersendiri.

Hasil daripada beberapa kajian kualitatif di beberapa buah sekolah, kumpulan ALPHA telah mendapati tiga masalah utama yang menyebabkan tercetusnya idea untuk menghasilkan sebuah kit inovasi ini. Pernyataan masalah yang pertama adalah kurangnya pengetahuan tentang perkembangan inovasi dalam kalangan guru. Kebiasaannya guru hanya mampu menghasilkan satu inovasi yang hanya tertumpu kepada sesuatu topik atau subjek sahaja. Dengan kata lain, inovasi yang dicipta mengalami penggunaan yang terhad; tidak dapat digunakan berulang kali untuk matapelajaran yang lain dan peluang kebolehpasaran produk tersebut sangat rendah.

Masalah kedua yang diperoleh adalah berkaitan kurangnya literasi tentang teknologi terkini seperti kecerdasan buatan (AI) dan automasi dalam kalangan guru. Kebanyakan guru terutamanya guru veteran kurang mahir dalam menggunakan teknologi dan kurang pengetahuan mengenainya. Inovasi pendidikan sangat menitikberatkan perkembangan teknologi terkini. Oleh hal yang demikian, kekurangan literasi teknologi terkini akan membantutkan perkembangan sesuatu inovasi ke arah Revolusi Industri 4.0. Kurangnya masa, tenaga dan dana guru untuk menerapkan unsur didik hibur di dalam bilik darjah juga merupakan salah satu masalah yang ingin diketengahkan oleh kumpulan ALPHA. Guru tidak mempunyai masa untuk menghasilkan sesuatu inovasi disebabkan oleh terlalu sibuk dengan pelbagai tugasan di sekolah.

Bagi kos keseluruhan untuk kit AlphaPLAY 2 ini, kumpulan ALPHA telah menggunakan bahan yang sangat murah namun berkualiti. Anggaran kos keseluruhan bagi kit ini bernilai RM 20.53 sahaja. Ini bermakna dengan harga serendah RM 20, guru telah mempunyai 10 jenis permainan dalam satu kit. Beralih pula kepada ganjaran, kumpulan ALPHA telah menyediakan ganjaran berupa stik ganjaran dalam kit tersebut. Stik ganjaran akan diberikan kepada murid yang berjaya menyelesaikan permainan dengan pantas. Stik ganjaran akan membantu murid untuk lebih bersemangat dan dalam masa yang sama guru mampu menilai tahap murid berdasarkan stik ganjaran yang dikumpul oeh murid.

AlphaPLAY 2 semestinya mempunyai keunikan dan keistimewaannya yang tersendiri. Kit AlphaPLAY 2 bersifat fleksibel kerana boleh digunakan untuk pelbagai matapelajaran, tahap penguasaan murid dan sesuai untuk semua peringkat umur. Tahap kesukaran juga boleh dilaraskan mengikut kesesuaian guru untuk mengajar pada murid. Konsep AlphaPLAY 2 sangat mudah iaitu Pilih, Sunting, Cetak dan Siap. Selain itu, AlphaPLAY 2 ini menerapkan unsur teknologi terkini iaitu penggunaan AI untuk mengakses bahan dan penggunaan automasi pula bertujuan untuk menyunting bahan. Keunikan lain AlphaPLAY 2 adalah mudah dikembangkan mengikut citarasa dan keperluan guru. Secara tidak langsung, minat guru terhadap inovasi dapat ditingkatkan. AlphaPLAY 2 juga bersifat mesra pengguna kerana barang yang digunakan dalam kit ini mudah didapati. Kit ini juga mudah disimpan dan mudah untuk dibawa ke mana sahaja. Akhir sekali, bimbingan berterusan yang diberikan kepada pembeli merupakan satu inisiatif untuk mengubah kaedah pengajaran yang lebih baik dan stabil. Kursus dan bimbingan secara percuma oleh pakar teknologi juga turut diberikan untuk belajar pelbagai jenis kecerdasan buatan.

Huraian Produk

Pasaran alat permainan di seluruh dunia dipenuhi dengan pelbagai alat permainan kad seperti 'Donkey', 'Hearts', 'UNO', 'Happy Family' dan pelbagai alat permainan berpapan seperti 'Snake & Ladder', 'Monopoly', 'Dam'. Alat-alat permainan ini sangat diminati oleh semua lapisan masyarakat bermula kanak-kanak sehingga orang tua. Pihak ALPHA bercdang untuk menggabungkan 10 jenis permainan berasaskan kad dan berpapan di dalam satu kit permainan yang dinamakan 'AlphaPLAY 2'. Kit ini mempunyai peralatan yang hanya sedikit peralatan yang kos rendah dan mudah didapati yang mampu digunakan untuk 10 jenis permainan itu.

Semua alat permainan berasaskan kad dan berpapan dalam pasaran datang dengan tema dan illustrasinya yang tersendiri. Apabila 10 permainan itu digabungkan di bawah payung yang sama, pihak ALPHA tidak dapat menggunakan semua tema dan illustrasinya kerana terlalu banyak, jadi pihak ALPHA memperkenalkan tema yang menjadi kegilaaan anak-anak murid abad ke-21 iaitu bertemakan Arena Pertarngan Atas Talian (MOBA) khususnya permainan dalam talian 'Mobile Legends Bang Bang'. Terlalu banyak pendapat di luar sana yang menyatakan MOBA akan menjejaskan pendidikan anak-anak, tetapi tidak semua yang dapat memikirkan cara untuk menggunakan tema ini dalam konteks pendidikan untuk meningkatkan lagi minat mereka terhadap apa yang dipelajarinya.

Bahan utama kit ini merupakan pemegang kad (transparent card holder). Pemegang kad akan digunakan dalam kesemua 10 jenis permainan dalam kit inovasi ini. Terdapat 33 pemegang kad dalam setiap kit AlphaPLAY 2 ini. Setiap pemegang kad AlphaPLAY 2 adalah dwimuka. Pemegang kad digunakan dalam kit inovasi ini adalah untuk memudahkan pengguna mengeluarkan dan mengganti kad permainan untuk diaplikasikan dalam pelbagai subjek dan tahap, bukan hanya tertumpu untuk satu subjek sahaja. Muka hadapan kesemua 33 pemegang kad dilengkapi dengan gambar pelbagai hero atau karakter Mobile Legends Bang Bang malah bahagian belakang pemegang kad adalah subjektif dimana boleh diubah mengikut keperluan para pendidik. Kit ini juga mempunyai barang-barang lain seperti grip rambut, dadu, kad segi 4, jam randik, batang aiskrim pelbagai warna dan papan permainan. Kehilangan semua bahan ini mudah digantikan kerana boleh didapati di semua kedai serbaneka terutamanya 'Mr DIY' dan 'ECO Shop'.

Kit ini terdiri daripada 5 permainan berasaskan kad yang dinnovasikan daripada pelbagai permainan kad tradisional iaitu 'War', 'Memory 2', 'Donkey', '5 Seconds'dan 'Set'; 5 permainan berpapadn dan lain-lain yang menarik seperti 'The Battleground', ' The Quirkle', ' The Villa Paletti', ' Snake & Ladder'dan 'PAK 21: Traffic Light'. Setiap 10 jenis ini mempunyai cara permainan yang mudah dan berbeza daripada satu sama lain. Manual yang lengkap untuk guru, murid dan ibu bapa diberikan dalam bentuk digital melalui aplikasi 'Canva Websites'.

Selari dengan peredaran zaman, Inovasi AlphaPLAY 2 ini dilengkapi dengan pengintegrasian teknologi terkini seperti Kecerdasan Buatan (AI) dan automasi. Kedua-dua inovasi ini akan membantu para guru untuk menyediakan bahan yang akan dimasukkan pada bahagian belakang pemegang kad AlphaPLAY 2, lalu guru hanya perlu cetak, potong dan tampal; guru tidak lagi perlu menyunting bahan satu demi satu. Prom AI digital akan diberikan bersama kit permainan AlphaPLAY 2, guru hanya dikehendaki menukar tahun, tajuk dan tahap kesukaran lalu salin & tampal dalam Aplikasi AI percuma seperti 'ChatGPT', 'Google Bard', 'Bing AI' dan sebagainya. Hasil yang akan diperoleh adalah dalam bentuk jadual dan mengikut Dokumen Standard Kurikulum dan Pentaksiran (DSKP) kerana telah disetkan dalam prom tersebut. Lalu Automasi 'Canva Bulk Create' akan membantu guru mengubah bentuk jadual kepada beberapa kad berdasarkan keperluan , lalu guru cetak, potong dan tampal.

Dapatan & Perbincangan

Tidak seperti kebanyakkan inovasi-inovasi pendidikan diluar sana yang dicipta untuk digunakan oleh murid, inovasi AlphaPLAY ini dicipta untuk guru yang secara langsung akan memberikan impak yang positif untuk murid-murid. Impak utama inovasi AlphaPLAY 2 adalah dapat meningkatkan budaya inovasi dalam kalangan guru. Pertama sekali, inovasi ini akan memberikan pengetahuan kepada guru tentang perkembangan inovasi zaman kini. Guru akan mendapat bayangan bagaimana sesuatu inovasi yang dicipta perlu memenuhi pasaran dan permintaan. Inovasi AlphaPLAY 2 akan menjadi penanda aras dalam penciptaan inovasi-inovasi moden yang tidak akan lupus akibat peredaran zaman dan mampu dinaiktaraf dari masa ke semasa. Guru juga akan belajar cara yang terbaik untuk menginovasikan dan menggunakan inovasi orang lain semasa sesi penyampaiannya secara beretika.

Inovasi ini secara langsung akan meningkatkan minat guru untuk mencuba membuat iovasi yang tersendiri. Para guru akan diberikan bimbingan yang berterusan secara dalam talian melalui pelbagai aplikasi perhubungan dalam talian dan group sokongan secara berterusan. Pihak ALPHA tidak mahu guru menggunakan kit ini untuk jangka masa panjang tetapi mahu guru menggunakan bahan-bahan yang disediakan untuk mencipta pelbagai inovasi yang baharu. Guru yang telah membuat inovasi akan berkongsi maklumat dalam group telegram pengguna AlphaPLAY 2 lalu menjadi inspirasi kepada guru-guru yang lain.

Selain itu, Inovasi AlphaPLAY 2 akan meningkatkan literasi kecerdasan buatan (Artificial Intelligence) dalam kalangan guru. Inovasi AlphaPLAY 2 akan menjadi pendedahan kepada guru-guru kerana memberikan tunjukkan dan desakkan untuk menggunakan AI dan automasi kepada guru sama ada guru-guru novis mahupun vateran. Guru-guru yang tidak terbiasa dengan teknologi tinggi atau terkini akan mencubanya, lalu akan melihat sendiri

yang AI dan automasi sebenarnya memudahkan tugas-tugas mereka yang seterusnya akan meningkatkan minat mereka terhadap pelbagai teknologi terkini.

Inovasi AlphaPLAY 2 akan membawa unsur didik hibur ke semua bilik darjah di seluruh Malaysia tanpa mengira tahap pencapaian dan prestasi murid. Inovasi ini mampu diubah berdasarkan tahap kesukaran. Jadi semua murid yang tergolong dalam golongan lemah, sederhana, pintar dan Murid Bekeperluan Khas (MBK) boleh bermain kit ini, kit ini bukan hanya terbatas untuk murid pemulihan semata-mata.

Inovasi AlphaPLAY 2 sangat menjimatkan masa, tenaga dan dana guru untuk menyiapkan sesuatu Bahan Bantu Mengajar (BBM) yang akan digunakan dalam kelas. Inovasi AlphaPLAY 2 datang dengan konsep PSCS iaitu Pilih, Sunting, Cetak, Siap yang tidak memakan masa yang banyak. Bantuan AI dan Automasi juga turut menjimatkan masa guru. Guru akan menggunakan semua bahan yang disediakan, perkara ini akan menjimatkan dana dan tenaga guru untuk mencari bahan untuk setiap yang dibuatnya.

Kesimpulan

Inovasi AlphaPLAY 2 telah mendapat sambutan yang hangat dalam kalangan guru sekolah rendah. Sebanyak 43 kit telah diberikan secara percuma pada bulan Julai dan Ogos 2023 kepada 7 buah sekolah termasuk Sekolah Kebangsaan, Sekolah Jenis Kebangsaan Tamil & Cina serta Sekolah menengah kebangsaan. Setiap kali menyertai pertandingan inovasi, kit ini akan dinaiktaraf atau mengalami penambahbaikan. Pihak ALPHA turut menerima maklum balas daripada guru-guru dan para pensyarah di seluruh Malaysia lalu penambahbaikkan dibuat dengan segera. Kit ini akan mula dijual pada hujung tahun 2023 setelah didaftarkan dengan pihak Perbadanan Harta Intelek Malaysia (MyIPO). Suatu kit yang bernama 'AlphaPLAY Junior' juga akan diperkenalkan tidak lama lagi untuk memenuhi permintaan guru-guru pra sekolah dan untuk Murid Bekeperluan Khas (BPK).

Pencapaian dan Anugerah

Rajah 1: Pencapaian dan anugerah

Tourism attraction interactive map of Zoo Negara

Mohd Mohadir Bin Harun, Nurfadhillah Ameerah Binti Zainal Arifin, Muhammad Ridzwan Bin Muhammad Ali, Zefidiena Shazqin Binti Khairul Hanizam

Politeknik Sultan Idris Shah, Sabak Bernam, Selangor[1,2,3,4,5]
mdir2013@yahoo.com, fadhillahameerah25@gmail.com,
ridzwan6620@gmail.com, zefidienashazqin@gmail.com,

Highlights: This project creates an interactive Zoo Negara pop-up map. This map lets tourists learn about animals and exhibitions in a fun and interactive way. It was developed using the traditional pop-up technique and enhanced with virtual information by scanning QR codes. The final product was tested and evaluated by a focus group of tourists. The findings of the study show that this product has positive usage effectiveness and good future development prospects.

Key words: Interactive pop-up map; Zoo Negara; Tourist

Introduction

Tourism is a major contributor to the Malaysian economy, generating substantial income and employment. According to Shaheen et al. (2023), tourists come from all over the world to visit the country's unique cultural landmarks, diverse natural landscapes, and cutting-edge infrastructure. Tourism is a significant contributor to Malaysia's gross domestic product, contributing approximately 15% of the country's GDP in 2019 (Suppiah & Selvaratnam, 2020). Tourism not only generates revenue but also creates jobs in other industries such as hotels, transportation and entertainment. The Malaysian government has launched a number of tourism-related initiatives, such as developing new destinations, upgrading infrastructure and organizing international events. These efforts have attracted tourists from all over the world and made Malaysia a major tourist destination in Southeast Asia. Overall, tourism is important to the Malaysian economy as it promotes economic growth, job creation and cultural exchange (Peachyessay, 2023).

The National Zoo is a famous tourist destination all around the world, and Malaysia's National Zoo is no exception. Each year, more than half a million visitors travel there to get a better look and personal with a variety of animals. The money that visitors spend on entry, drinks, and souvenirs is a significant source of revenue for local businesses. The National Zoo's goal also includes teaching and research (Zoo Negara, 2023). The zoo provides educational programs for schools and the general public, including guided tours and interactive displays. It also undertakes wildlife conservation research, which involves researching the behavior and biology of various species in order to better understand their requirements and establish successful conservation measures. The National Zoo's most essential aim is species conservation. It strives to safeguard endangered species and their habitats, as well as to engage in breeding programs that aid in the preservation of endangered populations. The zoo's efforts assist future generations in appreciating the beauty and diversity of animals.

The pop-up interactive map is a resource that can be helpful for visitors to the National Zoo. It can include information about a variety of animal species, highlight specific exhibits, and even incorporate interactive components such as quizzes and games to engage visitors' knowledge and experience. The visitor can view the map on their smartphone device and the information on it will update immediately to reflect any changes or additions to the zoo. It can also help the zoo in achieving its mission in the wildlife conservation, education, research, recreation and training segments

Problem Statement

The visitor experience is currently limited due to a lack of information and orientation. Visitors often have trouble finding their way around the zoo and finding the animals and facilities they want to see. This can lead to frustration, confusion, and a bad experience for visitors (M. Zakaria, 2007). Zoo Negara must develop a viable business plan, which must be realized by combining multiple innovation strategies, marketing products and online services. (Chan, 2020). To address this, the Negara Zoo needed an interactive map that provided visitors with up-to-date information about the zoo's animals, habitat, and facilities. Interactive maps should be easy to use, visually appealing, and navigate. It must also be optimized for different devices and platforms, such as desktops, smartphones, and tablets. Interactive maps will make it easy for visitors to plan their visit, discover new spots zoo area and learn about animals and habitats in a fun and interactive way. Zoo Negara can increase visitor satisfaction, improve engagement and promote animal conservation providing a better experience.

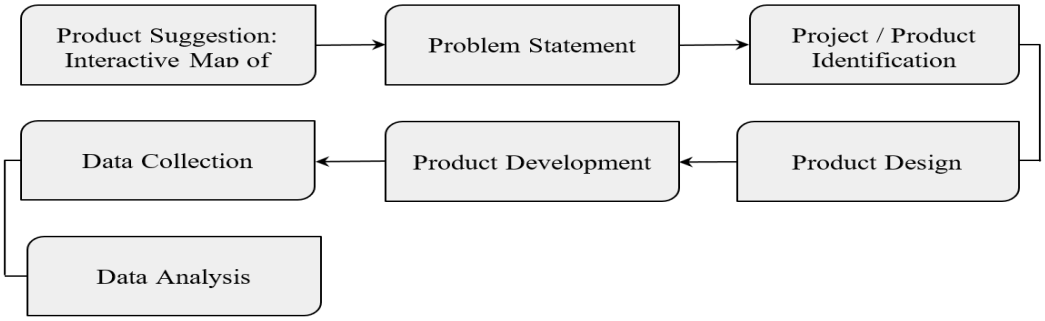
Product Description

Our group intends to create interactive maps that provide visitors with information about the zoo's animals, habitats, and facilities in order to improve the visitor experience and promote animal conservation. This interactive map is an innovative and user-friendly product designed. It combines the traditional tactile aspects of physical maps with interactive (pop-up) elements. The combination of QR codes with digital elements offers a new dimension to visitors and national zoos. In the project development process, we well-defined project methodology including outlining the project scope, objectives, requirements, resources, timelines, and deliverables. Our team had collaborate

closely with various stakeholders, such as Zoo Negara management, visitors, and welfare organizations to ensure that the maps meet their needs and expectations.

The Project Frameworks

A tool that provides guidance and structure for the execution of a project. Our project framework is as below:



Product Development
To complete the development of this project. It goes through 4 phases:

Phase 1: Idea Generation
In this phase, we do research on the background of Zoo Negara. Also, we discussed the theme of the interactive map of Zoo Negara.

Phase 2: Information
We do a short Interview with the person in charge and the tourist at the Zoo Negara to get more information and first impressions. Also search for information about Zoo Negara or data from articles, journals, and official websites.

Phase 3: Product Design
We discussed the product, which is the Interactive map for Zoo Negara. The product anatomy is discussed and negotiated to achieve a result that is satisfactory to both of us and the consumers/people who use it.

Phase 4: Completion
After finishing the product and conducting some preliminary testing. There are several flaws as well as development and change possibilities that can be altered.

Product Process
The process of creating an interactive pop-up map for Zoo Negara includes planning the objectives and features, designing the visual layout, creating informative content about the zoo's locations, developing the digital format with interactive features, testing for functionality and compatibility, integrating it into Zoo Negara's website or app, and creating QR codes of information about the main animals at the Zoo Negara, and updating the map to ensure accuracy and usability.

Final Product
These Interactive Maps contain information about the overall map of the Zoo Negara and the route to the end. Along this route, an interactive pop-up containing information about the animal is placed. In addition, visitors can also improve their knowledge by answering quiz questions and watching videos that can be accessed by scanning the QR Code.

Results & Discussion

This study aims to measure the effectiveness of using Maps from the aspect of product features, design and functionality. The results and discusses the findings, giving light on the project's primary outcomes. The study used quantitative research methodologies to provide a full grasp of the issue under inquiry (Marshall & Rossman, 1989). This study uses a questionnaire as a research instrument and is distributed to respondents using Google Forms. A total of 154 respondents participated. The findings of the study as shown in Table 1.

Table 1: Findings of the study

QUESTION			
	NUMBER OF RESPONDENT	MEAN	Std. DEVIATION
Product Features			
The map of Zoo Negara is very interactive	155	4.81	0.44
The content of the interactive map is clear	154	4.81	0.44
The popup features in the interactive map is interesting	154	4.82	0.45
Product Functionality			
The interactive map is easy to carry	154	4.79	0.45
The interactive map convenient for tourist's needs	154	4.84	0.4
The interactive map convenient for tourist's activity plan	154	4.83	0.39
Product Design			
This interactive map design is attractive	154	4.84	0.37
The interactive map is very creative	154	4.81	0.41
The interactive map is high quality	154	4.83	0.39
The interactive map is user friendly	154	4.82	0.42

From the data presented in Table 1, it can be concluded that the product features, product functionality and product design of this interactive map have the highest mean between 4.79-4.84 and the Standard Deviation below 0.5. This means that the data points in the data set are relatively close to the mean, showing low variability or dispersion around the mean. This result shows that respondents are very satisfied when using this product in terms of product features, product functions and product design. Design products such as attractive, very creative, high quality and user-friendly designs are the main attraction for them to use this interactive map. It also shows that this interactive map product can be used as a tool to help increase user knowledge, facilitate their visit to Zoo Negara and promote visits to Zoo Negara.

Conclusion

The map can provide detailed information about the zoo's layout, the locations of various exhibits and animals, and any upcoming events or shows. Visitors can plan their route through the zoo in advance by using the maps interactive features, saving time and avoiding unnecessary walking (Ishida et al., 2016). Furthermore, an interactive map lets the zoo provide more information about the animals, exhibits, and essential safety guidelines. Visitors can directly access photos, videos, and written descriptions from the map. The map can be updated in real-time to reflect changes in the zoo's layout or events, ensuring that visitors always have the most recent information. An interactive map is a valuable tool for both visitors and the zoo, improving the visitor experience and assisting the zoo in better engaging with its audience. These interactive maps will be digitalized using augmented reality technology for future planning to fulfil the current trends (Karlsson et al., 2010;Syahidi et al., 2022).

Publication, Award and Intellectual Property

MYIPO : CR-1A [LY2023W03773]

Competition JPH : SILVER

References

Chan, D. (2020). *Zoo Negara urged to come up with viable business plan*. New Street Time. https://www.nst.com.my/news/nation/2020/12/646532/zoo-negara-urged-come-viable-business-plan

Ishida, T., Shinotsuka, Y., Iyobe, M., Uchida, N., Sugita, K., & Shibata, Y. (2016). Development of a Zoo Walk Navigation System using the Positional Measurement Technology and the Wireless Communication Technology. *J. Internet Serv. Inf. Secur.*, 6(4), 65–84.

Karlsson, J., ur Réhman, S., & Li, H. (2010). Augmented reality to enhance visitors experience in a digital zoo. *International Conference on Mobile and Ubiquitous Multimedia*. https://api.semanticscholar.org/CorpusID:13475311

M. Zakaria. (2007). *Perception of visitors towards the role of zoos: a Malaysian perspective*.

Marshall, C. C., & Rossman, G. B. (1989). *Designing Qualitative Research*. https://api.semanticscholar.org/CorpusID:61026256

Peachyessay. (2023). *THE CONTRIBUTION OF TOURISM SECTOR TOWARDS MALAYSIAN ECONOMICS GROWTH*. https://peachyessay.com/sample-essay/the-contribution-of-tourism-sector-towards-malaysian-economics-growth/

Shaheen, R., Mahfud, S., & Alhawat, Q. (2023). Hosoya, Schultz, and Gutman Polynomials of Generalized Petersen Graphs P n , 1 and P n , 2. Journal of Mathematics, 2023(1), 13–24. https://doi.org/10.1155/2023/7341285

Suppiah, R., & Selvaratnam, D. P. (2020). Tourism demand in Malaysia: a panel data analysis of 17 OECD countries. *Journal of Tourism and Hospitality*, *12*(3), 52–64.

Syahidi, A. A., Joniriadi, J., Waworuntu, N. H., Subandi, S., & Kiyokawa, K. (2022). Tour Experience with Interactive Map Simulation based on Mobile Augmented Reality for Tourist Attractions in Banjarmasin City. *The IJICS (International Journal of Informatics and Computer Science)*, *6*(1), 22. https://doi.org/10.30865/ijics.v6i1.3900

Zoo Negara. (2023). *Zoo Negara - About Us*. https://www.zoonegara.my/zoo.html

Revolutionizing English Language Education with Augmented Reality Board Games

Diana Lee Phooi Yan[1], Logaiswari Indiran[2], Chai Teck Jung[3]
Politeknik Sultan Idris Shah, Selangor, Malaysia [1, 3]
Universiti Teknologi Malaysia (UTM), Faculty of Management, Skudai, Malaysia [2]

dianalpy@psis.edu.my[1], logaiswari@utm.my[2], tjchai@psis.edu.my[3]

Highlights: In recent years, there has been significant progress in the use of technology in education, particularly with the incorporation of augmented reality (AR) technology in educational games. This advancement has allowed for a more immersive learning experience, in which learners are immersed in a computer-generated 3D visual environment with realistic sensory experiences. The development of educational games has made the teaching and learning process more captivating and engaging, especially for younger learners and the digitally savvy millennial generation. This research introduces an innovative educational board game that utilizes augmented reality technology, and it is aimed specifically at the millennial generation, particularly those at the tertiary level. This educational board game's primary aim is to enhance learners' English-speaking skills while also motivating and engaging them in the process of learning the English language. To assess students' perceptions regarding the use of AR Board Games for English language learning, a pilot study was conducted using a questionnaire based on the Theory of Acceptance Model (TAM). The study's findings revealed a high level of acceptance among students, who expressed satisfaction and positivity towards the use of AR board games in their English language learning efforts.

Keywords: Augmented Reality (AR) Technology; Millennial Generation; English Language Learning

Introduction

In the context of today's technological advancements, there has been a notable surge in the development of teaching and learning tools that capitalize on the latest innovations. Among these innovations, augmented reality (AR) technology has been gaining popularity, particularly among the millennial generation. According to Azuma (1997), AR is a form of virtual reality where 3D virtual objects are seamlessly integrated into a real 3D environment in real-time. Its integration into the educational field has proven to be highly beneficial, enhancing teaching and learning experiences by providing interactive, immersive, and engaging learning opportunities.

Augmented reality technology has found application in various educational domains, including Saudi education (AlNAjdi, 2022), computer & network education (Hamzah et. al., (2021), mathematical education (Demitriadou et. al., 2020; Lee & Lee, 2008), geometry education (Do & Lee, 2007), and English Education (Yilmaz et. al., 2022; Taskiran, 2019). In English education, the use of game-based learning materials has been shown to be more effective than traditional materials (Taskiran, 2019). AR technology, with its fusion of virtual elements into the real world, adds excitement, interactivity, and immersion to the English language learning process. Games facilitate real-time self-verification of learning, encouraging students' involvement and engagement within a fun and stimulating environment (Barma et al., 2015). Consequently, educational games utilizing AR technology can be a highly effective and engaging method to motivate learners, improve language retention, and create enjoyable learning experiences.

In the present day, teaching and learning the English language can be quite challenging, as learners often lose interest and motivation due to repetitive classroom activities and uninspiring learning materials (Jamrus & Razali, 2021; Taskiran, 2018). Traditional approaches often fail to foster interaction and engagement, which are vital for enjoyable and effective learning experiences. Educational games are believed to help address this issue and enhance English language proficiency. As in the latest study by Liao et.al. (2023) reported that AR game-based intervention helped to significantly improve students' English language proficiency and the students both in rural and urban areas were more engaged and motivated towards learning.

This research aims to introduce an educational board game utilizing AR technology to enhance students' English-speaking skills. English is an international language, and in Malaysia, students have been learning and using it as a second language from primary to tertiary education. However, despite this exposure, many students struggle to master the language, especially speaking skills. Various reasons contribute to this, including limited practical use of the language in daily conversations, lack of confidence in speaking, and fear of making grammatical errors, leading to negative peer judgment. Over time, students become demotivated to use English. Therefore, the development of this AR board game aims to boost students' confidence and alleviate their apprehension when using the English language.

The objectives of the research

The objectives of the board game for English teaching and learning are as follows:

i. To design 3D AR Board Games
ii. To identify the perception of students' satisfaction with learning English through AR board games using the TAM framework.
iii. To expose students to an enjoyable learning environment.
iv. To provide learning experiences and interaction towards the subject through AR with text, images, and video.

Product Description

The application is developed using Unity3D— a real-time application development software. Unity3D is used to ease the process of application development due to its many features and development supports. One of the supports that is used is its integration with the Vuforia Engine software development kit (SDK) which is responsible for AR-related functionalities. The image tracking functionality provided by Vuforia Engine SDK is used. The building images and the AR board are designed and drawn using Unity3D from scratch. Figure 1 below shows the AR scene of the development process using Unity3d.

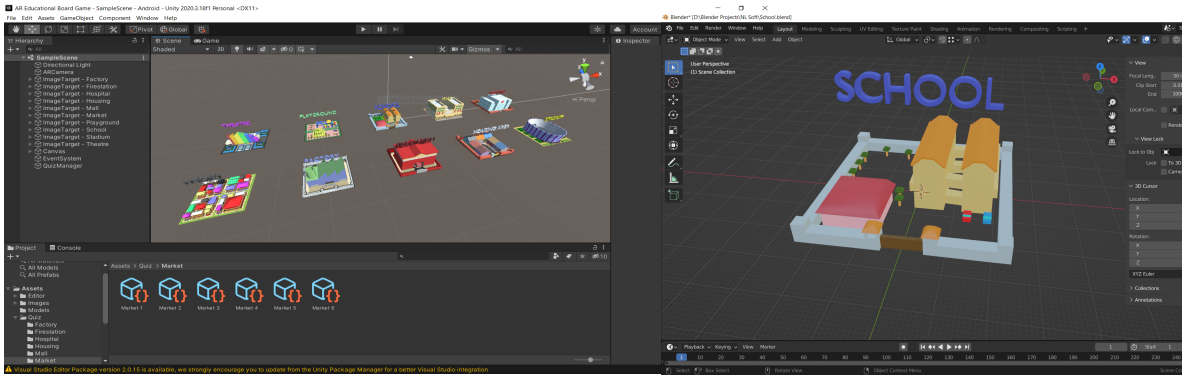


Figure 1: The AR scene of the AR Board development using Unity3D software.

Figure 2 below shows the development process of the AR Board Game. First, the images that will be used for the image targets are first drawn on the computer. Then, the images are uploaded into the Target Manager in the Vuforia Developer Portal. The images are then placed on the game board to be used during testing and actual gameplay. Inside the Vuforia Developer Portal, the images uploaded into the Target Manager are rated and generated as part of an image target database. Besides that, a Vuforia development license is generated by using the License Manager. Both the image target database and Vuforia development license are uploaded into Unity3D. Inside Unity3D, the Vuforia Engine software development kit (SDK) is installed from the Package Manager. The SDK enables AR functionalities for Unity3D. In the SDK's Vuforia Configuration settings, the Vuforia development license is inserted into the License slot and the image target database is imported into the Database slot. 3D assets were designed and imported from Blender3D, a free open-sourced 3D modelling software. C# scripts were generated and written within Unity3D using the default MS Visual Studio to handle the gameplay functionalities and other interactivities. The Unity3D project is compiled as an Android package (APK) file and uploaded onto an Android mobile device for testing.

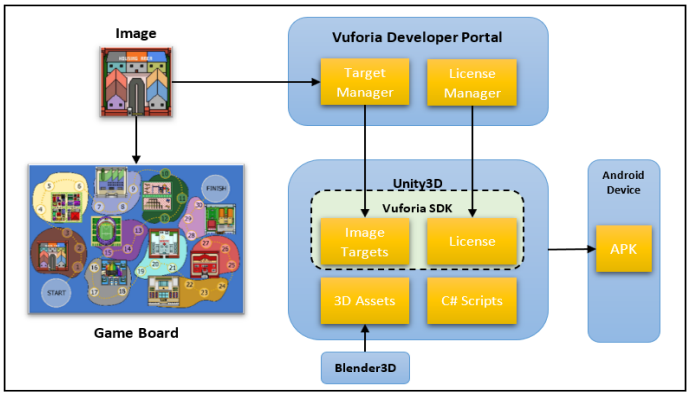


Figure 2: The development process of AR Board Game

This game needs a minimum of two players and the players need to have an AR Board, a dice, counters, and a smartphone. Before the game starts, the players need to install the .apk file in their smartphone to scan the Augmented Reality objects on the board. Below are the steps and rules to play this game.

1. Each player puts their counter on the space that says "Start".
2. Each player takes turn to roll a dice. The number on dice determines the number of movements on the board. (i.e. if the dice show '3', the player needs to move the counter three steps forward)
3. Player scans the building based on the number where he/she landed in order to view the question. (If the player can give correct answer or sufficient opinion/view on the scenario given, then he/she can roll the dice again and move forward to complete the next task.
4. A teacher or moderator is the person who will verify whether the player pass and able to move to the next round.
5. If the player fails to complete the task, then he or she will miss one turn.
6. The same method continues until one of the players reach the "Finish" box and declare as the Winner.

Results & Discussion

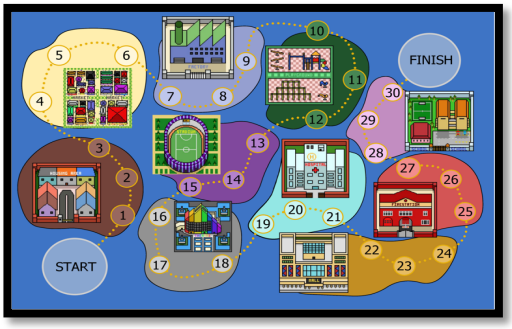


Figure 3: The design of the AR Board

Figure 3 above shows the design of the AR board. When the player scans the buildings on this AR ESL Board, the 3D Augmented Reality image (i.e., the buildings) will appear. When players click "Begin", a question will appear on their phone screen. Players may cancel by clicking on the "Cancel" button. Each building contains seven to eight multiple-choice questions and open-ended questions as well as images and videos as shown in Figures 4 and 5 respectively.

Figure 4: The 3D Augmented Reality images for each building

Figure 5: The example of questions portrayed on a smartphone screen after each scan on the buildings.

Users Satisfaction

A pilot test was conducted to identify users' acceptance and satisfaction towards the usage of AR Board game in English language learning based on the Technology Acceptance Model (TAM). Based on the model, this study aimed to identify students' perceived usefulness, perceived ease of use, attitude, and intention to use the innovative AR board game in English class. The questionnaire has been tested for content validity by English lecturers from Politeknik Sultan Idris Shah who have expertise in using Technology Acceptance Model (TAM) before distribution. The questionnaire was distributed using Google form to a group of volunteer students from Politeknik Sultan Idris Shah. Table 1 below shows the mean and standard deviation of the four studied variables. As can be seen, the mean value above 4.00 for all four studied variables revealed that the students were satisfied and feeling positive towards the use of AR board game in English language learning. perceived usefulness (4.44), perceived ease of use (4.22), attitude (4.20), and user acceptance (4.08) to use the innovative AR board game in English class.

Table 1: The mean and standard deviation of perceived usefulness, perceived ease of use, attitude, and user acceptance.

Variables	Mean	Std. Deviation
Perceived Usefulness	4.44	0.695
Perceived Ease of Use	4.22	1.013
Attitude	4.20	0.771
User Acceptance	4.08	0.831

Perceived usefulness which recorded the highest mean (4.44) showed that the students found the AR board game useful to help enhance their English language proficiency. This could be because, through the game, students were required to express their points of view or justify their opinion based on their understanding of the statement and issues given. Perceived ease of use with a mean of 4.22 (the second highest) revealed that the students were able to use the AR board with ease in aiding their learning and understanding the application well. Besides that, students also showed a positive feeling and attitude towards the usage of the AR board game (mean of 4.20). Overall, it can be deduced that there is a high acceptance level among the students (mean of 4.08) and the students were satisfied with the application of AR board games in improving their English language proficiency.

Impact of the Research

The impact of a board game on English teaching and learning can be significant and beneficial in various ways:

i. Engaging Learning Experience: Board games offer an interactive and engaging learning experience, making language learning more enjoyable and motivating for students. The hands-on approach encourages active participation and fosters a positive attitude towards learning English.
ii. Enhanced Language Skills: The board game can target various language skills, including vocabulary building, grammar comprehension, speaking, listening, and reading. Through gameplay, students can practice and reinforce these skills in a practical and context-based manner.
iii. Increased Retention and Application: Board games often incorporate repetition and reinforcement, which can lead to better retention of language concepts. Students are more likely to apply what they learn in real-life situations, improving their language proficiency.
iv. Collaboration and Communication: Board games encourage collaboration and communication among players, promoting language use and interaction. Students learn to express themselves, negotiate, and cooperate while playing, enhancing their communicative abilities.
v. Personalized Learning: The board game can be designed with various difficulty levels, allowing for personalized learning experiences that cater to different proficiency levels and learning styles.
vi. Inclusivity and Cultural Awareness: By incorporating diverse themes and contexts, the board game can promote inclusivity and cultural awareness, exposing students to different cultures and perspectives.
vii. Motivation and Confidence: Success and achievements in gameplay can boost students' motivation and confidence in their English language abilities, encouraging them to continue their language learning journey.
viii. Teacher Support: The board game can serve as a valuable supplementary resource for English teachers, providing a fun and effective tool to reinforce classroom lessons and target specific language learning objectives.
ix. Positive Learning Environment: Board games create a positive and supportive learning environment, where students can experiment with the language without fear of making mistakes, fostering a growth mindset towards language learning.
x. Long-Term Impact: The engaging and enjoyable nature of board games can create a lasting interest in language learning, encouraging students to continue their language studies beyond the classroom setting.

Overall, the impact of a board game for English teaching and learning extends beyond traditional methods, offering a dynamic and interactive approach that enhances language skills, fosters a positive learning environment, and instils a lifelong passion for learning English.

Commercialization Potential

The commercialization potential for a board game designed for English teaching and learning can be significant for several reasons:

i. The commercialization potential for a board game for English teaching and learning is high due to the demand for effective language learning tools.
ii. Opportunities exist in educational institutions, language learning centres, online platforms, and home learning environments.

iii. Export opportunities and collaborations with publishers or educational companies could help the game reach a wider audience, and
iv. Converting the concept to a digital format as a language learning app and focusing on language certification preparations can boost commercialization prospects.

Conclusion

Augmented reality (AR) technology has ushered the teaching and learning process into a whole new realm of immersive and enjoyable experiences. This educational game can serve both educational purposes and be a source of fun-filled entertainment. Originally designed for use in both face-to-face and online settings, the AR Board game incorporates the use of online dice from a free application or website when played online. In this scenario, the lecturer assumes the role of a presenter and manages the online platform, including the rolling of the dice on behalf of the players. To elevate the gaming experience further, we propose a remarkable upgrade for the AR board game - a fully online version that integrates 3D dice, allowing the players to take control of themselves within the application. With this enhancement, players can personally interact with the 3D dice, clicking and rolling them at their discretion, thereby amplifying the enjoyment and engagement within the game. This improved iteration promises to be an exciting journey into the world of augmented reality gaming.

References

AlNAjdi, S. M. (2022). The effectiveness of using augmented reality (AR) to enhance student performance: using quick response (QR) codes in student textbooks in the Saudi education system. *Education Technology and Research Development,* 70(1), 1105–1124. https://doi.org/10.1007/s11423-022-10100-4

Azuma, R.T. (1997). A survey of augmented reality. *Presence: Teleoperators and Virtual Environments,* 6(4), 355-385.

Barma, S., Daniel, S., Bacon, N., Gingras, M. A., & Fortin, M. (2015). Observation and analysis of a classroom teaching and learning practice based on augmented reality and serious games on mobile platforms. *International Journal of Serious Games,* 2(2), 70 - 88.

Demitriadou, E., Stavroulia, K. E. & Lanitis, A. (2020). Comparative evaluation of virtual and augmented reality for teaching mathematics in primary education. *Education and Information Technologies, 25*(1), 381–401. https://doi.org/10.1007/s10639-019-09973-5

Do, V.T., & Lee, J.W. (2007). Geometry Education using Augmented Reality. In: Mixed Reality Entertainment and Art Workshop2 in ISMAR, Japan, pp. 11–15.

Hamzah, M. L., Ambiyar, A., Rizal, F., Simatupang, W., Irfan, D., & Refdinal, R. (2021). Development of Augmented Reality Application for Learning Computer Network Device. *International Journal of Interactive Mobile Technologies (iJIM)*, *15*(12), 47–64. https://doi.org/10.3991/ijim.v15i12.21993

Jamrus, M. H. M. & Razali, A. B. (2019). Augmented reality in teaching and learning English reading: Realities, possibilities, and limitations. *International Journal of Academic Research in Progressive Education and Development*, *8*(4), 724–737. http://dx.doi.org/10.6007/IJARPED/v8-i4/6696

Lee, H.S., & Lee, J.W. (2008). Mathematical Education Game Based on Augmented Reality. In: Pan, Z., Zhang, X., El Rhalibi, A., Woo, W., & Li, Y. (Eds.), Technologies for E-Learning and Digital Entertainment. Edutainment 2008. Lecture Notes in Computer Science, vol 5093. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-69736-7_48

Liao, C. H. D., Wu, W. C. V., Gunawan, V. & Chang, T. C. (2023). Using an Augmented-Reality Game-Based Application to Enhance Language Learning and Motivation of Elementary School EFL Students: A Comparative Study in Rural and Urban Areas. *Asia-Pacific Education Researcher*, 32(2). https://doi.org/10.1007/s40299-023-00729-x

Taskiran, A. (2018). The effect of augmented reality games on English as foreign language motivation. *E-learning and Digital Media, 0* (0), 1-14.

Taskiran, A. (2019). The effect of augmented reality games on English as foreign language motivation. *E-learning and Digital Media, 16* (2), 122 - 135. https://doi.org/10.1177/2042753018817541

Yilmaz, R.M., Topu, F.B. & Takkaç Tulgar, A. (2022). An examination of vocabulary learning and retention levels of pre-school children using augmented reality technology in English language learning. *Education and Information Technology,* 27(5), 6989–7017. https://doi.org/10.1007/s10639-022-10916-w

BIOPES UBI GADONG

Samsudin Yahya, Fatanah Khatun Ahmad@Amzah, Mastura Zainun, Siti Noorrizkiah Ahmad, Napisah Sidik

Institute Kemahiran MARA Tan Sri Yahaya Ahmad, Pekan[1,2,3,4]
fatanah.khatun@mara.gov.my

Highlights: Biopes Ubi Gadong is one of the products made from wild plants, that plant grows in the equatorial forest. This tuber or sweet potato is delicious to eat but can be intoxicating for up to 2 days if it was made incorrectly. From this intoxicating nature of tubers lead to the result of the innovation of Biopes Ubi Gadong which is specifically for insects and animals in the area of paddy fields such as caterpillars and rats. Biopes doesn't contain any chemicals as it is derived naturally 100% from the cassava or tuber only. There are 2 methods in using Biopes Ubi Gadong which are by sowing dry if the paddy field is watery and by mixing it with a small amount of water if the paddy field is dry. When pests are exposed to the substance, the pests will not die but the pests will be dizzy or intoxicated. The novelty of Biopes Ubi Gadong is other insects or animals will easily attack the intoxicated pests such as by injecting its eggs into the caterpillars. Later, the eggs will hatch in the stomach of the caterpillars. Thus, we managed to control the population without using chemical pesticide. Sprinkling or spraying process should be done in the direction of the wind and not against the wind. 1 acre of paddy field is equivalent to 4kg to 5kg of dried ubi gadong substances or Biopes.

Key words: ubi gadong; tuber; paddy fields; pesticide control; biodegradeble

Introduction

Novelty

Biopes Ubi Gadong will cause other insects easily attack intoxicated caterpillars by injecting its eggs into the caterpillars and the eggs will hatch in the stomach of caterpillars. Eventually the population of pests will be able to control without the use of chemical pesticide. 1 acre of paddy field is equivalent to 4kg to 5kg of dried ubi gadong substances or Biopes.

Product

Farmers often have problems such as stem digging caterpillars, leaf caterpillars, squirrels, birds, and mice. Their losses often reach more than 75% of the 1 acre planted. Excludes low grade of paddy which cause the selling price of paddy to decrease. From this existed problem, Biopes Ubi Gadong has been created. This invention focuses on resolving 80% of attacks from small insects and only 20% for plant pests such as rats.

First strategy of Biopes Ubi Gadong is opening farm for planting Ubi Gadong by the department of agriculture Negeri Pahang at Integrated Agricultural Development Area (IADA), Pekan. Second is sales of sweet potatoes Ubi Gadong as food and biopes products for all kinds of pest's plant. Third is reduce 50% suspension use of chemical pesticides for Negeri Pahang. Fourth encourage farmers to planting Ubi Gadong as side income or for personal use.

This project will continue through cooperation with the national poison center to increase the consumption capacity to the maximum. The cost of producing is below RM50 only. This is because, the price of sweet potato is in the range of RM3.00 to RM5.00 per kilo and the drying operation becomes a powder of RM40.00 per kilo. A total of 3 to 5 researchers will participate in this project from the beginning until the study is fully completed. Incentives to produce this biopes project will be made with farmers to provide exposure to safe and orderly use techniques. The results of a study will share to farmers to encourage them to use of biopes. Studies between Malaysian and Indonesian cassava are also made. This project can open new opportunities in the commercial sector of cassava crop.

Result / Impact:

Pahang Tua scheme project, Pekan (1/2/2021-21/5/2021)

75	• Pembajaan tambahan II	• Baja 12:3:18:2:3 (50kg) atau • Baja 12:12:17:2 (50kg) atau • Baja 13:13:21 (50kg)
80	• Penakaian padi angina II	• Buang pokok padi angin
85	• Menyembur Baja Foliar	• Gunakan Biopes Ubi Gadong
100	• Keringkan sawah	• Untuk penyediaan menuai
110	• Menuai (Beras)	• Tuai padi pada 90% padi masak
115	• Menuai	• Tuai pada 95% padi masak

1. SEBELUM MENANAM

Hari Lepas Tabur (HLT)	Kerja/ Aktiviti	Jenis/Kadar
Seminggu selepas menuai *	• Menebas tunggul padi	-
	• Menyembur Pereput Jerami	
6 hari	• Membina/membaiki tali air, parit buang dan kotak kawalan paras air setiap lot.	-
	• Memasang kotak sarang burung pungguk untuk kawalan tikus	-
11 hari	• Menentukan pH tanah	-
	• Meracun rumpai, anak padi batat dan padi angin.	• Racun rumpai yang disyorkan mengikut arahan di label
5 hari	• Membersih dan membaiki batas, parit, taliair dan pintu kawalan air	-
	• Menabur kapur jika perlu	• Gunakan *Ground Magnesium Limestone* (GML) pada kadar 1.5 tan/ha bagi pH 5.0-5.49, 3.0 tan/ha bagi pH 4.5-4.99 dan 5.0 tan/ha bagi pH<4.49
3 hari	• Membajak I	-
	• Meningkatkan CEC tanah (kadar pertukaran kation)	• Gunakan baja organan mengikut arahan pada label
12 hari	• Mengumpan tikus	• Gunakan racun tikus yang disyorkan mengikut arahan pada label
	• Memasukkan air ke dalam sawah	-
7 hari	• Membajak II	-
	• Mengawal siput gondang emas (jika ada) secara manual atau kimia	• Gunakan Biopes Ubi Gadong
2 hari	• Membajak III (Membajak akhir & membadai)	-

* Dilaksanakan selepas menuai musim sebelum ini jika tidak hujan

2. SELEPAS MENANAM

Hari Lepas Tabur (HLT)	Kerja/ Aktiviti	Jenis/Kadar
0	• Menanam*	-
1	• Mengawal rumpai	• Sembur racun rumpai pracambah seperti *pretilachlor*
	• Masukkan air perlahan-lahan	• Pada paras air 5 cm
3	• Membaja I	• Baja urea • Gunakan 20 kg baja sebatian
4	• Menyulam	• Perlu diselesaikan selewat-lewatnya seminggu sebelum menanam
7	• Menyembur Foliar	• Gunakan Biopes Ubi Gadong
14	• Menyembur Foliar	• Gunakan Biopes Ubi Gadong
15	• Membaja II	• Baja urea • Gunakan 20 kg baja sebatian
20	• Menyembur racun rumpai daun lebar	• Gunakan racun *pyrazosulfuron* mengikut arahan pada label
25	• Menyembur Foliar	• Gunakan Biopes Ubi Gadong
30	• Penakaian padi angin I	• Buang pokok padi angin di antara barisan
32	• Menyembur Foliar (Kawalan serangan ulat batang)	• Gunakan Biopes Ubi Gadong
35	• Membaja III	• Gunakan 20 kg baja urea • Baja 15:15:15 (50kg)
45	• Menyembur baja foliar	• Gunakan Biopes Ubi Gadong
55	• Pembajaan tambahan I	• Gunakan 20 kg baja urea • Baja 16:16:16 (50kg) atau • Baja 12:3:18:2:3 (50kg) atau • Baja 12:12:17:2 (50kg) atau • Baja 13:13:21 (50kg)
58	• Menyembur baja foliar	• Gunakan Biopes Ubi Gadong
65	• Menyembur baja foliar	• Gunakan Biopes Ubi Gadong
74	• Menyembur Baja Foliar	• Gunakan Biopes Ubi Gadong

The impact or effectiveness can be expressed when the successful implementation of this Biopes Ubi Gadong is carried out comprehensively in all places.

First, it has an impact on the quality of life that is without the use of chemicals, a positive increase in the industrial sector and the strengthening of the country's economic income. Second, it has an added value element compared to existing products on the market. For example, organic poisons such as fragrant lemongrass. Third, save operating time and operating costs. Fourth, easy to use because the material is easily soluble and user friendly. Fifth, give real benefits such as being able to generate business opportunities such as the slogan "agriculture is a business". The last is to be able to give satisfaction to customers or stakeholders.

Conclusion

The management of this biopes will continue to be carried out through collaboration with the national poison centre to increase the ability to use it to the maximum level. The production cost of this Biopes Ubi Gadong is estimated to be under RM50 only. This is because the price of sweet potato is in the range of RM3.00 to RM5.00 per kilo and the drying operation into powder amounts to RM40.00 per kilo. A total of 3 to 5 researchers will participate in this project from initiation until the study is fully completed. The production incentive of this yam biopes project will be made with farmers to provide exposure to safe and orderly use techniques. In appreciation for this study, I also shared the results of the study conducted with farmers to encourage the use of ubi gadong biopes in rice crops. In addition, a study related to how to grow yams, the difference between Malaysian and Indonesian ubi gadong was also made. So that this project can open new opportunities in the commercial sweet potato sector.

Publication, Award and Intellectual Property

Innovation competitions:

Malaysia Technology Expo MTE 2021 International Award organized by BITK MARA Public Service Innovation Awards category Silver medal The Union of Arab Academic Award TUOAA Special Award	 
MTE SDG International Award 2021 Gold Medal	 
Anugerah i-MARATech 2021 Anugerah Inovasi Harapan (Tempat Ke-4)	

IICE2023 – International Innovation Competition in Education 2023

Pertandingan MY INSTINCT 2021 Gold Medal Anugerah Jabatan Alam Sekitar (Tempat Ke-3)	 
Pertandingan Inovasi Pahang 1st 2022 Tempat ke-2	 

Video: http://tiny.cc/VideoBiopes

Slides: http://tiny.cc/SlideBiopesUbiGadong

Title : Engtranss Mobile Simulator

Tengku Ahmad Sukri bin Tengku Mansor, Aniza bt Othman
Institut Kemahiran MARA Tan Sri Yahaya Ahmad Pekan
aniza.othman@mara.gov.my, sukri.mansor@mara.gov.my

Highlights: **Engtranss is a combination of engine ECU and TCU** for automatic gearbox placed in one place it can test to collect engine information data and explain how to use a scan tool for diagnostic trouble code with the right technique.
We provide products that facilitate troubleshooting' in the field of Automotive Electrical and Electronics that can be used in Education and Services. To Automotive Practitioners who delve into Electrical and Electronic knowledge. ENGTRANSS Mobile Simulator is a 'troubleshooting' problem solver providing the facility to find damage in a short time.
ENGTRANSS can help solve sensor and actuator problems in the automotive field in a short time.

Key words: EngTranss; Automotive; Sensor and Actuator Troubleshoot; ECU+TCU; Save time and increase efficiency.

Introduction

Novelty

EngTranss Mobile Simulator came up with the initial idea when PDPR for TVET teaching aids replaced the real simulator engine, it was reduced in size, easy to carry anywhere and could also be marketed to workshops or service centers for problems to mechanics in the work of finding sensor and actuator damage. An automatic engine and transmission type, this tool focuses on electrical components such as a Crankangle sensor, Camangle sensor, knock sensor, MAP sensor, TPS sensor and various sensors it can also make immobilizer coding for ECU.

Product

The objective of the EngTranss project is to improve and attract the interest level of understanding of TVET students and also for workshop operators during troubleshooting work where it takes a long time to identify the damage, especially various types of sensors and actuators with this EngTranss as a one-stop central checking it will increase high profit to the owner of the vehicle workshop by using this invention tool.

After studying the type of simulator for engines of all large sizes and weights to be carried anywhere on the market involves only one type for this EngTranss is combined Between ECU engine TCU for Gearbox automatic placed in a host can test it to collect engine alert data, explain how to use scan tool to diagnose the trouble code with the correct technique. To ensure all sensors are in good condition and active. The results of this tool that have been developed soon still need improvement before entering the market fully. The life of the components tested such as sensors and actuators if the wrong test can cause damage where the cost will increase and takes a long time to find any damage to the engine and transmission system.

Impact

The impact of this tool has been tested on workshop owners around IKM where the results are very helpful in testing sensors, actuators and saving that time which is important for workshop owners. The average workshop owner is very satisfied with the use of this EngTranss tester. The design of EngTranss can be improved such as using a multimeter type that can make signal wave pattern readings for commercial purposes and can be added with other component testers such as relay testing.

Product Description

EngTranss Mobile Simulator facilitates learning to be done from the TVET instructor's home during PdPR. Apart from that, it can also help mechanics solve problems related to using EngTranss Mobile Simulator. It can save time and energy and can increase income and efficiency in handling the troubleshooting of damaged cars.

Results & Discussion

Marketing strategy is to recommend to MARA to use the product in all IPMa (Institut Pendidikan MARA) for examples Giat MARA, Institut Kemahiran MARA, Kolej Kemahiran Tinggi MARA, UniKL and MARA Entrepreneur Program Participants. We can provide Automotive technicians in the market that are full of knowledge and confidence to do the job listed to them. The community also gets a high impact automotive service by receiving a high quality of service and saving their life while driving the car.

Conclusion

In conclusion, the products produced are very helpful in the learning and teaching process and can be disseminated to other skills training institutions, workshop owners and vehicle spare parts shops. The high quality of students provided professional future mechanics to the market and more lives can be saved while they drive the car that troubleshoots perfectly.

Publication, Award and Intellectual Property

Apply for MOSTI fund and TRL recognition.

AiNEX 2021 Advance Innovation & Engineering Exhibition UMP	- GOLD MEDAL & 2nd Runner Up
IAM 2022 International Innovation ARSVOT MALAYSIA	- GOLD MEDAL
MIIX 2022 Malaysia Invention & Innovation Expo	- SILVER MEDAL
JUM! TVET 2022 By JPK & UniRAZAK	- Most Promising Entrepreneurs Awards

References

Adhalina, N. (2011). The Different Language Style and Language Function Between Students and Teachers in Updating Their Status In Facebook Webpage (A Case Study of the Topic National Final Examination 2011)(Doctoral dissertation, University of Diponegoro).

Alessandra, A. J., O'Connor, M. J., & Van Dyke, J. (1994). People Smarts: Bending the Golden Rule to Give Others what They Want. Pfeiffer.

Burleson, B. R., Holmstrom, A. J., & Gilstrap, C. M. (2005). "Guys Can't Say That to Guys" Communication Monographs, 72(4), 468-501.

Lingkaran Selamat

Foo Soon Yen, Nur'iza Husna binti Mohd Anor, Ummu Habibah binti Nasruddin, Nurul Yusrina binti Yussuf
Institut Pendidikan Guru Kampus Tun Hussein Onn, Batu Pahat, Johor, Malaysia
foosoonyen@epembelajaran.edu.my, 564-15-nuriza@epembelajaran.edu.my, 570-15-ummu@epembelajaran.edu.my, yusrinayussuf13@gmail.com

Abstrak: "Lingkaran Selamat" merupakan satu bahan bantu mengajar yang berbentuk objek pembelajaran digital. Objek pembelajaran digital ini merupakan sebuah permainan digital yang sesuai digunakan dalam mata pelajaran bahasa Melayu, Sains, dan Matematik pada tahap sekolah rendah. Inovasi ini memfokuskan kepada peningkatan kemahiran mendengar dan kemahiran membaca dalam kalangan murid. Selain itu, permainan digital ini juga dapat membantu murid menghubung kaitkan penggunaan wang dalam kehidupan harian. Konsep Sains yang diaplikasikan dalam permainan digital ini juga dapat meningkatkan kesedaran murid tentang pencemaran alam sekitar atas faktor penggunaan kenderaan di jalan raya.

Kata kunci: Permainan Digital; Papan Jalan Raya; Wang; Pencemaran Alam Sekitar

Pengenalan

"Lingkaran Selamat" merupakan satu permainan digital yang dicipta untuk mendidik murid-murid mengenali dan mematuhi papan tanda jalan raya (Bahasa Melayu), mengenal pasti pencemaran alam sekitar atas faktor penggunaan kenderaan di jalan raya (Sains), dan mengaplikasi penggunaan wang bagi operasi tambah dan tolak dalam kehidupan seharian (Matematik). Kandungan permainan digital ini adalah merujuk kepada Dokumen Standard Kurikulum dan Pentaksiran (DSKP) Tahun 1 (KPM, 2016) yang bertopik "Awas! Di Jalan Raya" bawah tema "Keselamatan" (Bahasa Melayu) manakala pengaplikasian Matematik dalam permainan digital ini adalah merujuk kepada Dokumen Standard Kurikulum dan Pentaksiran (DSKP) Tahun 1 (KPM, 2016) yang bertopik "Wang" dan "Operasi Asas" bawah tema "Nombor dan Operasi".

Tujuan pembinaan permainan digital ini adalah untuk mengatasi beberapa isu yang dihadapi dalam kalangan murid di bilik darjah Antaranya termasuk murid (terutamanya tahap rendah) adalah sukar untuk memahami cara melintas jalan raya dan cara pengiraan wang melalui penerangan guru. Oleh itu, permainan digunakan untuk mengukuhkan pemahamam murid. Selain itu, murid tahap rendah (terutamanya murid tahun satu) sukar untuk memahami dan mengecam sebutan bagi pelbagai jenis papan tanda jalan raya yang dipelajari. Oleh itu, gambar grafik ditunjukkan untuk memudahkan pemahamam murid manakala audio digunakan untuk membantu murid mengecam sebutan semasa audio dimainkan. Tambahan pula, murid yang lemah dan kurang minat belajar bahasa Melayu dan Matematik tidak akan memberi fokus kepada pembelajaran sekiranya proses pengajaran guru dalam kelas adalah bosan. Oleh itu, kaedah permainan digunakan untuk memotivasi dan menyeronokkan proses pembelajaran.

Penerangan Produk

Proses pembinaan "Lingkaran Selamat" adalah melalui pemanfaatan digital yang menggunakan beberapa perisian dan aplikasi. Antaranya ialah Microsoft Power Point, Canva, Genially, dan Capcut. Gabungan penggunaan kedua-dua perisian dan aplikasi ini telah menghasilkan permainan digital "Lingkaran Selamat" yang dapat disebar luas dalam platform media sosial seperti Whatsapp, Facebook, dan Telegram.

Antara ciri-ciri yang direka bentuk dalam "Lingkaran Selamat" adalah seperti berikut:

1. Murid dikehendaki membentuk kumpulan. Setiap kumpulan terdiri daripada empat orang murid. Setiap individu diwakili oleh salah satu simbol kereta.

2. Murid memutar dadu untuk memulakan permainan.
3. Murid menggerakkan butang simbol kereta mengikut angka yang ditunjukkan pada dadu.
4. Setiap kali sampai pada ikon, murid dikehendaki klik butang bintang untuk menjawab soalan secara lisan dalam Bahasa Melayu
5. Individu yang berjaya menjawab soalan (murid dikehendaki mengaplikasikan keselamatan melintas jalan raya yang dipelajari) dibenarkan melangkah ke hadapan. Sebaliknya, individu yang gagal menjawab soalan berkenaan dikehendaki mundur satu langkah ke belakang.
6. "Peluang" merupakan pengaplikasian konsep Sains dalam permainan digital untuk membolehkan murid memahami kepentingan penggunaan kenderaan awam dan kenderaan eletrik terhadap pengurangan masalah pencemaran alam sekitar.

7. "Denda" yang diaplikasian dalam permainan digital bertujuan untuk mendidik murid bahawa pelanggaran peraturan jalan raya akan dikenakan saman oleh polis.

8. Pengaplikasian konsep Matematik (wang) dalam "Peluang" dan "Denda" membolehkan murid mengenal pasti mata wang Malaysia dalam bentuk syiling dan wang kertas serta menghubung kaitkan penggunaan wang dalam kehidupan harian.

9. Lagu pengajaran (ciptaan ahli Kumpulan) yang diintegrasikan pada akhir permainan berperanan untuk mendidik murid-murid perlu berhati-hati semasa melintas jalan raya. Selain itu, lagu yang dicipta oleh ahli Kumpulan juga bertujuan untuk menyeronokkan proses pembelajaran.

Keputusan & Perbincangan

Permainan digital ini adalah dicipta oleh ahli kumpulan (keaslian). Permainan digital yang dicipta adalah bertujuan untuk meningkatkan kemahiran mendengar dan kemahiran membaca murid dalam proses mengenali papan tanda jalan raya dan keselamatan melintas jalan raya. Contoh, audio dibina untuk meningkatkan kemahiran mendengar murid manakala ayat yang ringkas beserta dengan gambar grafik digunakan untuk meningkatkan kemahiran membaca murid. Komponen "Peluang" dan "Denda" yang diintegrasikan dalam permainan digital bertujuan untuk murid mengaplikasikan konsep Sains dan Matematik dalam kehidupan seharian.

Permainan digital ini dapat memberikan rangsangan secara audio (deria telinga) dan visual (deria mata) dalam kalangan murid. Contoh, audio dicipta oleh ahli kumpulan dengan menggunakan bahasa Melayu yang jelas dan tepat. Grafik animasi yang direka bentuk oleh ahli kumpulan adalah bertujuan untuk memudahkan kefahaman murid tentang cara melintas jalan dengan selamat. Permainan secara berkumpulan menggalakkan penglibatan murid dalam proses pengajaran dan pembelajaran.

Produk inovasi ini juga memberi peluang kepada murid menggunakan teknologi digital dalam proses pembelajaran kerana produk inovasi ini diakses hanya menggunakan satu pautan sahaja dengan menggunakan telefon pintar, tablet dan komputer riba. Penghasilan produk inovasi ini juga adalah sejajar dengan prinsip pembelajaran abad ke-21 kerana permainan yang direka bentuk dapat mencetuskan pemikiran kritis, menggalakkan kolaborasi dan komunikasi dalam kalangan murid. Selain itu, permainan yang menghiburkan sesi pembelajaran dapat mengubahkan murid daripada pasif kepada aktif apabila mereka turut melibatkan diri dalam permainan bersama-sama.

Penggunaan produk ini tidak melibatkan kos pembayaran (jimat kos) kerana permainan digital ini dibina menggunakan aplikasi digital seperti Canva dan Genially yang percuma. Pembinaan bahan bantu mengajar berbentuk objek pembelajaran digital ini juga tidak menggunakan kertas, pencetak, dakwat dan sebagainya (mesra alam). Bahan bantu mengajar berbentuk objek pembelajaran digital tidak memerlukan ruang atau tempat untuk penyimpanan kerana pautan dapat disebar luas di mana-mana platform media sosial seperti Whatapps, Telegram, Facebook secara bebas tanpa pembayaran kos.

Produk ini dapat memberi manfaat kepada warga pendidik (terutama guru yang mengajar pada tahap sekolah rendah) bawah Kementerian Pendidikan Malaysia. Hal ini disebabkan oleh produk ini adalah direka bentuk berdasarkan DSKP. Warga pendidik boleh memuat turun permainan digital ini di platform media sosial secara bebas. Contoh, produk ini telah dibentangkan kepada Penolong Kanan 1 dan Ketua Panitia Bahasa Melayu di SJK(C) Buloh pada 2 Julai 2023. Produk inovasi ini telah mendapat sambutan yang baik dan kepujian yang tinggi daripada pihak sekolah.

Kesimpulan

Inovasi ini juga menerapkan konsep repurpose (guna semula) kerana ia dapat diubahsuai mengikut kontek pembelajaran guru mengikut topik, subject lain (contoh, bahasa Inggeris), dan tahap murid tanpa melibatkan sebarang kos. Produk terakhir yang dipersembahkan dalam bentuk pautan boleh dikongsikan oleh para guru di lokasi sekolah yang berbeza kepada murid-murid untuk diakses di mana-mana dan pada bila-bila masa.

Rujukan

KPM. (2016). Dokumen Standard Kurikulum dan Pentaksiran Bahasa Melayu SJKC Tahun 1. Malaysia: Kementerian Pendidikan Malaysia .

KPM. (2016). Dokumen Standard Kurikulum dan Pentaksiran Matematik SJKC Tahun 1. Malaysia: Kementerian Pendidikan Malaysia .

KPM. (2016). Dokumen Standard Kurikulum dan Pentaksiran Sains SJKC Tahun 2. Malaysia: Kementerian Pendidikan Malaysia .

Aplikasi Mudahalih Psikobrain

Emy Zulyiana binti Mohd Nor[1] , Norihan bt Mahmood[2], Julia bt Mohd Yusof[3], Naksa Binti Ahmad[4] , Zainab binti Ali Taha[5]

[1]Department of Information Technology, Kolej Komuniti Pasir Gudang
61, Jalan Kijang, Taman Scientex , Pasir Gudang, Johor
[2,3,4,5]Department of Mathematic, Science & Computer,,Politeknik Ibrahim Sultan
Polytechnic Ibrahim Sultan, Jalan Kong Kong, Pasir Gudang, Johor
[1]emyzulyiana@kkpg.edu.my, [2]norihan@pis.edu.my, [3]julia@pis.edu.my, [4]naksa@pis.edu.my, [5]zainab@pis.edu.my

Abstrak: Pada tahun 2021, Jabatan Matematik, Sains dan Komputer(JMSK), Politeknik Ibrahim Sultan(PIS) telah menjalin kolaborasi dengan Syarikat Brain Story Sdn. Bhd. di mana ia merupakan sebuah syarikat pengeluar makanan kesihatan yang diasaskan oleh Dr. Rizal Abu Bakar. Jalinan kolaborasi ini diteruskan dengan pembangunan Aplikasi Mudahalih Psikobrain (AMP). Aplikasi ini dibangunkan sebagai alat bantuan atau tools bagi penyediaan ujian otak dan ujian personaliti dengan tujuan untuk mengenalpasti perwatakan peserta kursus. Objektif utama pembinaan aplikasi ini adalah untuk menjadi alat serampang dua mata bagi kedua-dua pihak berkepentingan. Ia bertujuan untuk kegunaan pihak Brain Story Sdn. Bhd. menyampaikan maklumat kepada para peserta sepanjang kursus dan membantu pensyarah PIS untuk mengenali pelajar sebelum memulakan sesi perkuliahan. Di samping itu, projek inovasi ini juga bertujuan untuk menerapkan unsur-unsur Revolusi Industri 4.0 di mana maklumat seharusnya berada dihujung jari tanpa mengira masa , tempat dan semestinya tanpa kertas. Pembangunan aplikasi mudahalih ini telah menggunakan methodology "AGILE". Secara keseluruhan, impak yang diperolehi daripada inovasi ini adalah ia memudahkan interaksi di antara pensyarah dengan pelajar dan di antara penceramah dengan peserta kursus. Ini kerana kaedah pembacaan melalui touch screen, bookmark, zoom in, zoom out membuatkan perjalanan pembacaan yang lebih menarik. Selain itu, pelajar dan peserta kursus boleh mencapai bahan dan membuat ujian seberapa kerap dan di mana-mana sahaja yang mereka mahu hanya dengan menggunakan aplikasi ini. Pelajar dan peserta kursus tidak perlu lagi merujuk kepada cetakan handout atau paparan pada skrin projector yang mana ianya adalah aktiviti yang agak membosankan. Mereka hanya perlu menekan butang pada menu utama aplikasi mudah alih Psikobrain untuk membaca nota atau membuat ujian dengan paparan yang lebih menarik. Proses penilaian personaliti peserta kursus juga dapat dilaksanakan dengan kadar segera hanya dengan menggunakan aplikasi ini. Secar keseluruhan , aplikasi Psikobrain berjaya mencapai objektif pembangunan sekaligus mengeratkan hubungan kolaborasi di antara pihak PIS dan Brain Story Sdn. Bhd.

Kata kunci: Pembelajaran Mudahalih ; Aplikasi Mudahalih ; Rekabentuk Pembangunan Pembelajaran

Pengenalan

Syarikat Brain Story Sdn. Bhd. Merupakan sebuah syarikat pengeluar makanan sihat dan turut menganjurkan taklimat kesedaran dan juga kursus berkaitan pemakanan sihat kepada komuniti-komuniti. Justeru, inovasi neurosains yang diberi nama Aplikasi Mudah Alih Psikobrain (AMP) dibangunkan untuk Syarikat Brain Story Sdn. Bhd. bagi menyediakan ujian otak dan ujian personaliti kepada peserta kursus . Dengan adanya ujian-ujian ini, penceramah dapat mengenalpasti perwatakan dan sikap pelajar atau peserta kursus. Sewaktu remaja, personaliti individu masih dibentuk menerusi pengalaman di zaman kanak-kanak serta dipengaruhi oleh persekitaran anda. Lazimnya seseorang itu mempunyai personaliti yang stabil setelah mencapai umur 21 tahun. Inovasi ini sesuai untuk digunakan kepada pengguna yang berada dalam golongan belia khususnya para pelajar dan peserta kursus motivasi. Menurut J.A.Philips (1999), tingkah laku seseorang individu yang mempunyai dominasi otak kanan atau otak kiri mempunyai beberapa ciri unik yang boleh digambarkan seperti berikut:

Rajah 1: Ciri otak kiri dan otak kanan (Sumber: R. Seiva Subramaniam, 2015)

Terdapat beberapa ujian yang disenaraikan dalam aplikasi neurosains ini bertujuan untuk memudahkan pengendali program khususnya Brain Story Sdn Bhd untuk menguruskan dan melaksanakan program dengan lebih mudah, pantas dan menjimatkan. Maklumat yang terkandung dalam inovasi yang dihasilkan merangkumi ujian personalit dan ujian otak seperti DOPE test, Brain test dan Disc Test.

Pernyataan Masalah

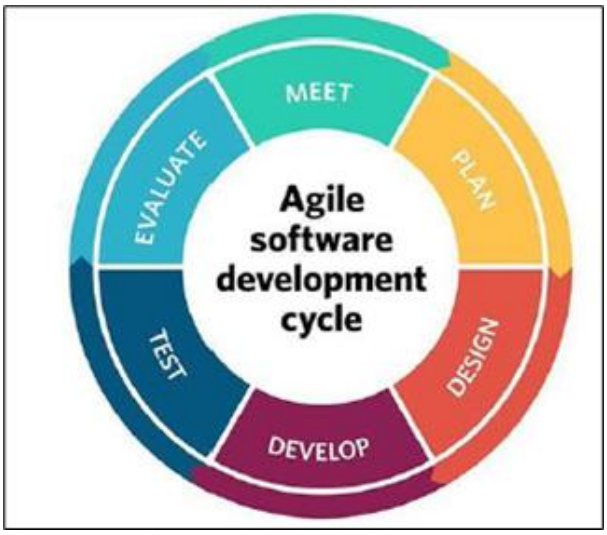
Sebelum Inovasi dilaksanakan, pengajar perlu mencetak bahan bacaan dan instrumen lain yang berkaitan dengan otak dan personaliti untuk kegunaan pelajar atau peserta. Kemudian, pengajar perlu mengedarkan handout berbentuk nota bercetak atau ujian bercetak kepada pelajar atau peserta. Kaedah manual ini adalah kurang efisyen dan lambat kerana kadangkala, helaian handout tidak mencukupi.

Dari sudut paparan semasa sesi kursus, pensyarah atau penceramah perlu membuat persediaan tempat dan peralatan untuk memaparkan maklumat yang ingin disampaikan pada skrin projektor. Penyampaian maklumat hanya berlaku di dalam bilik kuliah atau bilik seminar dengan suasana yang biasa. Kadangkala, berlaku kerosakan teknikal terhadap skrin projektor

Justeru, idea inovasi ini adalah bertujuan untuk menyelesaikan masalah yang berlaku. Selain itu, pembinaan aplikasi ini adalah untuk menjadi alat serampang dua mata bagi kedua-dua pihak berkepentingan (Syarikat Brain Story Sdn.Bhd dan Politeknik Ibrahim Sultan). Ini kerana, ia bertujuan untuk kegunaan pihak Brain Story Sdn. Bhd. dan membantu pensyarah PIS untuk mengenali pelajar sebelum memulakan kuliah dan memudahkan penceramah Brain Story Sdn. Bhd menyampaikan maklumat kepada para peserta sepanjang kursus. Di samping itu, projek inovasi ini juga bertujuan untuk menerapkan unsur-unsur Revolusi Industri 4.0 di mana maklumat seharusnya berada dihujung jari tanpa mengira masa dan tempat dan semestinya tanpa kertas.

Deskripsi Produk

Pembangunan aplikasi mudahalih ini telah menggunakan methodology "AGILE.



Rajah 2: Fasa Pembangunan AGILE

Fasa 1: Perjumpaan (Meet)

I. Perjumpaan bersama wakil syarikat Brain Story Sdn. Bhd. (Puan Saleha Idris) dibuat di Politeknik Ibrahim Sultan.
II. Perbincangan berkaitan keperluan syarikat agar selari dengan peredaran zaman IR 4.0 telah berlaku.
III. Pihak Brain Story Sdn. Bhd. membuat keputusan untuk memohon JMSK, PIS membangunkan aplikasi mudahalih berkaitan elemen Psikologi dan Otak.

Fasa 2: Perancangan (Plan)

I. Jawatankuasa Pembangunan Aplikasi Mudahalih dilantik.
II. Perbincangan berkaitan modul yang akan dibangunkan.
III. Aplikasi yang dibangunkan di beri nama PSIKOBRAIN.
IV. Modul yang terlibat adalah:
    - o BRAIN STORY & DR RIZAL
    - o OTAK
    - o PSIKOLOGI
    - o BRAIN TEST

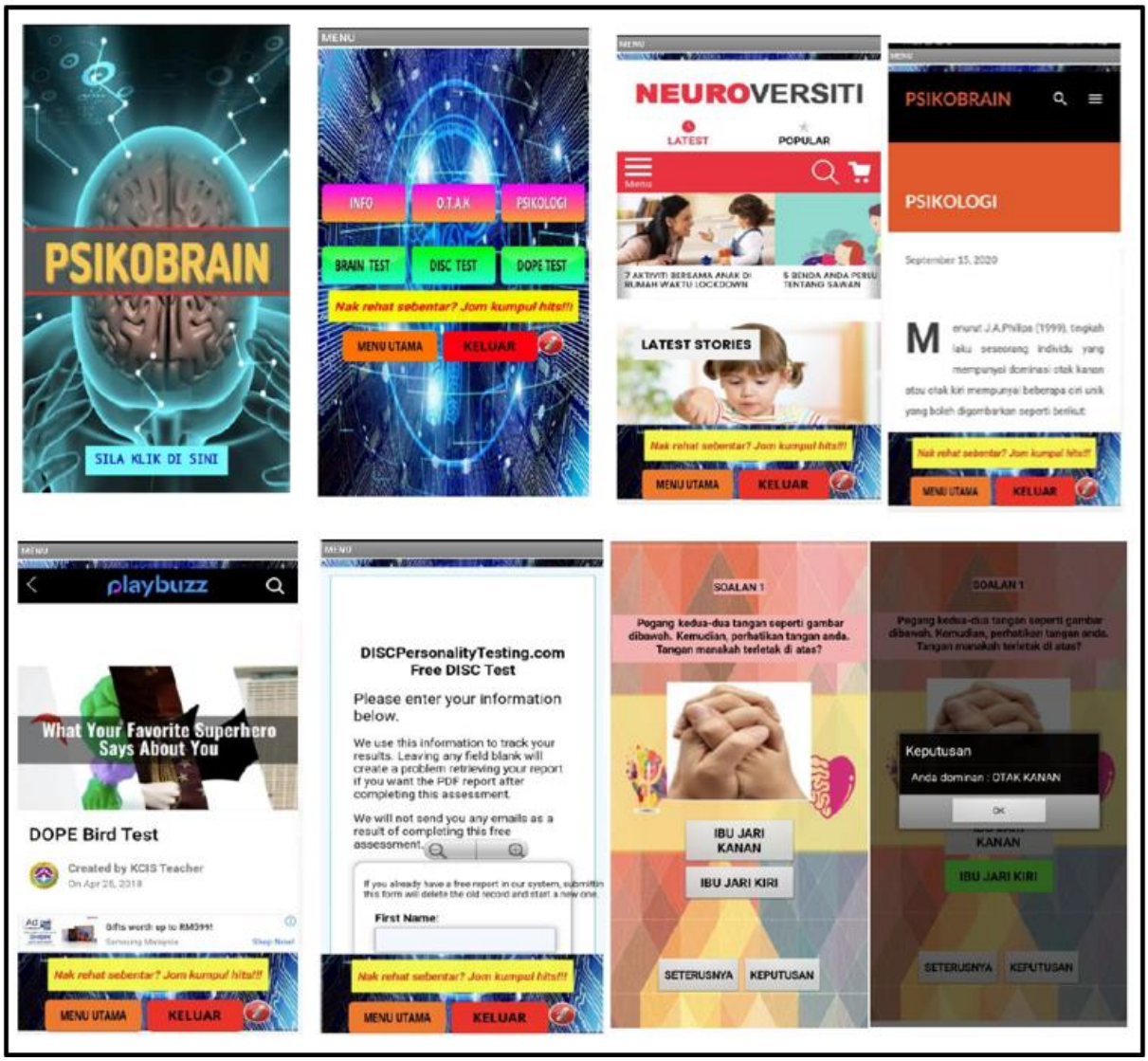
Fasa 3: Rekabentuk (Design)

Proses rekabentuk aplikasi mudahalih dibuat pada fasa ini. Berikut adalah modul yang telah dipersetujui oleh pihak Brain Story Sdn. Bhd. untuk dibangunkan:

I. INFO
II. O.T.A.K
III. PSIKOLOGI
IV. BRAIN TEST
V. DOPE TEST
VI. DISC TEST
VII. FUN QUIZ

Fasa 4: Pembangunan (Develop)

I. Platform utama untuk pembinaan ini adalah MIT APP Inventor.
II. Maklumat yang diperlukan di dalam PSIKOBRAIN ini dicapai melalui laman sesawang https://psikobrain.blogspot.com
III. Berikut merupakan paparan aplikasi psikobrain yang dibangunkan.



Rajah 3: Antaramuka pengguna bagi aplikasi Psikobrain

Fasa 5: Pengujian (Test)

Pada fasa ini, aplikasi mudahalih yang dibangunkan telah diuji oleh sekumpulan pengguna. Hasil komentar daripada kumpulan pengguna ini dijadikan panduan untuk menambahbaik aplikasi ygng dibangunkan.

Fasa 6: Penilaian (Evaluation)

Pada fasa ini, proses penilaian terhadap aplikasi ini dilaksanakan. Borang penilaian terhadap aplikasi turut di edarkan kepada pengguna dan dapatan akan dibincangkan pada seksyen seterusnya.

Keputusan & Perbincangan

Berdasarkan dapatan yang diperolehi semasa fasa penilaian,pengguna bersetuju bahawa kelajuan merujuk nota menggunakan aplikasi ini jauh lebih pantas daripada menyelak halaman buku secara tradisional. Di samping itu, nota dan ujian yang disediakan didalam aplikasi ini lebih berfokus dan membantu pengajar untuk menyampaikan maklumat kepada peserta dengan lebih pantas. Dapatan ini selari dengan kajian Hinze, et.al (2022) yang melaporkan bahawa aplikasi mudahalih banyak digunakan semasa di dalam kelas untuk perkongsian atau penyimpanan dokumen, serta komunikasi komunikasi dengan pelajar. Pelajar juga boleh mendapat manfaat daripada ini dari segi penjimatan masa semasa belajar.

Dari aspek pengajar, penceramah bersetuju bahawa aplikasi yang digunakan membantu penceramah melaksanakan ujian penilaian dan mengenali peserta kursus semasa sesi kursus dengan lebih pantas . Dari sudut pensyarah PIS pula, walaupun aplikasi ini tidak berkaitan dalam sesi pengajaran subjek matematik, sains dan komputer, aplikasi ini membantu pensyarah mengenali personaliti pelajar. Pelajar PIS pula berpendapat , walaupun aplikasi ini tidak mempunyai kaitan dengan subjek pembelajaran mereka, mereka berpendapat ujian yang dilaksanakan melalui aplikasi ini merupakan salah satu kelainan dan elemen tambahan yang membantu pelajar mengurangkan tekanan semasa di dalam kelas. Lovely (2020) turut menyatakan perkara yang sama did dalam kajian beliau di mana aplikasi yang mempunyai elemen permainan atau tugasan yang mencabar dapat membantu mengembangkan sel otak dan meningkatkan kemahiran kendiri. Aplikasi mudah alih Psikobrain dapat memberikan

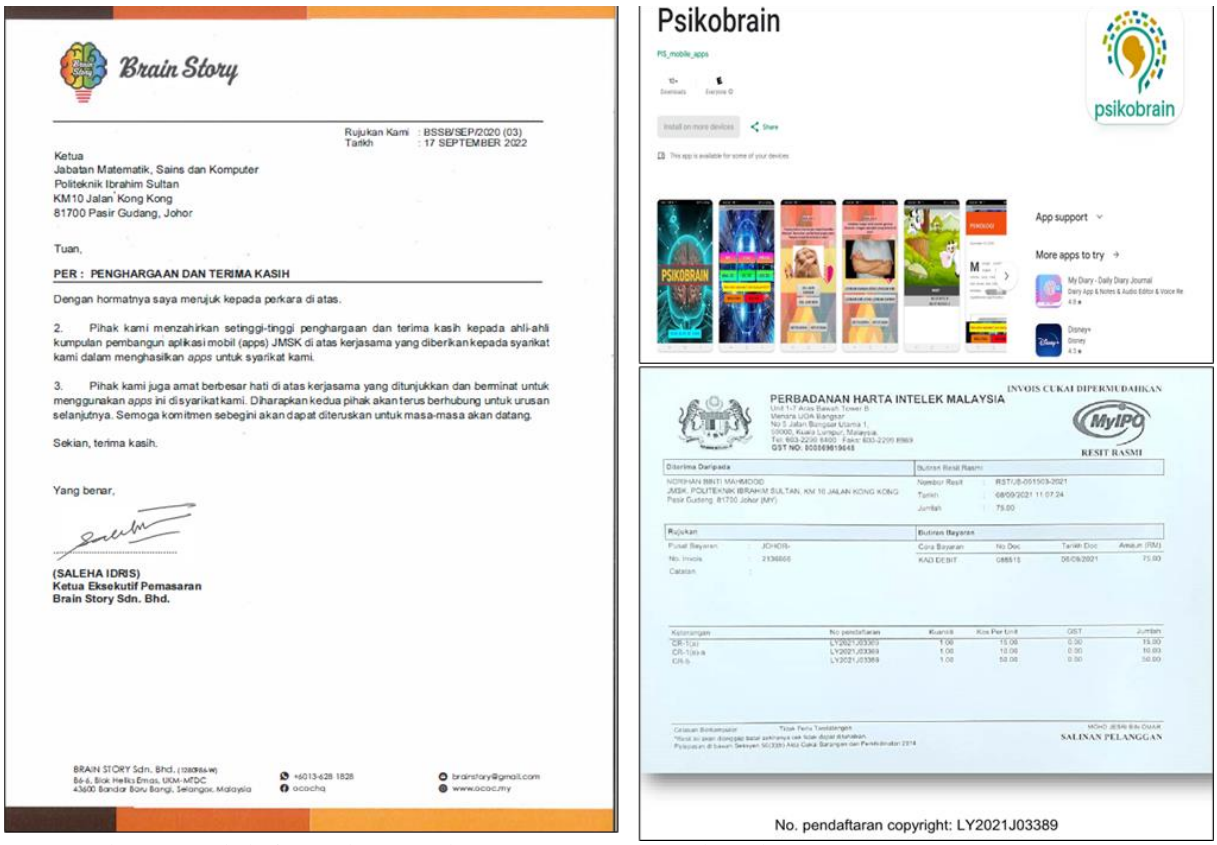
keseronokan dan kesan positif kepada pelajar, peserta kursus, pensyarah dan penceramah kerana ia lebih terkini dan memudahkan pengendalian sesi pengenalan di antara pelajar dengan pensyarah dan sesi penyampaian kursus di antara peserta dengan penceramah.

Kesimpulan

Secara keseluruhan, aplikasi mudah alih Psikobrain dapat memberikan keseronokan dan kesan positif kepada pelajar, peserta kursus, pensyarah dan penceramah kerana ia lebih terkini dan memudahkan pengendalian sesi pengenalan di antara pelajar dengan pensyarah dan sesi penyampaian kursus di antara peserta dengan penceramah. Jabatan Matematik, Sains dan Komputer mampu berpuas hati dengan pencapaian dalam KPI kerana telah berjaya mencipta aplikasi mudah alih yang boleh digunakan oleh kedua-dua pihak iaitu Politeknik Ibrahim Sultan dan Brain Story Sdn. Bhd. Imej Jabatan Matematik Sains dan Komputer, Politeknik Ibrahim Sultan juga bertambah baik di mata industri terutamanya bagi warga Brain Story Sdn. Bhd.

Dengan tercapainya objektif yang disasarkan ini, diharap agar aplikasi Psikobrain dapat memberi manfaat kepada semua lapisan masyarakat yang menggunakannya pada masa akan datang. Pembinaan aplikasi ini juga diharapkan dapat mewujudkan suasana mencipta di kalangan staf Jabatan Matematik, Sains dan Komputer, Politeknik Ibrahim Sultan dan dapat membuka lebih banyak ruang dan peluang kolaborasi dengan pihak industri.

Penerbitan, Pengiktirafan dan Harta Intelek



Rajah 4: Pengiktirafan daripada Brain Story Sdn. Bhd, Penerbitan di Google Playstore dan Harta Intelek

Rujukan

Hinze,A., Vanderschantz, N., Timpany, C., Cunningham, S.J., Saravani, S., & Wilkinson, C. (2022). A Study of Mobile App Use for Teaching and Research. Journal of Technology, Knowledge and Learning (2023) 28:1271–1299

Lovely Joseph Pullokaran (2020). Impact Of Mobile Apps In Education: A Comparative Study of Rural and Urban Schools in Kerala . The International Journal of Creative Research Thoughts (IJCRT) Volume 8, Issue 4 April 2020 pp 112-118.
Di capai dari https://ijcrt.org/papers/IJCRT2004016.pdf

Oliveira,D.;Pedro,L.; Santos,C.(2021). The Use of Mobile Applications in Higher Education Classrooms: An Exploratory Measuring Approach in the University of Aveiro .Educ.Sci. 2021, 11,484.
Di capai dari: https://files.eric.ed.gov/fulltext/EJ1314744.pdf

Seiva Subramaniam, Ramiah (2015) Pemikiran masyarakat Tamil awal dalam kesusasteraan Tamil Klasik . PhD Thesis, University of Malaya.

Penggunaan Aplikasi Rasm-Tech Dalam Mengenali Tanda-Tanda dan Sebutan Bacaan Al-Quran Rasm Uthmani

Mohamad Zarkhuan Zainol, Mohamad Raffe Ghalil Abbas, Adzli Ismail
Institut Pendidikan Guru Kampus Pendidikan Teknik[1,2,3]
zarkhuan.zainol@ipgm.edu.my, raffe.abbas@ipgm.edu.my, adzli@ipgm.edu.my

Abstrak: Terdapat perbezaan tanda-tanda dan sebutan Rasm Uthmani berbanding dengan Rasm Imla'i seperti penambahan huruf (*ziyadah*), pertukaran huruf (*badl*) dan sebagainya yang membawa kepada berlakunya kekeliruan dan kesilapan dalam membaca al-Quran. Oleh itu, tujuan penyelidikan ini adalah untuk mengkaji keberkesanan penggunaan Rasm-Tech dalam mengenali tanda-tanda bacaan Rasm Uthmani dan sebutannya dengan betul. Kajian ini menggunakan metodologi kuantitatif melalui soalan ujian pra dan pasca yang ditadbir kepada siswa guru Kursus TTQK3013. Hasil kajian adalah signifikan (t=-22.756, df=29, p<.05) yang menunjukkan terdapat perbezaan antara ujian pra dan ujian pasca selepas penggunaan Rasm-Tech. Justeru, penggunaan aplikasi Rasm-Tech meningkatkan pemahaman dalam mengenali tanda-tanda dan sebutan bacaan al-Quran Rasm Uthmani.

Kata kunci: Rasm-Tech; Rasm Uthmani; tanda; sebutan; Tahsin

Pengenalan

Rasm Uthmani merupakan salah satu daripada cabang-cabang ilmu al-Quran. Penyusunan ilmu ini merupakan antara usaha dan inisiatif yang dilakukan oleh para ulama besar terdahulu dalam memartabatkan al-Quran kepada masyarakat Islam. Antara ciri pemeliharaan yang boleh disaksikan hingga ke hari ini ialah keutuhan ejaan huruf dan tulisannya. Ini terjadi kerana al-Quran bukan sahaja diriwayatkan bacaannya, tetapi bentuk tulisan dan huruf perkataan-perkataannya juga telah diriwayatkan oleh ulama Rasm terutama ejaan huruf pada perkataan-perkataan yang terdapat di dalam penulisan Rasm Uthmani. Tuntutan menguasai kemahiran ilmu Rasm merupakan satu kewajipan kepada masyarakat Islam untuk mempelajarinya bagi membendung penyelewengan dan pengubahan terhadap penulisan al-Quran oleh musuh-musuh dan golongan anti Islam.

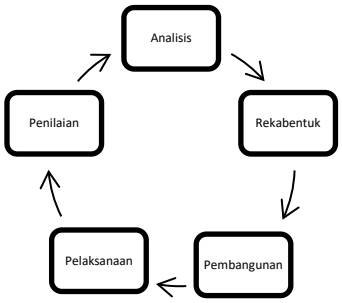
Kesukaran untuk memahami ilmu *al-Dabt* (tanda-tanda dan simbol yang menentukan sebutan yang betul Al-Quran) sering menjadi masalah dan perbezaan pendapat kerana ia juga berlaku dalam perbincangan tentang Rasm Uthmani dalam pengkajian al-Quran (Zaenal, 2014). Struktur rasm al-Quran (ortografi) dan *al-Dabt* dalam Mushaf Imla'i adalah berbeza dari Mushaf Uthmani disebabkan oleh beberapa faktor seperti penambahan huruf *(ziyadah)*, pertukaran huruf *(badl)* dan sebagainya. Perbezaan beberapa aspek tersebut juga telah membawa kepada berlakunya kekeliruan dan kesilapan dalam membaca al-Quran (Daud Ismail & Asyraf Ab Rahman, 2013). Kekeliruan dan kesilapan dalam bacaan al-Quran juga berlaku kepada guru Pendidikan Islam seperti yang dijelaskan oleh Daud Ismail et al. (2010) yang menunjukkan terdapat masih ramai lagi dari kalangan guru Pendidikan Islam berada pada tahap kemahiran sederhana dan rendah berkaitan ilmu Rasm Uthmani.

Institut Pendidikan Guru Malaysia (IPGM) sebagai sebuah institut yang melatih bakal guru-guru di Malaysia telah menawarkan Kursus Tahsin Tilawah al-Quran (TTQK3013) secara elektif terbuka yang mengandungi topik ilmu Rasm Uthmani. Kursus ini ditawarkan selama 3 jam kredit bagi satu semester dan terbuka kepada semua siswa guru IPG. Siswa guru kursus tersebut di Institut Pendidikan Guru Kampus Pendidikan Teknik (IPGKPT) didedahkan dengan pengajaran dan pembelajaran menggunakan aplikasi mudah alih sebagai medium pembelajaran bersesuaian dengan perkembangan pembelajaran digital di Malaysia. Penggunaan aplikasi mudah alih menjadikan proses pembelajaran bukan lagi tertumpu dalam satu platform atau hanya terhad di dalam sesebuah bilik darjah tetapi, lebih bercorakkan *just-in-time, just-in-case, on-the-move* dan *on-demand* (Traxler, 2007; Neyema et al., 2012). Hal ini menunjukkan bahawa penggunaan alat mudah alih lebih mudah menjadikan pembelajaran berlaku pada bila-bila masa dan mana-mana tempat berbanding dengan penggunaan buku nota yang mudah rosak dan tidak bertahan lama (Aliff Nawi et al., 2014). Keadaan ini menunjukkan bahawa alat mudah alih seperti telefon bimbit, Pocket PC dan lain-lain mempunyai kelebihan dari bahan yang bersifat konvensional. Oleh itu, pembangunan aplikasi mudah alih seperti Rasm-Tech merupakan cara berkesan untuk meningkatkan pemahaman para siswa guru mengenai tanda-tanda atau simbol-simbol bacaan al-Quran Rasm Uthmani serta ketepatan sebutannya.

Perincian Produk

Aplikasi Rasm-Tech adalah aplikasi mudah alih (mobile apps) yang dibangunkan melalui perisian mobincube.com iaitu perisian pembangunan aplikasi secara *web-based*. Reka bentuk aplikasi Rasm-Tech ini menggabungkan kefahaman berkaitan bacaan al-Quran yang tepat dalam Rasm Uthmani dengan mengenali tanda-tanda serta sebutannya. Rajah 1 menunjukkan pembangunan aplikasi Rasm-Tech berasaskan model ADDIE (Gagne, Wager, Golas & Keller, 2005) iaitu analyze (analisis), design (rekabentuk), develop (pembangunan),

implement (pelaksanaan) dan evaluate (penilaian). Fasa pertama iaitu fasa analisis (analyze) pembangunan aplikasi Rasm-Tech ini dilakukan dengan mengkaji keperluan penggunaan produk digital untuk membantu siswa guru Kursus TTQK3013 iaitu kursus elektif terbuka di Institut Pendidikan Guru Malaysia (IPGM). Analisis keperluan ini dilakukan secara temubual dengan siswa guru berkenaan berkaitan keperluan pembangunan produk aplikasi mudah alih Rasm-Tech. Hasil temubual menunjukkan siswa guru memerlukan produk aplikasi mudah alih untuk memudahkan mereka belajar secara kendiri berkaitan bacaan al-Quran Rasm Uthmani. Fasa kedua, rekabentuk (design) produk aplikasi Rasm-Tech dihasilkan melalui pemahaman siswa guru untuk mengenali tanda-tanda Rasm Uthmani serta sebutannya dengan tepat. Rekabentuk produk Rasm-Tech dibina secara data-based dengan menggunakan perisian mobincube.com. Fasa seterusnya, pembangunan (develop) Rasm-Tech iaitu dengan menggunakan perisian mobincube.com yang mengandungi butang menu berkaitan pengertian Rasm Uthmani, sejarah dan tanda-tanda bacaannya. Aplikasi Rasm-Tech mengandungi 20 tanda bacaan Rasm Uthmani berdasarkan rujukan Buku Panduan Rasm Uthmani keluaran Jabatan Kemajuan Islam Malaysia (JAKIM) (Kementerian Dalam Negeri, 2012). Kandungan aplikasi Rasm-Tech menggabungkan paparan skrip, video dan audio bacaan Rasm Uthmani. Fasa seterusnya adalah pelaksanaan (implement) iaitu melaksanakan penggunaan aplikasi Rasm-Tech kepada siswa guru Kursus TTQK3013 dengan muat turun aplikasi tersebut kepada setiap orang siswa guru supaya mereka dapat menggunakan aplikasi Rasm-Tech secara pembelajaran kendiri. Fasa terakhir iaitu penilaian (evaluate) dilakukan dengan menggunakan ujian pra dan ujian pasca untuk menilai keberkesanan penggunaan aplikasi Rasm-Tech dalam meningkatkan kefahaman mengenali tanda-tanda serta sebutan yang tepat bacaan al-Quran Rasm Uthmani.



Rajah 1: Model ADDIE (Gagne, Wager, Golas & Keller, 2005)

Hasil & Perbincangan

Peningkatan yang signifikan tahap pemahaman siswa guru Kursus TTQK3013 terhadap tanda, simbol dan sebutan bacaan al-Quran Rasm Uthmani menggunakan aplikasi mudah alih Rasm-Tech. Dalam kajian ini pengkaji menggunakan ujian-t berpasangan untuk membandingkan dua min daripada dua kumpulan terhadap pemboleh ubah yang tidak bersandar. Gambaran hasil ujian pra dan ujian pasca dapat dilihat dalam jadual 1.

Jadual 1: Ujian-t berpasangan bagi ujian pra dan ujian pasca

Ujian	N	Min	SP	dk	t	Sig.
Ujian Pra	30	11.83	2.052	29	-22.756	0.00
Ujian Pasca	30	18.50	1.456			

Berdasarkan jadual 1, nilai min bagi skor ujian pra ialah 11.83 manakala nilai min bagi skor ujian pasca ialah 18.50. Hal ini memperlihatkan nilai min bagi skor ujian pasca yang melebihi ujian pra. Sisihan piawai bagi skor ujian pra ialah 2.052 manakala bagi skor ujian pasca ialah 1.456, dengan serakan data bagi skor ujian pasca lebih kecil berbanding skor ujian pra. Bilangan peserta (N) ialah 30 nilai signifikan (2-Tailed) yang dicatatkan dalam jadual ialah 0.00, iaitu kurang daripada aras signifikan .05. Oleh itu, dapat disimpulkan bahawa wujudnya perbezaan yang signifikan ($t=-22.756$, $df=29$, $p<.05$) antara min skor ujian pra dan skor ujian pasca siswa guru. Memandangkan jadual statistik ujian sampel bersandar menunjukkan nilai min skor ujian pasca melebihi skor ujian pra, dapat disimpulkan bahawa kaedah intervensi menggunakan aplikasi mudah alih Rasm-Tech memberikan kesan yang signifikan terhadap perubahan positif pemahaman siswa guru berkenaan bacaan al-Quran Rasm Uthmani, sekaligus membuktikan bahawa aplikasi Rasm-Tech berkesan sebagai medium pembelajaran siswa guru Kursus TTQK3013.

Kesimpulan

Peralihan masa kepada zaman serba canggih dalam era digital menuntut agar dunia pendidikan berevolusi ke destinasi yang sama. Sebagai salah satu daripada elemen dalam pendidikan, proses pembelajaran yang

dintegrasikan dengan gaya pembelajaran abad ke-21 menggunakan pembelajaran digital merupakan satu langkah alternatif untuk tabiat pembelajaran yang lebih berkesan. Penggunaan aplikasi mudah alih Rasm-Tech sebagai medium perantara bukan sahaja mesra pensyarah dan siswa guru, malahan fokus siswa guru terhadap aktiviti pembelajaran Kursus TTQK3013 adalah lebih baik berbanding kaedah pembelajaran konvensional yang kurang efektif. Berdasarkan dapatan kajian yang menunjukkan keberkesanan aplikasi Rasm-Tech kepada pemahaman siswa guru mengenali tanda, simbol dan sebutan tepat bacaan al-Quran Rasm Uthmani, IPG disarankan untuk dilengkapkan dengan kemudahan internet dan pengetahuan tentang penggunaan aplikasi terkini.

Rujukan

Aliff Nawi, Mohd Isa Hamzah & Surina Akmal Abd Sattai. (2014). Potensi Penggunaan Aplikasi Mudah Alih (Mobile Apps) dalam Bidang Pendidikan Islam. The Online Journal of Islamic Education , 2(2), 26-35

Daud Ismail & Asyraf Ab. Rahman. (2013). Sejarah dan Perkembangan Mushaf Uthmani di Malaysia, UMT: Universiti Malaysia Terengganu

Daud Ismail Daud Ismail, Asyraf Ab Rahman & Muhamad Safiih Lola. (2010). Kemahiran Rasm Mushaf 'Uthmani Guru J-QAF Negeri Terengganu, Jurnal Pembangunan Sosial, 13, 85–102

Gagne, R. M., Wager, W. W., Golas, K. C. & Keller, J. M. (2005). Principles of Instructional Design. 5th Ed. Belmont, California: Thomson Wadsworth Learning.

Kementerian Dalam Negeri Malaysia. (2012). Panduan Rasm Uthmani. Kuala Lumpur: Percetakan Nasional Malaysia Berhad.

Neyema, A., Ochoa, S. F., Pino, J. A. & Franco, R. D. (2012). A Reusable Structural Design for Mobile Collaborative Applications. The Journal of Systems and Software, 85, 511–52

Traxler, J. (2007). Defining, Discussing and Evaluating Mobile Learning: The Moving Writes and Having Writ. International Review of Research in Open and Distance Learning, 8(2),1492-3831

Zaenal Arifin Madzkur. (2014). Harakat dan Tanda Baca Mushaf Al-Qur'an, Jurnal Kajian Al-Quran, 7(1), 205-310

Inovasi Kit Disleksia UNO (DINO)

Muhamad Luqman Hakim Md Zamri 1, Nur Imanina Batrisyia Azlan 2, Kadija Budih 3, Rosnawati Saad 4
Institut Pendidikan Guru Kampus Bahasa Melayu, Wilayah Persekutuan Kuala Lumpur, Malaysia
Email address g-ipgp22192329@moe-dl.edu.my, g-ipgp22192204@moe-dl.edu.my, g-ipgp22193980@moe-dl.edu.my

Abstrak: Disleksia adalah masalah pembelajaran yang paling lazim dan masalah pembacaan yang paling diakui sering berlaku. Persekutuan Neurologi Dunia mentakrifkan disleksia sebagai gangguan yang ditunjukkan melalui kesukaran dalam pembelajaran untuk membaca walaupun menerima arahan konvensional, kecerdasan yang mencukupi dan peluang sosiobudaya. Inovasi Disleksia Uno Kit (DINO) merupakan suatu alat yang boleh dijadikan bahan bantu mengajar (BBM). Inovasi DINO yang dihasilkan ini adalah bertunjangkan pada huruf-huruf yang sering berlaku kekeliruan iaitu huruf /b/,/d/,/u/,/n/,/p/ dan /q. Selain itu, produk ini dibangunkan berdasarkan analisis daripada Model Pembangunan Inovasi KIBUK serta bersandarkan kepada Model Disleksia Interaktif, Multimedia Learning Object Model dan Model Pemulihan Disleksia Davis.

Kata kunci: Disleksia; Dino; Model Disleksia Interaktif; Multimedia Learning Object Model; Model Pemulihan Davis

Pengenalan

Perubahan proses pengajaran dan pembelajaran (PdP) kepada pengajaran dan pemudahcaraan (PdPc) telah menjurus kepada persekitaran kemahiran berfikir aras tinggi (KBAT) seperti penggunaan alat berfikir dan teknik penyoalan. Ke arah mencapai matlamat pengajaran dan pemudahcaraan (PdPc) yang lebih berkesan, kaedah intervensi berinovasi telah digunakan bagi membantu para pendidik menghadapi norma baharu ini. Dino ataupun singkatan kepada disleksia uno merupakan sebuah inovasi yang dicipta untuk membantu murid yang mengalami masalah pembelajaran disleksia. Disleksia yang pada awalnya diperkenalkan buat pertama kalinya dalam seminar yang dianjurkan oleh Rotary Club Gombak pada tahun 1993 kini telah menjadi istilah yang sering digunapakai dalam istilah pendidikan, khususnya bagi kanak-kanak yang mengalami masalah pembelajaran. Masalah pembelajaran bagi kanak-kanak disleksia ini sebenarnya adalah satu 'disorder', di mana kanak-kanak yang menerima pendidikan biasa tetapi tidak mampu memperolehi beberapa kemahiran seperti kemahiran bahasa, kemahiran bacaan, kemahiran tulisan dan ejaan yang setaraf dengan intelek mereka. Namun, perlu ditekankan bahawa disleksia ini bukanlah satu penyakit ataupun kecacatan, sebaliknya program pendidikan yang sesuai dapat mengurangkan masalah ini

Uno merupakan nama bagi sebuah permainan yang melibatkan penggunaan kad dan peraturan yang khusus. Permainan asal uno memerlukan pemain menggunakan kognitif dan kecerdasan semasa memadankan warna dan nombor pada kad. Oleh sebab itu, kaedah ini disesuaikan bagi kanak-kanak disleksia untuk memadankan huruf, lebih-lebih lagi huruf-huruf yang sering mengelirukan mereka seperti huruf b dan d, m dan w, n dan u, serta p dan q. Fokus utama pembinaan produk ini adalah untuk memudahkan pembelajaran murid yang mengalami masalah disleksia visual dengan menggunakan aplikasi konsep pembelajaran murid disleksia visual iaitu membantu murid mengenal huruf, huruf berdasarkan bunyi, dan bunyi-huruf perkataan. Produk ini telah dikhususkan untuk murid prasekolah dan murid sekolah rendah tahap 1.

Huraian Produk

1. Kuraian eunikan Inovasi

Produk inovasi Dino mempunyai keunikan tersendiri apabila menggabungkan bahan secara dalam talian yang berperanan sebagai bahan rangsangan dan bahan maujud yang bertindak sebagai bahan pengukuhan. Justeru, produk inovasi ini bertemakan konsep bermain sambil belajar bagi mewujudkan pembelajaran yang menarik, kreatif dan efektif. Dalam era teknologi yang semakin berkembang, pendigitalan amatlah ditekankan bagi memenuhi keperluan Teknologi Maklumat dan Komunikasi seperti yang telah ditetapkan oleh Kementerian Pendidikan Malaysia (KPM). Oleh sebab itu, produk inovasi Dino telah memilih platform Google site untuk digunakan sebagai medium bagi mengaplikasikan idea, mereka bentuk, serta menyimpan maklumat seperti manual

penggunaan dan bahan rangsangan yang telah dihasilkan. Selain itu, bahan rangsangan yang terkandung di dalam *Google Site* adalah adalah 100 peratus dihasilkan menggunakan aplikasi digital seperti *Canva, voice recorder* serta *online game creator.* Tambahan pula, elemen-elemen seperti warna, animasi yang digunakan serta saiz dan jenis tulisan disesuaikan untuk menarik minat kanak-kanak. Jenis aktiviti yang dipilih juga telah disesuaikan dengan tahap umur dan minat kanak-kanak. Contoh aktiviti adalah permainan menyelesaikan teka-teki bergambar (huruf), aktiviti mendengar dan membaca perkataan serta aktiviti mengasingkan huruf. Manakala bahan maujud yang digunakan dalam aktiviti pengukuhan adalah kad uno. Kad uno telah direka bentuk dengan ciri-ciri khas seperti warna, saiz tulisan serta animasi yang menarik telah digunakan.

2. Cara Mengenal Pasti Masalah

Mengenal pasti masalah adalah bertujuan untuk mengenal pasti, membuktikan dan menganalisis masalah seterusnya mencari jalan untuk menyelesaikan masalah. Cara mengenal pasti masalah yang digunakan adalah dengan merujuk kepada kajian-kajian lepas dan jurnal-jurnal untuk mengenal pasti teori-teori yang berkaitan dengan murid disleksia seperti Model Pembangunan Inovasi KIBUK serta bersandarkan kepada Model Disleksia Interaktif, Multimedia Learning Objek Model dan Model Pemulihan Disleksia Davis. Teori ini menjelaskan bahawa pemikir visual seperti pembaca disleksia berfikir melalui imej mental atau imej sensori. Mereka akan menggabungkan sesuatu perkataan yang disebut dengan gambar di otak untuk mencapai kefahaman. Namun, ketika membaca, mereka akan bertemu dengan perkataan tanpa gambar. Apabila situasi ini berlaku, urutan kefahaman berasaskan gambar hilang dan menimbulkan kekeliruan.

3. Kreativiti

Produk inovasi DINO ini bertunjangkan kepada konsep pembelajaran murid disleksia dengan menumpukan kepada pengenalan abjad, sebutan abjad berdasarkan bunyi dan sebutan perkataan yang terbina daripada bunyi abjad. Setelah pemerhatian dilaksanakan, didapati bahawa kebiasaannya bahan bantu mengajar (BBM) yang sering digunakan adalah berbentuk pembentangan *PowerPoint* dan kad imbasan untuk membantu murid-murid disleksia dalam sesi pembelajaran dan pengajaran (PdP). Bukan itu sahaja, satu daripada produk inovasi yang sedia ada di pasaran adalah produk Ba. Tu. Board. Produk ini merupakan alat bantuan mengajar dalam kaedah fonetik. Oleh yang demikian, idea penghasilan DINO telah dijana sebagai salah satu inovasi BBM yang berpotensi untuk digunakan. Inovasi DINO ini adalah adaptasi sebuah permainan kad Uno yang digandingkan dengan penggunaan platform *Google Sites* sebagai medium pembelajaran yang interaktif dan menarik untuk murid-murid. *Google Sites* tersebut mengandungi satu manual penggunaan produk dan tiga bahan rangsangan pembelajaran yang terdiri daripada aktiviti Kenali Huruf, Dengar dan Sebut serta Pengasingan Huruf. Setelah murid-murid berjaya menguasai ketiga-tiga aktiviti, barulah mereka akan diperkenalkan dengan aktiviti pengukuhan menggunakan kad Uno.

Hasil & Perbincangan

1. Impak invasi dari aspek penjimatan masa

Kit Disleksia Uni (DINO) mampu menjimatkan tempoh masa proses Pengajaran dan Pembelajaran (PdP) bagi pelajar yang menghadapi masalah tersebut dengan proses pengajaran dan pembelajaran bacaan secara fonetik. Seterusnya memupuk dan menanam minat guru- guru disleksia bahasa Melayu untuk menggunakan teknik dan kaedah yang lebih cepat dan berkesan dalam proses pengajaran dan pembelajaran mereka, khususnya dalam penggunaan kaedah bacaan fonetik yang berasaskan kepada tahap-tahap kemahiran membaca yang tertentu.

2. Impak inovasi dari aspek penjimatan kos

Kit Disleksia Uno (DINO) ini mempunyai kos yang rendah kerana produk diperbuat daripada bahan yang boleh direka dan dihasilkan sendiri.Hal ini kerana inovasi ini menggabungkan elemen digital dan bahan maujud iaitu permainan kad uno. Pengguna hanya perlu membelanjakan sedikit wang untuk mencetak kad uno yang telah direka. Ternyata keseluruhan pengeluaran produk ini memang 100% kos efektif.

3. Impak inovasi dari aspek peningkatan produktiviti

Penggunaan kit Dino ini dalam sesi pengajaran dan pembelajaran sudah tentu membantu guru serta murid dalam mencapai hasil pembelajaran dengan lebih baik. Hal ini demikian kerana produk ini direka khas bersesuaian dengan fungsi yang berguna, iaitu pembelajaran secara berperingkat dan permainan pengukuhan yang mampu menjimatkan masa serta membantu murid dalam proses pembelajaran awal.

Produk ini juga menggunakan Model Disleksia Interaktif Multimedia Learning Object Model yang menerapkan penggunaan pelbagai grafik dan auditori untuk membantu mengurangkan kesukaran murid disleksia dalam mengenal pasti huruf-huruf atau perkataan. Bukan itu sahaja, Model Pemulihan Disleksia Davis juga digunakan sebagai satu gabungan yang membantu sebagai satu tunjang proses pembelajaran

bagi pelajar disleksia kerana model ini menerapkan teori pembelajaran secara berperingkat, iaitu daripada pengenalan huruf kepada pembentukan perkataan.

Di samping itu, produk ini dicipta mengikut cita rasa kanak-kanak yang kini majoritinya menyukai pembelajaran yang diselitkan dengan elemen permainan. Hal ini demikian kerana kanak-kanak meminati penggunaan grafik dan pembelajaran interaktif. Sehubungan dengan itu, penggunaan ilustrasi mampu menarik minat mereka untuk fokus belajar khususnya pembelajaran awal mengenali huruf sehingga mahir membentuk perkataan.

4. Mudah Digunakan (*User-Friendly*)

Dino adalah produk inovasi yang telah memenuhi konsep mesra pengguna (*User-friendly*). Buktinya, pendidik boleh terus menggunakan produk Dino secara langsung dengan hanya merujuk kepada manual pengguna yang telah disediakan. Masalah seperti tertinggal manual dan kehilangan manual tidak lagi menjadi masalah kerana segalanya berada dalam talian dan mengaksesnya adalah sangat mudah hanya dengan beberapa klik. Produk Dino juga mengurangkan beban guru untuk membawa bahan yang banyak dan berat kerana produk inovasi Dino hanya terdiri daripada bahan pengukuhan iaitu kad uno yang saiznya dapat dibawa ke mana-mana dan bahan rangsangan yang hanya perlu diakses secara dalam talian.

Kesimpulan

Rumusannya, kombinasi antara bahan maujud dan bahan secara dalam talian membawa kepada impak yang positif khususnya terhadap bidang pendidikan. Oleh hal yang demikian, pendekatan inovasi Dino ini pastinya menjadi satu solusi yang mujarab untuk membantu para pendidik bagi mewujudkan persekitaran pembelajaran yang lebih menarik dan efektif kepada murid disleksia. Selain itu membantu membantu murid disleksia dalam bidang awal literasi. Melalui penghasilan inovasi DINO ini diharapkan dapat dijadikan bahan bantu mengajar (BBM) dalam proses PdP yang berlangsung dengan mengurangkan kekeliruan imej yang berlaku terhadap murid-murid yang mengalami disleksia. Tambahan pula, harapan bagi penciptaan produk inovasi Dino ini adalah supaya dapat memberi manfaat dan sumbangan bermakna dalam dunia pendidikan, serta dapat diperkembangkan dan disebarluaskan lagi keseluruh Malaysia dan ke luar negara kerana masalah disleksia adalah masalah yang tidak asing lagi di seluruh dunia.

Penerbitan, Anugerah dan Harta Intelek

Anugerah Gangsa Konvensyen Bahasa Melayu dan Pertandingan Inovasi peringkat kebangsaan pada 5 hingga 6 September tahun 2023.

Rujukan

Hasuria, C. O. et. al. (2009). *Bahasa verbal dan bukan verbal*. Institut Terjemahan Negara Malaysia Berhad.

Haliza. Y. (2021, September 28). *Guru cipta Ba. Tu. Board bantu murid disleksia. Berita Harian.* https://www.bharian.com.my/berita/pendidikan/2021/09/869692/guru-cipta-batu-board-bantu-murid-disleksia

Vijayaletchumy a/p S. (2008). Disleksia dalam konteks pembelajaran bahasa di Malaysia. *Pertanika J. Soc. Sci. & Hum, 16(2), 115-139.*

https://dokumen.tips/documents/full-presentation-tutorial-disleksia.html

Blynk IoT Trainer Kits

Norazila binti Md Posdzi 1, Ts. Rasidah binti Abdul Rani 2, Norsaadah bt Mahmor 3
Jabatan Kejuruteraan Elektrik, Politeknik Ungku Omar, Ipoh, Malaysia[1,2,3]
norazila.m@puo.edu.my [1], rasidah@puo.edu.my [2], nsaadah@puo.edu.my [3]

Highlights: IoT Trainer Kits are an innovative approach to teaching IoT concepts for Project 1 and Project 2. These kits are designed to enhance learning by integrating various components from microcontroller Arduino ESP32 and Blynk applications. These kits include push buttons, humidity sensors, ultrasonic sensors, temperature sensors, LCD displays, buzzers, LEDs, servo motors, and relays. By using these kits, students can easily and quickly learn and visualize the input and output of their programs. The ABBM system helps students develop their skills and knowledge in coding, programming, and programming Arduino applications.

Keywords: IoT Trainer Kits; Arduino ESP 32; Blynk

Introduction

The Project 1 (DEE40082) and Project 2 (DEE50102) courses are mandatory courses taken by students in semesters 4 and 5 at the Department of Electrical Engineering (JKE) to qualify for graduation. Indirectly, this course can apply the creativity and innovation of students to produce electrical and electronic-related projects. The course also exposes students to knowledge of problem-solving, planning, implementation, and project development methods, either in hardware, software or a combination of both, that can meet current industry needs. In addition, through project 1 (DEE40082), the CLO (Course Learning Outcomes) that are drawn to students are like CLO 3, which is to do a project construction procedure (hardware project) or produce a flow chart and algorithm draught for the system program (software project) and record progress systematically in a logbook. Usually, students are more likely to develop conceptual interfacing projects that combine hardware and software using microcontrollers such as Arduino. Therefore, in meeting the needs and developments of the Industrial Revolution 4.0 (IR 4.0), all students at JKE need to apply the Internet of Things (IoT) element in the student project implementation process. The IoT project is a new technology that enables the connection of devices to internet networks so that users can monitor, view, control, collect data, and so on from a distance. By developing these IoT-based projects, students need to acquire practical skills and learn the basics. In helping students produce IoT projects, this teaching material tool (ABBM) is essential to helping and facilitating students learn the basic IoT concepts and providing early exposure to IoT project applications. Without this early exposure, students will be enthusiastic but uninterested in deepening their understanding of the basic concepts of IoT.

At the same time, IoT Trainer Kits have been produced as a tool for student-centered teaching materials to give students a real picture of the IoT-related projects to be produced. This trainer is designed suitably for projects that use software using the Blynk application and Arduino programming using the provided devices. The Blynk app is an iOS and Android platform that controls the Arduino and ESP32 modules via Internet access, as shown in Figure 1. Through this application, students can create an exciting and creative graphic interface for projects to be implemented. The application is very easy to set up and control from a distance. In the meantime, most students will use this Blynk app as a facilitator in implementing their final IoT-based project.

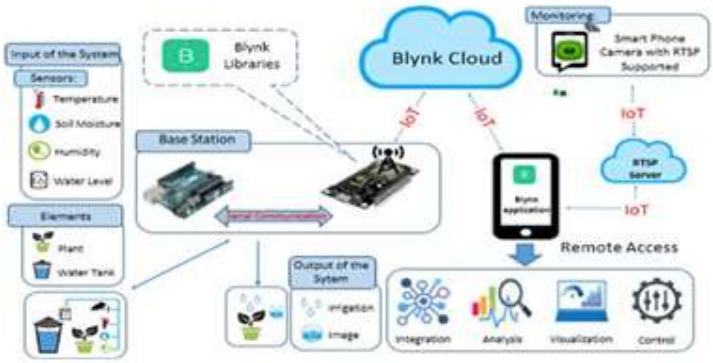


Figure 1: Integration between Blynk and NodeMCU ESP32 (Macachor et al., n.d.)

The trainer is also equipped with input and output devices that are often used by students, such as a push button, humidity sensor, ultrasonic sensor, temperature sensor, LCD display, buzzer, LED, servo motor, and relay, which help students prepare before implementing a real final project. This trainer helps students create Arduino programs by

developing Blynk apps that are downloaded via smartphones. This method can also help students produce projects that are not only quality but also more hands-on with minimal costs. The Arduino-based IoT project using the Blynk app is an open platform for students to build and develop electric and electronic projects. ESP32 is a Wi-Fi module that is often used by students in the implementation of IoT-based projects. There are various IoT projects that can be expanded using the Blynk app and the ESP32 microcontroller, such as:

i. IoT Car Parking System
ii. IoT Smart House
iii. IoT Temperature Humidity Monitoring

The primary component of this training kit is a microcontroller. This component acted as the 'brain' of the training kit, controlling the complete hardware (Rahman et al., 2020). The ESP32 microcontroller is a low-power chip that has been equipped with Bluetooth and Wi-Fi modules that are perfectly suitable for creating an Internet of Things application system. Typical applications for IoT platforms that can be integrated into smartphones via an internet network are Blynk, Adafruit.io, Favoriot, IFTT, Think Speak, and Asksensor, as shown in Figure 2. However, IoT Trainer Kits only focus on the Blynk application because it is easier to learn and apply to students as a start-up.

Figure 2: Applications for IoT platforms suitable for the ESP32

Product Description

IoT Innovation Project Implementation This IoT Trainer Kit is applied as a teaching aid tool (ABBM) for Project 1 (DEE40082) and Project 2 courses. (DEE50102). Both courses are mandatory courses taken by all students in the fourth and fifth semesters of all programs offered at the Department of Electrical Engineering, Polytechnic Ungku Omar. Students should design and develop conceptual interfacing projects, i.e., a combination of hardware and software with the IR4.0 element covering the electrical and electronic fields and encompassing Internet of Things (IoT) technology. This IoT Trainer Kit is also a student-centered ABBM because it is designed to facilitate and attract students' interest in learning the basics of the Arduino microcontroller, ESP32, along with the Blynk manual-guided application and lab sheet to study the arrangements. Thus, using this IoT Trainer Kit, students can test arrangements for input and output devices that are often used by students, such as push buttons, humidity sensors, ultrasonic sensors, temperature sensors, LCD displays, buzzers, LEDs, servo motors, and relays. In addition, students can learn something new compared to before because they are less knowledgeable about Arduino, such as coding, programming, and Blynk application display design. Implications: students are easier and faster to identify and visually test how the program created can control the input and output already set. The purpose of this ABBM is to open the mind and nurture the curiosity of students to make a real examination of the program that has been made. Indirectly, using this ABBM can guide students to plan and manage the purchase of the appropriate components while completing the student project. In addition, students can produce their final projects faster and more qualitatively. The application of this ABBM can be considered in terms of the three factors stated below:

i. This ABBM is used for the subjects Project 1 (DEE40082) and Project 2 (DeE50102), which expose students to the use of input and output components such as sensors and microcontrollers.
ii. The ABBM has three main parts: input, processing, and output. On the input part, it is controlled by push buttons or sensors such as DHT sensors, motion sensors, and ultrasonic sensors, while on the processing part, it uses the microcontroller Arduino ESP32, and on the output part, it is controlled by LED lights, a buzzer, a relay, an LCD display, and a servo motor.
iii. The ABBM is also used by students as a space or platform for their project testing, visually identifying the functionality of their components and projects.

The objectives of this project are:

i. Develop teaching materials tools to facilitate student implementation of final projects using IoT elements.
ii. Connect simulated arrangements with real applications.

iii. Understand the functions of input, output, and microcontroller devices (ESP32) directly while using the trainer kit.
iv. Contribute to the department by providing these IoT Trainer kits specifically to Project 1 and Project 2 supervisors.
v. Learn the basic concepts of IoT-based projects using the available Blynk manual-guided application.

Among the market potentials of using this ABBM are the following:

i. Multifunctional
This one set of ABBMs can be used to test various types of input and output components. In addition, the application of communication between hardware and software is not limited to using Blynk.

ii. Mobility
This ABBM can also be small, lightweight, and easy to carry to any location.

iii. User friendly
The ABBM is easy to use and does not require a complex connection; it only needs to make an interface between the microcontroller (ESP32) and the smartphone.

The novelty of this ABBM is divided into:

i. Designed
   a. This ABBM is suitable for use in the classroom or laboratory.
   b. The kits are small and lightweight, making it easy for teachers to take them anywhere.
   c. This kit only uses a 5V DC power supply, but teachers can use a power bank or adapter during the teaching and learning sessions.
ii. Costly
The cost of developing cheap ABBMs can help teachers provide more kits for the use of students. Next, it can improve the efficiency of the teaching and learning process.

iii. Applications
This ABBM can also be applied to the Project Subject only, but it can also be used for other subjects such as the Embedded Application System Subject (DEC40053), the embedded Robotic subject (DEC50122), and the internet-based controller (DEC50132).

Results & Discussion

Impact of Innovation

i. Impact on students
This IOT Trainer Kit is specifically designed for Project 1 (DEE40082) and Project 2 courses. (DEE50102). In evaluating the effectiveness of these IoT Trainer Kits for students, one study using the questionnaire form was carried out with students who took Project 1 and Project 2. A total of 34 students who have used IOT trainer Kits in Session II 2022–2023 have responded through a survey form distributed through Google Forms. From the findings of the studies carried out, the student feedback obtained on the effectiveness of using this Blynk IOT Trainer Kit is shown in Figure 3. Referring to Figure 3, 70.95% strongly agree on using IOT Trainer Kits in the implementation of student projects.

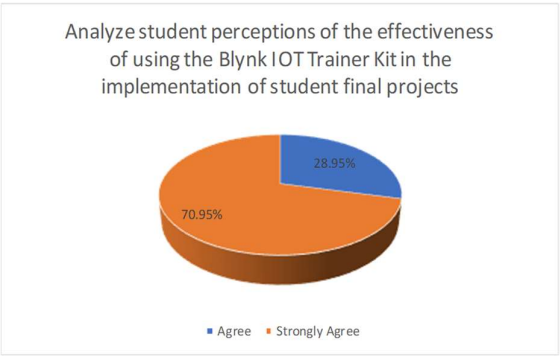


Figure 3: Analyze student perceptions of the effectiveness of using the IoT Trainer Kit

In addition, through survey forms and interviews with students, they have given a variety of positive feedback or suggestions on the production of this guide. Among the responses received by students were:

a. This developed kit is user-friendly, easy to use, and very helpful throughout the completion of my final project.
b. This IOT trainer helped me a lot to understand the use of Blynk.
c. This tool was very helpful to me before I started to create the final project using the Blynk app.
d. interesting and easy for students to understand.
e. These tools and manuals are very interesting and help to understand the versatile, little-related Blynk basics.

ii. Impact on the lecturer
Based on feedback from project supervisors, these IOT Trainer Kits greatly help students prepare to implement IOT-conceived final projects, such as using the Blynk app. The perception supervisor related to the JKE student's final project are:

a. Students' skills in using IOT and software development increased.
b. Students no longer struggle to create interface projects between hardware and software.
c. Students no longer need a long time to deepen the implementation of student projects using IOT applications.
d. Assist students in the process of selecting the appropriate components.
e. Even if students have no knowledge of IOT, it does not interfere with the implementation process of students' projects using IOT applications.
f. Assisting students in testing the programming developed in relation to student projects.

iii. Saving time
Students don't have to take a long time to find suitable components, making it easy for students to test visually made programming. In addition, students will be able to better understand the use of the Blynk app.

iv. Cost savings
Students do not have to spend high costs in the student project assessment process on the oversight of incorrect or unnecessary components in a student project. Students can make better estimates of expenses.

v. Contribution to the achievement of KPIs at Poly PMO
This IOT Trainer Kit has been registered with Intellectual Property Malaysia with the copyright registration number.

Conclusion

This IoT Trainer Kit upgrade will continue to be implemented periodically to consolidate its implementation. Adding additional input components or devices, such as infrared sensors, LDR sensors, and switches, that students can implement in their final project can be used to implement improvement proposals. In addition, the experiment manual can demonstrate the use of various applications other than Blynk, such as ThinkSpeak or Favourites. To enhance the use of the IOT Trainer Kit, it is proposed that these kits be multiplied so that more students and instructors can utilise them. In addition, the project is conducted each semester by establishing a scientific partnership with students and a partnership between professors from Polytechnics or other educational institutions, such as vocational colleges and Community colleges.

Publication, Award, and Intellectual Property

Copyright No: LY2023P04160

References (Use APA format)

Macachor, E. B., Notarte, M. P., & Molejon, W. L. (n.d.). *IoT-Based Precision Irrigation System for Eggplant and Tomato Intelligent and Sustainable Agricultural Systems View Project Biomedical Devices and Biomedical Signal Processing View project IoT-Based Precision Irrigation System for Eggplant and Tomato*. https://www.researchgate.net/publication/346001616

Rahman, N. A., Idris, M. R., & Baharudin, K. S. (2020). Development of educational kit for IoT online learning. *International Journal of Technology, Innovation, and Humanities*, *1*(1), 26–32. https://doi.org/10.29210/881001

READING BOX

KARTTIVAREN A/L KARTHIKESU, SHATHISKUMAR A/L LOGANATHAN, THANUSHA A/P PARAMASIVAM, YONG SHENG HUI, TS MOHD HARATH ALI BAIUNID B.OMAR

Institut Pendidikan Guru Kampus Pendidikan Teknik Kompleks Pendidikan Nilai, 71760 Bandar Baru Enstek, Negeri Sembilan

karttivaren281101@gmail.com, shathiskumar0104@gmail.com, p.thanusha03@gmail.com, 378-8-yong@epembelajaran.edu.my, Harath_omar@yahoo.com

Abstrak: Projek *Reading Box* ini bertujuan untuk mengurangkan masalah pembelajaran dalam kalangan murid-murid sekolah rendah. Tema bagi hasil ciptaan produk ini ialah Inovasi dalam sesi Pembelajaran dan Pengajaran(PDP). Projek ini merangkumi tiga tunjang utama Persekitaran Lestari yang berkaitan dengan Pendidikan iaitu kesaksamaan sosial (*social equity*), Pemeliharaan persekitaran (*Environmental protection*) dan daya maju ekonomi (*economic viability*). Objektif projek inovasi ini adalah untuk meningkatkan inisiatif guru bagi menggalakkan murid-murid dalam mengekalkan amalan belajar dan menggalakkan persaingan positif dalam pendidikan. Ini kerana, pada masa sekarang didapati sesetengah murid tidak mempunyai minat dalam pembelajaran menyebabkan mereka mempunyai prestasi akademik yang rendah. Projek ini dapat meningkatkan kualiti atau keberkesanan pengajaran dan pembelajaran. Projek ini menyumbang kepada cara bekerja yang lebih cekap, cepat, tepat dan mudah atau memperjelaskan suatu konsep dalam pengajaran dan pembelajaran. ini kerana, kami telah mengimplementasikan elemen robotik iaitu cip microbit dalam projek ini.

Kata kunci: Inovasi dalam sesi Pembelajaran dan pengajaran, robotik, masalah belajar, motivasi extrinsik

Pengenalan

Nama projek kami ialah *Reading Box*. Kami mencipta projek ini kepada murid-murid sekolah rendah kerana projek ini dihasilkan dengan mengaplikasikan konsep pembacaan dan tanda apresiasi. Rasional bagi membangunkan projek ini adalah untuk meningkatkan inisiatif guru bagi menggalakkan murid-murid dalam mengekalkan amalan pembacaan dan menggalakkan persaingan positif dalam pendidikan. Selain itu, penggabungan unsur-unsur teks, permainan dan grafik dapat meningkatkan minat pelajar untuk mencapai rasional penciptaan projek ini.

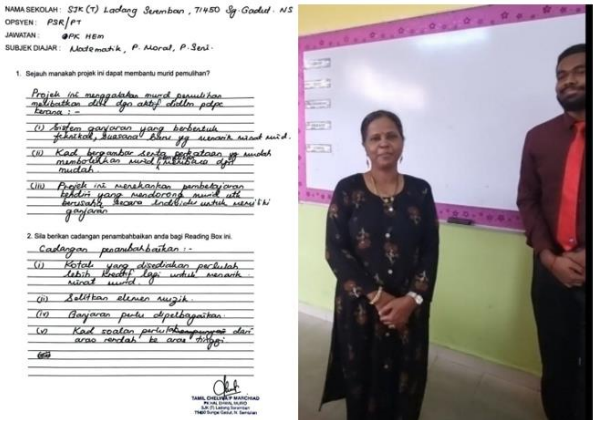
Maklumat Produk

Projek ini iaitu *Reading Box* mempunyai pelbagai keistimewaan dengan adanya cip microbit, bank kuasa (*power bank*), bahan kitar semula dan sebagainya. Projek yang diinovasikan ini mempunyai kecekapan untuk memberikan ganjaran kepada murid-murid yang Berjaya membaca konteks pada kad. Projek ini dapat membantu kita dalam memelihara alam sekitar kerana kita telah menggunakan bahan kitar semula sebagai bahan asas projek ini. Selain itu, projek ini dapat menepati cita rasa dan kehendak pengguna terutama warga-warga pendidik kerana mempunyai penggabungan unsur-unsur teks, permainan dan grafik dapat meningkatkan minat pelajar untuk mencapai rasional penciptaan projek ini.

Projek ini juga dapat menjimatkan masa kerana, pengguna mudah membawa projek ini dari satu tempat ke tempat yang lain. Projek ini mudah di selenggara kerana tidak menggunakan unsur robotik yang kompleks. Akhirnya, projek ini boleh dijual dan digunakan oleh pengguna terutamanya murid-murid sekolah dalam usaha meningkatkan minat belajar.

Keputusan & Perbincangan

Gambar Rajah 1: Menunjukkan bukti bagi melaksanakan tinjauan bagi projek *Reading Box* di Institut Pendidikan Guru Kampus Pendidikan Teknik oleh Pengarah dan Pensyarah.



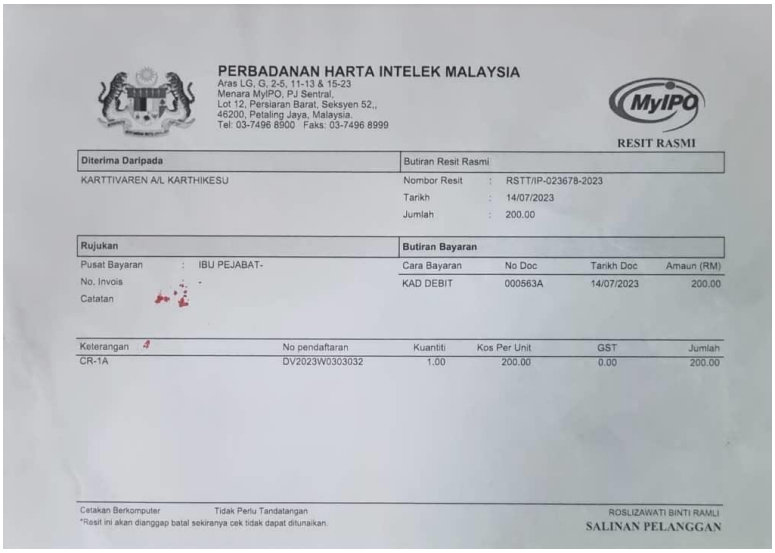
Gambar Rajah 2: Bukti bagi melaksanakan tinjauan kedua bagi projek *Reading Box* di SJK(T) Ladang Seremban oleh Guru Besar dan beberapa guru.

Kesimpulan

Kami menggunakan Pengaturcaraan Microbit untuk membina *pseudokod* bagi *Reading Box* supaya ia akan memudahkan murid-murid memahami konsep projek ini. Hal ini kerana dalam DSKP tahun 5 dan 6 melibatkan topik pengaturcaraan Microbit. Sebagai penambahbaikan, bagi projek seterusnya kami akan menggunakan perisian *Bling* dan Esp32 supaya meningkatkan fungsi dan nilai komersial projek ini dalam sektor Pendidikan.

Penerbitan, Anugerah dan Harta intelek

Gambar Rajah 1: Anugerah Emas dalam pertandingan Inovasi Raja Melewar



PERBADANAN HARTA INTELEK MALAYSIA
Aras LG, G, 2-5, 11-13 & 15-23
Menara MyIPO, PJ Sentral,
Lot 12, Persiaran Barat, Seksyen 52,,
46200, Petaling Jaya, Malaysia.
Tel: 03-7496 8900 Faks: 03-7496 8999

MyIPO

RESIT RASMI

Diterima Daripada	Butiran Resit Rasmi	
KARTTIVAREN A/L KARTHIKESU	Nombor Resit	: RSTT/IP-023678-2023
	Tarikh	: 14/07/2023
	Jumlah	: 200.00

Rujukan		Butiran Bayaran			
Pusat Bayaran	: IBU PEJABAT-	Cara Bayaran	No Doc	Tarikh Doc	Amaun (RM)
No. Invois	: -	KAD DEBIT	000563A	14/07/2023	200.00
Catatan	:				

Keterangan	No pendaftaran	Kuantiti	Kos Per Unit	GST	Jumlah
CR-1A	DV2023W0303032	1.00	200.00	0.00	200.00

Cetakan Berkomputer Tidak Perlu Tandatangan
*Resit ini akan dianggap batal sekiranya cek tidak dapat ditunaikan.

ROSLIZAWATI BINTI RAMLI
SALINAN PELANGGAN

Gambar Rajah 2: Bukti pendaftaran Harta Intelek bagi *Reading Box*

Rujukan

Badushah, J., Rahimi Nik Yusoff, N. M., Mahamod, Z., & Timbang,T. (2010). Masalah Membaca Murid-murid Sekolah Rendah Kerajaan di Brunei Darussalam: Satu Kajian Kes. *JURNAL Pendidikan MALAYSIA*, *35*(2), 77–85. http://www.ukm.edu.my/jurfpend/Jilid%2035(1),%202010/Bab%207.1.pdf

Digital Synopsis. (2017). This Brilliant Vending Machine Gives Food To Stray Dogs In Exchange For Plastic Bottles. *Digital Synopsis*. https://digitalsynopsis.com/inspiration/pugedon-recycle-bottle-dog-vending-machine/

Freimann, Anita & Ham, Marija & Mijoč, Josipa. (2014). Measuring Objective Well-Being and Sustainable Development Management. Journal of Knowledge Management, Economics and Information Technology. 2.1- 29.

Pugedon. (2018). *Automatic Feeding Machine From Recycling Waste For Street Animals*. http://www.pugedon.com/

Recycling Machines in Turkey Provide Food for Stray Animals When a. (n.d.). The Bark. http://surl.li/nvmws

Rookie Developer. (2014, July 25). *This Vending Machine Takes Bottles And Gives Food To Stray Dogs In Exchange* [Video]. YouTube. https://www.youtube.com/watch?v=gQ11f6urLVQ

Pembangunan *Jig Alignment for Four Jaw Center Lathe Machine*

Ts Raman bin Ibrahim, Haryanti Binti Hassan
Politeknik Merlimau Melaka, Merlimau, Melaka[1]
Politeknik Kota Bharu, Kota Bharu, Kelantan[2]
raman@pmm.edu.my, yanharyanty@gmail.com

Abstrak:

Jig merupakan suatu alat sokongan yang dibangunkan untuk memudahkan kerja-kerja pemesinan. Selain meningkatkan produktiviti, alat ini juga dapat membantu mengurangkan masa dan tenaga selain aspek utama dalam pengeluaran bahan kerja menepati dimensi pengukuran yang perlu ditepati. Masalah utama yang dihadapi pengguna mesin larik terutamanya pelajar yang melakukan amali bengkel ialah semasa melakukan kerja melarik tidak sepusat menggunakan cuk 4 rahang. Kesukaran membuat pelarasan titik pusat dan memasang bahan kerja mengambil masa yang lama. *Jig Alignment For Four Jaw Center Lathe Machine* direka dan dibina bagi tujuan untuk memudahkan kerja dalam menyelaraskan titik tidak sepusat bagi pemegang 4 rahang dan memegang bahan kerja yang tidak stabil. Hasil menunjukan penjimatan masa yang diambil adalah 36% hingga 48% menggunakan *jig* berbanding secara manual tanpa *jig*. Penjimatan masa 30% purata pengurangan masa dalam 5.3 minit bagi kategori tidak mahir , separa mahir 42% purata pengurangan masa dalam 4.2 minit dan mahir 48%. purata pengurangan masa dalam 3.6 minit. Penghasilan *jig* ini sebagai ABBM bagi perlaksanaan PdP dengan lebih berkesan dan efektif. Kajian Inovasi ini juga memberi peluang kepada pelajar dan pengajar untuk menerokai kajian lanjutan akan datang.

Kata Kunci: *Jig*, Melarik Tak Sepusat, Pemegang 4 Rahang, Alat Bantu Mengajar

Pengenalan

Jig merupakan suatu alat sokongan yang dibangunkan untuk memudahkan kerja-kerja pemesinan. Selain meningkatkan produktiviti, alat ini juga dapat membantu mengurangkan masa dan tenaga selain aspek utama dalam pengeluaran bahan kerja menepati dimensi pengukuran yang perlu ditepati.Mesin larik adalah salah satu alat mesin tertua dan wujud dari pelarik kayu awal yang kemudiannya merupakan alat untuk berputar dan memesin sekeping kerja yang diadakan di antara dua pokok bersebelahan. Pada tahun 1797, Henry Maudslay, membina pelarik pemotong skru pertama yang merupakan pelopor mesin pelarik pengeluaran tugas berat laju berkelajuan tinggi hari ini, sebuah alat mesin yang telah dibentuk secara praktikal hingga kini hari peradaban dengan membina mesin dan industri [1].Melarik tidak sepusat bermaksud sebuah cakera atau roda mempunyai paksi revolusi yang dipindahkan dari pusatnya, sehingga mampu menyampaikan gerak sipi. Ia boleh ditakrifkan dengan cara yang lain sebagai, jika sekeping kerja silinder mempunyai dua paksi putaran yang berasingan, satu yang keluar dari pusat di sisi yang lain, sekeping kerja disebut sebagai eksentrik dan membalikkan permukaan yang berlainan dari sekeping kerja yang dikenali sebagai 'Eccentric Turning" [2].Pemegang empat rahang boleh digunakan untuk memegang benda kerja yang bulat, persegi atau bentuk yang tidak sama rupanya. Setiap rahang pemegang ini bergerakbebas dan boleh juga diterbalikkan. Pada muka pemegang ini terdapat lengkung-lengkung sepusat yang boleh digunakan sebagai panduan untuk memusatkan benda kerja. Pemegang empat rahang ini lebih kukuh dan komponenkomponen yang telah dimesin terlebih awal dahulu boleh dilaraskan kembali dengan lebih jitu [3]. Di dalam proses Pengajaran dan Pembelajaran (PdP) bagi DJJ 20042 amali bengkel terutamanya di bengkel mesin, mesin larik digunakan sebagai mesin utama bagi tujuan pemesinan. Untuk melakukan pelarasan melarik tidak sepusat dengan menggunakan pemegang empat rahang ini merupakan kerja yang rumit dan memakan masa yang agak lama. Kesukaran ini sering dihadapi Oleh hampir kesemua pelajar jurusan kejuruteraan mekanikal yang mengambil amali bengkel ketika menjalankan kerja melarik tidak sepusat. Dengan adanya *jig* ini, ianya dapat menjimatkan masa serta memudahkan menyelaraskan titk tidak sepusat bagi pemegang empat rahang kepada para pelajar ketika melakukan amali di bengkel.

Penyataan Masalah

Masalah utama yang dihadapi pengguna mesin larik terutamanya pelajar yang melakukan amali bengkel ialah semasa melakukan kerja melarik tidak sepusat menggunakan cuk 4 rahang. Kesukaran membuat pelarasan titik pusat dan memasang bahan kerja mengambil masa yang lama. *Jig*

Alignment For Four Jaw Center Lathe Machine direka dan dibina bagi tujuan untuk memudahkan kerja dalam menyelaraskan titik tidak sepusat bagi pemegang 4 rahang dan memegang bahan kerja yang tidak stabil. Perlaksanaan kaedah mudah bagi memegang dan menyelaraskan bahan kerja, diharapkan dapat membantu para pelajar mahupun pensyarah untuk memasang bahan kerja ke dalam pemegang 4 rahang dengan tepat dan mudah di samping menjimatkan masa pemasangan.

Objektif Inovasi

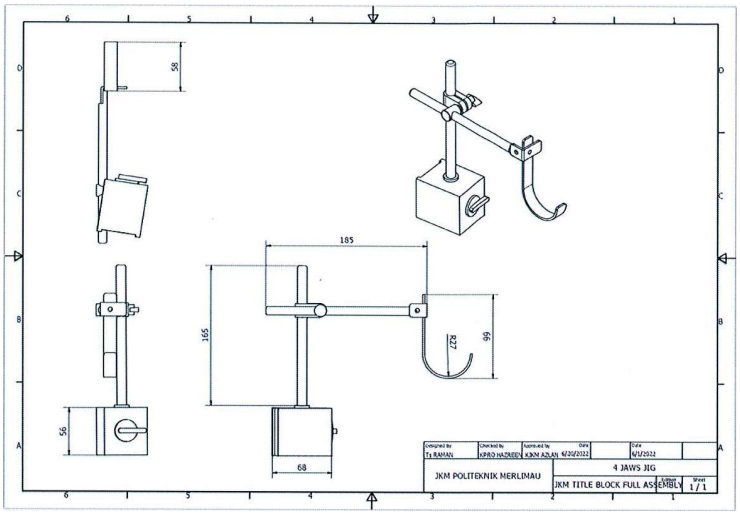
1. Membangunkan satu *jig* yang boleh membantu dalam melakukan pelarasan bahan untuk kerja pemesinan melarik tak sepusat.
2. Menambahbaik kaedah memenggang atau mengikat bahan kerja dengan lebih cepat dan mudah bagi menjimatkan masa dan proses kerja.

Ciri-Ciri Inovasi

Reka Bentuk Kajian yang telah disediakan dalam bentuk ortografik seperti yang dilampirkan pada Rajah 1 dibawah telah dihasilkan menggunakan perisian *Autodesk Inventor 2022*. Reka bentuk ini merupakan idea yang terhasil selepas melakukan analisis pada projek *jig* prototaip yang sedia ada. Selepas membuat perbandingan, idea ini mempunyai struktur yang lebih stabil kerana mempunyai tapak magnet yang lebih kukuh apabila digunakan. Selain itu, sistem pelarasan yang lebih baik dan mudah digunakan supaya kerja-kerja pemasangan bahan kerja lebih mudah dah tepat. Kaedah memegang bahan kerja juga lebih mencengkam dan tidak mudah bergerak. Reka bentuk pada Rajah 1 bawah juga merupakan idea selepas membuat penambahbaikkan supaya projek ini dapat mencapai objektif yang telah di tetapkan.

Rajah 1 bawah adalah lukisan isometrik yang dihasilkan menggunakan *Autodesk Inventor 2022*. Lukisan ini menerangkan tentang ukuran-ukuran yang terdapat pada struktur projek secara terperinci. Asas binaan *jig alignment* dibahagikan kepada 3 komponen. Komponen pertama ialah pada tapak *jig*. Tapak *jig* menggunakan magnetic base yang digunakan pada *dial indicator*. *Magnetic base* ini mempunyai *on/off* kuasa magnet, oleh itu penggunaan jig ini lebih mudah dikendalikan.

Selain itu, komponen yang kedua ialah pemegang bahan kerja yang berperanan sebagai pemegang bahan kerja. Pemegang ini menggunakan asas *velacro* yang akan dihasilkan, kaedah ini lebih mudah kerana tidak perlu lagi mengetatkan skru untuk mengikat bahan kerja pada pemegang bahan kerja.Komponen yang terakhir ialah pelaras paksi X, Y dan Z. Jig ini boleh dilaraskan ke kiri, ke kanan, ke hadapan, ke belakang, ke atas, dan ke bawah untuk menggerakkan *jig* semasa menentukan dan selarikan titik tidak sepusat pada bahan kerja. Besi *hollow stainless steel* digunakan untuk menghasilkan penyangga *jig* yang tahan lasak dan tidak mudah karat.



Rajah 1: Ukuran Rekabentuk

Dapatan dan Perbincangan

a) Kajian masa

Kajian ini dibuat untuk menilai masa untuk memasang bahan kerja tidak sepusat pada cuk 4 rahang. Penilaian ini akan dijalankan menggunakan *jig* dan tanpa *jig*. Terdapat tiga golongan yang membuat ujian iaitu tidak mahir, separa mahir dan mahir. Tidak mahir diwakili oleh pelajar sem 1 Politeknik Merlimau, selain itu pelajar sem akhir Politeknik Merlimau pula mewakili golongan separa mahir dan akhir sekali mahir pula ialah golongan pensyarah Jabatan Kejuruteraan Mekanikal Politeknik Merlimau. Penilaian ini juga akan direkod masa dengan menggunakan jam randik. Setiap eksperimen akan dijalankan 3 kali untuk mendapatkan purata masa ditunjukkan pada Jadual 1 kajian pemasangan bahan kerja pada mesin larik dibawah.

Jadual 1: Kajian Masa Pemasangan Bahan Kerja Pada Mesin Larik

No	Pelarasan masa manual			Pelarasan menggunakan jig			Diameter bahan kerja (mm)
	Tidak Mahir	Separa Mahir	Mahir	Tidak Mahir	Separa Mahir	Mahir	
1.	15.13	10.20	08.00	9.40	06.18	04.40	51mm
2.	14.40	10.00	7.50	9.14	05.58	04.00	
3.	14.00	9.40	7.15	9.10	5.30	3.50	
purata	14.51	9.86	7.55	9.21	5.68	3.96	

Daripada kajian dan pemerhatian telah direkodkan masa yang diambil terhadap pemasangan bahan kerja pada mesin larik tanpa menggunakan *jig* (manual) dan menggunakan *jig* yang telah dibangunkan. Hasil menunjukan penjimatan masa yang diambil adalah 36% hingga 48% menggunakan *jig* berbanding secara manual tanpa *jig*. Penjimatan masa 30% purata pengurangan masa dalam 5.3 minit bagi kategori tidak mahir , separa mahir 42% purata pengurangan masa dalam 4.2 minit dan mahir 48%. purata pengurangan masa dalam 3.6 minit. Pengurangan masa yang diambil bagi tujuan pelarasan bahan kerja akan menjadi lebih baik jika dipraktikan berulang kali dan memberi catatan masa yang lebih baik terutama bagi kategori tidak mahir.

b) Kajian kefungsian Mengikut Tahap Kemahiran

Kajian ini dibuat bertujuan menilai kualiti *jig* semasa menggunakannya untuk mengikat bahan kerja pada ragum. Kajian ini akan dibuat pemerhatian ke atas *jig* yang mampu atau tidak menampung setiap bahan kerja yang dilakukan pada mesin larik dan tapak mesin larik ditunjukkan pada Jadual 2 dibawah.

Jadual 2: Kajian kefungsian Mengikut Tahap Kemahiran

		Pelarasan Menggunakan Jig					
ARAS	Bil	A	B	C	D	E	PURATA
TIDAK MAHIR	1	3	3	4	3	4	3.4
	2	4	4	4	4	4	4
	3	4	4	4	4	4	4
SEPARA MAHIR	1	4	4	4	4	4	4
	2	4	4	4	4	4	4
	3	4	4	4	4	4	4
MAHIR	1	4	4	4	4	4	4
	2	4	4	4	4	4	4
	3	4	4	4	4	4	4

Rate	Penerangan
0	Sangat sukar
1	Sukar
2	Sederhana
3	Mudah
4	Sangat mudah

A) pemegangan bahan kerja
B) kestabilan
C) pelarasan titik pusat
D) mengikat bahan pada ragum
E) mudah alih

Hasil daripada ujian kefungsian, didapati bahawa kesemua bahagian *jig* berfungsi dengan baik. Pergerakkan pada paksi x,y dan z dapat diselaraskan dengan mudah kepada titik ukuran yang dikehendaki. Pemegang bahan dapat menampung berat dan diameter bahan dengan kemas dan stabil, ini memudahkan pengendalian pemasangan oleh operator. Hasilnya, prosedur kaedah pertama dan kedua menggunakan *jig* dapat membantu dalam penentuan titik tidak sepusat serta kerja melarik dapat dilakukan dengan lebih baik dan tepat.

Perbezaan Sebelum Dan Selepas

1. Inovasi yang dibina mudah digunakan dengan kos yang murah.
2. Penggunaan *jig* ini banyak membantu dan memudahkan terutama bagi kerja pelarasan pemesinan tidak sepusat.
3. Pelajar lebih cepat faham dalam kongsep penjajaran, menjimatkan masa dan mempercepatkan proses pelarasan bagi kerja pemesinan.
4. Boleh digunakan oleh pelbagai peringkat kemahiran untuk melaksanakan kerja pemesinan.

Impak Inovasi

1. Sebagai satu Alat ABBM bagi pelaksanaan PdP dengan lebih berkesan dan efektif.
2. Boleh ditambah baik bagi pengelolaan PdP dan meningkatkan pemahaman Pelajar.
3. Mencetuskan pemikiran kreatif kepada pelajar dan Pengajar dalam proses melaksanakan kearah kerja yang lebih mudah dan efektif.
4. Kajian Inovasi ini juga memberi peluang kepada pelajar dan pengajar untuk menerokai kajian lanjutan akan datang.

Kesimpulan

Dengan wujudnya *jig alignment* yang digunakan semasa melakukan kerja melarik tidak sepusat pada mesin larik konvensional, ia dapat memudahkan kerja pelajar-pelajar ipt yang menjalankan kerja amali di bengkel yang menggunakan mesin larik konvensional. Daripada data yang telah dikumpul daripada analisis, didapati bahawa *jig alignment* ini memberi kesan yang sangat besar jika dibandingkan dengan kerja melarik tidak sepusat juga tidak menggunakan alat bantuan seperti *jig*. Ia kerana dengan adanya alat bantuan ini, ia dapat mengurangkan masa pemasangan bahan kerja, memudahkan pemegangan bahan kerja, lebih stabil, dan mudah mendapatkan titik pusat yang selari tanpa berlaku ralat.

Hasil Kajian juga menunjukan penjimatan masa yang diambil adalah 36% hingga 48% menggunakan jig berbanding secara manual tanpa jig. Penjimatan masa 30% purata pengurangan masa dalam 5.3 minit bagi kategori tidak mahir , separa mahir 42% purata pengurangan masa dalam 4.2 minit dan mahir 48%. purata pengurangan masa dalam 3.6 minit. Kesimpulannya dengan penghasilan jig ini membantu sebagai ABBM bagi perlaksanaan PdP dengan lebih berkesan dan efektif. Daripada kajian Inovasi ini juga memberi peluang kepada pelajar dan pengajar untuk menerokai kajian yang lebih lanjut dimasa akan datang dalam skop kajian yang baru.

Harta Intelek

Inovasi telah didaftarkan hakcipta :

Tajuk	: *The development Jig for Four Jaw center Lathe Machine*
No Pemberitahuan	: CRLY2023M00225
Nama Pencipta	: Ts Raman Bin Ibrahim

Rujukan

Mohammad Syahrul Nizam et al. (2014). Kaedah Memegang Bahan Kerja DiMesin Larik. Blog Cikgu Mesin. Retrieved from http://cikgumesin2014.blogspot.com/p/kaedah-memegang-bahan-kerja-di- mesin.html. On the 15 December 2014.
Faozan Tri Nugroho.(2021). Jenis-jenis Magnet Dan Penjelasannya. Bola.com. retrieved from https://www.bola.com/ragam/read/4663922/jenis- jenis- magnet- beserta-penjelasannya-yang-perlu-diketahui. On the 22September 2021.
Bellabelli.(2012). General Machinist. Retrieved from http://nabellasaid.blogspot.com/2012/10/mesin-larik_12.html?m=1. On the 12October 2012
ROSHLAWATY RAIEH (2016). Mesin Kisar. Ahlifikirnegara. Retrievedfrom http://ahlifikirnegara.blogspot.com/2016/08/mesin-kisar-berprogram.html.
On the 10 August 2016.

Ronasina (2010). Teknologi Kimpalan Arka Tungsten Gas Lengai (TIG/GTAW). Retrieved from http://chekguzaidi.blogspot.com/2013/04/kimpalan-arka-tungsten-gas- lengai.html. On the 30 April 2010

Decimal shirt: a teaching aid for decimal computational task

Tolhah Binti Abdullah, Heng Kang Chuan, Jacinta Johnny
Jabatan Matematik, Institut Pendidikan Guru Kampus Temenggong Ibrahim, Johor Bahru, Johor, Malaysia[1,2,3]
tolhah14-121@epembelajaran.edu.my, jacinta.johnny@ipgm.edu.my

Highlights: The Decimal Shirt is a teaching aid that can be used to compute decimal numbers involving addition according to the place value. This is suitable especially to pupils who face difficulty in using standard form to perform addition involving decimal numbers. In other words, the used of Decimal Shirt can help to enhance pupils' understanding and skill of adding decimal numbers with regrouping up to two decimal places.

Key words: decimal numbers; addition with regrouping; decimal shirt

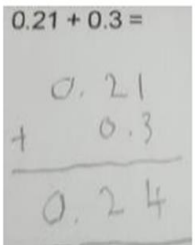
Introduction

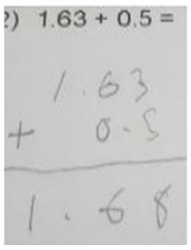
Decimal number is one of the topics in the field of numbers that is taught in primary school. It is important as it relates to other topics in Mathematics such as Fraction and Money. However, some pupils face difficulties in learning the concepts and algorithms involving decimal numbers. A study done by Heng and Tolhah (2018) found that pupils with learning difficulties were unable to add with regrouping according to the place value up to two decimal places accurately. Hence, the Decimal Shirt innovation was introduced to help overcome these misconceptions. It is a teaching aid that can be used to teach addition of decimal numbers up to two decimal places with regrouping. It is also very compatible with the learning of the 21st century that requires creative and innovative teaching aids so that effective teaching can be carried out. The use of Decimal Shirt as a teaching aid is highly recommended to be used to help pupils especially those who have learning difficulties.

Product Description

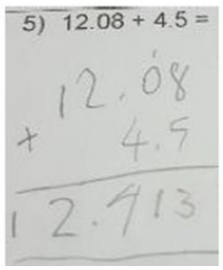
Traditionally, the misconception in adding decimal numbers that pupils face is the result of using standard form. In order to understand pupils mathematical thinking while using this algorithm, some analysis of pupils' errors are taken into consideration as follow:

a) Error : place value

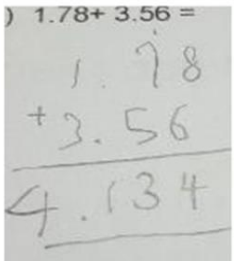




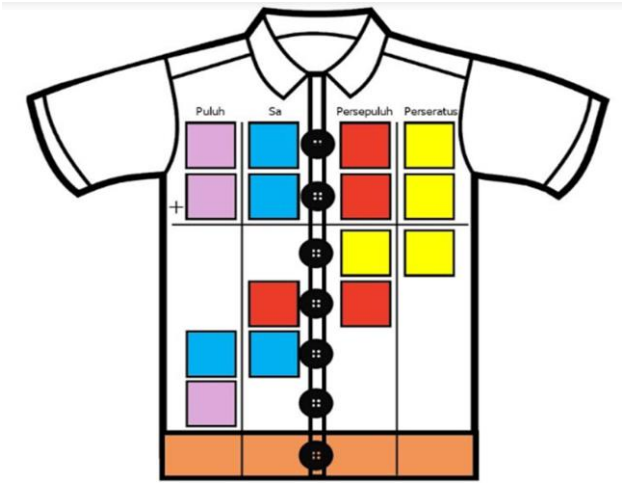
b) Error : place value and regrouping



c) Error : regrouping

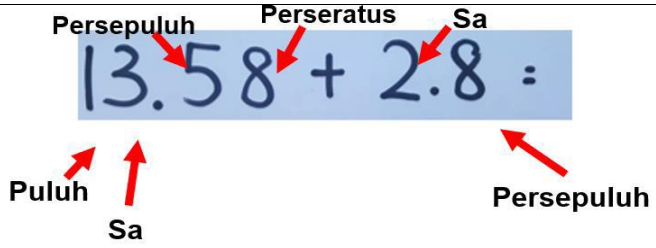


Hence, the idea of Decimal Shirt is based on these analysis.

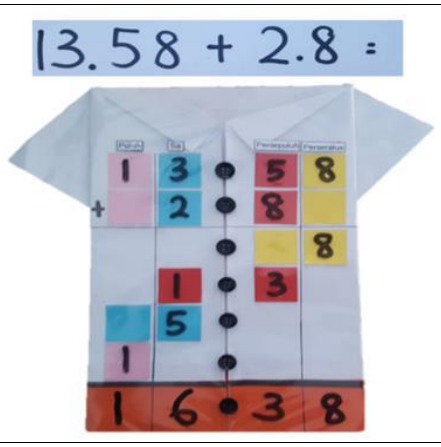


The buttoned shirt design and color retain the basic concept of place value and regrouping.

Below are the descriptions on how to use the Decimal Shirts.

	Descriptions	Illustrations
1.	Determine the value of tens, ones, tenth and hundredth of the given decimal number	
2.	Insert the number according to the place value into the colored square : ones – blue square tens – pink square tenths – red square hundredths – yellow square *	

3.	Add the digit in the hundredths place value. Write the sum of the digits on the yellow square.	
4.	Add the digit in the tenths place value. Write the sum of the tenths digit in the red square. *each square can only be filled with one digit. If the sum gives two digits, write each digit on the colored square	
5.	Add the digits in the ones place value. Write the sum of the digits in blue square.	
6.	Add the digits in the tens place value. Write the sum of the digits in pink square.	

7.	Add the sums according to the respective columns. Write the final answer on the last part of the shirt (orange color).	

Results & Discussion

The Decimal Shirt was tested as an intervention upon 5 pupils who faced difficulty in performing addition using standard form with regrouping involving decimal numbers up to two decimal places in a classroom. The findings are shown in Table 1.

Table 1: Pre-Test And Post-Tes Scores

Respondent	Pre-Test	Post-Test
Respondent 1	0/5	5/5
Respondent 2	1/5	5/5
Respondent 3	1/5	5/5
Respondent 4	0/5	5/5
Respondent 5	1/5	5/5

The results show that all respondents were able to improve their computational skills after using the Decimal Shirt. Hence, teachers can use the Decimal Shirt to overcome the misconceptions lead by the traditional way of adding decimal numbers with regrouping.

Conclusion

Pupils have different styles of learning. Therefore, in order to deal with the issue of misconceptions and mastery of basic mathematical concepts, teachers need to create a conducive and meaningful learning environment. The integration of pedagogy and innovation can improve pupils' mathematical thinking ability and generate quality ideas. Hopefully the Decimal Shirt can be extended its use to decimal numbers that are larger in value and up to more than two decimal places.

References

Heng Kang Chuan & Tolhah Abdullah. (2018). Baju Perpuluhan: Meningkatkan Penguasaan Penambahan Dua Nombor Perpuluhan Hingga Dua Tempat Perpuluhan Bagi Murid Tahun Empat. *Jurnal Penyelidikan Temenggong (Edisi Pendidikan Matematik)*, 1/2018, 26-33.

Penggunaan Kod QR untuk Sistem Peminjaman Kunci Bilik Kuliah

Dasima Shahinan
Politeknik Kuching Sarawak
dasima@poliku.edu.my

Abstrak

Kawalan pengurusan kunci yang sistematik perlu ada di setiap organisasi. Tanpa sistem kawalan yang teratur, keselamatan kunci dan bilik kuliah menjadi longgar dan mudah terdedah kepada sesiapa sahaja untuk bebas memasuki sesebuah bilik tanpa pengawasan. Selain itu bilik kuliah juga terdedah kepada kecurian asset-aset berharga. Di Politeknik Kuching Sarawak, bilik kuliah diletakkan dibawah pengawasan jabatan-jabatan yang tertentu. Billik Kuliah utama di Blok B dan C adalah bilik kuliah guna sama, di mana semua jabatan boleh menggunakannya. Kaedah peminjaman kunci masih digunakan secara konvensional di mana pengguna akan mengambil kunci di jabatan dan merekodkan di dalam buku peminjaman kunci. Di dalam projek ini, *keychain* akan di hasilkan dengan menggunakan pencetak 3D. *Keychain* yang telah siap akan dilekatkan dengan kod QR untuk memudahkan pengguna mengimbas dan mengisi maklumat peminjaman di dalam borang yang telah disediakan dalam bentuk *Google Form*. Semua data peminjaman akan tersimpan di dalam *Google Sheet* yang boleh di akses dengan mengimbas kod QR yang ada di setiap pintu Bilik Kuliah. Inovasi ini diharapkan dapat menyelsaikan masalah yang timbul apabila sistem rekod kunci tidak terkawal.

Kata kunci: Kod QR; Sistem Peminjaman Kunci; Bilik kuliah; *Google Form*; *Google Sheet*

Pengenalan

Penggunaan Kod QR untuk sistem peminjaman kunci di bilik kuliah merupakan satu sIstem yang dicipta untuk memudahkan proses peminjaman kunci di Politeknik Kuching Sarawak. Secara umumnya banyak masalah yang timbul apabila sistem rekod kunci tidak terkawal. Terdapat pengguna yang tidak merekod data dengan betul. Ada juga pengguna yang tidak merekod penggunaan kunci kerana mengejar masa dan hendak menggunakan bilik kuliah dengan cepat. Terdapat juga rekod yang ditulis dengan sebarangan dan sukar untuk dibaca. Perekodan data peminjaman kunci yang tidak kemas dan tidak tepat ini akan menimbulkan masalah kepada pengguna lain. Apabila kunci hilang dan tidak tahu siapakah pengguna kunci yang bertanggungjawab terdapat pensyarah yang terpaksa membatalkan kuliah. Di samping itu proses mengambil kunci dan merekod penggunaan kunci di dalam buku membazirkan masa dan tenaga pengguna atau pensyarah yang ingin memulakan kuliah tepat pada masanya.

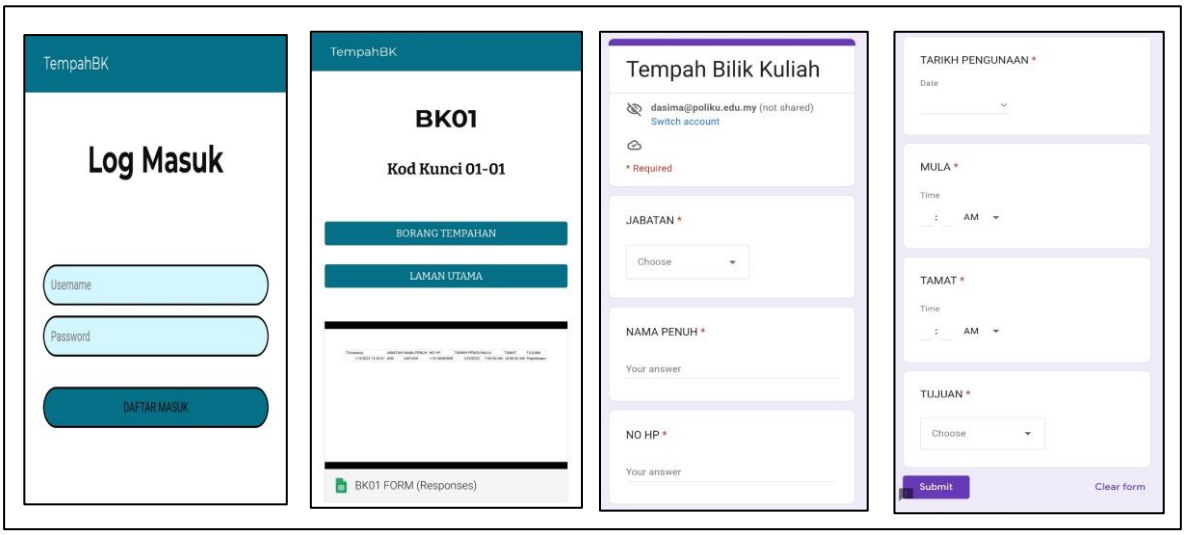
Penerangan Produk

Sebagai langkah permulaan, sebanyak 50 unit *keychain* akan di hasilkan dengan menggunakan pencetak 3D. *Keychain* yang telah siap akan dilekatkan dengan kod QR untuk memudahkan pengguna mengimbas dan mengisi maklumat peminjaman di dalam borang yang telah disediakan dalam bentuk *Google Form*. Semua data peminjaman akan tersimpan di dalam *Google Sheet* yang boleh di akses dengan mengimbas kod QR yang ada di setiap pintu Bilik Kuliah. Gambar 1 menunjukkan kod QR yang dihasilkan melalui Aplikasi *QR Code Generator*. Kod ini dicetak dan di masukkan ke dalam pemegang kunci yang dibuat khas di Jabatan Kejuruteraan Mekanikal, Politeknik Kuching Sarawak dengan menggunakan mesin *3D printer* seperti di dalam Gambar 2.
Gambar 3 menunjukkan sistem tempahan bilik kuliah dengan menggunakan aplikasi Google.site dan Google Form.

Apabila kod QR diimbas menggunakan telefon pintar, paparan yang pertama akan keluar dan pengguna diminta untuk mengisi *Username* dan *Password* sebelum mengklik butang Daftar Masuk. Kemudian senarai bilik kuliah akan terpapar dan pengguna akan klik sekali lagi bilik kuliah yang ingin digunakan. Setelah pengguna klik butang Borang Tempahan, Borang Tempahan Bilik Kuliah akan terpapar dan pengguna dikehndaki untuk mengisi semua data yang diperlukan seperti jabatan, nama, nombor telefon, tarikh penggunaan, jam dan tujuan. Apabila pengisian borang sudah selesai data peminjam akan tersimpan di dalam sistem seperti gambar 4 di bawah.

Gambar 1

Gambar 2



Gambar 3

BK C1 FORM (Responses) : Form Responses 1

Timestamp	JABATAN	NAMA PENUH	NO HP	TARIKH PENGUNAAN	MULA	TAMAT
2/21/2023 9:33:15	JKM	Mohd Rosli Saad	0194155191	2/21/2023	10:00:00 AM	
2/23/2023 9:02:56	JPA	Alfred Bakrin	0168684437	2/23/2023	9:00:00 AM	
2/24/2023 13:50:26	JKM	ASHRAF AZZAM BIN ZU	0193658380	2/24/2023	2:00:00 PM	
3/2/2023 8:55:50	JPA	Alfred Bakrin	0168684437	3/2/2023	9:00:00 AM	
3/9/2023 9:06:23	JPA	Alfred Bakrin	0168684437	3/9/2023	9:00:00 AM	
3/21/2023 9:36:27	JKM	MOHD ROSLI BIN SAAD	019-4155191	3/21/2023	10:00:00 AM	
3/23/2023 8:48:28	JPA	Alfred Bakrin	0168684437	3/23/2023	8:55:00 AM	
3/28/2023 9:37:02	JKM	MOHD ROSLI BIN SAAD	0194155191	3/28/2023	10:00:00 AM	
4/4/2023 9:59:31	JKM	MOHD ROSLI BIN SAAD	0194155191	4/4/2023	10:00:00 AM	
4/13/2023 10:12:10	JPA	Alfred Bakrin	0168684437	4/13/2023	9:00:00 AM	
5/11/2023 8:39:01	JPA	Alfred Bakrin	0168684437	5/11/2023	9:00:00 AM	
5/11/2023 12:42:19	JKM	ASHRAF AZZAM BIN ZU	0193658380	5/12/2023	2:00:00 PM	
5/18/2023 8:23:46	JPA	Alfred Bakrin	0168684437	5/18/2023	9:00:00 AM	

Gambar 4

Keputusan/Perbincangan

Inovasi ini secara umumnya telah menyelesaikan banyak masalah berkaitan peminjaman kunci bilik kuliah di Politeknik Kuching Sarawak. Di antara impak daripada hasil inovasi ini ialah:

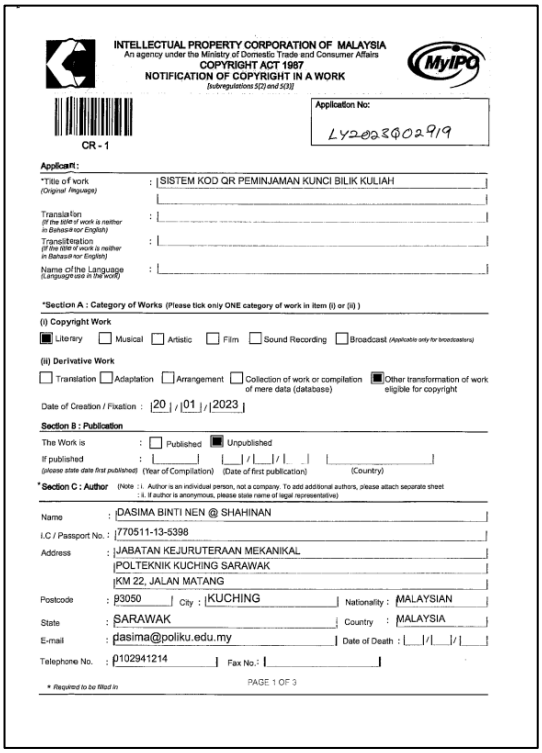
a) Penyeragaman pemegang kunci yang lebih baik
b) Masa pengajaran dan pempelajaran tidak dibazirkan dengan mencari kunci.
c) Pengguna boleh menjimatkan tenaga untuk berulang alik ke bilik kunci
d) Pengguaan sistem dapat menjimatkan wang dalam pembelian buku & pen untuk mendaftar peminjaman kunci
e) Meningkatkan keselamatan kunci di mana keberadaan kunci dapat dikesan dengan data pengguna sebelumnya
f) Boleh mengesan pengguna yang menggunakan kunci sebelumnya sekiranya kunci tidak dapat dikesan
g) Meningkatkan semangat pensyarah untuk membangunkan inovasi seterusnya menggalakkan pensyarah lain untuk mencetus idea inovasi bagi peningkatan sistem pengurusan di tempat kerja.

Kesimpulan

Sistem perekodan untuk tujuan peminjaman kunci di bilik kuliah atau mana-mana bilik guna sama di institusi adalah sangat penting. Sistem yang sedia ada secara manual banyak kekurangannya. Di antaranya kecuaian pegawai untuk tidak mengisi buku daftar kunci, mengisi salah maklumat dan mengisi dengan tulisan yang sukar dibaca. Dengan adanya inovasi sistem terbaru seperti ini, masalah peminjaman kunci dapat dikurangkan terutama dari segi keselamatan dan penjimatan masa dan tenaga. Sejajar dengan teknologi *Industrial Revolution 4.0* setiap institusi sepatutnya menambah dan menggiatkan lagi inovasi seperti ini untuk memantapkan sistem pengurusan di institusi agar lebih produktif dan berkualiti.

Pendaftaran MyIPo

Produk inovasi ini telah didaftarkan di bawah MyIPO pada 11 Julai 2023 dengan nombor pendaftaran LY2023Q02919.



INTELLECTUAL PROPERTY CORPORATION OF MALAYSIA
An agency under the Ministry of Domestic Trade and Consumer Affairs
COPYRIGHT ACT 1987
NOTIFICATION OF COPYRIGHT IN A WORK
[subregulations 5(2) and 5(3)]

CR - 1

Application No: LY2023Q02919

Applicant :

*Title of work (Original language) : SISTEM KOD QR PEMINJAMAN KUNCI BILIK KULIAH

Translation (if the title of work is neither in Bahasa or English) :

Transliteration (if the title of work is neither in Bahasa or English) :

Name of the Language (Language use in the work) :

*Section A : Category of Works (Please tick only ONE category of work in item (i) or (ii))

(i) Copyright Work
☑ Literary ☐ Musical ☐ Artistic ☐ Film ☐ Sound Recording ☐ Broadcast (Applicable only for broadcasters)

(ii) Derivative Work
☐ Translation ☐ Adaptation ☐ Arrangement ☐ Collection of work or compilation of mere data (database) ☑ Other transformation of work eligible for copyright

Date of Creation / Fixation : 20 / 01 / 2023

Section B : Publication

The Work is : ☐ Published ☑ Unpublished

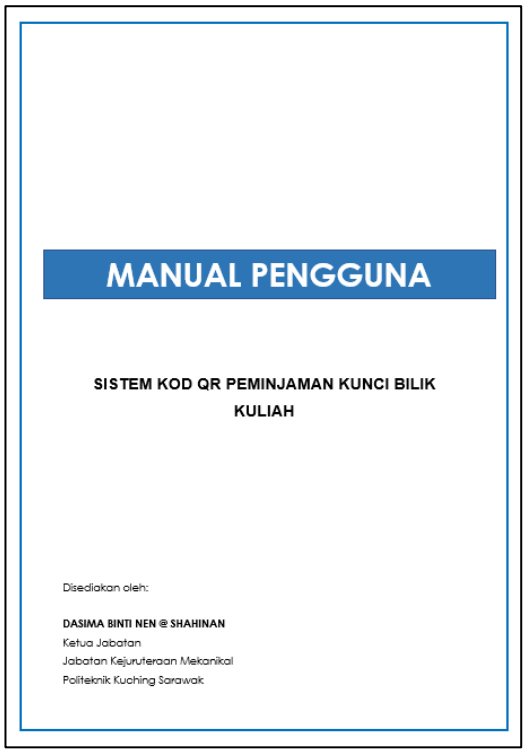
If published : ____ (Year of Compilation) ___/___/___ (Date of first publication) ____ (Country)
(please state date first published)

*Section C : Author (Note : i. Author is an individual person, not a company. To add additional authors, please attach seperate sheet
ii. If author is anonymous, please state name of legal representative)

Name : DASIMA BINTI NEN @ SHAHINAN
I.C / Passport No. : 770511-13-5398
Address : JABATAN KEJURUTERAAN MEKANIKAL
POLTEKNIK KUCHING SARAWAK
KM 22, JALAN MATANG
Postcode : 93050 City : KUCHING Nationality : MALAYSIAN
State : SARAWAK Country : MALAYSIA
E-mail : dasima@poliku.edu.my Date of Death : ___/___/___
Telephone No. : 0102941214 Fax No.:

* Required to be filled in

PAGE 1 OF 3



MANUAL PENGGUNA

SISTEM KOD QR PEMINJAMAN KUNCI BILIK KULIAH

Disediakan oleh:

DASIMA BINTI NEN @ SHAHINAN
Ketua Jabatan
Jabatan Kejuruteraan Mekanikal
Politeknik Kuching Sarawak

Rujukan

S. Tiwari, "An Introduction to QR Code Technology," *2016 International Conference on Information Technology (ICIT)*, Bhubaneswar, India, 2016, pp. 39-44, doi: 10.1109/ICIT.2016.021.

Prasetya, R., & Supriyono, H. (2019). Sistem Peminjaman Sepeda Otomatis berbasis QR Code. *Emitor: Jurnal Teknik Elektro*, *20*(1), 26-31.

Saputra, E., & Purnamasari, S. D. (2019). RANCANG BANGUN SISTEM PEMINJAMAN BUKU MENGGUNAKAN QR CODE PADA UNIVERSITAS BINA DARMA BERBASIS ANDROID. In *Bina Darma Conference on Computer Science (BDCCS)* (Vol. 1, No. 5, pp. 2053-2060).

Pisau Toreh Smart

Mohamad Mursyid Mohd Yusof, Muhammad Rafiqi Aiman Abdul Rahman, Chung Boon Chuan
Politeknik Kota Bharu, Kelantan
bchuan@pkb.edu.my

Abstrak

Penorehan getah merupakan satu proses yang penting, jika cara penorehan tidak betul atau tidak mengikut seperti yang disyorkan ianya akan menjejaskan hasil pengeluaran getah. Dengan kaedah dan peralatan penorehan yang betul akan dapat menyumbang kepada hasil susu getah yang maksimum. Pencetus idea dalam menghasilkan PISAU TOREH SMART ini adalah dari kajian lapangan yang telah dibuat di kebun getah Bukit Merah selama sebulan. Kaedah torehan secara tarik akan menyebabkan penoreh menggunakan daya tenaga yang tinggi dan ini akan meletihkannya. Dengan menggunakan kaedah torehan pisau toreh yang biasa, kedalaman torehan kulit pokok getah adalah sukar dikawal oleh penoreh, tambahan pula pelbagai ketebaran kulit pokok mengikut umur pokok. Berpandukan beberapa masalah ini inovasi Pisau Toreh Smart ini dihasilkan dengan menggunakan kaedah Design Thinking Model, yang melibatkan 5 proses iaitu Empathize, Define, Ideate, Prototype and Test. Inovasi ini melibatkan ciptaan yang baru secara pakej. Pisau Toreh Smart yang kreatif ini melibatkan mata pemotong boleh boleh laras , power bank dan Pemeggang boleh laras menghasilkan pelbagai kawalan ttorehan. Kos untuk menghasilkan Pisau Toreh Smart ini hanya RM200.00 untuk satu set lengkap. Inovasi yang dihasilkan ini merupakan salah satu hasil produk dari pembelajaran kursus projek semester 4 dan 5 (DEE40082 DAN DEE50102). Inovasi ini juga dijadikan satu model untuk kursus projek untuk pelajar yang akan mengambil kursus projek semester 4 dan 5.

Kata kunci: Design Thinking; Empathize; Define; Ideate; Prototype ; Test

Pengenalan

Industri getah asli di Malaysia bermula pada tahun 1877 di Kuala Kangsar, Perak. Anak getah yang ditanam adalah spesis Hevea brasiliensis. Estet getah pertama telah dibangunkan di Melaka pada tahun 1902/1903. Selepas itu keluasan penanaman getah terus berkembang hingga mencapai kemuncaknya iaitu seluas 2.06 juta hektar pada tahun 1979. Pengeluaran tertinggi yang pernah dicapai oleh negara ialah sebanyak 1.66 juta metrik tan iaitu pada tahun 1988. Secara ringkasnya pokok getah berasal dari negara Brazil. Christopher Columbus ahli pelayaran Sepanyol ialah orang pertama menjumpai getah di Brazil pada tahun 1473 dan beliau telah membawa balik ke Eropah untuk dikaji kegunaannya.

***Design Thinking*:** Inovasi ini menggabungkan *design thinking* sebagai pendekatan penyelesaian masalah dan melibatkan lima fasa—*Empati, Define, Ideate, Prototype* dan *Test*.

***Empathy*:** Pada peringkat ini, pengkaji cuba bersikap empati untuk memahami masalah penoreh-penoreh getah dengan membuat kajian lapangan, untuk mengetahui keperluan dan masalah yang mereka hadapi semasa proses menoreh getah setiap hari. Ia memberi tumpuan kepada kaedah dan alat penorehan yang penting dalam inovasi yang akan dihasilkan.

***Defining the Problem*:** Pada peringkat ini, penyelidik menganalisis maklumat yang telah dikumpul dan mensintesiskannya supaya dapat mengenal pasti dan mentakrifkan masalah sebenar yang dihadapi oleh penoreh-penoreh getah ini. Ahli pasukan juga membincangkan idea untuk menyelesaikan masalah ini.

***Ideate*:** Hasil daripada menjana idea kreatif, ahli kumpulan bersetuju untuk mencipta Pisau Toreh Smart yang boleh menyelesaikan masalah berkaitan. Memandangkan kosnya yang rendah, pelaksanaan pantas, impak tinggi dan kemampanannya. Analisis SWOT digunakan untuk melengkapkan cadangan yang telah dibuat iaitu hasil ahli pasukan dengan menghasilkan prototaip terlebih dahulu.

***Prototype*:** Ahli kumpulan telah menghasilkan prototaip pertama dan menambah baik pada prototaip kedua yang lebih baik dan lebih sesuai. Di samping itu, kumpulan telah menghasilkan set komponen yang lengkap untuk memudahkan proses ujian.

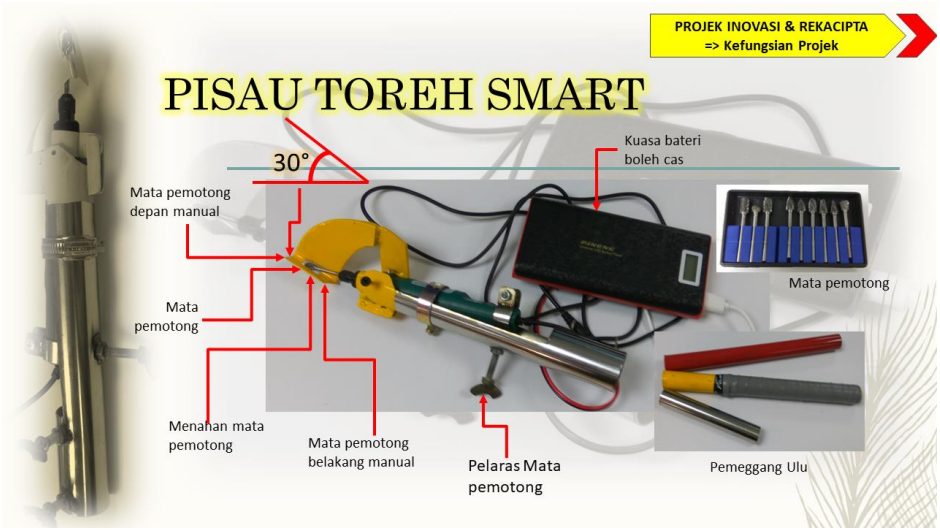
Test: Pengujian dan pelaksanaan telah dijalankan di ladang getah Kok Lanas, untuk mengumpul data dan menilai keberkesanan projek.

Penerangan Produk

Pisau Toreh Smart mempunyai ciri-ciri inovasi :

i. Menahan mata pemotong : untuk mengelakkan torehan terkena batang pokon
ii. Mata pemotong depan manual : untuk membuat torehan pada hujung atas alur
iii. Mata pemotong belakang manual : untuk membuat torehan hujung bawah
iv. Mata pemotong boleh laras ketebalan torehan: untuk mengawal ketebaran torehan
v. Mata pemotong boleh tukar: untuk menukar mata pemotong mengikut keadaan kulit getah dan umur pokok

vi. Pemeggang Ulu: untuk laras dan tukar ulu mengikut kesesuaian dan keperluan pengguna
vii. Sudut mata torehan: untuk mengawal sudut torehan 30°
viii. Kuasa bateri boleh cas (Power Bank). Bateri ringan dan tahan lama
ix. Motor berkuasa rendah dan jimat kuasa
x. Satu alat Inovasi yang mudah,ringkas dan senang digunakan serta tidak perlu kemahiran yang tinggi
xi. Mudah diselenggara oleh pengguna



Keputusan & Perbincangan

Penjimatan Masa : Pisau Toreh Smart dapat menjimatkan masa torehan kerana menggunakan motor dan dapat mengawal ketebalan torehan dengan mudah, Pengguna dapat membuat torehan yang lebih cepat tanpa menggunakan tenaga yang banyak. Pemasangan Pisau Toreh Smart mudah dan senang.

Penjimatan kos : Bateri untuk Pisau Toreh Smart adalah murah dan pengguna boleh membuat penyelenggaraan sendiri. Kos menghasilkan alat ini murah. Untuk satu set SMART PORTABLE TAPPER kosnya sebanyak RM200

Tahan lama : Pisau Toreh Smart tahan lama kerana mata pemotong dibuat daripada Stainless Steel begitu juga alatannya

Peningkatan produktiviti : Mengelakkan kerosakan pokok Mempunyai ciri-ciri kawalan terhadap penorehan yang diperlukan mengikut spesifikasi yang ditetapkan

Peningkatan hasil kebun : Penorehan yang sekata dan mengikut spesifikasi akan memperoleh hasil yang maksimum. Tiada kerosakan pada pokok getah. Jangka hayat penorehan boleh dipanjangkan

Mudah digunakan : Pisau Toreh Smart Mudah digunakan kerana pengguna hanya perlu "ON" kan switch sahaja

Ulu boleh laras dan tukar : Ulu boleh laras dan tukar mengikut kehendak pengguna

Model pembelajaran kursus projek: projek dihasilkan ini juga dijadikan satu model hasil pembelajaran bagi kursus DEE40082 dan DEE50102 projek.

DATA UJIAN: LAPANGAN Purata sebatang pokok mengambil masa 8.4 saat

UJICUBA	MASA TOREHAN (SAAT)
1	10
2	11
3	9
4	9
5	8
6	9
7	7
8	6
9	8
10	7
JUMLAH	84
PURATA	84/10
	8.4 SAAT

Jadual 1: Data ujian lapangan masa torehan

DATA UJIAN: POWER BANK

peratus Power Guna	Masa penorehan
5%	20 minit

Jadual 2: Data ujian lapangan ketahanan bateri

100% = 100/5 *20 (minit)
= 400(minit)
= 400/60 (JAM)
= 6.67 (JAM)

Kesimpulan

Pisau Toreh Smart yang dihasilkan telah mencapai objektif yang diperlukan dan mengikut kehendak spesifikasi yang telah ditetapkan. Malah ia juga boleh dilaras melebihi spesikasi yang diperlukan

Rujukan

Christian, M. (2018). Handbook of Design Thinking. Kindle Direct Publishing.

Rafain Ahuar, Zaimah Darawi & Mohd Noor Mamat (2012). Membina Senario Masa Hadapan Industri Getah Malaysia: Road Map dan Pemacu Utama Industri. Prosiding PERKEM VII.

AVOCAPALE

Muhammad Haziq Hafizi Zaini, Nur Nisrina Azreen Shahrulrizal, Chow Lai Kim, Siti Rahayu Ahmad Subri
Perak Matriculation College, Gopeng, Perak, Malaysia
E-mail addresses: m-6393130@moe-dl.edu.my, m-6319223@moe-dl.edu.my, bm-1444@moe-dl.moe.my, bm-1620@moe-dl.edu.my

Highlights:

Plastic has been quite detrimental to the environment during these past few decades. The usage of plastic itself has killed a lot of life whether it be plants or animals. In this innovation project, we use Avocado-based bioplastic because it can withstand a lot more load than traditional petroleum plastic bags. Furthermore, it can dissolve in water a lot easier so that aquatic life will be no harmed if this bioplastic being consumed. In addition, it also helps to reduces the usage of petroleum-based plastics that are nonbiodegradable. Moreover, it's a lot easier to make by using basic kitchen supplies and tools.

Key words: Bioplastic; avocado; biocomposite; agricultural waste

Introduction

Bioplastics are plastic materials produced from renewable biomass sources, such as vegetable fats and oils, corn starch, straw, woodchips, sawdust, recycled food waste, etc. Bioplastic can be made from agricultural by-products and also from used plastic bottles and other containers using microorganisms. Common plastics, such as fossil-fuel plastics (also called Petro based (polymers) are derived from petroleum or natural gas. Not all bioplastics are biodegradable nor biodegrade more readily than commodity fossil-fuel derived plastics. Bioplastics are usually derived from sugar derivatives, including starch, cellulose, and lactic acid.

Avocado seeds are usually in an oblate, round, conical or ovoid. Seeds colors ranged from yellowish brown to reddish brown. Although the avocado seed contains various nutrition and benefits, it is poisonous when raw. That is because in an uncooked avocado, it contains cyclopropane fatty acids. The avocado seeds hold a high starch content in about 30%. Being high in starch, many of food technologists and scientists regard avocado seeds as a potential candidate for a lot of other food substitute. Starchy food also carries fibers, which aids digestion and avoid constipation and other digestive problems. One of the minerals that have been postulated is highly contained in avocado seeds is zinc. It holds a vital position in our body by acting as a catalyst for more than 100 enzymes in the metabolism. The avocado seeds also contain a certain amount of calcium and other healthy compounds capable of providing nutritional intake for bone and teeth.

Product Description:

Since we are in Asia, we've decided to use one of the most neglected parts of a Avocado fruit and that is its seed. The seed surprisingly has high contents of starch and a lot easier to find in Malaysia and even surprisingly in Indonesia rather than the more unusual industrial grade starch. The Avocado fruit or its scientific name is 'Persea Americana' that we are using its seed as our alternative to replace the starch as the main component of our bioplastic.

We are using the seed of the fruit to convert it into a flour-like powder. We mix it with various ingredients to ensure our final product has similar characteristic with the harder to be made starch-based bioplastic. The benefits of our Avocado-based bioplastic are it can withstand a lot more load than traditional petroleum plastic bags. Furthermore, it can dissolve in water a lot easier so that aquatic life will be no harmed if this bioplastic being consumed. In addition, it also helps to reduces the usage of petroleum-based plastics that are nonbiodegradable. Moreover, it's a lot easier to make and can truly being made using basic kitchen supplies and tools.

Results & Discussion

The experiment 1 aims to determine how much weight can the Avocapale bioplastic handle before breaking without the disturbance of other factors. The fixed variable is the diameter of the bioplastic, while the manipulated variable is the weight suspended, and the responding variable is the total weight the bioplastic can withstand before breaking. Using different diameters (6 cm, 8 cm, and 10 cm) of Avocapale bioplastics, the procedure involves securing each plastic on a retort stand and hanging a 1kg slotted weight initially. Additional weights are incrementally added until the bioplastic breaks, recording observations at each stage. This process is repeated for all three diameters to gather comparative results on their weight-bearing capacities. Table 1 and Figure 1 below show the result of the experiment. The weight that can be accommodated by the Avocapale bioplastic increases when the diameter of the bioplastic increases.

Table 1: Result of Experiment 1

Diameter of Avocapale bioplastic (cm)	Weight that can be accommodated (g)
3	200

6	400
9	600

Based on the test carried out to know the exact weight a Avocapalebioplastic with different diameter can handle before it starts to crumble, we can conclude that the maximum weight our bioplastic can handle is around 200g for each 3 cm diameter bio-plastic before it starts to break and buckle. The experiment shows that our bioplastic can still hold load lots of load and is able to hold itself a lot longer than expected.

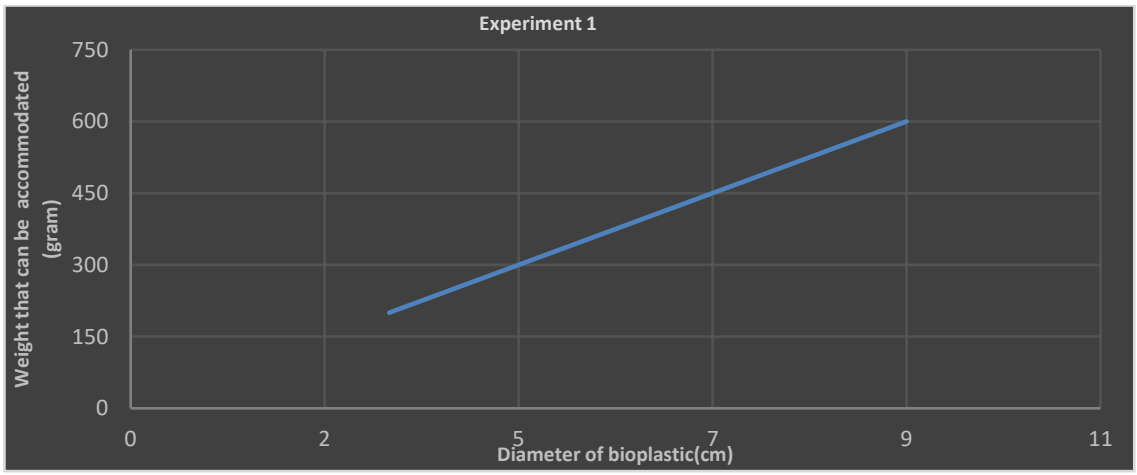


Figure 1: Experiment on the exact weight a Avocapale bioplastic with different diameter can handle before breaking

The aim of experiment 2 is to determine how much time needed for a 4cm^2 Avocapale bioplastic to fully dissolve in various water temperatures in an enclosed environment. The hypothesis was that the shortest time needed for a 4cm^2 Avocapale bioplastic to fully dissolve in water is 10 minutes and at temperature 90°C. The manipulated variable is the temperature of water in three separate beakers (30°C, 60°C, and 90°C), the responding variable is the time taken for complete dissolution of the bioplastic, and the fixed variable is the volume of distilled water (200ml) in each beaker. The materials include the bioplastic and distilled water, with apparatus such as 300ml beakers, water baths, thermometers, and a timer. The procedure involves labeling three beakers (A, B, and C), pouring 200ml of distilled water into each, placing them in water baths set to designated temperatures, submerging the bioplastics in the respective beakers, and recording the time taken for eh bioplastics to fully dissolve. Thermometers, ensuring they don't touch the beaker walls, monitor water temperatures throughout the experiment for accuracy. Table 2 and Figure 2 shows the result of experiment 2. Water sample A took the most time for the bioplastic to dissolve compared to water sample B and C respectively. This is because the low temperature of the water is causing the molecule bond inside the components of the bioplastic to break up and separate a lot slower than the other bioplastics inside higher temperature water baths. Avocapale in tested shown that it can be used widely across all school's canteen and can normalize the students with practicing fertilization habits.

Table 2 : Result of Experiment 2

Water samples	Temperature (°C)	Time taken to dissolve (minutes)
A	30	45.7
B	60	23.4
C	90	10.5

From the results on the experiment for the shortest time needed for our bioplastic to fully dissolve in water is 10 minutes at 90°C. It can be said that the higher the temperature of the water sample the shorter the time it takes for the bioplastic to dissolve completely.

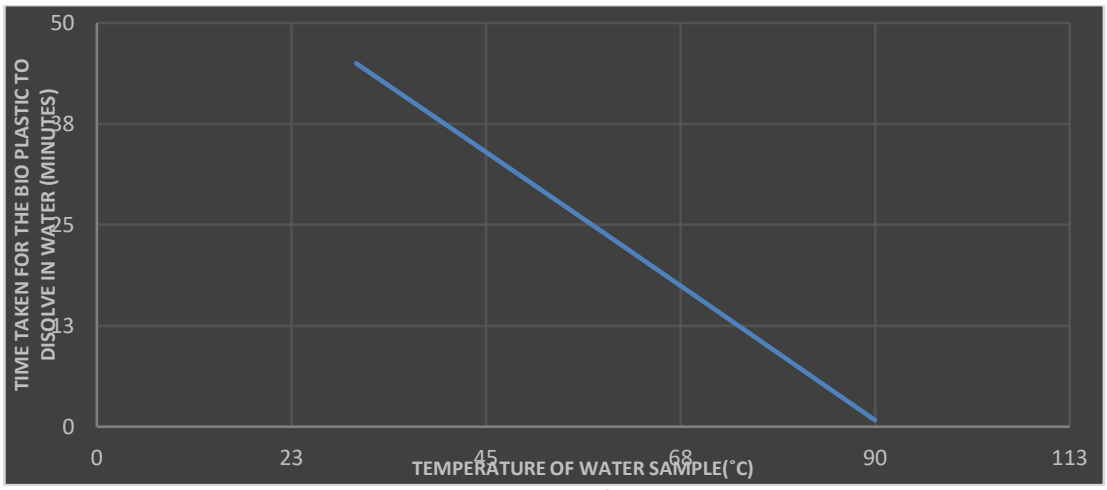


Figure 2 : Experiment on the dissolvability of a 4cm^2 Avocapale bioplastic in distilled water.

Conclusion

The Avocapale innovation being utilized in this context is undeniably an exquisite idea for a better world and its environment. It not only helps improve marine life populations after water pollution incidents but also eliminates the possibility of harming the soil due to its toxicity. Through this Avocapale innovation, we have successfully transformed it into a natural fertilizer that can decompose over time, unlike petroleum-based plastics. Furthermore, students can easily create it with cost-effective materials, making it an ideal option for their practical studies.

In our ongoing efforts to enhance this innovation, our team is exploring the use of fruit-based materials from specific countries, such as durian and rambutan seeds. These seeds contain a high volume of starch, making them excellent candidates to further improve and expand the Avocapale concept. This approach not only addresses the issue of marine pollution but also contributes to a more sustainable and eco-friendly solution.

Publication, Award and Intellectual Property

- International Warsaw Invention Show (IWIS2020), Diploma Silver Medal
- European Exhibition of Creativity and Innovation (Euroiinvent2021), Diploma Gold Medal & WIIPA Special Award
- 10th Malaysia International Young Inventors Olympiad (MIYIO2022), Silver Award & Best Youtube Video

References

Cho, Renee. (13 December 2017). The Truth about Bioplastics. Columbia Climate School. Retrieved from: https://news.climate.columbia.edu/2017/12/13/the-truth-about-bioplastics/

Gerngross, T.; Slater, S. (August 2000) How Green Are Green Plastics? Scientific American. Retrieved from: https://www.acs.org/content/dam/acsorg/education/resources/highschool/chem atters/videos/chemmatters-april2010-bioplastics.pdf

Kyle Hall. (3 May 2023). How To Make Bioplastic. Petersburg, Florida. wikiHow. Retrieved from: https://www.wikihow.com/Make-Bioplastic

M Cornelia and A Christianti. (2018). Utilization of modified starch from avocado (Persea americana Mill.) seed in cream soup production. IOP Publication. Retrieved from:https://iopscience.iop.org/article/10.1088/1755-1315/102/1/012074/pdf#:~:text=Avocado%20seeds%20contain%20about%2030,natural)%20starch%20and%20modified%20starch.

Manuel Neila Matas. (15 April 2015). The Advantages of Bioplastics. Seville, Spain. Abengoa S.A. Retrieved from: http://www.theenergyofchange.com/advantages-bioplastics

Ziegler, J. (August 2009) Metabolix Defies Skeptics With Plastic From Plants (Update 2), Bloomberg.com. Retrieved from: http://www.bloomberg.com/apps/news?pid=conewsstory&tkr=MBLX:US&sid=a14PM9E9M4r4

AI companion

Samprreethaa a/p Mahenthran 1, Nurin Qistina binti Shamsul Anwar 2, Ubashini a/p Krishnan 3, Jayanee Thanabalan 4, Nurin Hayati binti Mohd Zunaindy 5, Uvathi a/p Mariappan 6

Kolej Matrikulasi Perlis, 02600, Arau, Perlis[1,2,3,4,5,6]

samprreethaa1905@gmail.com 1

Introduction

Within the realm of education, one encounters a diverse spectrum of students, each with their unique learning preferences and habits. Some students thrive amidst the melodic strains of music, finding it conducive to their study routine, while others seek the camaraderie and collaborative energy of group study sessions. On the opposite end of the spectrum are those who relish the solitary pursuit of knowledge, finding solitude to be their ideal learning environment.

However, the complexities arise when we consider the needs of introverted students who primarily prefer studying alone but occasionally yearn for companionship, be it for intellectual discussion or simply to break the monotony of solitude. Similarly, students who opt for solitary study often do so to minimize distractions and maintain a laser-like focus on their academic pursuits, making quick access to answers for their questions a top priority.

Furthermore, the importance of maintaining one's physical and mental health cannot be overstated, especially for students who find themselves studying far away from the comforts of home. The rigors of academia can often lead to neglecting essential aspects of self-care, which can have detrimental effects on both academic performance and overall well-being.

These multifaceted challenges demand innovative and effective solutions. In our contemporary world, where technology is seamlessly integrated into daily life and education, we have an incredible opportunity to leverage its capabilities to address these issues. It is within this context that our AI Companion app steps in to offer invaluable assistance.

This AI Companion app is designed not only to facilitate study sessions by providing companionship when needed but also to act as an instant knowledge resource, offering prompt answers to questions, thereby enhancing the productivity of solitary study sessions. Moreover, it incorporates features to promote student health and well-being, providing reminders for regular breaks, exercise routines, and nutritional guidance.

In this ever-evolving educational landscape, our AI Companion app serves as a testament to the potential of technology to adapt and cater to the unique needs and challenges faced by students in their pursuit of academic excellence and personal growth.

Product Description

The AI Companion app comprises two integral sections, each serving distinct but equally crucial functions: the academic section and the healing section. What sets our app apart is its ability to replicate the experience of conversing with a human, creating a profoundly realistic and effective interaction between users and artificial intelligence.

In the academic section, users have the freedom to pose an array of study-related questions, unlocking a treasure trove of knowledge. The AI within the app excels in providing not just answers but also comprehensive explanations and elaborations. Users can delve into diverse fields of study, from general science inquiries to specific domains like biology or economics. The app's expansive knowledge base ensures that users receive accurate, insightful, and in-depth responses tailored to their academic pursuits.

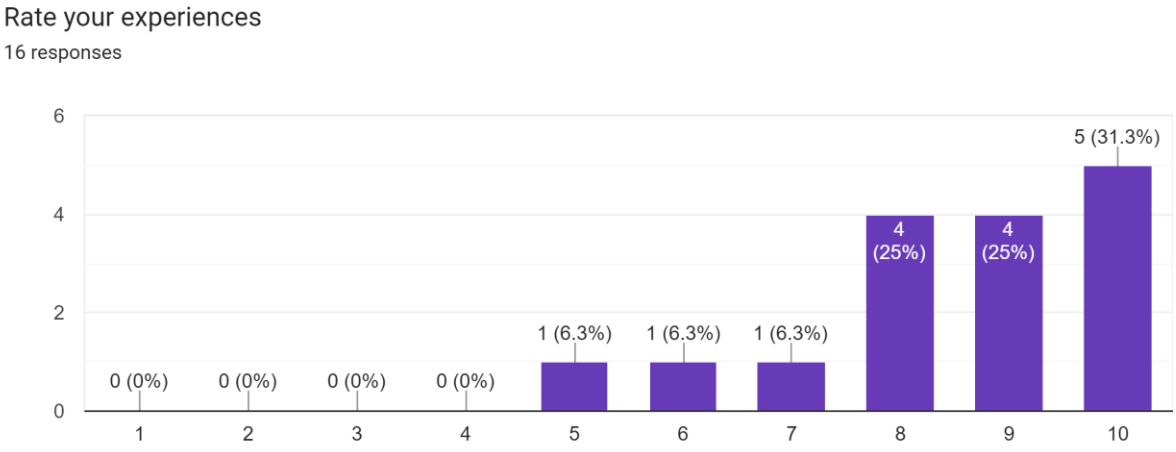
Switching gears to the healing section, the AI Companion app takes on a deeply empathetic role. Here, it serves as a guardian of users' mental well-being. Through sophisticated algorithms and compassionate programming, the app keeps a vigilant eye on the mental health of its users. It's a safe space where users can open up and share their innermost thoughts and emotions, free from fear of judgment or embarrassment.

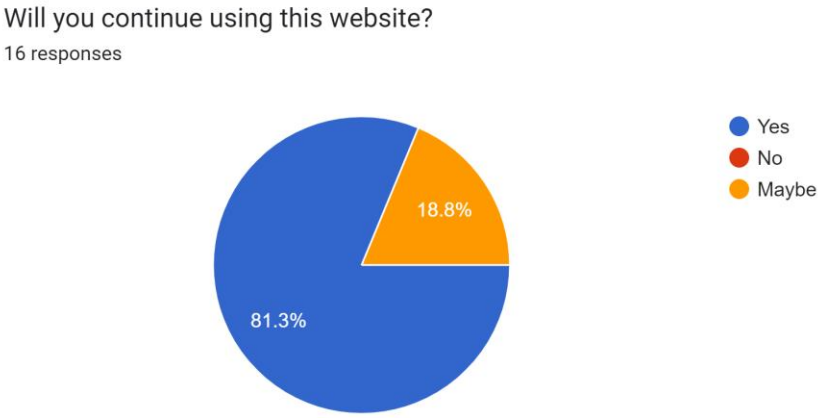
Whether one is grappling with stress, seething with anger, or overwhelmed by the urge to shed tears like a torrential rain, the AI Companion app is there to lend a compassionate ear and a virtual shoulder to cry on. It offers responses that are not just relevant but also rational, guiding users towards constructive solutions and offering solace in times of distress.

By encompassing both academic and mental health dimensions, this app becomes an indispensable companion on the journey of personal growth and self-improvement. It not only empowers users with knowledge but also nurtures their emotional well-being. In an era where digital solutions are often seen as detached, our AI Companion app stands out as a testament to technology's capacity to enhance and support the most fundamental aspects of human existence: the pursuit of knowledge and the preservation of mental health.

Results & Discussion

In my role as the app's creator, my team and I have distributed Google forms to gather feedback on our application. We have reached out to at least 16 students, spanning across various educational levels from primary school to college, to collect their input and insights. This is aimed at app development with the goal of optimizing its utilization. This will empower students to make the most of the app for their benefit. All students have completed this form after using our app, AI Companion from 4 September to 9 September. Throughout these six days, students have used all the features in the app. For instance, students are able to find solution for their academic problems using this app and able to share their problems they're facing; they got rational advice and an emotional companion. These are the results of the survey:





Based on our survey findings, it's clear that the majority of students are enthusiastic about our concept and app. This is primarily because they express a high level of satisfaction with our app, which is evident among virtually all the students surveyed. Additionally, almost all 16 students express contentment with the features we have incorporated into our application. For instance, human generated AI answering to study related questions and free counselling session if needed.

Conclusion

In the future, we intend to improve our app and introduce new features. This makes sure students are able to optimize the benefits of AI companion. Initially, we will introduce a feature known as 'Physical Well-being.' It's important to recognize that sound physical health plays a pivotal role in enhancing our mental well-being, ultimately boosting our academic performance. To illustrate, this feature will encompass a checklist covering aspects such as hydration, sufficient sleep, consistent exercise, regular screen breaks, and a well-balanced diet.

References

Thunkable Tutorial for Beginners 2022 (Better than Bubble.io?) | Build A No Code App With Thunkable.
https://youtu.be/lQc1IPqj5jU

How to Design a Thunkable App (2 of 4)
https://youtu.be/wqHUomFRaTY?si=YleDqEjlym4dhrXD

How to Customize a Data Viewer in Thunkable
https://youtu.be/O6ohlj0ZfMg?si=EmCWrGqrFLjOGtAm

Bio-Enzyme Detergent

Tharin A/L Bamrong[1],Livaashini A/P Thayalan[2],Khor Chek Lin[3], Thong Kit Qi[4],Keerthana A/P Inderan[5]
Perak Matriculation College,Gopeng ,Perak ,Malaysia (Kmpk)

m-6523961@moe-dl.edu.my[1],m-7389130@moe-dl.edu.my[2],m-6502438@moe-dl.edu.my[3],m-6228358@moe-dl.edu.my[4] , m-6502894@moe-dl.edu.my[5]

Introduction

The dangers of additives in our food, cosmetics, and personal care items are becoming more widely known, but laundry products are sometimes overlooked. Conventional fabric softeners and laundry detergents, however, can leave chemical residues on garments that are easily absorbed by the skin. For those with sensitive skin, conventional laundry detergent can be particularly problematic as it may result in inflammation, or irritation. These negative effects are frequently caused by substances including optical brighteners, synthetic scents, and synthetic fragrances. That is why our team has come out with innovation that is to make bio-enzyme detergent using bio enzyme which is human and environmentally friendly.

***Key words*:**
Environmentally friendly; Human friendly ; bio-enzyme detergent ; bio enzyme,

Product description

Our team's main idea is to make bio detergent out of natural ingredients that are commonly available. After conducting some research, we came to know that soapnuts have the ability to replace commercial detergent. Soapnuts are basically dry fruits of Ritha tree. Soapnuts are said to be highly effective and gentle at the same time on the cloths. Research also said that soapnuts are allergy free and good for all skin type. The problem is that how sure does soapnuds remove all the stains from dirty cloths. Hence, we decided to combine the idea of making enzyme which can help to remove the stains and also produced naturally at the same time. Bio enzyme that we make as our contains jaggery. Jaggery has the potential to accelerate fermentation. This help the enzyme to not attract any insects. The product will not stink either. We also use citrus fruit peels in bio enzyme for better stain cleaning. For commercial purposes, we added natural fragrances which are rose petals. Overall, we believe our product will be able to be a great substitute to chemical detergent available in market as it can be prepared at home easily and naturally.

The process of making bio detergent

Objectives : 1) To produce bio detergent using bio enzyme
2) To test the effectiveness of bio detergent produced

Materials : 1) Soapnuts
2) Used citrus fruit peels (lime and orange)
3) Jaggery
4) Freshly plucked rose petals

Apparatus : 1) Hot plate
2) Measuring cylinder (100ml x 2)
3) Containers x4
4) Spatula
5) Dropper
6) Knife
7) White tile
8) Filter funnel
9) Beaker (250ml x 2)

Procedure:

Part A: To produce bio enzyme

1. The used citrus fruit peels are cut into smaller pieces.
2. The container is filled with 400ml of tap water using a measuring cylinder.
3. The mass of soapsuds and jaggery are weighed using analytical balance and recorded.
4. The jaggery is put in the container filled with water to dissolve the jaggery. The solution is stirred using a glass rod.
5. The solution is filtered using filter paper and filter funnel into a beaker to filter out the residue of jaggery in the solution that cannot dissolve.
6. The used citrus fruit peels are added into the solution.
7. The flower petals are added into the container as solution.

8. The solution is left for one week.

Part B: To prepare bio detergent

1. 250Ml of water is added into the beaker containing soapnuts.
2. The solution is boiled until foamy texture is formed.
3. The solution is cool to room temperature.
4. The solution is filtered using filter paper and filter funnel to get the filtrate of the soapnuts.
5. The bio enzyme solution is mixed with the soapnuts filtrate at different ratios.
6. The mixture is stirred using glass rod until the homogeneous solution is produced.

Part C: To test the effectiveness of the bio detergent

1. The old cloth is cut into pieces.
2. The stained cloth pieces are placed into different containers and labelled.
3. Bio detergent is added to the samples and left for 5 minutes.
4. The data is recorded in a table.

Results & Discussion

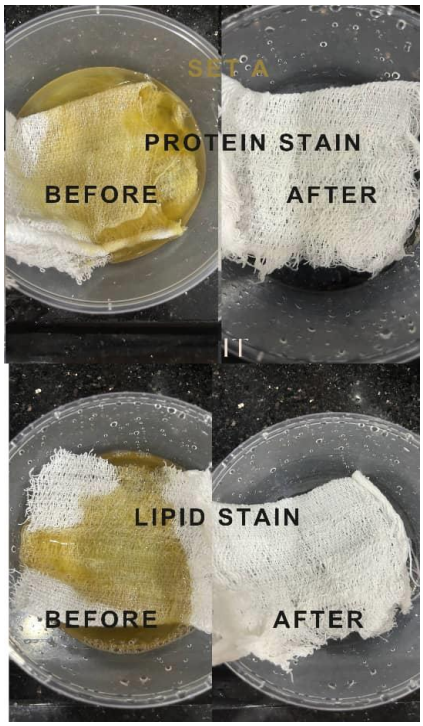
Part A

Materials	Mass (g)
Soapnuts	56.9254
Fruit peels	76.0538
Jaggery	45.0755

Testing

Sample A : 50ml soapnut solution and 100ml bio enzyme
Sample B : 50ml soapnut solution, 50ml bio enzyme and 50ml water
Sample C : 50ml soapnut solution,25ml bio enzyme and 75ml water

Sample	Remove Lipid Stain(Oil) Completely In 5 Minutes	Remove Protein Stain (Egg Yolk)Completely In 5 Minutes
A	Yes	Yes
B	No	Yes
C	No	Yes



SET A

SET B

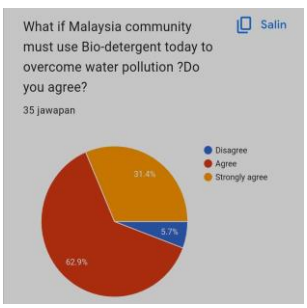
SET C

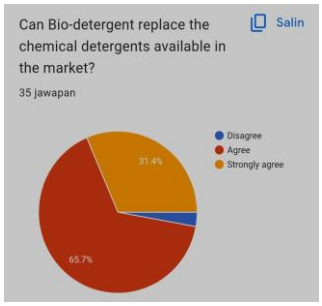
Based on our experiment, sample A was able to remove both lipid and protein stain effectively. Sample B was able to remove protein stain effectively however, lipid stains were slightly left behind. Sample C was able to remove protein stain however, a bigger stain was left behind when tested with lipid. Therefore, the most ideal ratio of mixing to produce bio-enzyme detergent is sample A that contains 50ml of soapnut solution and 100ml of bio enzyme.

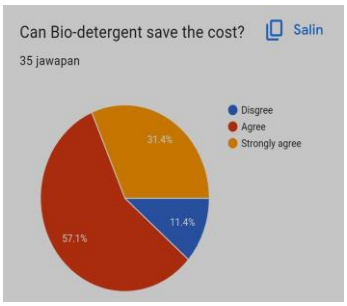
Our team came out with a survey in the form of google form which was shared to the students who are studying in KMPk Institution. The purpose of this survey is to know what others thing about our innovation project.

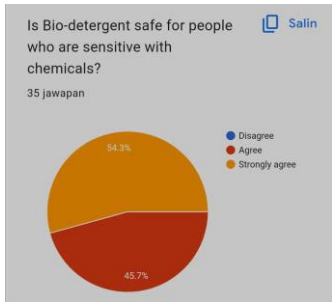
The survey results are as follows:

Based on the survey, we can conclude that most of the people agree that our product is able to overcome water pollution, replace chemical detergents available in market, save the cost and safe for people who are sensitive with chemicals. However, there are a small number of people who disagreed with our product. Therefore, there must be some improvement need to be done in order to make our product more sustainable and demanding in the future.









Impact towards students :

1) Students are educated about the knowledge of the function of bio enzyme which can be used to apply in their daily life .
2) Allow the students to be more creative and innovative in producing products using natural things.
3) Bio enzyme cleaners encourage a zero-waste lifestyle as it is a sustainable way to clean the clothes.
4) Students are able to make money by innovating our bio detergent product and sell them to make extra income.
5) Educate the students about the effects of using commercial detergent to our environment.

6) Give knowledge to the students about the function of soapnuts in bio detergent which is safe to the skin.
7) Students are able to know the type of skin diseases which are caused by chemical detergent.

Conclusion:

Based on our research, experimental results and survey our product is able to solve the major problem that we face which is the effect of commercial detergent towards the users and environment. If our product is commercialised, this product is able to solve the problems such as skin diseases, high cost ,overcome water pollution effectively, educate student and will be beneficial to the industry. In long run, we believe our product can replace all the chemical detergents available in market which will lead to a healthier and safer society.

Acknowledgement

Our sincere thanks to Madam Chow Lai Kim, Chemistry Lecturer in Perak Matriculation College who guided and provided us with all the apparatus needed for our innovation project. We also thank the students of Perak Matriculation College for helping us by answering the survey which was useful to analyse, understand and improve our product.

References (Use APA format)

1. WHAT ARE SOAPNUTS?. (n.d.). Retrieved from
2. How Do Biological And Non-Biological Detergents Work. (n.d.). Retrieved from
3. Aviaska Wienda Saraswati.(2022, December 6). Detergent Waste Endangers Environment and Human Health.
4. The Ecology Works.(2022, Disember 15). Retrieved from
5. Kendra Cosenza.(2022, June 7). Biological versus Non-Biological Detergents: What's the Difference?
6. William Esketch Lever. (2023). The Editors of Encyclopedia Britannica
7. Calista Raviella (29 September 2014).https://prezi.com/is0wi2ezrgix/experiment-between-biological-and-non-biological-washing-pow/

Title : the development of digital flashcard: investigating the effectiveness of e-terabest

Nurriswin Jumadi[1], Siti Norzekhan Che Aziz[2]
Kolej Komuniti Jelebu, Kuala Klawang, Malaysia[1]
Kolej Komuniti Segamat, Segamat, Malaysia[2]
nurriswin@s.unikl.edu.my[1], rensa_renz@yahoo.com.my[2]

Highlights: Terabest is a flashcard that contains procedures and diagrams to effectively set-up the total station tool. Through observation, students had trouble in using Terabest during practical on-site. E-Terabest was then upgraded into Mobile Apps. From the survey results, the knowledge transfer using E-Terabest showed positive results on understanding and efficiency. Knowledge transfer using E-Terabest may change the learning atmosphere to be more interesting, easier and effective time consuming. E-Terabest is also relevant to be used by students who take the subject of level measurement at colleges and universities.

Key words: Travers; surveying; flashcards; total station; E-Terabest

Introduction

After the world is faced with the COVID-19 pandemic, digital learning is the main medium in continuing the learning session. Digital learning means any learning that includes technology and uses small or large scale electronic devices as a medium, uses the internet and can be implemented in different locations. Era revolution 4.0 has changed aspects of education to improve pedagogy and successfully manage time effectively during learning sessions (Sudrajat et al., 2023). The Malaysian Ministry of Education (KPM) and Google Malaysia have trained 5000 school teachers and made the DELIMa program an official digital learning program since 2019 (Asri, 2021).

In 2019, student enrollment at Jelebu Community College record the highest intake since 2003. The quota for the number of students provided is only 30 people, while the student intake is 60 people. So, the lack of teaching staff to meet the needs of students in the subject of Traverse Surveying is worrying. The instructor is unbearable to fully monitor all students during the practical. So, the flash card initiative was developed to help teachers meet the needs of students.

Flashcards are frequently used to memorize vocabulary, historical dates, formulas, and anything else that can be learned using a question-and-answer format. Now, in line with technology, digital flash cards have been widely developed in the form of applications that can be used on smartphones. Terabest is a flashcard that contains a procedure to set up a total station on a station that has been set. In the beginning, Terabest was a physical flashcard which in A5 size (14.8 cm x 21 cm). However, through observation, even though Terabest may reduce student's time consumption for setting up, but there is still weakness that need to be improved. During on-site land surveying, students often forget to bring Terabest along with them and they faced difficulty to print Terabest. Therefore, e-Terabest was created through the FlipHTML5 application. Through this application, all students may use Terabest through their smartphone, tablet, or laptop. In addition, in supporting the Government's call to empower digital learning, e-Terabest might help learning process become more effective. According to Ying et al. (2022), learning Mandarin by using flashcards has increased students' vocabulary and interest in learning Mandarin. Khairunnisa et al. (2022) claimed that the combination of problem-based learning with flashcards has increased the level of creative thinking skills among students. Astra et al. (2022) also point out that student's scientific literacy in Kinetic theory of gases material has improved by flashcard as e-learning material.

Product Description

The Terabest production process started in 2019. This product was produced when the number of students exceeded the target (60 people) and the number of lecturers was insufficient. During the practice, the area involved was too large and caused the lecturers to be unable to monitor the students. So, Terabest's is produced in the form of flashcards to ensure that students can perform practicals well. E-Terabest flashcards are an innovative teaching tools designed to increase students' understanding of total station setting up. Each card has a picture and instructions for carrying out setting up procedures. E-Terabest flashcards come with 15 scan cards that include an introduction to the total station as well as the procedures to perform setting-up.

After several semesters, there are still Terabest weaknesses that need to be improved. Terabest has been digitized in PDF form and distributed in the Telegram application in the pandemic year (2020-2022). Through this application, students can use e-Terabest on their smartphones.

E-Terabest has been improved once again when students return to contact lecturers when they are already in higher education institutions at diploma and degree level. So, e-Terabest has been uploaded on the flipHTML5 website to facilitate college alumni, polytechnic students and university students to access e-Terabest for learning purposes. The flow chart below is a conclusion from the explanation above.

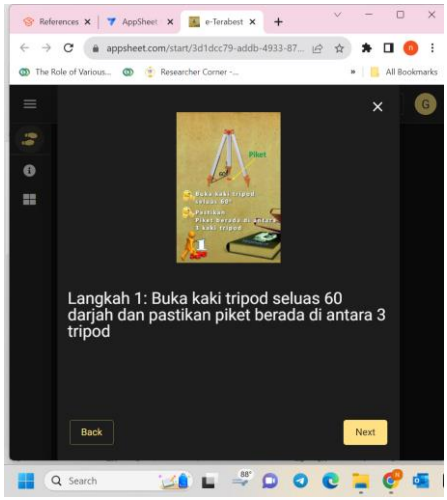
Then, after considering all comments from students, alumni and other users, E-Terabest was upgraded to Mobile Apps. The apps are cloud-based, and more convenient for the user. E-Terabest App is compatible with various devices, including smartphones, tablets, and desktops, ensuring accessibility across multiple platforms. It is a deal companion

for individuals on the go, ensuring continuous learning opportunities. Users may use the E-Terabest App by entering the link or scanning the QR code.

E-Terabest link:

i) FlipHTML5
https://online.fliphtml5.com/jhqed/uyem/

ii) Appsheet (Mobile Apps)
https://shrturl.app/vdTR09



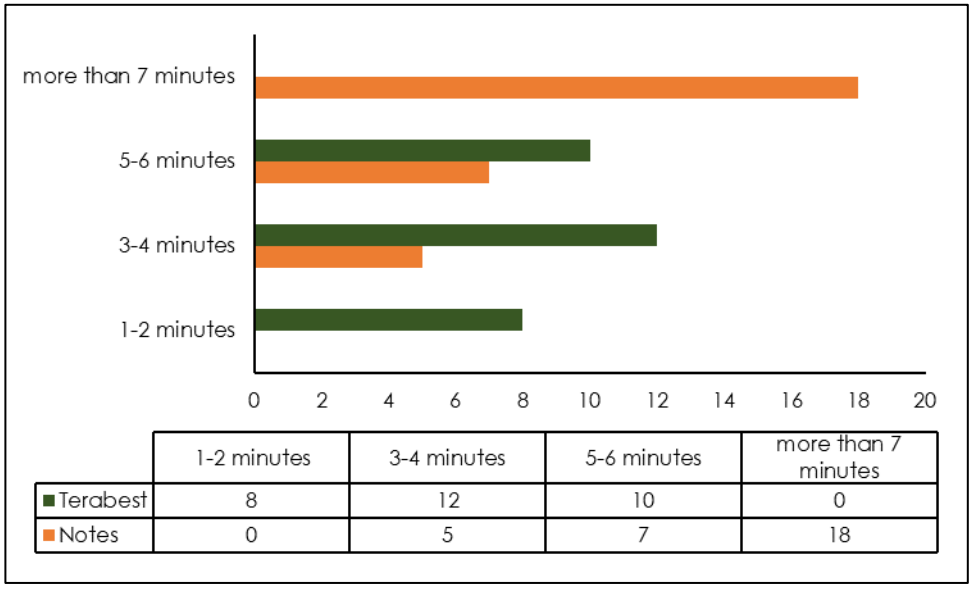
Results & Discussion

The pre-test and post-test have been conducted to 60 students. The understanding tests covered the procedures for setting-up and time consumption by referring to notes and e-Terabest. According to Table 1, the understanding level of student by e-Terabest significantly increased. Students able to conduct total station and set it to exact position without any major mistakes.

Referring to Figure 1, the time taken for student setting up total station also reduced by referring to e-Terabest. Students able to finish setting-up total station less than 6 minutes for each station. By observation, students are no longer completely dependent on e-Terabest after setting-up more than three times. So, it is believe that students are more easily understand flashcards compared to notes.

Table 1: Formatting used in heading paragraph formats, table and figure

No	Item	Pre-test	Post-test
1.	Level of understanding to setting-up total station	33.6%	96.6%



	1-2 minutes	3-4 minutes	5-6 minutes	more than 7 minutes
Terabest	8	12	10	0
Notes	0	5	7	18

Figure 1: Time taken for students setting up total station

Conclusion

In conclusion, digital learning helps students to be more effective, competitive and think more creatively. By using E-Terabest, the knowledge transfer would be easier, effective time consuming, more interesting makes it a favourable medium that may increase student interest.

For future improvements, E-Terabest will be accompanied by a video and uploaded to YouTube to make it as easy as possible and can be a reference for students taking engineering surveying subjects at the polytechnic or university inside or outside country.

Publication, Award and Intellectual Property

1. Silver Award in *Seminar Penyelidikan dan Pembentangan Pensyarah dan Inovasi Pelajar* in 2019 (SPPiP 2019).
2. 3rd International conference in Science Technology Engineering and Mathematics 2021 (3rd ICSTEM 2021).
3. Nurriswin Jumadi & Siti Norzekhan Che Aziz. (2020). *Keberkesanan Kad Imbas Terabest dalam Meningkatkan Pemahaman Pelajar Bagi Subjek Ukur Terabas Di Kolej Komuniti Jelebu*, 99 – 106.
4. *Koleksi Ilmiah Pendidikan Inovasi Edisi 2020* (E-ISBN : e 978-967-18115-0-4).
5. Copyright: Registration number CRLY2023M04302.

References

Asri, S. (2021, August 1). Perkasa guru era pembelajaran digital. Harian Metro. https://www.hmetro.com.my/akademia/2021/08/737627/perkasa-guru-era-pembelajaran-digital

Astra, I. M., & Halimah, S. I. (2022). The development E-Learning assisted by Flashcard to improve students scientific literacy in high school on the kinetic theory of gases materials. Journal of Physics, 2309(1), 012096. https://doi.org/10.1088/1742-6596/2309/1/012096

Khairunnisa, K., Abdullah, A., Khairil, K., & Rahmatan, H. (2022). The Influence of Problem Based Learning Models combined with Flashcard Media on Creative Thinking Skills of Students. Jurnal Penelitian Pendidikan IPA (JPPIPA), 8(1), 247–251. https://doi.org/10.29303/jppipa.v8i1.1154

Sudrajat, A., Salsabila, F. G., & Marini, A. (2023). Digital-Based Flash Card to Increase Social Studies Learning Outcomes for Elementary School Students in The Fourth Grade. Journal of Education Technology, 7(2), 235–246. https://doi.org/10.23887/jet.v7i2.63327

Ying, Y., Marchelline, D., & Wijaya, G. (2021). Using Technology-Flashcard to encourage students learning Mandarin. Journal of Physics, 1764(1), 012138. https://doi.org/10.1088/1742-6596/1764/1/012138

Bim Senibina Module Assessment Rubric Application

Mohd Raduan bin Amran[1], Lizawati binti Zainudin[2]

Kolej Komuniti Kuantan,Kuantan Malaysia1, Kolej Komuniti Kuantan,Kuantan Malaysia[2]

Jali46664@gmail.com[1], lizawati7983@gmail.com[2]

Highlight: A scoring rubric is an assessment method used to set clear and objective assessmentcriteria for each assignment and practice. In the assessment for the BIM senibina module, a scoring rubric is used to assess student performance in assignments and practices. Rubrics are an important tool to ensure fairness and accuracy of learner assessment. Rubrics provide a clear and consistent framework for marking learner work. In using the marking rubric in the assessment of the Senibina BIM module, it can be considered to develop a marking rubric application that can facilitate the preparation and calculation of markings automatically. This application can help speed up the process of assessment and mark management. The librarian can also provide more detailed feedback and help students understand where they need to improve their performance. With the help of this app the learner will be able to score marks continuously, and in case the student fails, the student is given the opportunity to makea second, third attempt and so on until the student passes.

Keywords: Rubric; Application; BIM senibina; assessment; mark management

Introduction

Subjective assessment requires appropriate assessment mechanisms that can be trusted to achieve learning objectives. The absence of standardized or overly generalized criteria can lead to confusion in the emphasis given to the assessment criteria used by the screener. Assessment becomes difficult to assess if no clear criteria are used. Because ofthis, the way in which the screener understands and the imprecision in marking will lead to inconsistent marking. Such a situation can lead to the learner's mark being assessed by each scorer differently and will cause injustice to the learner.

Rubrics designed to assess a specific set of skills or knowledge can also present their usefulness in assessing more complex tasks. Some rubrics focus too much on the quantity of work produced versus quality, which can lead to students prioritizing quantity over quality. In addition, the use of strict rubrics can lead to a lack of flexibility i.e. studentsare only limited to creating assignments or practices that are within the scope only. Creatingrubrics is not a rather easy matter, especially when it comes to determining the appropriaterating scale (Azmanirah et al., 2019). It is also time-consuming, especially if it is not well designed or if the reviewer is not familiar with how to use it effectively. The use of rubrics will also be problematic in case the scribe incorrectly enters the mark score for assessment.Rubric development should help reduce measurement errors in assessment. Understanding Rubrics that have been equipped with criteria will be able to help students make assignments and reduce their worries about carrying them out. In addition, studentscan use the criteria contained in the rubric as a guideline to get good marks.

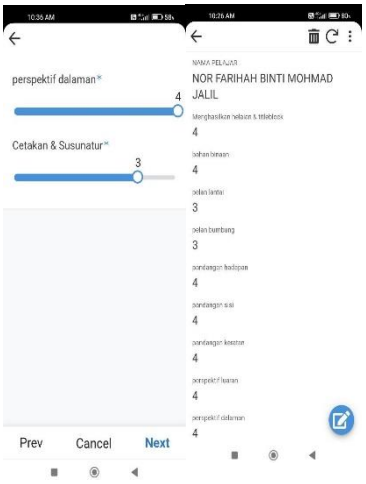
Objective

Among the objectives of the Senibina BIM module assessment rubric application are;

1. Used to establish clear and objective assessment criteria for each assignmentand practice.
2. Helps the translator to provide more detailed feedback and helps students understand where they need to improve their performance.
3. Allows the scribe to assess the learner's performance consistently and fairly.
4. Enable students to understand what is expected of them in each assignment andpractical test.
5. A marking rubric can help teachers to identify a learner's strengths andweaknesses and provide extra help where needed.

Innovation Picture/Painting

Figure 1: Entering data via the mobile app



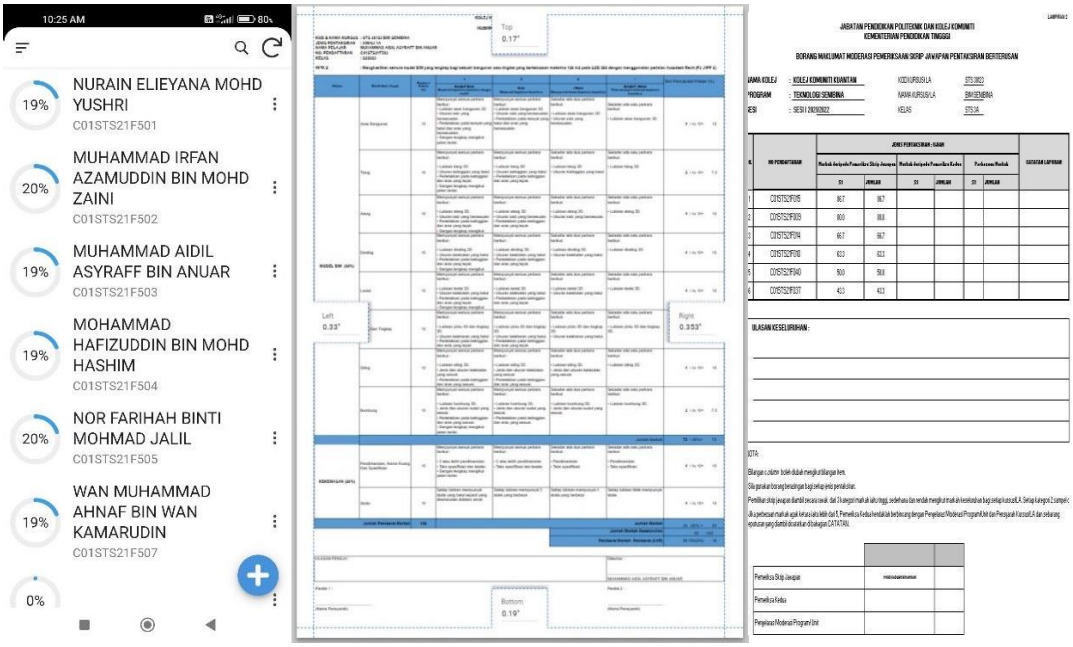


Figure 2: Results are out putted through the app and printed directly through Google Drive and Moderation.

Result & Discussion

Here are some of the functions that may be available in the senibina BIM module's bookmarking rubric application:

1. Ability to establish clear and objective assessment criteria for each task and practice inthe BIM senibina module.
2. Ability to facilitate automatic markup and calculation.
3. The ability to provide more detailed feedback and help learners understand where they need to improve their performance.
4. Ability to assess learner achievement consistently and fairly.
5. The ability to enable learners to understand what is expected of them in eachassignment and practice.
6. The ability to recognize a learner's strengths and weaknesses and provide extra help where needed.

7. In the use of the marking rubric application in the assessment of the senibina BIM module, these functions can help improve the efficiency and effectiveness of the assessment of student performance in the module.

Conclusion

In the context of the assessment of the senibina BIM module, innovation can help improve the efficiency and effectiveness of the marking rubric, as well as facilitate the assessment and mark management process. By harnessing the potential of these innovations, the assessment of senibina BIM modules can become more efficient and effective in assessingstudent performance and improving learning outcomes.

Publication, Award and Intellectual Property

In the context of the assessment of the senibina BIM module, innovation can help improve theeffectiveness and efficiency of the marking rubric, as well as facilitate the assessment and marking management process. Some potential innovations in the assessment of the BIM senibina module include:

1. Development of a bookmarking rubric application that can facilitate the automaticcompilation and calculation of bookmarks.
2. Development of a mobile app containing comprehensive teaching aids in the STS30123 course to improve learner understanding and make it easier for learners to review.
3. Development of more effective and efficient bookmarking rubrics by utilizing technologyand innovative teaching methods such as computer-based teaching.
4. Development of more efficient and effective learning strategies utilizing action to improve teaching practices and enhance learning outcomes.
5. May be saved in softcopy for future reference.

By harnessing the potential of this innovation, the assessment of the BIM senibina module can become more efficient and effective in assessing student performance and improving learning outcomes.

References

Azmanirah Ab Rahman, Nurfirdawati Muhamad Hanafi Anizam Mohamed Yusof,Halizah Awang. (2019). Scale Functionality Analysis for the Development of Amali Competency Assessment Rubrics: Analysis Based on a Multifaceted Rasch Measurement Model, Online Journal for TVET Practitioners, 4(2), 120-126.

Henrietta, K. (2012). Visual Arts Education Assessment.

Siti Rahayah Arifin, (2003) Theory concepts and practices in measurement and assessment.

ARCHICUT- Architectural Cutting Template

Ts. Mohd Azmi Bin Abd Sukor[1], Ts. Azharina Binti Azman[2], Lizawati Binti Zainudin[3]
Kolej Komuniti Kuantan, Pahang, Malaysia[2]
Politeknik Sultan Haji Ahmad Shah Kuantan, Pahang, Malaysia[1,3]
mohd_azmi@polisas.edu.my[1], azharina@kkkua.edu.my[2], lizawati@polisas.edu.my[3]

Abstract: The Architectural Technology Programme in Community College offers the subject STS30133 Architectural Model in 3rd semester. The skills of model-making are one of the fundamental knowledge required for architecture students. The main purpose of the ARCHICUT innovation is designed to address the issue of cutting model boards for doors and windows during practical assignment in this subject. Typically, the process of cutting door and window openings is done manually, resulting in work that is less precise, less tidy, less consistent, and less safe. Manual cutting is also more susceptible to the risk of injury as it involves only the use of a knife and ruler. Students also need to mark and draw before cutting these openings. The objective of this innovation is to assist students in cutting models with direct guidance from the ARCHICUT template. The template provides predefined scale sizes and guidance on door and window heights to be cut without the need for manual measurements. With this convenience, it will reduce errors and mistakes made by students in cutting model boards. This can also save model board material. Therefore, the ARCHICUT innovation idea is inspired to address the issue of cutting doors and windows in architectural model practical assignments.

Keywords: Archicut; Cutting template; Door and window openings; Architectural Model

Introduction

Students of Certificate of Architectural Technology is required to enroll for subject STS 30113 during the third semester of their studies. In this subject, students will be exposed and learned cutting techniques for house model components.

Typically, the issues arise are the process of cutting door and window openings is done manually, resulting in work that is less precise, less tidy, and less consistent. Manual cutting is also more susceptible to the risk of injury as it involves only the use of a knife and ruler. Students also need to mark and draw before cutting these openings.

Therefore, the ARCHICUT innovation idea is inspired to address the issue of cutting door and window openings in architectural model practice. This product is designed to be user-friendly and has features of flexibility and mobility for easy portability. It is lightweight and suitable for window and door sizes at scales of 1:50 and 1:75. According to Normah Jantan (2016), "Innovation is the result of utilizing creative abilities, especially to transform concepts, ideas, methodologies, processes, and functions to make them better and of higher quality".

Product Description

The ARCHICUT template is made of Perspex material. The ARCHICUT template were cut by using a laser printer machine. The idea of using the Perspex were to have a smooth cutting techniques and easy to carry. Other than that, Perspex is the most suitable material because it was transparent and easy to see through the cutting area of model boards.

Figure 1 : ARCHICUT template are used to cut model board for door and window openings.

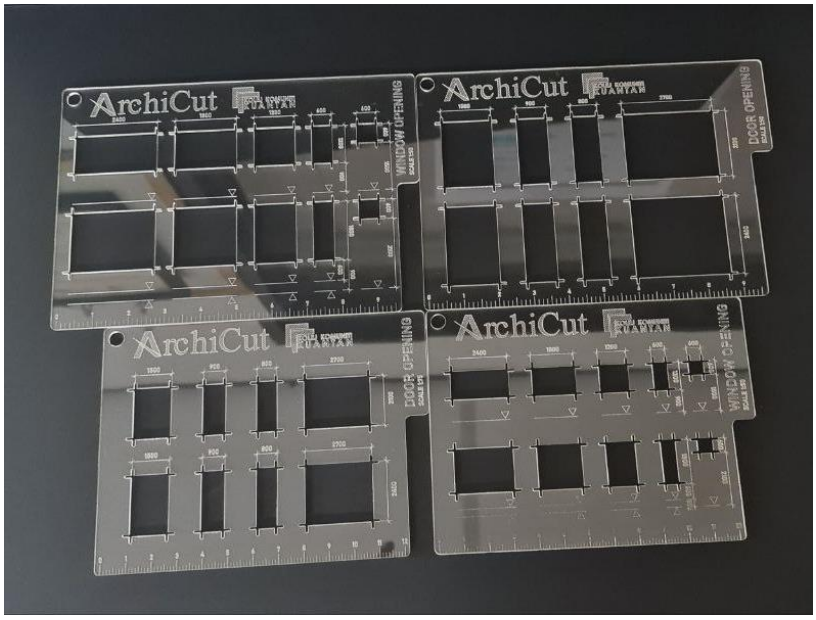


Figure 2: 4 pieces of ARCHICUT template which represent Window Opening Scale 1:50 & 1:75 and Door Opening Scale 1:50 & 1:75.

ARCHICUT come with a set of 4 pieces of ARCHICUT template, a cutter, a pencil, a steel ruler and a bag to carry all of the items. It was design for a commercial purpose and portability as the students can carry the bag anytime and anywhere they want to use the template.

The significant features of the template are the size of the door and window openings itself which was variety of sizes complete with the dimensions and the guidelines of the floor level for model boards and the scale ruler at the bottom of the template.

Results & Discussion

Impact of Innovation:

1. The ARCHICUT template makes it easier for students or model makers to create models without the need to draw first and measure doors and windows before cutting the model board.
2. Model boards can be cut directly using this template because there are predefined scales on the template.
3. The complete set in a single bag makes it convenient to carry this template anywhere.
4. There are scale ruler measurements on this template for use in any working drawings and other parts of the model.

This ARCHICUT template can be commercialise and has a potential to expand the market towards all of Architecture Students in Higher Education Institution.

A research has been done for this ARCHICUT Template for Architectural Students in Kuantan Community College. There are two research questions that need to be answered, and each of them is directly related to the formulated research objectives. These research questions are as follows :

1. Can the use of ARCHICUT assist students and course instructors in the teaching and learning process in architectural model production?

   From the analysis of the obtained data, it was found that students' perception of the use of ARCHICUT is high. The results suggest that the majority of students strongly agree that ARCHICUT greatly assists them in cutting door and window openings more quickly and accurately, resulting in higher-quality cuts that are neater and cleaner. With ARCHICUT, students are able to enhance their skills and interest in the architectural model subject. On observations in classes using ARCHICUT, most of them were very confident and did not hesitate during the cutting process. It greatly facilitates their work as they do not need to mark door and window opening measurements.

2. Does the design of ARCHICUT help students in cutting door and window openings more effectively?

   The respondents strongly agree that ARCHICUT can be used regardless of time and place. This indicates that students appreciate the flexibility and mobility of the ARCHICUT design. Students can practice architectural model-making not only in the classroom but also outside of it. Furthermore, majority of students strongly agree that ARCHICUT can assist them in cutting model boards more comfortably and easily. Students also strongly

agree that the ARCHICUT template is complete with scales of 1:50 and 1:75, which are suitable for the practical questions and help students cut without the need to mark measurements beforehand. The students also strongly agree that ARCHICUT is safe to use and suitable for all architecture stream students and for public use. Moreover, many students agree that ARCHI CUT can be commercialized for use as an educational tool. Students have a tool that can help them complete their work when engaging in learning activities outside the classroom.

Conclusion

The implementation of the ARCHICUT innovation can assist both lecturers and students in the teaching and learning process. The quality and precision of cutting door and window openings in architectural model-making can be improved, making students' work easier and faster. The design of ARCHICUT is highly flexible and mobile, making it easy to carry anywhere. This method greatly helps students cut boards more comfortably and easily, enhancing their skills more effectively. Indirectly, this can prove that ARCHICUT can be used as a teaching tool in teaching and learning process. In the teaching process, the methods used by lecturers are crucial in helping students master the subject matter effectively. This innovative product is highly suitable for commercialization as a resource to assist lecturers and other students in facilitating the teaching and learning process, thereby enhancing the quality of students' work through improved knowledge and skills.

Publication, Award and Intellectual Property

Registered under Perbadanan Harta Intelek Malaysia (MyIPO) with registration number : LY2023C03746

References

Berenyi, L., & Deutsch, N. (2018). Effective teaching methods in business higher education: A student's perspective. International Journal of Education and Information Technologies, 12, 37-45.

Jantan, N. (2016). Penerapan Budaya Kreatif dan Inovatif Di Kalangan Pelajar Politeknik Merlimau Melalui Perkaya Inovasi. Melaka: Politeknik Merlimau.

Master BMC Board + 3: Usahawan Pelajar Institusi Pendidikan MARA (IPMA)

Muhamad Zahirudin bin Mohtar[1], Nadia binti Abdullah Sani[2]
Kolej MARA Banting, Selangor, Malaysia [1] & Kolej Profesional MARA Beranang, Selangor, Malaysia [2]
zahirudin.mohtar@mara.gov.my, nadia.sani@mara.gov.my

Abstrak: Model kanvas perniagaan (BMC) merupakan satu kerangka visual yang membantu organisasi dan individu melibatkan keusahawanan untuk penjanaan idea perniagaan yang bakal dilakukan mahupun yang sedang dilakukan. Kanvas ini mempunyai 9 komponen utama iaitu rakan kongsi utama, aktiviti utama, sumber utama, cadangan nilai, hubungan pelanggan, saluran, segmen pelanggan, struktur kos dan aliran hasil. Meskipun BMC memberikan pelbagai faedah, tetapi terdapat komponen yang perlu ditambah iaitu penambahbaikan berterusan, kemahiran dan aspek sumbangan sosial kepada masyarakat termasuklah kepada usahawan pelajar di IPMA. Oleh itu, penghasilan *Master* BMC *Board* + 3 melibatkan 12 komponen ini perlu dilakukan sebagai nilai tambah kepada mereka untuk menguruskan perniagaan yang lebih menyeluruh.

Kata Kunci: BMC, IPMA, KPM

Pengenalan

Model kanvas perniagaan atau dikenali sebagai '*Business Model Canvas*' merupakan satu kerangka visual yang membantu pelbagai pihak seperti usahawan untuk memahami mengenai perniagaan mereka melalui kanvas. Di dalam kanvas ini mengandungi komponen utama perniagaan melibatkan 9 komponen iaitu rakan kongsi utama, aktiviti utama, sumber utama, cadangan nilai, hubungan pelanggan, saluran, segmen pelanggan, struktur kos dan aliran hasil (Simanjuntak, 2021). Kesembilan komponen ini penting untuk pihak seperti usahawan bagi melihat keupayaan syarikat mereka dan bahagian yang memerlukan penambahbaikan serta bahagian yang perlu dikekalkan bagi memastikan kelangsungan perniagaan mereka. BMC boleh digunakan untuk perniagaan yang akan atau sedang dijalankan bagi memastikan kejayaan organisasi tersebut (Sarooghi et al., 2019). Kanvas ini telah dibangunkan oleh Alexander Osterwalder dan Yves Pigneur pada tahun 2010 dan dikatakan sangat membantu pelbagai pihak untuk mengesan kelemahan ataupun penambahbaikan dengan masa yang lebih cepat berbanding rancangan perniagaan. Kajian literatur lepas menunjukkan terdapat perubahan di dalam templat BMC mengikut kesesuaian melibatkan objektif yang ingin dicapai berbanding templat original (Strulak-Wójcikiewicz et al., 2020).

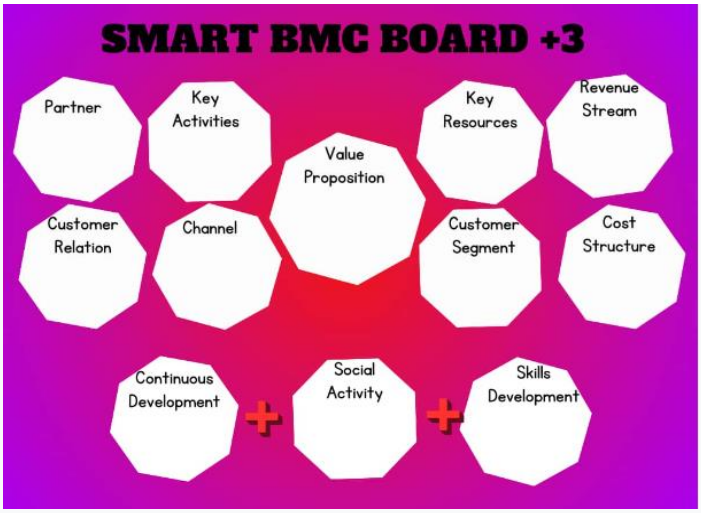
Meskipun pelajar-pelajar di IPMA seperti Kolej Profesional MARA telah mempelajari mengenai kanvas ini melalui subjek e-keusahawanan, tetapi kritikan berkaitan BMC ini dapat dilihat apabila usahawan pelajar ini tidak dapat memahami kanvas ini, menguasai dan mengaitkan dengan realiti perniagaan yang mereka lakukan. Sebahagian daripada mereka pula merasakan BMC ini terlalu meringkaskan kanvas perniagaan yang mereka lakukan sehingga menyebabkan perincian terhadap strategi perniagaan telah terlepas pandang. Sesetengah daripada mereka merasakan kanvas ini tidak menyatakan aspek kemahiran yang dipelajari oleh mereka, ruang penambahbaikan berterusan dan aspek kemahiran serta aspek sumbangan sosial kepada masyarakat.

Oleh yang demikian, kumpulan kami mencadangkan 9 blok bahagian ini ditambah dengan 3 aspek baru iaitu ruang penambahbaikan berterusan (Fish et al., 2017), kemahiran (Abdelwhab Ali et al., 2019) serta sumbangan sosial (Pollard et al., 2023). Ketiga-tiga aspek ini akan memberikan nilai tambah kepada templat BMC terutamanya kepada usahawan pelajar yang masih dalam proses pembelajaran mengenai keusahawanan. Sebagai contoh:

1) *Penambahbaikan berterusan – konsistensi kualiti perkhidmatan, R&D berterusan terhadap produk, kualiti perkhidmatan, kepuasan hati pelanggan, strategi perniagaan, kos per unit, breakeven (unit)*
2) *Kemahiran – penilaian risiko, problem solving, kemahiran penjualan, kawalan stress*
3) *Sumbangan Sosial – zakat, pendidikan berterusan kepada pelanggan, sumbangan, kerjasama projek komuniti*

Deskripsi Produk

Oleh yang demikian, kumpulan ini akan membangunkan sebuah kanvas *printed* BMC dengan 3 elemen tambahan bagi membantu usahawan pelajar untuk aktiviti PDP seperti titik permulaan untuk perbincangan dan penjanaan idea sebelum perniagaan. Saiz kanvas ini ialah panjang (20 cm) x lebar (20 cm). Kanvas ini diberikan nama '*Master Board* BMC' merangkumi *board*, kad kata kunci dan penyata kewangan. Kanvas ini dibangunkan dengan harga kos sebanyak RM50. Kanvas ini mewakili 1 perniagaan yang bakal dilakukan atau sedang dilakukan oleh pelajar-pelajar. Mereka boleh merubah kanvas perniagaan syarikat melibatkan 12 bahagian di dalam kanvas.



Hasil dan Perbincangan

Kanvas ini akan memberikan impak kepada pelajar-pelajar melalui:

a. meningkatkan minat mereka dalam bidang keusahawanan melalui simulasi *Master BMC Board* yang dapat dilihat secara terus dan interaktif
b. memberikan peluang kepada pelajar mengaitkan elemen penambahbaikan berterusan, kemahiran dan aspek sosial dalam perniagaan yang mereka lakukan
c. memahami kompleksiti perniagaan melalui kerangka visual yang menyeluruh serta mengambil pendekatan terbaik untuk perniagaan mereka

Penutup

Sebagai penutup, *Master BMC Board* ini diharapkan dapat digunakan secara meluas di semua IPMA MARA dan institusi pendidikan lain dengan niat untuk meningkatkan kemahiran pelajar-pelajar menguruskan perniagaan dengan jayanya melibatkan aspek urus tadbir yang cekap, mampan dan fleksibel (Sadikin et al., 2023). Penambahbaikan boleh dilakukan dengan memfokuskan kepada harga kos yang lebih rendah dalam membina kanvas ini dan menambahbaikkan kandungan senario kajian kes dan perisian.

Rujukan

Abdelwhab Ali, A., Panneer selvam, D. D. D., Paris, L., & Gunasekaran, A. (2019). Key factors influencing knowledge sharing practices and its relationship with organizational performance within the oil and gas industry. *Journal of Knowledge Management*. https://doi.org/10.1108/JKM-06-2018-0394

Fish, M., Miller, W., Becker, D., & Pernsteiner, A. (2017). The role of organizational culture in the adoption of customer profitability analysis: A field study. *Qualitative Research in Accounting and Management*, *14*(1), 38–59. https://doi.org/10.1108/QRAM-09-2015-0080

Pollard, J., Osmani, M., Grubnic, S., Díaz, A. I., Grobe, K., Kaba, A., Ünlüer, Ö., & Panchal, R. (2023). Implementing a circular economy business model canvas in the electrical and electronic manufacturing sector: A case study approach. *Sustainable Production and Consumption*, *36*, 17–31. https://doi.org/10.1016/j.spc.2022.12.009

Sadikin, A., Naim, S., Asmara, M. A., Hierdawati, T., & Boari, Y. (2023). Enrichment : Journal of Management Innovative strategies for MSME business growth with the business model canvas approach. *Enrichment: Journal of Management*, *13*(2).

Sarooghi, H., Sunny, S., Hornsby, J., & Fernhaber, S. (2019). Design Thinking and Entrepreneurship Education: Where Are We, and What Are the Possibilities? *Journal of Small Business Management*, *57*(S1), 78–93. https://doi.org/10.1111/jsbm.12541

Simanjuntak, M. (2021). Designing of Service Dominant Logic and Business Model Canvas: Narrative Study of Village Tourism. *Golden Ratio of Marketing and Applied Psychology of Business*, *1*(2), 73–80. https://doi.org/10.52970/grmapb.v1i2.60

Strulak-Wójcikiewicz, R., Wagner, N., Lapko, A., & Hacia, E. (2020). Applying the business model canvas to design the E-platform for sailing tourism. *Procedia Computer Science*, *176*, 1643–1651. https://doi.org/10.1016/j.procs.2020.09.188

The Design and Development of Mobile Application (mobile app) for The Topic of Probability

Naksa Binti Ahmad[1] , Zainab binti Ali Taha[2] , Emy Zulyiana binti Mohd Nor[3]
Department of Mathematic, Science & Computer, Politeknik Ibrahim Sultan[1,2]
Department of Information Technology, Kolej Komuniti Pasir Gudang[3]
naksa@pis.edu.my[1], zainab@pis.edu.my[2], emyzulyiana@kkpg.edu.my[3]

Abstract: The use of applications for mobile devices has grown exponentially and has become a hotly talked about issue in the field of education as well as student development. Flexibility, user-friendly, small, ease of access, and various other mobile technology capabilities make it valuable and a necessity nowadays. This study aims to explore the design and development potential of mobile applications for probability topics. According to student interviews, the topic of probability was deemed uninteresting since the concepts of probability were challenging to grasp. This situation leads to students being unconfident and unable to answer probability questions correctly. With the advantages of mobile learning, a mobile application (mobile app) named "*Kebarangkalian*" has been developed to address this issue. Mobile app developed using MIT app inventor based on ADDIE teaching model (Analyse, Design, Develop, Implement and Evaluate). The objectives study is to develop a teaching aid to improve students' interest in learning probability and to boost students' confidence in their ability to answer probability-related questions. A total of 36 students who took the Electrical Engineering Mathematics course were involved in using this new app. In the evaluation phase, the findings showed that the app was able to encourage students to gain a deeper understanding of the topic. This application facilitates and assists students in their learning process. In conclusion, the mobile application has great potential to be integrated into the topic of probability. Despite the various limitations and constraints faced there will be improvements by app developers in the future.

Key words: Mobile Learning; Mobile Application; Design and Development; Probability

Introduction (The context or background of the innovation / issues or problems)

In a modern education system, the use of mobile devices will be very important to facilitate learning. Smartphones and tablets have also been identified as crucial in enhancing the feedback process between educators and students, providing for a better grasp of the overall learning process. As a result, mobile learning is becoming an increasingly significant part of higher education's evolution of teaching methodologies (Criollo-C et al., 2018). The development of information and communication technology affects almost every aspect of modern life including the education system. In fact, advancements in technology have changed the way people acquire knowledge. One of the new concepts to gain knowledge that has been used nowadays is through mobile learning.

Mobile learning is an extended version of e-learning using mobile technologies and devices to facilitate learning process anywhere and anytime. Because of its flexibility, there are potential benefits that can be supported by mobile learning. One of them is, it allows students to pace learning at their own speed, convenience, and place. Mobile learning enables collaborative learning when students use mobile devices to easily interact and communicate with other students and lecturers. It also supports informal learning and allows students to learn out of class at their convenience (Ansari & Aditya, 2017). According to the research conducted by Wilkinson and Barter (2016), incorporating mobile devices and app-related learning material can improve student achievement. Therefore, as an initiative to improve and enhance Engineering Mathematics Learning session, we develop a mobile application name "Aplikasi Mudahalih Kebarangkalian". It is hoped that mobile application will be able to assist students who are facing difficulty grasping certain concepts of learning, including mathematics.

Problem Statement

At Polytechnic Ibrahim Sultan, the challenge of learning mathematics is relatively high because students lack the ability to understand certain concepts. One of the topics that always concerns lecturers is probability, due to the low level of achievement shown in this topic. The following is the student achievement in probability, one of the topics covered in the course Electrical Engineering Mathematics, which must be taken by all students in the engineering diploma program.

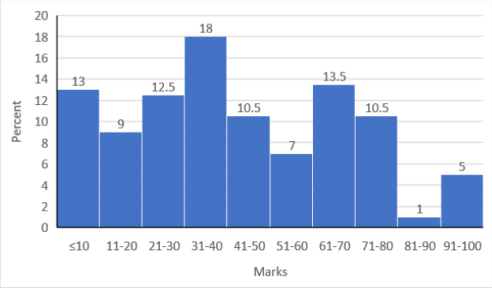


Figure 1: Student Achievement in Probability, Continuous Assessment Session II: 2021/2022

Figure 1 demonstrates that 52.5% of students achieve marks below 40. According to student interviews, the topic of probability was deemed uninteresting since the concepts of probability were challenging to grasp. This situation leads to students being unconfident and unable to answer probability questions correctly.

According to Anggara et al. (2018), some students have difficulty in describing sample space and constructing the event space. They also could not relate the principle of events in solving probability problem. Based on Figure 1, interviews and previous research, students have the ability to use the principles of probability and appropriate quantitative information, but it may be incorrect or inadequate. Therefore, with the advantages of mobile learning, a mobile apps named "Kebarangkalian" has been developed to enhance the learning and overcome this issue.

Product Description

The mobile apps are planned based on ADDIE model, where ADDIE is an acronym for Analysis, Design, Development, Implementation and Evaluation. ADDIE was the earliest instructional design model that has been developed, and it has since been used as a foundation for numerous other instructional system design models (Gustafson & Branch, 2001).

Phase 1: Analysis

The first process that needs to be carried out according to the ADDIE model is analysis. Based on previous interviews and student achievement in probability, we have set out to design and develop a mobile application with the following objectives:

i. To improve students' interest in learning probability.
ii. To boost students' confidence in their ability to answer probability-related questions.

Phase 2: Design

The second phase that needs to be implemented according to the ADDIE model is design. The aim of this second phase is to figure out and plan the methods that can be used to reach the objectives. We decided to use the Connectivism theory, which was first put forward by Siemens in 2005. This theory focuses on learning that is based on interaction with students through social networking lines and technology. A new learning theory called connectivism has emerged to address how learning occurs in the current digital era. Technology has changed the life of communication and learning. Therefore, as technology advances, traditional education must also adapt to the digital format.

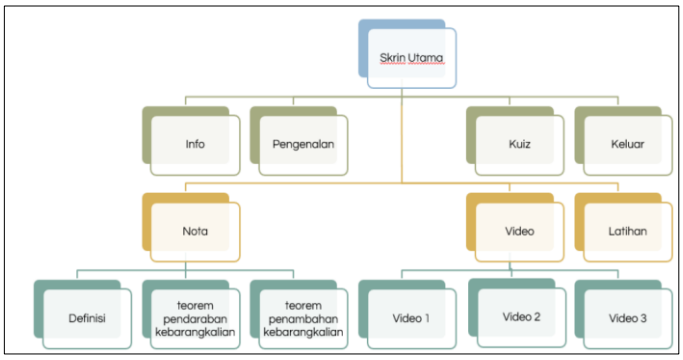


Figure 2: Flow Chart in Designing Mobile Apps "Kebarangkalian"

Figure 2 shows how notes, videos, exercises, and interactive quizzes are linked together in the mobile apps "Kebarangkalian". Inferred the theory of connectivism learning requires students to learn by using the online methods that are widely available today. So, in the development of this application the full use of the internet has been used such as videos, notes through blogs, exercises, and quizzes online. It is not just limited to classroom learning; it also has a communication network where students can get more information based on what they are learning.

Phase 3: Development

The next step is development, which is the process of producing the mobile apps that have been designed using all the media and technology that has been chosen based on what is needed. MIT app inventor has been utilized as the key platform to integrate all the provided materials to produce the mobile apps. The actual user interfaces of the mobile app "Kebarangkalian" are as follows:

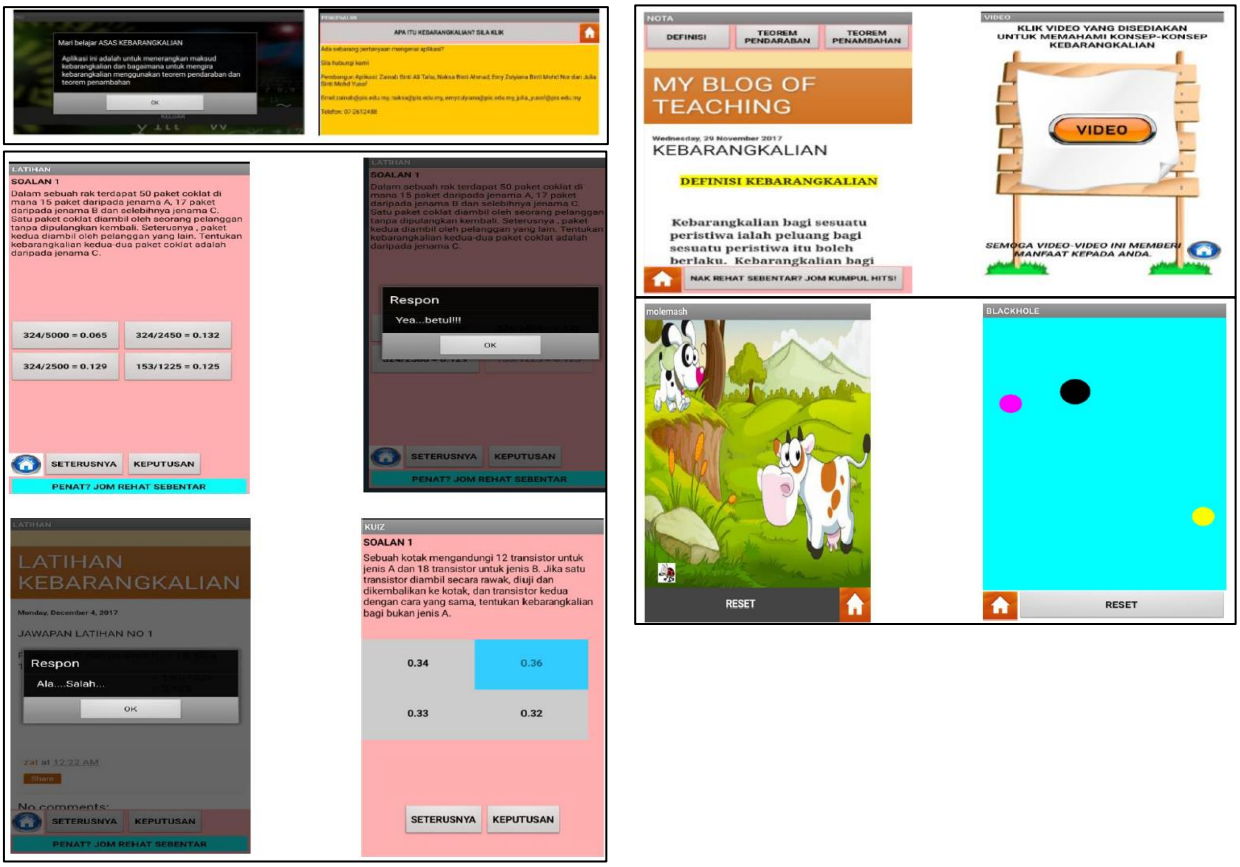


Figure 3: Interface of The First Four Main Menu in Mobile Apps "Kebarangkalian"

Phase 4: Implementation

During this stage, the mobile apps "Kebarangkalian" was published to the Google Play Store for distribution. Students can download the application on their smartphones and begin using it immediately.

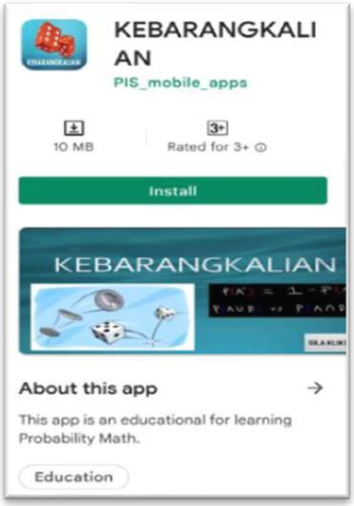


Figure 4: Icon of Mobile Apps "Kebarangkalian" Displayed in Google Play Store

Phase 5: Evaluation

The assessment was carried out at Polytechnic Ibrahim Sultan. The sample of the study consists of 36 diploma students that took the Electrical Engineering Mathematics course. The syllabus of Electrical Engineering Mathematics has the topic Probability. So, this mobile app is given to the student to evaluate the mobile learning application that has been built and to provide marks based on the rubric given. The data obtained are analyzed descriptively.

Results & Discussion

Based on the findings, the total score for the mobile apps built was 15.25, then it was at a moderate performance. However, the speed of referring to notes with this application is considerably faster than flipping through the pages of a book traditionally. In addition, the notes provide more focused information, and students do not need to refer to any other examples during their studies. Students can also benefit from this in terms of saving time while learning.

Therefore, the use of mobile applications in this mathematics subject can help students develop self-learning skills, and it requires individuals to demonstrate self-motivation, dedication, and discipline as well as the production of more mobile applications because the emergence of these educational applications has enhanced the interest and flexibility of the teaching process and learning.

Conclusion

In conclusion, a mobile app is a program that is loaded into mobile tools and can be used anytime and anywhere. The mobile application developed through mobile phones to make it easier for students to learn the topic of probability is suitable to be used to attract students. Several factors need to be noted in the success of this effort to ensure that the application developed meets the teaching and learning objectives that have been set. One aspect that aids the production of applications in education is by applying instructional models in construction.

Apart from ADDIE, there are many more models that can help material developers such as ASSURE, ACTION, Hannafin and Peck, Dick and Carey, Robert Glasea, and others. All these models are beneficial and can be used by other app developers to produce more flexible and effective educational applications in the future. Hence, the conclusion of the construction of this mobile application is successfully developed and potentially implemented in teaching and learning on the topic of probability.

Some technical issues with mobile devices have been raised, such as their small screens and low-resolution displays, inadequate and low memory, slow network speeds and dis-connectivity, and lack of standardisation and comparability. Apart from that, users of iPhones are restricted because this programme is only available for Android. Even against the various limitations and constraints faced, there will be improvements by app developers in the future such as for users of small-screen mobile devices, learning materials for mobile apps should be scaled down and will build an app that can be used for all kinds of phone users.

References

Criollo-C, S., Luján-Mora, S., & Jaramillo-Alcázar, A. (2018, March). Advantages and disadvantages of M-learning in current education. In 2018 IEEE world engineering education conference (EDUNINE) (pp. 1-6). IEEE.

Ansari, M. S., & Tripathi, A. (2017). An investigation of effectiveness of mobile learning apps in higher education in India. International Journal of Information studies and libraries, 2(1), 33.

Anggara, B., Priatna, N., & Juandi, D. (2018, May). Learning difficulties of senior high school students based on probability understanding levels. In Journal of Physics: Conference Series (Vol. 1013, No. 1, p. 012116). IOP Publishing.

Gustafson, K. L. & Branch, R. M. (2001). Survey of instructional development models. New York: ERIC Clearinghouse on Information & Technology.

Portable buck-boost converter power supply

Ts. Rasidah binti Abdul Rani1, Norazila binti Md Posdzi2, Norsaadah bt Mahmor3
Politeknik Ungku Omar, Ipoh, Malaysia[1,2,3]
rasidah@puo.edu.my 1, Norazila.m@puo.edu.my 2, nsaadah@puo.edu.my 3

Highlights: A power supply is a source of power that supplies power to electrical and electronic circuits. Most electronic devices require a power supply to turn them on. For learning purposes, the power supply is required to supply the electrical and electronic circuits to be tested and measured. In addition, the Portable Buck-Boost Converter Power Supply was designed and applied as a facilitator during the practise session of the Electrical Technology course in general. This course is a core course and should be studied by students in semester 1 at the Department of Electrical Engineering Politeknik Ungku Omar. It focuses on the introduction of DC electrical circuits, and students are also focused on and born to the installation of electrical and electronic circuits. This device is a portable DC power supply that can be adjusted from 0.5 VDC to 12 VDC and only requires input from a USB or 9 V battery. The purpose of this device was to overcome the failure to use a DC power supply in the laboratory, as its use is necessary and essential for each test session being carried out. The devices developed are small, flexible, user-friendly, and energy-saving. Indirectly, this device can also be used for other courses in the Department of Electrical Engineering. The conclusion of the implementation of this innovation is that it can facilitate students and faculty in the process of implementation practise and also address the problem of the shortage of power supplies.

Key words: Power Supply; DC to DC; Buck-Boost

Introduction

The national education transformation programme for strengthening technical education and vocational training (TVET) in Malaysia is an important factor in producing a compact labour force in a particular discipline. In accordance with Malaysian Polytechnic's mission to produce quality TVET graduates, one of the steps in satisfying the requirements of the Malaysian Education Development Plan 2015–2025 (PPPM) has been taken (Rusli et al., 2021). To ensure that Polytechnic students remain competitive in satisfying the industry's skill requirements, skills and practical aspects must be emphasized. During the practical application sessions of the teaching and learning process (PnP), students can acquire their skills more efficiently. Every first-semester student at Ungku Omar Polytechnic who enrols in the Electrical and Electronic Engineering (DEE), Electronic (Communication) Engineering (DEP), or Electronic Engineering (Computer) (DTK) Diploma programmes is required to enrol in DET10013 Electric Technology. All students must take this course to understand the fundamentals of electrical and electronic engineering. The curriculum of this course incorporates both theoretical and practical coursework. During the practical application of this course, students will construct electrical and electronic circuits in order to assess their psychomotor skills in measuring voltage (V) and current (I) values on such circuit outputs. Consequently, the power supply is a piece of equipment that must be supplied to the students during the practise session. In order to achieve objectives and excellent learning outcomes, practical classroom learning sessions measuring the psychomotority of each student were also implemented. Nevertheless, through observations and experience, it was determined that the primary obstacles were the dearth of power supply tools and the inability to finance the purchase of new, expensive power supplies. Due to the severity of this power shortage, students will be required to share power supply equipment. Due to this circumstance, students are unable to acquire the necessary and desired skills. The students' emotions and motivation decreased, and they were apprehensive about the next practise session. In addition, approximately 350 students per semester are enrolled in semester 1 of the Department of Electrical Engineering at Polytechnic Ungku Omar. The total number of students is divided into ten courses, each with approximately 35 students. The engineering laboratory has the capacity and number of available power supply apparatus for only 20 students during a single practise session. Therefore, the number of students exceeds the available apparatus. In addition, the Portable Buck-Boost Converter Power Supply was devised and utilised as an aid during the Electrical Technology course's practise sessions. In keeping with this, the purpose of this innovative instrument is as follows: i. Teaching Aids (ABBM) in the Teaching and Learning Process (P&P), particularly in the practise sessions of DET10013 Electrical Technology ii. construct a variable DC power supply with a voltage range of 0.5 V to 12 V and a current of 1 A. Overcoming the laboratory power supply device limitations at the Department of Electrical Engineering

Product Description

Implementation of this project serves as an instrument of teaching materials (ABBM) for the Electrical Technology course (DET10013), as all first-semester students of all programmes offered by the Department of Electrical Engineering are required to take this course. During the practise session, students measured the voltage and current by using ABBM: Portable Buck-Boost to activate the circuit operation for psychomotor assessment. This ABBM was created by using Plan-Do-Check-Act method (PDCA). The PDCA Cycle is a systematic series of stages to collect useful

learning and knowledge for the continuous development of a product or process (Patel & Deshpande, 2017) . This ABBM created is to compensate for the lack of power supply in the announcement, as the number of students admitted to JKE and PUO is increasing each year and the existing equipment cannot accommodate all students. In addition, the majority of the existing equipment is severely damaged. The implications of the development of this ABBM could indirectly alleviate the department's apparatus shortages, as the ABBM's construction is considerably less expensive than the cost of the laboratory's supplies. The application of this ABBM can be considered in terms of the two factors stated below:

1. This ABBM is used for the subject Electrical Technology (DET10013) a, in which students can use either a 0.5 V or 12 V power supply to activate the operation of their circuit.
2. The ABBM has three main parts: input either using a USB cable or battery (9V, variable supply by using a knob, and display of the value of supply on the LCD.

The objectives of this project are:

1. Develop tools for teaching materials to teach and educate students during practical sessions.
2. Overcome the inadequate power supply at the laboratory
3. Develop a mobile power supply that can be used anywhere.
4. Contribute to the department by providing these ABBM specifically to the Electrical Technology subject or other related subjects.

Among the market potentials of using this ABBM are the following:

1. Multifunctional
   This one set of ABBMs can be used to vary the power supply from 0.5 V to 12 V.

2. Mobility
   This ABBM can also be small, lightweight, and easy to carry to any location.

3. User friendly
   The ABBM is easy to use and does not require a complex connection; it only needs to connect the main supply from a USB cable or 9-volt battery.

The novelty of this ABBM is divided into:

i. Design

a. This ABBM is suitable for use either in the classroom or in the laboratory.
b. The kits are small and lightweight, making it easy for teachers to take them everywhere.
c. This kit only uses a small power supply, for which the user can use a power bank or adapter or 9 VDC during the teaching and learning sessions.

ii. Cost

The cost of developing this ABBMs is cheap so it can help teachers provide more kits for the use of students. Next, it can improve the efficiency of the teaching and learning process.

iii. Applications

This ABBM not only can be applied to the Electrical Technology Subject, but it also can be used for other subjects such as the Semiconductor Devices Subject (DEE20023), the Electronic Circuit Subject (DEE30043), and the Measurement Subject (DEE10013).

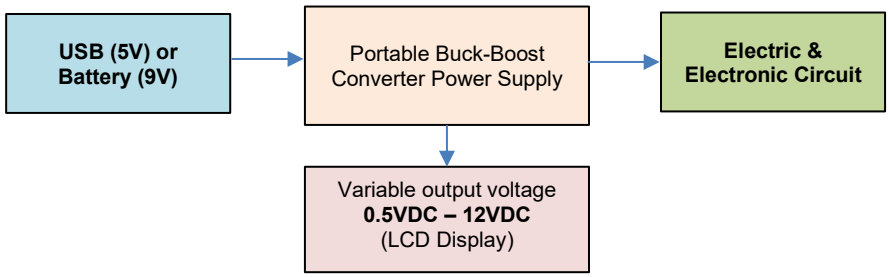


Figure 1: Block Diagram of Portable Buck-Boost Converter Power Supply

Figure 1 shows the flow of the overall functionality of this ABBM, which can be divided into three parts. Part 1 is the supply of the system, which can be from a USB cable or a battery 9 V. After that, part two is the buck-boost controller, with which this power supply can be regulated from 0.5 V to 12 V, and the last part is monitoring the value of the reading on the LCD display.

Results & Discussion

Impact of Innovation

A questionnaire study was carried out to obtain feedback on the innovation of the Portable Buck-Boost Converter Power Supply. The respondents to this questionnaire study consisted of students from semester 1 in the Department of Electrical Engineering. The following is an analysis of the percentage of students answering the survey questions, which means that the number of respondents is 73. The evaluation element of this survey question consists of four components. The evaluation that will be tested is in terms of the use of innovative products and the impact of innovation on users. A summary that can be made based on the respondent's survey of the Portable Buck-Boost Converter Power Supply innovation product is shown in Table 1 and Figure 3 below.

Table 1: Summary of the respondent's analysis

	Strongly Agree	Agree	No Agreed	Strongly Not Agreed
Easy to used	40	33	1	0
Saves time	36	36	2	0
User Friendly	38	33	3	0
Technology friendly	39	32	3	0

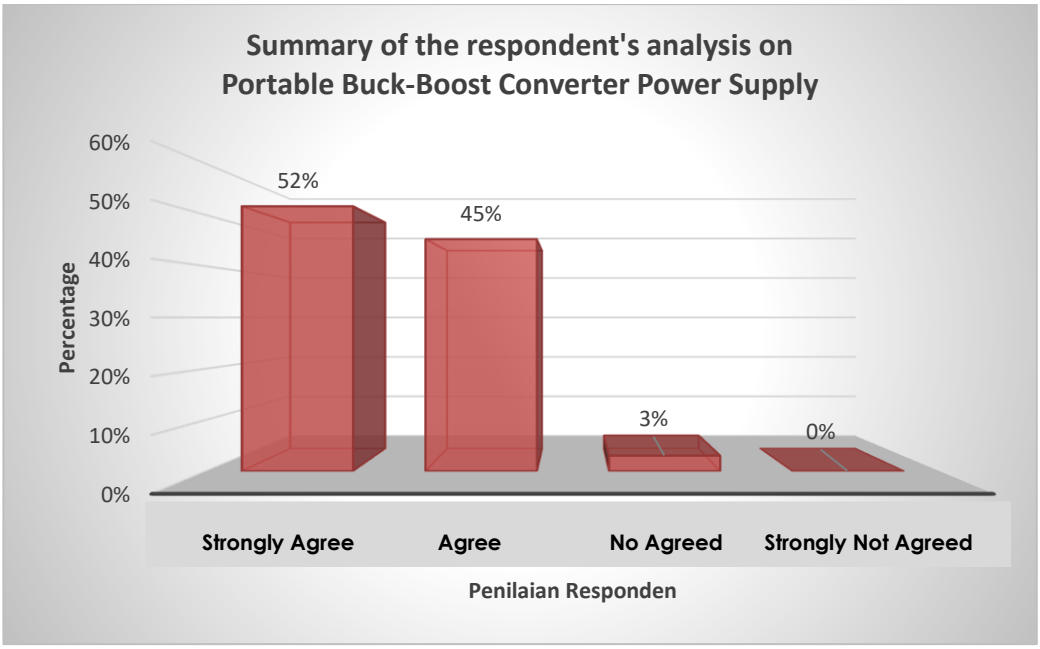


Figure 2: Summary of the respondent's analysis on Portable Buck-Boost Converter Power Supply

Figure 2 shows that the overall result of the evaluation is that 52% of respondents strongly agree with all four components of the survey question. Respondents strongly agree that this innovative product is easy to use, time-saving, user-friendly, and technology-friendly.

i. Impact on students and lecturers

a) The practical implementation process can run smoothly and effectively according to the time allocation given.
b) Students can focus on the lecturer's explanation, and their understanding of psychomotor skills can be improved.
c) This innovative product can help save practical implementation.

i. Impact to the department

a) This innovative product can solve the problem of a lack of power supply in the laboratories of the Department of Electrical Engineering, Ungku Omar Polytechnic.
b) This product can save electricity and reduce the cost of purchasing a new power supply. Since the cost of developing, it is low, this can help the department build and provide more power supply equipment to accommodate the large number of students each semester.
c) This innovative product is designed specifically for the DET10013 Electrical Technology course but can also be used to practice for other courses.

Conclusion

The Portable Buck Boost Converter Power Supply innovation product is a positive innovation effort towards conducive and effective teaching and learning process. The usefulness of the production is that it can contribute to saving the practical time and making it more efficient and effective learning environment. It can also contribute to students' understanding and focus on the teaching and learning process more effectively. Therefore, this situation can increase positive motivation for students to produce quality human capital with outstanding achievements.

References

Patel, P. M., & Deshpande, V. A. (2017). *Application Of Plan-Do-Check-Act Cycle For Quality And Productivity Improvement-A Review*. www.ijraset.com

Rusli, M. N., Mohamad, A. N., Fahmee Nordin, I., Aly, M., & Halim, R. (2021). *Peranan Teknologi Dalam Isu dan Cabaran Pendidikan Tvet di Malaysia*.

Matrics streamline academy (MSA) app

Rishikeesh A/L Krishnan ,Shamalan A/L Vellu Thavar,
Kheshvin Singh A/L Sukhdave Singh, Mokeish Rajan Baskaran, Kuberan A/L Rajah,
Uvathi A/P Mariappan
Kolej Matrikulasi Perlis, 02600, Arau, Perlis[1,2,3]
shikeesh@gmail.com, svthavar@gmail.com, rkheshvin@gmail.com, dkmokeish@gmail.com, kuberanrajah12@gmail.com, uvathiuva@gmail.com

Highlights: In the contemporary era, the number of matriculation students who earned 4.0 CGPA is much fewer than the overall number of matriculation students. This is the fundamental problem that our app, Matrics Streamline Academy (MSA) will help to tackle. This is due to the fact that this MSA application contains a tonne of features to aid Matriculation students in getting high PSPM scores. For instance, by watching lecture videos through the app, matriculation students can understand a specific subject in-depth. Furthermore, the lecture notes are available to students without charge. This aids them to be prepared for the year-end end examination. At the same time, this MSA app allows students to access Artificial intelligence (AI) tools such as ChatGPT, Gradescope, Ivy Chatbot, Plaito, and Grammarly. This will help students finish their project and thesis in time, and they'll be able to get outstanding scores for their assignments as well.

Key words: Matrics Streamline Academy; MSA; matriculation; education

Introduction

Following the global pandemic, technology has grown significantly in the education industry. This is due to the fact that students across were forced to attend online classes using Google Classroom and Google Meet due to the COVID-19 pandemic. The entire industry is implementing new methods to enhance the education level in our nation. Technology has always been a main key in moving forward the education system; nevertheless, the number of educational applications has been relatively small.

Utilizing technology was once optional, but now it's mandatory. Due to this, instructional software development for mobile platforms has become popular, enabling businesses particularly those in the education sector to scale new heights. It became obvious that there was an enormous need for technology tools and systems that allowed teachers to engage with their students, monitor their academic progress, and deliver their courses throughout the mandatory distance learning period.

Previously, students could only receive an education in a physical classroom, but mobile learning technology has made it attainable for them to attend schools through computers, tablets, and mobile phones. By downloading assignments and uploading completed homework, students are able to engage in the learning process at any time and from any location. The world of education is expanding rapidly, and mobile learning has begun to take off. Mobile learning has numerous advantages.

One of the well-known educational systems in our nation is matriculation. This is so that students can continue their education anywhere they desire after completing their matriculation studies. Although matriculation is one of the education programs where students can easily score 4 flat, the vast majority of matriculation students in our country struggle to perform well on their year-end examination, which is the PSPM. This is because the proportion of matriculation students who achieved a 4.0 CGPA for their year-end examination is typically greater than STPM students. However, fewer than half of the total matriculation students achieved a 4.0 cumulative grade point average (CGPA). This is where Matrics Streamline Academy (MSA), our app, will be essential in resolving the issue.

Product Description

Matrics Streamline Academy (MSA) application is available for free download.It is downloadable for Android mobile devices. For access to all the features of this app, users must first register for an account. Most essential, before enrolling, individuals have to verify their email addresses. It verifies to see if the email address entered during registration is valid. In addition, the app has buttons to make it easier for users. At the same time, all of the app's icons are clear, saving users from having to search for the buttons. Hence, users can save time. Additionally, the application separates all the subjects based on their module codes to make it easier for users to find the subjects.

In addition, users get access to lecture videos that are linked to YouTube. As a result, students don't have to spend hours searching YouTube for lecture videos or downloading the YouTube app in order to watch these videos. On

top of that, the students also can take quizzes using this app, MSA. The quizzes were picked from the Quizzizz website, one of the most well-known quiz websites. Furthermore, users have access to questions from previous years from other matriculation colleges. Students can also access class notes through this MSA app. These lecture notes were written by lecturers from various matriculation colleges. Also, there are notes for every single subject. Also, there are notes for each and every subject. Along with that, this MSA app enables students access to artificial intelligence (AI) tools like ChatGPT, Gradescope, Ivy Chatbot, Plaito, and Grammarly.

The intended target audience for our application is matriculation students. For students who struggle with a particular subject, this app can be beneficial. Through the lecture videos in this app, they can use it to learn specific topics in-depth. Additionally, this app enables students to catch up on their studies whenever they miss class due to an unexpected occurrence. In addition, those who aspire to become experts in a certain subject may find this app to be helpful. For instance, Peer Assisted Learning Leaders, or PAL Leaders, are present at every matriculation. This group of individuals must be experts in particular fields before they may instruct other students and improve their performance on tests. Since these PAL Leaders can use our app to answer quizzes and past year's questions, our MSA app becomes crucial in assisting these leaders. By doing so, they are able to master every subject and are kept from misguiding the other students. In addition, matriculation students can use our app to get free access to the lecture notes. This is because these notes are written in the most simplest form possible. Hence, students may learn all of the topics in just a brief period of time. As a result, the students will make the best use of their time. Moreover, students are able to utilize this MSA app to access the AI tools in order to complete their assignments and homework. For instance, students can check the grammar of their essays or theses using artificial intelligence (AI) tools like Grammarly. Students will benefit from this and perform exceptionally well in their assignments.

Results & Discussions

As the creator of the app, my team has sent Google forms to 20 students from 4 different matriculation colleges such as Perlis Matriculation College, Penang Matriculation College, Kedah Matriculation College, and Selangor Matriculation College. This is to develop the app and maximize its usage. This will enable the students to use the app to their advantage. All students have completed this form after using our app, MSA for five days from 3 September until 7 September. Throughout these 5 days, The students have used all of the app's features. For example, they watched the lecture videos and did revision using the lecture notes in the app. Additionally, they also answered the quizzes to deepen their comprehension. These are the results of the survey:

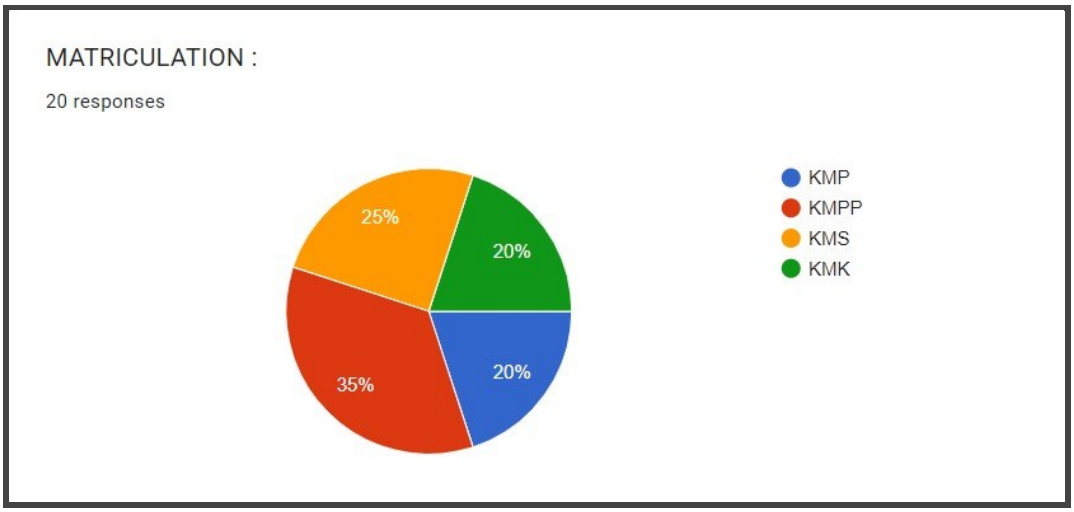


Figure 1: Results of 20 responses

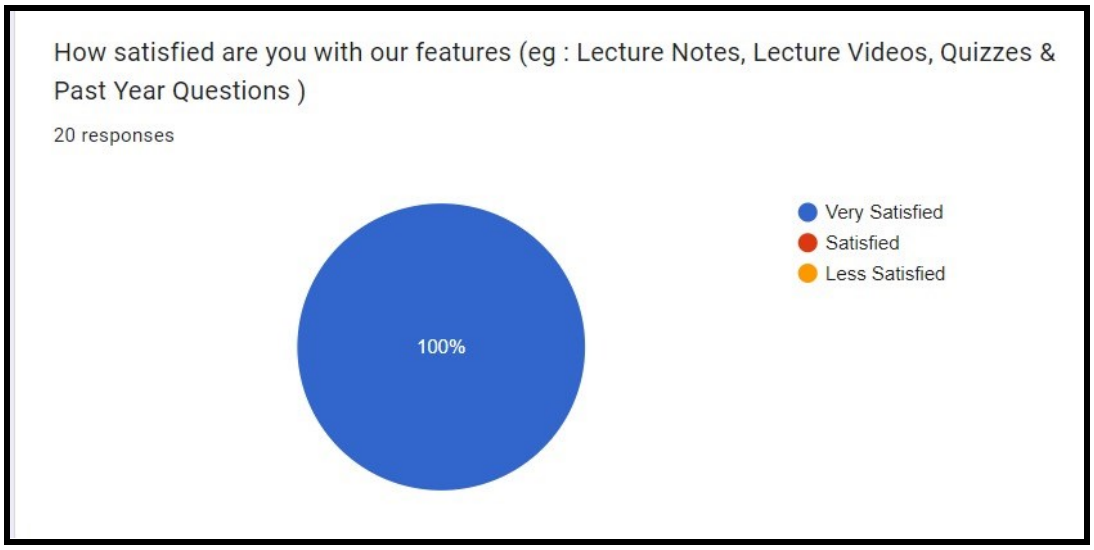


Figure 2: Results of satisfaction with features

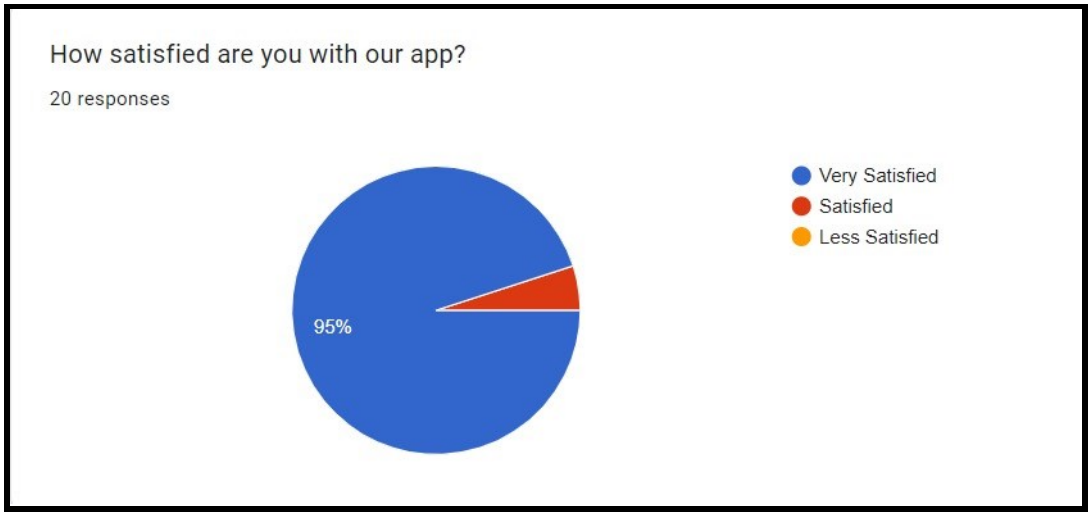


Figure 3: Result of satisfaction with application

We've come to the conclusion that the majority of students adore our concept and application after doing the survey. This is due to the high level of satisfaction with our app across practically all of the students. At the same time, all 20 students are happy with the features we introduced to our application. For instance, lecture notes, lectures on video, tests, and questions from previous years.

Conclusion

In the future, we plan to enhance and add new features to our app. This is so that these changes can benefit the students who use this app in various ways. We will provide students who will be waiting for their results or acceptance

into a public university with short-term courses. For instance, networking and cybersecurity classes will be very beneficial for those students. Those who successfully complete these courses will also receive government-certified diplomas from us.

In addition, we will give this app's users access to a subscription plan. Therefore, we will pay the retired professors who are willing to teach online courses through our software using the money we receive from this subscription plan. The retired lecturers will benefit financially from this because it serves as a side source of income for them. In addition, graduates and students can make a little extra money by educating users in these online classes. Furthermore, we will eventually include STPM and secondary school subjects in this application. Numerous group of students across the nation will benefit from this.

Reference

Thunkable.(n.d.)https://x.thunkable.com/projects/64ef7af635241a5972a1ed9f/8dcaa143-dc89-469d-b2e6-eba173cee956/designer

WOWinfotech. (n.d.). Important of educational app in2021. www.linkedin.com. https://www.linkedin.com/pulse/important-educational-app-2021-wowinfotech/

Laman Web Rasmi Kolej Matrikulasi Perlis. (n.d.). http://www.kmp.matrik.edu.my/

LinkedIn. (n.d.). https://www.linkedin.com/pulse/important-educational-app-2021-wowinfotech/

Simtastic creations: Design your sims!

Athirah Nabilah binti Mohd Saidi 1, Nurafiqah Masyitah binti Mat Jani 2, Muhammad Adib Irfan bin Mohd Rodzi 3, Firzana Huda binti Azman 4
Institut Pendidikan Guru Kampus Temenggong Ibrahim[1,2,3,4]
g-p19124762@moe-dl.edu.my 1

Highlights: Unleash your creativity with 'Simtastic Creation'! Unlocking the vibrant world of adjectives has never been more engaging! Step into a world of imagination as students craft their unique Sims in The Sims 4. This interactive game empowers participants to design every aspect of their Sims – from appearances and personalities to hobbies and backgrounds all within the captivating realms of Sims 4. As they bring their virtual alter egos to life, students cultivate self-expression and storytelling skills. The final touch? Presenting their carefully crafted Sims to the class, fostering an engaging atmosphere of sharing and camaraderie. Our innovative approach to teaching adjectives takes students on an exciting journey of creativity and language exploration. Get ready for a journey of imagination, reflection, and connection and join us as we harness the power of character design to make adjectives come to life, inspiring students to embrace descriptive language like never before!

Key words: Creating Sims; Adjectives; Personalities; Immersive Learning Experience

Introduction

Are you tired of the same old, dull ways of introducing adjectives to students? Say goodbye to the monotony and welcome a fresh, exciting approach! We've all been there, struggling to engage students in the world of descriptive words (Soon et al., 2022). But fear not, because we have the solution: Sims 4. We've reimagined the adjective-learning experience by bringing it to life through character design. With Sims 4, adjectives transform from a chore into an adventure. Pettini, S. (2021) states that since the pandemic, people start turning into virtual worlds through the simulation life in The Sims 4. It's time to break free from the boredom and invigorate your lessons with the dynamic and interactive world of Sims 4. Say hello to a new era of adjective learning! Introducing a captivating way to learn adjectives through the art of storytelling and gaming! In this activity, students dive into the world of creativity by designing their own Sims characters in The Sims 4. By choosing appearances, personalities, hobbies, and crafting backgrounds, they'll not only explore their imagination but also grasp the concept of adjectives in a memorable way. Since The Sims 4 is a game-based learning which according to Adipat.S, et al., (2021), it can help to ensure collaborative learning among the class community. Through this unique blend of storytelling and gaming, learning becomes an exciting adventure where adjectives come to life which can bring several impacts toward educational stakeholders. Incorporating community engagement within this game fosters a dynamic learning environment where students interact with virtual communities to apply their understanding of adjectives in real-world contexts, bridging the gap between theory and practice. Meanwhile, teachers can use this feedback to assess students' understanding of adjectives and provide immediate guidance and corrections when needed.

Product Description

This innovation goes beyond conventional methods, seamlessly blending storytelling and interactive gameplay to make language learning an adventure. This innovation ensures a transformative learning experience that's both captivating and enlightening. Students can dive deeper into their artistic side while learning language skills at the same time. As students design their characters, they are encouraged to describe every aspect, from the character's appearance to their personality traits, hobbies, and backgrounds. The catch? They must use adjectives to paint a vivid picture. For example, they might describe a character's "charming smile," "adventurous spirit," or "mysterious past." It's not just about memorizing words; it's about applying them in a fun and practical way. Our product makes adjective usage tangible and relatable, as students see their descriptions come to life in the Sims 4 world. By engaging with adjectives in various contexts, students build a strong foundation in descriptive language, enhancing their vocabulary and communication skills. Not to mention, collaboration with peers in this game encourages students to share their observations, exchange ideas, and collectively build a comprehensive list of adjectives, promoting a supportive learning community where knowledge is co-constructed.

Results & Discussion

Anticipate transformative outcomes with "Simstastic Creations: Design Your Sims!". As students embark on this immersive learning journey, we foresee a host of expected results that promise to reshape the way they engage with adjectives and language. Using the "Simtastic Creations" as an educational tool to learn adjectives is expected to yield a range of positive outcomes for students. Firstly, by actively choosing adjectives to describe their Sims characters, students practice and reinforce their understanding of various adjective types and their usage in context. Secondly, crafting unique appearances, personalities, and background stories for their Sims characters fosters creativity and encourages students to think imaginatively while selecting adjectives that accurately represent their creations. Thirdly, students can grasp the nuances of adjectives by selecting appropriate descriptors to match their Sims characters' personalities, hobbies, and backgrounds, connecting grammar concepts to real-world scenarios. Teacher facilitation in this game guides students in making meaningful connections between their

observations and the proper usage of adjectives, offering valuable insights and clarifications to enhance their understanding and ensures that students receive the necessary guidance and support to navigate the learning process effectively, fostering a deeper grasp of adjective usage.

Conclusion

In conclusion, the 'Simtastic Creations' offers a remarkable blend of creativity, innovation, and language learning that impact the educational world. Through the engaging process of crafting unique Sims characters and selecting adjectives to describe them, students embark on a journey of discovery, imagination, and improved language skills. This activity goes beyond traditional methods, creating a learning experience that is both enjoyable and effective (Kaur, 2019). By embracing the power of storytelling and gameplay, students not only master adjectives but also develop a deeper appreciation for the richness and versatility of language. With the 'Simtastic Creations,' learning becomes an exciting adventure that leaves a lasting impact. Not to mention, continuous feedback and assessment in this game enable students to refine their understanding of adjectives, as they receive constructive insights from both peers and the teacher, ensuring that they can apply these concepts effectively in various contexts and not only gauge students' proficiency in using adjectives but also encourage them to reflect on their learning journey, promoting a well-rounded approach to language acquisition.

Publication, Award and Intellectual Property

The innovation is still at its prototype stage and we are in the midst of collecting data for analysis. Full article will be published in an indexed journal.

References

Adipat, S., Laksana, K., Busayanon, K., Ausawasowan, A., & Adipat, B. (2021). Engaging Students in the Learning Process with Game-Based Learning: The Fundamental Concepts. International Journal of Technology in Education, 4(3). https://doi.org/10.46328/ijte.169

Hui, S. M., Yong, T. S., & Md Yunus, M. (2022). Using Adjective Monsters kit to improve the pupils' mastery of comparative and superlative adjectives. International Journal of Academic Research in Progressive Education and Development, 11(1). https://doi.org/10.6007/ijarped/v11-i1/12292

.Kaur, R. (2019). A Study Of The Effectiveness Of Using Language Games In Teaching Vocabulary In Secondary School. INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH, 8(11). https://www.ijstr.org/final-print/nov2019/A-Study-Of-The-Effectiveness-Of-Using-Language-Games-In-Teaching-Vocabulary-In-Secondary-School.pdf

Pettini, S. (2021). Languaging and Translating Personality in Video Games: A Lexical Approach to The Sims 4 Psychological Simulation. StatusQuaestionis.https://www.academia.edu/50188815/Languaging_and_Translating_Personality_in_Video_Games_A_Lexical_Approach_to_The_Sims_4_Psychological_Simulation

Ragni, B., Toto, G. A., Furia, M. d., Lavanga, A., & Limone, P. (2023). The use of Digital Game-Based Learning (DGBL) in teachers' training: a scoping review. Sec. Teacher Education, 8. https://www.frontiersin.org/articles/10.3389/feduc.2023.1092022/full

Digital learning objects help increase students' interest in learning

Norrila Satari 1, Nur Fatihatul Zulizam 2, Nurfatihah 3, Nur Ameera Antasya 4, Rizqen 'Erdhea 5
Institut Pendidikan Guru Kampus Tun Hussein Onn[1,2,3,4,5]
norrilasatari2016@gmail.com 1

Highlights: The innovation named "Ladang Tok Aba" is an instructional aid in the form of a digital learning object. This innovation is a digital poster created for the subject of Bahasa Melayu at the primary school level with the topic "Kenali Haiwan Ternakan" focuses on improving students' listening and verbal response skills based on the digital poster. Additionally, this instructional aid can also assist students with diverse learning styles, such as auditory learners, in remembering different types of farm animals through the video lyrics and the animated video. The construction process in Genially involves digital utilization using various software and applications, including BandLab, Capcut, and Canva. Wordwall and Educaplay applications are also used to create reinforcement and remedial activities for students. The digital poster "Ladang Tok Aba," which has been widely distributed through social media platforms such as YouTube, TikTok, and Facebook.

Key words: Digital Learing Object; learning styles; primary students; reinforcement; remedial

Introduction

Students are already using technology in their personal lives, and they are expecting to use it in school as well. This innovation was produced to increase the use of technology in education. Kern (2006) believes that technology serves as an intermediary between teachers and students. In today's rapidly involving world, technology plays an increasingly central role in society. Students are no exception to this trend, as they are already well-versed in the use of digital tools in their personal lives. Consequently, there is a growing expectation among students that technology should also be integrated into their educational experiences. This shift is not merely a reflection of changing preferences; it is a recognition of the potential for digital tools to revolutionize the learning process. As technology continues to advance, educators have an opportunity to harness its power to improve educational outcomes, making learning more engaging, effective, and efficient.

The need to improve educational outcomes is paramount, and digital tools offer a promising avenue for achieving this goal. These tools can provide interactive and multimedia learning experiences that cater to diverse learning styles, enhancing student engagement. Moreover, they allow for personalized learning, adapting content to individual students' needs and progress. Additionally, digital tools have come to the forefront in addressing the challenges posed by distance learning, a shift accelerated by the COVID-19 pandemic.

By offering students access to high-quality educational resources, these tools ensure that learning can continue seamlessly, even when physical classrooms are not accessible. In sum, the integration of digital tools into education is not just a response to the changing technological landscape; it is a vital means to meet the pressing needs of today's learners and educators alike. In addition to giving students access to the Internet, various digital tools including computers, laptops, tablet technologies, and smartphones also give them more opportunity to be inspired, motivated, and involved in educational activities (Nygren & Vikström, 2013; Chen & Wang, 2015; Wang, 2010).

Product Description

The innovation named "Ladang Tok Aba" is an instructional aid in the form of a digital learning object. This digital learning object is a digital poster created for the subject of Bahasa Melayu at the primary school level. The content of this instructional aid refers to the Standard Curriculum and Assessment Document (DSKP) for Year 3, which is under the theme of Agriculture and Animal Husbandry, with the topic "Kenali Haiwan Ternakan."

https://view.genial.ly/630eecc14688bc0018

https://www.youtube.com/watch?v=NTb0OTLYbHk

This innovation focuses on improving students' listening and verbal response skills based on the digital poster. Additionally, this instructional aid can also assist students with diverse learning styles, such as auditory learners, in remembering different types of farm animals through the "Sayang Haiwan" video lyrics and the "Ladang Tok Aba" animated video.

https://www.youtube.com/watch?v=VK7cmEuao0o

The construction process of "Ladang Tok Aba" in Genially involves digital utilization using various software and applications, including BandLab, Capcut, and Canva.

Wordwall and Educaplay applications are also used to create reinforcement and remedial activities for students.

https://www.educaplay.com/learning-resources/12914676-ladang_pak_din.html

https://wordwall.net/resource/35593546/kita-susun-dia

The combination of all these software and application uses has resulted in the digital poster "Ladang Tok Aba," which has been widely distributed through social media platforms such as YouTube, TikTok, Facebook, and others.

This innovation is expected to benefit teachers and students in achieving more effective and meaningful teaching and learning experiences.

Results & Discussion

This innovation has an impact on stakeholders. One of them is this innovation can improved educational outcomes by making learning more engaging, effective dan efficient. Meaning that, digital learning environments can provide chances for collaborative and self-paced learning, can directly offer help and feedback, and can let students take part in fun and fascinating learning activities.

Beside that, this innovation can help to improve the efficiency of educational institutions by automating tasks and providing teachers with more time to focus on teaching.

Next, this innovation also can help to reduce the costs of education by providing students with access to high quality educational resources at a lower cost.

Conclusion

In conclusion, the integration of digital tools into education is not just a response to the changing technological landscape; it is a transformative shift that holds the potential to revolutionize the way we learn and teach. The increasing use of technology in society, driven by students' familiarity with digital tools in their daily lives, creates a natural synergy between their personal and educational experiences. Furthermore, the urgent need to improve educational outcomes, coupled with the challenges posed by events like the COVID-19 pandemic, underscores the importance of harnessing the power of digital tools in education(Wang, 2010; Pérez-Sanagustín et al., 2012; Sun & Looi, 2013).

Digital tools offer the promise of making learning more engaging, effective, and efficient. They cater to diverse learning styles, provide opportunities for personalized learning, and enable educators to reach students regardless of physical constraints. As we continue to advance in the digital age, it is incumbent upon educational institutions and policymakers to embrace these tools and ensure their widespread adoption. By doing so, we can not only meet the evolving expectations of today's learners but also unlock new possibilities for enhancing educational outcomes and preparing students for success in an increasingly technology-driven world.

References

Nygren, T. & Vikström, L. (2013). Treading old paths in new ways: Upper secondary students using a digital tool of the professional historian. Education Science, 3, 50– 73

Pérez-Sanagustín, M., Santos, P., Hernández-Leo, D., & Blat, J. (2012). 4SPPIces: A case study of factors in a scripted collaborative-learning blended course across spatial locations. Computer-Supported Collaborative Learning, 7, 443–465

Richard Kern. 2006. Perspectives on technology in learning and teaching languages. Teachers of English to Speakers of Other Languages, Inc. (TESOL). doi:10.2307/40264516.

Sun, D., & Looi, C.-K. (2013). Designing a Web-based science learning environment for model-based collaborative inquiry. Journal of Science Education and Technology, 22, 73–89

Wang, T.-J. (2010). Educational benefits of multimedia skills training. TechTrends, 54(1), 47–57

CrypTexto: Integrated virtual alternative spelling game

Ahmad Iman bin Zulkifli 1, Intan Zarifah Binti Anuar 2, Nur Farhana Najwa Binti Mohd Syarif 3, Nurul Allya Najwa Binti Abdul Razak 4, Mardiana binti Idris 5

Institution of Teachers Education Temenggong Ibrahim, Johor Bahru, Malaysia[1,2,3]

g-p19124751@moe-dl.edu.my 1

Highlights: A virtual spelling aid in a form of gamification that helps to develop young learners in spelling through objective oriented goals. CrypTexto is an embedded puzzle-solving game that attracts young learners who are developing their language to learn in an interesting approach and motivation driven. The game has an advantage of multitude levels of difficulty that can be adjusted according to the learner's mastery in spelling ranging from three to fifteen alphabet long words so that they can keep track of their progress in mastering vocabulary whilst spelling through visual instruments

Key words: CrypTexto; difficulty; spelling; objective

Introduction (The context or background of the innovation / issues or problems)

Spelling is a crucial aspect of language development involving learning to form words correctly using the appropriate arrangement of letters. It plays a significant role in communication, literacy, and cognitive development. As learners progress through different stages of language acquisition, their spelling skills evolve from basic phonetic attempts to mastering complex spelling rules and irregularities. Young learners often encounter a range of obstacles when it comes to mastering spelling (Kormos, 2020). These obstacles can stem from the complexity of the English language itself, as well as the developmental stage of these learners. Letter reversals, Phonetic spelling and Vowel confusion categorises in the obstacles that young learners encounter in mastering word spelling.

To aid young learners in their spelling journey, various strategies can be employed: Firstly, incorporating phonics instruction into the curriculum can be immensely beneficial. This approach emphasises the relationship between sounds and letters, equipping learners with the skills to decode and spell unfamiliar words. Engaging learners in word games and puzzles can make learning spelling an interactive and enjoyable experience (Dehghanzadeh, 2021). Such activities not only reinforce spelling skills but also foster a positive attitude toward language learning. A recent study by Hill, 2022, states that mnemonic devices and memory aids can be created to assist learners in remembering the spellings of challenging words and contextual learning.

Product Description

Game Concept and Engagement

The game's central narrative, woven seamlessly into the puzzle-solving experience, provides a sense of purpose and intrigue that keeps players motivated. It emphasizes development through transformation and reflection between various forms of knowledge while still centralized into the puzzle solving concept that will put their knowledge to the test.

Graduated Difficulty

Importance of a gradual learning curve as informed by Yello, 1997, is that it represents the progression of a learner from a state of initial unfamiliarity or incompetence to a level of proficiency or mastery in a particular subject or skill. CrypTexto employs a sophisticated algorithm that adapts puzzle difficulty based on the player's performance. Aligned with the principle of trialogical learning where it fosters long-term processes of knowledge advancement as players or learners can accumulate and provides enough time for iterative inquiry cycles to develop their progress in knowledge acquisition through long term processes. This ensures that players are consistently challenged but never overwhelmed, fostering a sense of achievement and progression throughout the game.

Real-World Integration

The game embraces the concept of gamified learning by integrating real-world knowledge and skills into its puzzles. For instance, players might need to find historical facts, scientific principles, or cultural references to decipher certain clues. This innovative approach not only makes the gameplay more enriching but also encourages players to expand their knowledge beyond the virtual realm.

Risk and Rewards System

While the game is operating to match the players gradual learning curve, difficulties may arise for remedial learners where they will hit a wall to their progress due to having difficulty to solve the word puzzle. Integrating the risk and reward system where players will be equipped with Zap energy which is an in-game currency, they have the option to use that currency to reveal clues and pass the level with less rewards or try their best while thinking critically without the aid of Zap Energy to succeed the level with greater rewards. This is aligned to the principles of operant conditioning, proposed by B.F. Skinner, involves the use of rewards (positive reinforcement) and punishments (negative reinforcement) to shape behaviour (Abrutyn, 2023).

Results & Discussion

This innovation will help players to gain vocabularies that spread their knowledge of the world while applying it to their real life. Players will also get to enjoy learning while playing games that offer interactive activities. They help learners become familiar with correct spelling of words through practice. Furthermore, success in games can help them gain confidence in their language abilities as well as them being willing to participate in language-related activities. Games also motivate young learners to learn and practice vocabularies outside of formal educational settings. Teachers also will be able to use this game as interactive tools to engage young learners in learning. Moreover, games can capture the young learners' attention and keep them engaged during lessons. This can lead to a more focused and participatory classroom environment. Teachers also can use the spelling games to assess their learners' spelling abilities in a less formal and more relaxed setting like in their own home.

Results for this product are yet to be deducted as the innovation is still at its prototype stage and we are in the midst of collecting data for analysis. Full article will be published in an indexed journal.

Conclusion

In conclusion, this innovation can lead to a more enjoyable learning experience for learners and alternative for teachers to design a game for fun learning. This innovative approach has the potential to revolutionize language learning in the classroom to provide teachers with a valuable tool for designing engaging lessons. With this product's original intention of captivating and redirecting learners' attention and curiosity, making them more enthusiastic about language learning, the gamification aspect of puzzles has motivated learners to actively participate in language-related activities, thereby boosting their vocabulary development. It is believed that it will make significant strides in improving language education. However, as the product is still in its foundation build, various improvements need to be implemented by the launch of this product such as by its user-interface (UI) to have a simplified navigation within the puzzle platform so that learners and teachers can easily access content and track progress, clear menus and directory, icons, and buttons to guide users. Visuals and assets also need refinement to have visually appealing graphics, vision friendly to make the learning environment engaging and aesthetically pleasing. By continually developing and enhancing this innovation with further patches and updates, we can look forward to a future where learners are more engaged, confident, and proficient in their language skills, while teachers are equipped with dynamic tools to foster effective learning experiences.

References

Abrutyn, S., & Lizardo, O. (2023). A motivational theory of roles, rewards, and institutions. Journal for the Theory of Social Behaviour, 53(2), 200-220.

Dehghanzadeh, H., Fardanesh, H., Hatami, J., Talaee, E., & Noroozi, O. (2021). Using gamification to support learning English as a second language: a systematic review. Computer Assisted Language Learning, 34(7), 934-957.

Hill, A. C. (2022). The Effectiveness of Mnemonic Devices for ESL Vocabulary Retention. English Language Teaching, 15(4), 6-15.

Kormos, J. (2020). Specific learning difficulties in second language learning and teaching. Language Teaching, 53(2), 129-143.

Yelle, L. E. (1979). The learning curve: Historical review and comprehensive survey. Decision sciences, 10(2), 302-328.

BrainFlex: Mathematic Special Education Application for Primary Cerebral Palsy Students

Aminah Bibi Bawamohiddin, Ng Khai Zhe, Zulfa Iza Mat Khalid
Department of Information and Communications Technology, Ungku Omar Polytechnic, Jalan Raja Musa Mahadi, 31400 Ipoh, Perak, Malaysia
E-mail addresses: aminahbibi@puo.edu.my, khaizhe2003@gmail.com, izza3734@gmail.com

Highlights:

BrainFlex is a mobile application that spearheads innovative inclusive education for students with cerebral palsy (CP) to learn basic mathematics. BrainFlex offers alternative and supplementary tools in addition to traditional teaching methods. Developed based on the 3M foundation special education syllabus for mathematics (Prenumber, Whole Number, Plus, Minus, Time, and Money), BrainFlex provides an interactive learning experience tailored to the unique needs of CP students. Preliminary testing results reveal significant progress and potential within the CP student community, highlighting BrainFlex's effectiveness in enhancing mathematical proficiency. However, these results also underscore the need for continuous refinement to further optimize the learning experience.

Key words: cerebral palsy; mathematic foundation; mobile game application; interactive learning; special education.

Introduction

In the realm of special education, the ability to adapt and customize teaching methods to meet the unique needs of students holds the key to unlocking their full potential (Escoto-Kemp, Rohani, Rosmawijah, & Ratna Suraini, 2019). This principle extends to students with special educational needs, particularly those with cerebral palsy (CP), who can also thrive when educators employ adaptable techniques and tailor activities to cater to their requirements. Mastery of fundamental skills, such as reading, writing, and arithmetic, is essential for these students to reach their optimal abilities.

Recent research has shed light on the potential of cognitive training games and mobile applications to enhance the cognitive proficiency of individuals with CP (Chen et al., 2007; Akhutina et al., 2003; Şahin et al., 2020). This underscores the significance of leveraging innovative approaches to education, especially in addressing the unique challenges faced by CP students.

Furthermore, it is imperative to recognize the vital role played by parents, caregivers, and educators in the learning process (Rentinck et al., 2007; Pereira et al., 2016; Tayuni & Oktaviani, 2023). Their active involvement and support are essential elements in nurturing the educational journey of children with CP.

This paper delves into the educational landscape for students with CP, focusing on the specific challenges they encounter. It highlights the limitations of traditional manual worksheets in fostering interactive and structured learning experiences, as well as the absence of accessible and inclusive resources tailored to their unique needs. Moreover, it addresses the necessity for a comprehensive and targeted curriculum to address the mathematical learning needs of children with spastic CP. In doing so, this paper advocates for innovative solutions and interventions that can pave the way for a more inclusive and effective educational journey for these exceptional learners.

Product Description

BrainFlex is a cerebral palsy brain training game. This project describes the development of a mobile game application designed to help children learning basic mathematics. It boldly redefines the learning experience for children with CP, incorporating unprecedented creativity and ingenuity based on Standard Document of Special Education Primary School Curriculum Standard, 3M Foundation. At its core, BrainFlex introduces an interactive mathematical learning tool that is tailored to the specific needs of children with CP. This revolutionary tool, encompassing colour classification, shape classification, size classification, whole numbers, addition, subtraction, money, and time.

Behind the scenes, BrainFlex leverages cutting-edge technology. The game engine is expertly crafted using mobile development platforms like Android Studio. Supplementary software tools, including Adobe Photoshop, elevate the game's design and user experience to unmatched heights. Data management relies on Firebase Cloud Firestore, ensuring the secure and organized collection of data.

The "Prenumber" topic within BrainFlex comprises three engaging subtopics: shape, color, and size. In the shape subtopic, students are presented with images on the screen and are prompted to select the correct option from primary colors (blue, yellow, red) based on the displayed image. In the shape subtopic, students need to identify and tap on the names of primary shapes (square, circle, triangle) corresponding to the shapes shown on the screen. The size subtopic challenges students to discern the relative sizes of two images, such as objects, animals, or vehicles, and tap on the image representing the smaller or larger item based on their common knowledge.

The "Whole number" topic offers three levels of difficulty: easy, medium, and hard. In the easy level, students match numbers 1 to 9 in words to the displayed numerical value. The medium level requires students to rearrange numbers in ascending order from 1 to 10 by dragging and dropping them into the designated boxes. The hard level presents a similar challenge but with numbers in descending order from 10 to 1, offering a more advanced task that fosters mathematical skills.

The "Addition" and "Subtraction" topics also feature three difficulty levels: easy, medium, and hard. In the easy level, students are shown two digits and must choose the correct option from 0 to 10 to complete the addition or subtraction. In the medium level, students perform the addition or subtraction operation using images displayed on the screen. If they encounter difficulty, a hint option is available, displaying images representing the numbers involved in the calculation. In the challenging hard level, no hints are provided, and students must rely solely on their mathematical knowledge to solve the problems.

The "Money" topic offers two difficulty levels: easy and hard. In the easy level, students identify different denominations of money (5 sen, 10 sen, 20 sen, 50 sen) by dragging and dropping the appropriate options into designated boxes. The hard level presents a more complex task, requiring students to select the images of sen based on objects and their respective prices displayed.

The "Time" topic encompasses clock and day subtopics. In the clock subtopic, students are required to select the appropriate time based on what the analog clock show. In the day subtopic, students tap on the appropriate time of day (morning, evening, afternoon, or night) based on images or gifs depicting related activities.

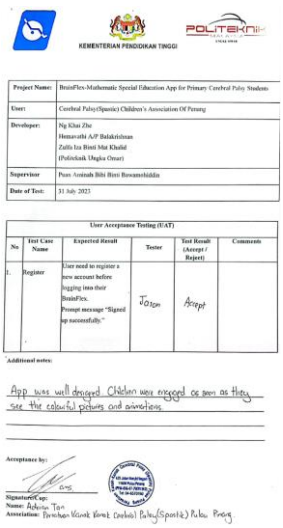
Furthermore, BrainFlex's innovativeness extends beyond its curriculum contents. In a groundbreaking stride toward inclusivity, it introduces a bilingual interface (Bahasa Melayu and Bahasa Inggeris). This visionary feature empowers children to engage with the application in their preferred language, setting new standards for personalized and highly effective learning experiences.

Recognizing the potential for guidance and support, BrainFlex stands as a trailblazer. Parents, caregivers, and educators can actively participate, offering personalized instructions and assistance. This approach is a resounding testament to BrainFlex's unwavering commitment to tailored learning.

What propels BrainFlex into a league of its own is its steadfast dedication to progress tracking. Each session is meticulously documented, with the application diligently collecting scores. This innovative tracking mechanism empowers stakeholders with data-driven insights, allowing them to monitor progress and pinpoint areas for development with unparalleled precision.

Results & Discussion

The BrainFlex was tested by 6 students of the Cerebral Palsy (Spastic) Children's Association of Penang. The testing, which took 3 hours and 30 minutes, was conducted with assistance from both teachers and speech therapist. Due to time constraints and the students' spastic CP condition affecting screen time, testing was limited to specific topics. The teachers and caregiver's feedback were documented in the User Acceptance Test (UAT) plan, as shown in Figure 1, and all requirements were met with some improvement feedback from the users. The progress results of the students with CP were displayed in Figure 2 and Table 1.


KEMENTERIAN PENDIDIKAN TINGGI

Project Name:	BrainFlex-Mathematic Special Education App for Primary Cerebral Palsy Students
User:	Cerebral Palsy(Spastic) Children's Association Of Penang
Developer:	Ng Khai Zhe Hemavathi A/P Balakrishnan Zulfa Iza Binti Mat Khalid (Politeknik Ungku Omar)
Supervisor	Puan Aminah Bibi Binti Bawamohiddin
Date of Test:	31 July 2023

User Acceptance Testing (UAT)

No	Test Case Name	Expected Result	Tester	Test Result (Accept / Reject)	Comments
1.	Register	User need to register a new account before logging into their BrainFlex. Prompt message "Signed up successfully."	Tester	Accept	

Additional notes:

App was well designed. Children was engaged as seen as they see the colourful pictures and animations.

Acceptance by:

Signature/Cap:
Name: Adeline Tan
Association: Persatuan Kanak Kanak Cerebral Palsy(Spastik) Pulau Pinang

Figure 1: User Acceptance Test

Figure 2: BrainFlex Progress Report

As a result, Student A demonstrated a score of 50% in the "Pre Number" category, indicating effective engagement with foundational mathematical concepts. Additionally, they showed progress in financial literacy skills with a score of 33.33% in the "Money" category and displayed some familiarity with time-related concepts, achieving a score of 20% in

the "Time" category. Student B showcased commendable progress in the "Pre Number" category (60%), emphasizing BrainFlex's effectiveness in reinforcing foundational mathematical skills. Student C demonstrated balanced growth across categories, excelling in "Whole Number" (42.85%) and displaying versatility in addressing different mathematical skills, as indicated by a 14.28% score in the "Plus" category. Student D made substantial progress in both "Plus" and "Minus" categories, highlighting BrainFlex's efficacy in teaching basic arithmetic. Student E exhibited proficiency in "Minus" and "Time" categories, emphasizing BrainFlex's potential in teaching time-related and arithmetic skills. Finally, Student F excelled in the "Money" category (43%), signifying significant improvement in financial literacy, with the need for further assessment in additional categories for a holistic evaluation of progress.

Table 1: BrainFlex Testing Results.

Student	Score Percentage					
	Pre Number	Whole Number	Plus	Minus	Money	Time
Student A	50%	16.66%	-	-	33.33%	20%
Student B	60%	20%	-	-	20%	-
Student C	42.85%	42.85%	14.28%	-	-	16.66%
Student D	66.66%	-	16.66%	16.66%	-	-
Student E				17%		33.33%
Student F					43%	14.28%

Generally, BrainFlex has a significant impact on three key stakeholders: children with CP, teachers, and caregivers.

BrainFlex significantly enhances the learning experience for children with CP, fostering a positive attitude towards education and improving their mathematical proficiency. This increased proficiency boosts academic confidence and prepares them for greater independence in daily life, particularly in handling mathematical tasks.

For teachers, BrainFlex is an effective teaching tool that complements traditional methods, streamlining the teaching process and allowing for more focused, individualized instruction. The built-in dashboard facilitates progress monitoring, enabling targeted support for students with CP and ultimately enhancing the quality of education.

BrainFlex encourages active caregiver participation in their child's education, strengthening the caregiver-student bond. Caregivers can provide assistance and benefit from progress tracking features, fostering involvement and empowerment to support their child's overall development, including mathematical skills.

Conclusion

Substantially, the educational landscape for students with CP presents both challenges and opportunities that demand innovative solutions. Our exploration has illuminated the potential of adaptable teaching methods, cognitive training games, and mobile applications in enhancing the cognitive proficiency of CP students, aligning with the importance of tailored education to unlock their full potential.

The limitations of traditional manual worksheets, the absence of accessible and inclusive resources, and the need for a structured curriculum targeting mathematical skills have been identified as significant hurdles in the educational journey of CP students. Addressing these challenges requires a concerted effort from educators, caregivers, and the broader educational community.

In addition to these challenges, we have also conducted a preliminary analysis of the BrainFlex testing results, showcasing progress and potential. However, further assessment and fine-tuning are necessary to provide a holistic evaluation of their educational journey.

Looking ahead, future efforts should focus on refining BrainFlex and similar innovative solutions, tailoring them to the specific needs and learning styles of CP students. Continuous research and development, as well as collaboration between educators, caregivers, and technology experts, will be crucial in achieving this goal. Moreover, fostering a supportive and inclusive learning environment remains paramount.

The journey toward inclusive and effective education for CP students is ongoing, marked by the commitment to adaptability, innovation, and collaboration. By recognizing the unique needs of these students and harnessing the power of technology and adaptive teaching methods, we can aspire to provide them with the tools and opportunities needed to thrive academically and personally. It is through these collective efforts that we can ensure that CP students reach their fullest potential and contribute meaningfully to society.

As we move forward, it is imperative to continue exploring and implementing innovative solutions, drawing inspiration from research, and embracing the active involvement of caregivers and educators. By implementing said strategies, we can pave the way for a brighter and more inclusive future for students with CP in the realm of education.

Award

BrainFlex has received the Best Extended Award and the Silver Award at the Innovation and Creativity Exhibition in 2023. Additionally, BrainFlex has entered into a collaboration agreement with the Cerebral Palsy (Spastic) Children's Association of Penang in BrainFlex development. The application has undergone testing and received approval from both patients and specialists at the Cerebral Palsy (Spastic) Children's Association of Penang, a non-profit

organization committed to offering academic, rehabilitation, and vocational services for the development of individuals with CP, regardless of their religion and ethnicity.

References

Chen, Y. P., Kang, L. J., Chuang, T. Y., Doong, J. L., Lee, S. J., Tsai, M. W., ... & Sung, W. H. (2007). Use of virtual reality to improve upper-extremity control in children with cerebral palsy: a single-subject design. Physical therapy, 87(11), 1441-1457.

Akhutina, T. Y., Foreman, N., Krichevets, A., Matikka, L., Narhi, V., Pylaeva, N., & Vahakuopus, J. (2003). Improving spatial functioning in children with cerebral palsy using computerized and traditional game tasks. Disability and rehabilitation, 25(24), 1361-1371.

Şahin, S., Köse, B., Aran, O. T., Bahadır Ağce, Z., & Kayıhan, H. (2020). The effects of virtual reality on motor functions and daily life activities in unilateral spastic cerebral palsy: a single-blind randomized controlled trial. Games for health journal, 9(1), 45-52.

Rosenberg, L., Maeir, A., & Gilboa, Y. (2021). Evaluating a therapeutic powered mobility camp for children with severe cerebral palsy. Canadian Journal of Occupational Therapy, 88(4), 294-305.

Rentinck, I. C. M., Ketelaar, M., Jongmans, M. J., & Gorter, J. W. (2007). Parents of children with cerebral palsy: a review of factors related to the process of adaptation. Child: care, health and development, 33(2), 161-169.

Pereira, A., Moreira, T., Lopes, S., Nunes, A. R., Magalhães, P., Fuentes, S., ... & Rosário, P. (2016). "My child has cerebral palsy": parental involvement and children's school engagement. Frontiers in psychology, 7, 1765.

Tayuni, C. D., & Oktaviani, J. N. (2023, January). Parents' Roles in Character Building of Children with Cerebral Palsy. In Unima International Conference on Social Sciences and Humanities (UNICSSH 2022) (pp. 667-671). Atlantis Press.

Escoto-Kemp, A., Rohani, Rosmawijah, & Ratna Suraini. (2019). The Designated Priority Level (DPL) System: Establishing Priority Levels for Students with Special Needs in Brunie Darussalam. Advances in Social Science, Education and Humanities Research, 388.

TriumphTrack : A Collection of Stars

Wan Syahidatul Faeizah Wan Daud, Siti Sarah Ahmad Sabri, Nur Anis Mohd Kowi, Fartini Aiza Zaidi, Ainur Athirah Rosli

Institute of Teacher Education Campus Temenggong Ibrahim, Johor Bahru, Malaysia

E-mail addresses: g-p19174774@moe-dl.edu.my, g-p19124741@moe-dl.edu.my, g-p19124740@moe-dl.edu.my, g-p19124747@moe-dl.edu.my, g-p19124752@moe-dl.edu.my

Highlights:

The emergence of online reward chart platforms has revolutionized how parents engage with behaviour management and academic performance of the students in the classroom. This digital platform empowers users to craft and personalize reward charts effortlessly on their smartphones, tablets, or computers. The quality of ideas of this "TriumphTrack: A Collection of Stars" innovation is clear, user-friendly and cost-effective. Beyond traditional charts, they incorporate dynamic features such as goal establishment, real-time progress monitoring, and interactive rewards. The innovativeness of this product highlights the aspect of technology integration, progress tracking and interactive collaboration. "TriumphTrack" is an online tool that has the potential to positively impact schools, teachers, parents, and students.

Key words: reward; monitoring; interactive; behaviour; academic performance

Introduction

The inspiration behind creating a new, innovative online reward chart platform stem from the recognition of the limitations and challenges posed by traditional methods of behavior management and academic achievement. As technology continues to reshape various aspects of our lives, it's become evident that traditional paper-based reward charts might not fully address the needs and preferences of modern families. Current issues with traditional reward charts, such as their lack of interactivity, real-time tracking, and customization options, have highlighted the need for a more dynamic and flexible solution.

This innovation is portrayed as a way out from unity and access issues in curriculum implementation. Achieving unity in curriculum implementation is an ongoing challenge that requires collaboration among educational stakeholders, clear communication, and a focus on equity and quality. This innovation foregrounds the parental engagement issue such as limited parental engagement, often due to work schedules or language barriers, can hinder students' access to educational support outside of school.

Product Description

TriumphTrack stands out as an innovative solution due to its holistic approach to addressing the limitations of traditional reward charts. The platform integrates advanced interactivity, and customization to create an engaging and dynamic experience for children. By embracing modern technology, TriumphTrack bridges geographical gaps and encourages collaborative caregiving, which is particularly relevant in today's multifaceted family structures. The emphasis on real-time tracking, goal-setting empowerment, and detailed insights demonstrates a thoughtful understanding of child development and motivation. Overall, TriumphTrack not only offers a novel and creative approach to behaviour management but also reflects a deep commitment to enhancing children's growth and well-being in education.

The innovativeness of this product then provides interactive collaboration**.** An innovative platform provides easy access to parents, teachers, and children on various digital devices, including smartphones, tablets, and computers, enhancing its usability and reach. The caregivers can also monitor the students' progress and achievements in behaviourism and academic performance continuously and contribute to the students' higher achievement. This product not only streamlines the process but also enhances engagement and motivation for children, fostering positive behaviours and achievements in an interactive digital landscape. Progress tracking to monitor and analyse a child's development over time, offering valuable insights. Incorporating interactive elements in technology integration, makes reward charts engaging and fun for children, encouraging their active participation in the process.

TriumphTrack offers clear purpose, features, and benefits that are easily understood by all stakeholders. This clarity can help users quickly grasp how to use the tool effectively for educational purposes. Plus, it is user-friendly that the innovation is designed with the end-users in mind. It implies that the interface is intuitive, navigation is straightforward, and users can easily access and utilize its features without extensive training or technical expertise. Finally, it is a cost-effective innovation that offers significant educational value without imposing substantial financial burdens on educational institutions or individuals. Cost-effectiveness is a crucial factor in education, as it often involves budget constraints.

1) Reward (stars & badges):
   - Students who do good deeds will receive a star as a reward. It is a "collection" reward system with a set number of stars collected to be able to achieve the specific badge. Eg: 30 stars : silver badge, 50 stars : bronze badge & 70 stars : gold badge.

- Interactive rewards are designed to make the process engaging and motivating for children, fostering a sense of accomplishment and responsibility.

2) Teacher key in the achievement:
   - Teachers will be responsible to key in each and every good deed and bad deed of each student as a merit and demerit system.
   - Teachers record students' achievement in studies for different subjects continuously.

3) Acknowledge students' final result:
   - By the end of the year the final collected stars will determine the badge for each student. Up to the school or institution to award them further.

4) Real-time tracking:
   - Caregivers can easily monitor students' achievements and improvement.

5) Collaborative environment:
   - shared responsibilities of parenting and caregiving in today's world. By providing a centralized and accessible online hub, this platform seeks to create a collaborative environment where everyone involved can contribute to a child's progress, regardless of their physical location.

Results & Discussion

The impact of "TriumphTrack" online aims to garner attention for its potential to revolutionize the educational landscape, bringing about positive impacts for schools, teachers, parents and students alike. TriumphTrack's data analytics capabilities empower school administrators to make informed decisions. By analyzing performance trends and patterns, administrators can tailor interventions to support students at risk of falling behind. Moreover, the platform enables administrators to recognize and celebrate successes, both on an individual and school-wide level. The system fosters a positive school culture by acknowledging and rewarding achievement. For teachers, TriumphTrack facilitates the creation of tailored reward systems. They can adapt the system to cater to different students' abilities, ensuring that every student has an opportunity to succeed. The ability to assign custom goals and rewards empowers educators to inspire and engage their students more effectively. In the realm of behaviour management, TriumphTrack offers a structured and consistent approach. Students learn about the consequences of their actions, and the positive reinforcement of rewards reinforces desirable behaviour. The platform is flexible, allowing administrators to implement school-wide behavioural goals and track progress with ease. The result is a more orderly and respectful school environment that supports effective teaching and learning. TriumphTrack's versatility extends to parents, who can set their own behavioural expectations for their children. The system bridges the gap between home and school, fostering collaboration in reinforcing positive behaviour. Parents are kept informed of their child's progress, enabling them to provide timely support and guidance.

Conclusion

In conclusion, the innovation of "TriumphTrack" digital reward chart platform has the potential to revolutionize education by transforming the way students, parents, teachers, and schools approach behaviour management, motivation, and goal-setting especially in education. It foregrounds the crucial roles of teachers in education leading the progression towards the success of achieving the goals on behaviourism and educational achievement of the students. Teachers work as an agent of improvement. Its innovative features cater to the needs of education stakeholders, creating a more dynamic, engaging, and collaborative learning environment that ultimately contributes to enhanced educational outcomes and student development.

Publication, Award and Intellectual Property

The innovation is still at its prototype stage and we are in the midst of collecting data for analysis. Full article will be published in an indexed journal.

References

Cherry, K. (2019). What is operant conditioning and how does it work. How reinforcement and punishment modify behaviour. https://www.verywellmind.com/operant-conditioning-a2-2794863

Coleman, J. S. (2018). Parents, their children, and schools. Routledge.

Drexler, J. (2010). Teachers' Attitudes about Reward Systems in the Classroom (Doctoral dissertation).

Homer, R., Hew, K. F., & Tan, C. Y. (2018). Comparing digital badges-and-points with classroom token systems: Effects on elementary school ESL students' classroom behavior and English learning. Journal of Educational Technology & Society, 21(1), 137-151.

Naite, I. (2021, March). Impact of parental involvement on children's academic performance at Crescent International School, Bangkok, Thailand. IOP Conference Series: Earth and Environmental Science 690(1), 12-64.

Gather town as a classroom convergence.

[1]Afiqa Aunie Binti M. Azman, [2] Azira Binti Mohammad Yacob, [3] Anis Nadira Binti Mohd Roslan, [4]Erna Nabilah Binti Kamaruddin & [5]Nur Athirah Hanim Binti Zahri
Institute of Teacher Education Campus Temenggong Ibrahim, Johor Bahru, Malaysia
[1] g-p19174737@moe-dl.edu.my, [2] g-p19124748@moe-dl.edu.my, [3] g-p19124749@moe-dl.edu.my,
[4] g-p19124771@moe-dl.edu.my & [5] g-p19124756@moe-dl.edu.my.

Highlights: Gather Town is a virtual space or platform that offers a unique blend of spatial interaction, video conferencing, and online collaboration. It creates an environment that simulates in-person interactions and conversations within a virtual setting. Gather Town gained popularity as a way to bring people together in a more engaging and interactive manner.

Key words: virtual space, interactive, self-learning, network, engagement

Introduction

Issues: Traditional online teaching methods often rely on static content delivery, such as recorded lectures and discussion boards, which can lead to reduced student engagement. Without interactive features, it may be challenging to maintain students' interest and active participation.

Innovation:
Gather Town's features can be valuable tools for teachers to enhance their ability to teach students effectively in online and virtual environments. Here's how some of Gather Town's key features can assist teachers:

1. Spatial Interaction: Gather Town's spatial layout allows teachers to create virtual classrooms or meeting spaces where students can move their avatars freely. This spatial aspect can mimic the physical classroom, fostering a more natural and interactive learning environment.
2. Real-time Communication: Gather Town supports real-time audio and video communication, allowing teachers to hold live lectures, discussions, and Q&A sessions with students. This feature promotes immediate feedback and engagement.
3. Collaborative Learning: Teachers can use Gather Town to facilitate collaborative learning experiences. Students can gather in virtual groups or spaces to work on assignments, projects, or group activities, replicating the in-person collaborative experience.
4. Interactive Tools: Gather Town provides interactive tools such as virtual boards, screen sharing, and presentation features. Teachers can use these tools to deliver lectures, share presentations, and illustrate concepts more effectively.
5. Networking and Engagement: Teachers can create virtual social spaces in Gather Town for students to network and engage with peers outside of formal class hours. This can foster a sense of community and connection among students.
6. Customization: Gather Town offers customization options, allowing teachers to design and personalise their virtual learning spaces to match the specific needs and objectives of their courses.
7. Accessibility: Gather Town can be adapted to accommodate students with disabilities. Features like customizable avatars and text-based communication can make the platform more accessible to all students.
8. Feedback and Assessment: Teachers can use Gather Town for interactive assessments, quizzes, and discussions. This feature allows for real-time assessment and immediate feedback on students' understanding of the material.

Role of the teacher: In using Gather Town for online teaching, teachers take on a leadership role by becoming proficient with the platform, designing engaging virtual learning spaces, and aligning curriculum goals. They provide clear instructions, facilitate discussions, and offer technical support. Teachers use interactive tools, assess student progress, and gather feedback to adapt and improve their virtual teaching. They also share best practices with colleagues, promote inclusivity, and engage in ongoing professional development, all while striving to create an effective and engaging online learning experience.

Trialogical Learning Approach: The effectiveness of using Gather Town in an educational context, especially in alignment with a trialogical approach, depends on how it is implemented, integrated into the curriculum, and supported by pedagogical strategies. Gather Town can be used as a platform for collaborative learning experiences. In a trialogical approach, students, teachers, and the socio-cultural context interact and collaborate to construct knowledge. Gather Town can facilitate these interactions by providing a virtual space for group discussions, collaborative projects, and shared learning experiences.

The socio-cultural context is an essential element of trialogical learning. Gather Town allows users to create and customise virtual environments, which can be designed to reflect specific socio-cultural contexts or themes. This customization can enhance the immersion and cultural relevance of the learning experience.

In addition, in Gather Town, teachers or facilitators can guide and mentor students within the virtual environment. They can host virtual classes, lead discussions, and provide support as students explore and interact with the digital space and each other. This aligns with the role of teachers as facilitators in the trialogical learning model. Lastly, Gather Town's interactive features, such as avatars and spatial audio, can promote active student engagement. Students can move around the virtual space, engage in discussions, and collaborate on projects, fostering the kind of dialogue and interaction emphasised in trialogical learning.

Product Description

In the classroom design using Gather Town, you can create a virtual learning environment that closely resembles a physical classroom. The layout typically includes seating arrangements with desks, chairs, a whiteboard, and a teaching podium. As students enter the virtual classroom, a designated sign-in area with clear instructions ensures a seamless start. The instructor's area, often featuring a virtual podium, becomes the central teaching space, making use of Gather Town's virtual whiteboard and screen-sharing capabilities for presentations and course materials. To foster interaction, different zones within the virtual classroom can be designated for student discussions and group activities. Additionally, you can include resource boards for course materials and assignments, private office hours corners, and breakout rooms for smaller group interactions. Common areas or lounges provide spaces for socializing before or after class. Interactive elements such as polls and quizzes engage students during lessons, and customization options allow for tailoring the virtual classroom to specific teaching styles and subjects. It's important to consider privacy and etiquette, ensuring students are comfortable, and providing recording options for those unable to attend live sessions. Lastly, clear instructions and technical support resources help students navigate and use the platform effectively. This design combines the familiarity of a physical classroom with Gather Town's interactive features to create an engaging and collaborative virtual learning environment.

In Gather Town, users typically navigate through a map-like environment using avatars. Users can move their avatars around the virtual space and interact with others as they would in real life, including walking up to others and engaging in conversations. Moreover, audio communication is based on proximity, meaning that users only hear and engage in conversations with others who are physically near their avatars. This feature helps replicate the experience of mingling at an event or gathering. In addition, users can usually join Gather Town sessions directly through web browsers without requiring the installation of additional software.

Results & Discussion

The adoption of Gather Town in education has a multifaceted impact on various stakeholders in the educational landscape. Firstly, students stand to benefit from a more engaging and interactive learning environment that can enhance their comprehension of course material. Next, educators find the platform advantageous for creating dynamic lessons, monitoring student engagement, and providing personalised support. Moreover, curriculum developers can tailor materials to virtual learning. Nonprofits and education advocates can leverage virtual platforms to reach underserved populations and promote education equity, but technology and internet connectivity disparities must be addressed to ensure equitable access.

Conclusion

To enhance Gather Town, it will be better if there are features where students should finish the learning and assessment first before leaving the meeting. This will help the students to focus on the learning and aid teacher to control the classroom management without any student left behind.

Publication, Award and Intellectual Property

Currently, our main focus is gathering vital project data, a crucial step in our ongoing innovation journey. This signifies our active work in developing and refining our innovation. Completed information will be published in future publications.

References (Use APA format)

Cursus, T. (2022). Gather.town - A 2D virtual world for the classroom. Thot Cursus. https://cursus.edu/en/24506/gathertown-a-2d-virtual-world-for-the-classroom

McClure, C. D., & Williams, P. N. (2021). Gather.town: An opportunity for self-paced learning in a synchronous, distance-learning environment. Compass: Journal of Learning and Teaching, 14(2). https://doi.org/10.21100/compass.v14i2.1232

Nur Fitria, T. (2021). Creating Sensation of Learning In Classroom : Using "Gather Town" Platform Video Game-Style For Virtual Classroom. Education and Human Development Journal, 6(2), 30–43.

Patrick Totzke | Using Gather.town for teaching. (n.d.). Patrick Totzke's Website. https://cgi.csc.liv.ac.uk/~patrick/blog/2021/gather/

Zhao, X., & McClure, C. D. (2022). Gather.Town: a gamification tool to promote engagement and establish online learning communities for language learners. RELC Journal.

Revolutionizing education: interactive educational models for tomorrow's learners

Lee Cheng Yang[1], Lohitakshan[2], Sineesh[3], Viyasinie[4]
Negeri Sembilan Matriculation College, Kuala Pilah, Malaysia[1,2,3,4]
m-7255988@moe-dl.edu.my[1], m-6280288@moe-dl.edu.my[2], m-6060479@moe-dl.edu.my[3],
m-6334779@moe-dl.edu.my[4]

Highlights: Catalyzed by the ever–evolving landscape of education and constant advancement of modern technology, the application of STEAM in education has become vital to create an innovative society. One such application is STEAM is that educators could use interactive education models in order to better convey harder topics to students. In our abstract, we have planned to use Pressure Principle Interactive Models to explain our concept of interactive education models. We will be preparing 3 interactive models, namely a Pascal's Principle Interactive Model, Archimedes's Principle Interactive Model and a Bernoull's Principle Interactive Model to illustrate our ideas.

Key words: Application (;) STEAM (;) Interactive Education Models

Introduction

In this age of technological advancement and global challenges, the job market has become significantly critical in its requirements and is more demanding towards current students. Thus, educators are perpetually in search of methods to better prepare students as traditional education systems are unable to help students cope in this challenging and demanding environment. This situation brings us to STEAM education, a forward-thinking and all-encompassing approach towards teaching that combines the concepts of Science, Technology, Engineering, Art, and Mathematics to create an innovative younger generation. STEAM not only equips students with modern day skills to tackle intricate problems but also enhances the creativity and adaptability of education as a whole. In this exploration of the application of STEAM in education to invoke an innovative society, we will delve into one particular method to apply it, which is the usage of interactive educational models to explain concepts and ideas in classes.

Interactive educational models in this scenario refer to physical models or structures that are able to be manipulated by students to convey ideas or the main topic of a lesson. These interactive models are to be used and touched by students to serve as an example on the topic that they are studying as it will help students form a more concrete idea on the topic rather than abstract concepts that are shown in the form of text. This application of STEAM in education will definitely allow students to better apply the concepts that they learn in school in their workplace. This prevents students from just being book smart about things they learn in school and are unable to neither explain nor demonstrate it to their interviewers as the job requires application of said topic. Hence, this in turn creates an innovative younger generation that are able to apply STEAM knowledge in their future in order to better adapt and survive in the harsh modern world. These interactive models also help students pay more attention in class as they are actively interacting with the educator rather than just hearing a boring lecture on the topic which does not help them properly understand the concept.

Product Description

The interactive educational models that we will be using in order to further solidify our concept are 3 models used to explain Fluid Pressure Principles, which are the Pascal's Principle, Archimedes' Principle and Bernoulli's Principle. We have chosen these topics to represent our ideas as these topics are hard for students to simply imagine without any solid examples and require strict guidance from educators to form a concrete idea. Besides, the interactive models for these topics are simple to create and even simpler to elaborate. With this, our goal is to prove that interactive educational models do not require a high cost or complex machinery to create and can just be made with simple materials without a complex procedure to allow educators from around the country to implement it in their daily lessons. We also aim to show that our concept will allow educators to plan more interesting and active classes that will definitely engage more students in the learning process.

For the interactive educational model for Pascal's Principle, we will be using a hydraulic made of a set of two syringes of different diameters. The two syringes are connected via a rubber tube and are fitted on a simple framing made of either wood or plastic. The syringes are filled with a hydraulic fluid, which in this case is oil. As the system is enclosed by the syringes and the rubber tube, it perfectly conveys to students the assumption of a closed system which is paramount in Pascal's Principle. The syringes of different diameters serve to show the amplification of force that occurs in a hydraulic system. Students will be able to interact with the model by pushing one syringe to observe the movement of the other syringe. To illustrate, when a smaller force is applied to the smaller syringe, a larger force will act upon the plunger of the larger syringe and vice versa. This will allow students to come to their own conclusion about the model that aligns with Pascal's Principle, which states that a change in pressure at any point in a fluid in a closed system will be transmitted evenly throughout the system to every point of the fluid.

Next, for the interactive educational model for Archimedes' Principle, we will use a Eureka can made out of a large plastic water bottle with a hole on the side that has been fitted with a rubber tube. The model will be filled with water up to the hole, and a cylindrical object will be placed inside the eureka can, The cylindrical object that we will be using is a plastic container filled with water, as this will allow students to control the weight of the object by

manipulating the amount of water it contains. Thus, water will be displaced by the plastic container and will flow out the rubber tube into a separate plastic container. Therefore, students will be able to deduce the relationship between the weight of the displaced water and the buoyant force acting upon the object, thus understanding and experiencing Archimedes' principle with their own hands.

Lastly, for the interactive educational model for Bernoullli's Principle, we will be using an aero foil model made out of polystyrene and fitted on an appropriate frame. Then, a small fan is placed in front of the aero foil, Students will then be able to switch on the fan and watch how the aero foil lifts up even though it has no visible force that is lifting it up. Hence, students will be able to see for themselves how the difference of the speed of wind on the aero foil's surfaces causes a difference in pressure and in turn generates lift to lift up the aero foil, thus formulating a concrete idea on Bernoulli's Principle via experimentation.

Results & Discussion

In this era of modern technological development, traditional lectures that involve one-way communication from teacher to students can lead to passive learning. Without active participation, students may disengage and find classes less interesting. Technology can enhance learning, but its overuse or misuse can lead to boredom. For example, too many PowerPoint slides or online videos may not effectively engage students. We believe that a model can make a class interesting by serving as a dynamic and engaging tool for teaching and learning. Hence, we believe that a model can improve the learning process. Models can simplify complex ideas or abstract concepts, making them more accessible to students. This visual representation can help students grasp difficult topics and gain a deeper understanding. These physical interactive models help students understand better than just looking at the pictures provided in textbooks. Visual models and demonstrations are often more engaging than lectures alone. They capture students' attention and interest, making the learning experience more enjoyable and memorable.

Apart from that, students will have problem solving skills when they interact with the models, thus models allow students to manipulate variables and observe outcomes, fostering critical thinking and analytical skills. For instance, regarding Pascal's Principle, the model we create is able to portray a clear visualization on application of Pascal's Principle on hydraulic systems. Hence, students are able to manipulate the input force to study the application of Pascal's principle.

Moreover, at a price of RM 100, the cost of our project is affordable for every lecturer around the world. Due to the fact we are using eco-friendly products, the models do not cost a fortune. Thus, having the models portable and convenient for the students, they can easily create one on their own to study the pressure principles anytime with the aid of various hypotheses.

Contemplating future research ideas, these models act as interactive educational tools and simulations based on pressure principles are able to enhance science education at various levels, from elementary to higher education. Furthermore, we can develop interactive models that incorporate pressure principles to simulate the effects of changing atmospheric pressure on climate patterns, including extreme weather events, to improve climate change predictions. We can also explore the use of pressure-based interactive models for optimizing material synthesis processes and manufacturing techniques, especially in industries like aerospace and automotive. These research ideas span various fields and have the potential to advance our understanding of pressure-related phenomena and their practical applications in science, technology, and everyday life.

Conclusion

To sum up, we believe that interactive educational models are the best way to apply STEAM concepts in modern day education. We would like to reiterate that these interactive educational models do not have to be a grand or complex structure that blows the minds of the students, rather just a simple tool to showcase ideas or topics in the form of physical activities. In the exploration of the application of STEAM in education, we must not forget that we are doing so in order to improve education all around the globe. Thus, by making these interactive models simple, we hope that it is easily accessible to educators everywhere, even in more rural areas. We do not wish to burden educators with huge costs or preparation for these models, rather we would like to show how simple household materials could be used to create a fun and engaging classroom activity.

As we navigate the intricate waters of modern education in this challenging and demanding future, concepts such as interactive educational models serve as a testament to the ingenuity and innovation that the application of STEAM in education hopes to achieve. The application of STEAM in education via interactive educational models is vital in promoting intellectual growth, creativity, critical thinking and empowerment for learners all across the country. We hope that the concept of interactive educational models is able to serve as emblematic ambassadors of STEAM's transformative potential in the education sector that not only enhances students' comprehension of their syllabus but also ignites a passion for learning amongst students who would otherwise never pay attention in class. Therefore, the application of STEAM in education via interactive educational models will in turn create an innovative and progressive society in the foreseeable future and lead to the advancement of humankind as a whole.

References

Barbara, L., Ian, G.,Fahad, J., Mohammed Hafez. (2017). 45th SME North American Manufacturing Research Conference, Integrated Design, Manufacturing and Analysis of Airfoil and Nozzle Shapes in an Undergraduate Course, Procedia Manufacturing 10, 1077 – 1086.

Huang, MuYan & Liu, Yongzhi. (2014). Operation Models of Interactive Learning. 10.2991/icss-14.2014.43.

Kwangmuang, P., Jarutkamolpong, S., Sangboonraung, W., & Daungtod, S. (2021). The development of learning innovation to enhance higher order thinking skills for students in Thailand junior high schools. *Heliyon*, *7*(6), e07309. https://doi.org/10.1016/j.heliyon.2021.e07309.

Loverude, Michael & Kautz, Christian & Heron, Paula. (2003). Helping students develop an understanding of Archimedes' principle. I. Research on student understanding. American Journal of Physics - AMER J PHYS. 71. 10.1119/1.1607335.

Nawwar, R., Nurulhuda, A.R., (2021). Pillar Of Physics Education, Development Of Pascal Principle And Undergraduate Physics Students' Perception Towards The Activities, Vol 14. (1), 475-478,Sultan Idris Education University, https://www.researchgate.net/publication/353182667_Development_of_Pascal_Principle_Activities_Using_The_Stem_Approach_and_Undergraduate_Physics_Students'_Perception_Towards_The_Activities/fulltext/60ec3b8e9541032c6d328fac/Development-of-Pascal-Principle-Activities-Using-The-Stem-Approach-and-Undergraduate-Physics-Students-Perception-Towards-The-Activities.pdf

SAFETY DROPPER HOLDER

Chow Lai Kim[1], Lizawati Binti Mohamad Ham[2], Norazela Binti Deraji[3], Tiong Guo Siang[4], Zuraidah Binti Idris[5]

Perak Matriculation College, Gopeng, Perak, Malaysia[1,2,3,4,5]
bm-1444@moe-dl.edu.my[1], bm-1597@moe-dl.edu.my[2], bm-1604@moe-dl.edu.my[3], bm-1686@moe-dl.edu.my[4], bm-1628@moe-dl.edu.my[5]

Abstrak: Safety Dropper Holder (SDH) diinovasikan oleh kumpulan Renaissance bagi menangani permasalahan pemecahan alat radas seperti tabung uji dan penitis. SDH mempunyai rekabentuk ringkas yang bercirikan bahan buangan terpakai di mana ia memudahkan pelajar meletakkan radas penitis selepas pengambilan bahan kimia di kebuk wasap. Ini membolehkan Ekperimen 5 dilaksanakan dengan lebih teratur dan keselamatan pelajar lebih terjamin. Dapatan soal selidik menunjukkan enam pembantu makmal Kimia bersetuju dengan penggunaan SDH dalam makmal Kimia. Selain dari aspek keselamatan, SDH dapat menjimatkan kos penyelenggaraan dan masa pencucian alat radas. SDH yang mudah dibuat dan ianya dapat diaplikasikan dalam semua eksperimen.

Kata kunci: *makmal Kimia, radas pecah, kelas amali, inovasi*

Pengenalan

Eksperimen 5 yang dijalankan oleh para pelajar jurusan Sains Semester 2, Program Satu Tahun, Program Matrikulasi KPM melibatkan pembelajaran topik tindakbalas sebatian hidroksi di mana para pelajar berpeluang untuk menguji beberapa jenis larutan alkohol dari kelas yang berbeza menggunakan reagen Lucas. Setelah menjalankan Eksperimen 5 tersebut, para pelajar diharapkan dapat memahami topik ini dengan lebih efektif. Bertepatan dengan hasrat KPM, kerja amali diperkenalkan dengan tujuan menjadikan aktiviti PdPc lebih komprehensif dan efektif. Sehubungan itu, kerja amali yang disarankan dapat menggalakkan pelibatan pelajar secara aktif dalam usaha mempelajari sesuatu (Majlis Peperiksaan Malaysia, 2012).

Secara umumnya, keselamatan di makmal Kimia adalah keutamaan yang teratas bagi memastikan objektif pengajaran tercapai dan pelajar dapat menguasai kemahiran amali pada tahap yang optimum. Namun demikian, hasil pemerhatian dan temuramah yang dibuat terhadap beberapa orang pembantu makmal Kimia, didapati beberapa masalah telah timbul semasa pengendalian Eksperimen 5 ini. Kaedah soal selidik dan temubual telah digunakan untuk mengenalpasti permasalahan tersebut.

1. Penitis kerap pecah dan rosak
2. Kos penyelenggaraan radas pecah meningkat
3. Risiko pelajar mengalami kecederaaan tinggi
4. Keselamatan pelajar kurang terjamin
5. Aktiviti PdP & perjalanan eksperimen terganggu
6. Pencemaran dan pembaziran bahan kimia

Walaupun makmal Sains menyediakan satu platform untuk pelajar menerokai ilmu secara *hands-on*, makmal Sains juga merupakan tempat yang berisiko. Kemalangan di makmal Sains adalah disebabkan oleh pelbagai faktor. Ia boleh berpunca daripada kecuaian dan kejahilan yang akan mengakibatkan kemudaratan kepada diri, peralatan dan juga persekitaran (Nur Liyana et al, 2018).

Pengkaji Abate Jote (2019) menyatakan bahawa alat radas yang rosak menjadi punca kegagalan sesuatu kerja amali. Jelasnya, kemudahan peralatan radas yang lengkap membantu pelaksanaan kerja amali. Namun, sumber kewangan yang tidak mencukupi akan menghalang penyediaan bahan kimia dan alat radas yang diperlukan untuk kerja amali (Herdini et al, 2018).

Justeru itu, Safety Dropper Holder (SDH) telah diinovasikan oleh kumpulan Renaissance bagi menangani permasalahan ini. SDH mempunyai rekabentuk ringkas yang bercirikan bahan buangan terpakai di mana ia memudahkan pelajar meletakkan radas penitis pada tempat yang selamat selepas pengambilan bahan kimia di kebuk wasap. Ekperimen 5 menjadi lebih teratur dan keselamatan pelajar lebih terjamin. Secara tidak langsung risiko berlakunya kecederaan dan kemalangan dapat dikurangkan. Pelajar juga menjadi lebih fokus terhadap eksperimen yang dijalankan. Persekitaran pembelajaran yang kondusif menyumbang kepada keberkesanan proses pengajaran dan pembelajaran amali di mana potensi pelajar dari aspek modal intelek dan modal sosial dapat diperkembangkan dengan baik.

Penerangan penghasilan produk

Ujicuba 1 :

Tabung uji yang diikat dengan *cable tight* putus selepas kena dengan larutan reagen Lucas yang seterusnya menyebabkan tabung uji pecah.

Ujicuba 2 :

Tabung uji yang diikat dengan benang tidak putus tetapi kesukaran bagi membersihkan tabung uji yang diikat pada botol reagen.

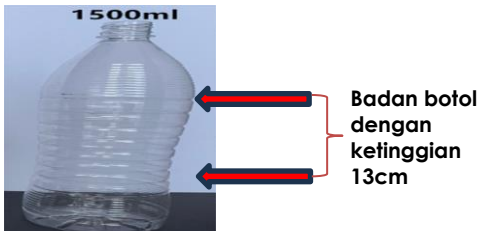
Ujicuba 3 :

Tabung uji diikatkan dengan dawai besi pada botol mineral kosong (1.5L) memudahkan proses membersihkan tabung uji selain mengelakkan tabung uji daripada pecah.

SAFETY DROPPER HOLDER ini senang dihasilkan sebab ia menggunakan beberapa bahan mudah diperolehi seperti botol mineral kosong 1.5L, dawai besi halus, colok, mancis dan gunting.

Kaedah pembuatan *SAFETY DROPPER HOLDER*:

1) Bersihkan botol mineral kosong. Potong botol yang telah dibersihkan dengan menggunakan gunting (12 cm dari atas dan 4 cm dari bawah, badan botol yang diperlukan berukuran lebih kurang 13cm mengikut ketinggian tabung uji) seperti dalam Rajah 1.



Rajah 1: Langkah 1

2) Buatkan 6 lubang pada badan botol dengan menggunakan colok. Jarak lubang tersebut adalah antara 2.0cm secara menegak dan 2.0cm secara melintang Seperti dalam Rajah 2. Penggunaan colok boleh digantikan dengan paku besi yang dipanaskan@ kemenyan nyamuk.

Rajah 2: Langkah 2

3) Ikatkan tabung uji dengan menggunakan dawai besi halus yang senang dilenturkan seperti yang ditunjukkan dalam Rajah 3 di atas (rujuk pautan: https://drive.google.com/file/d/1n7u9nvKmlcy13h36POA-Xw_IyfrvFULa/view?usp=sharing menunjukkan cara ikatan tabung uji kepada badan botol yang berukuran 13cm.

Rajah 3: Langkah 3

4) Pautan link: https://drive.google.com/file/d/1GR3C-IUj_RyIs6Fb1_hhKVqCCgSf2i8h/view?usp=sharing

menunjukkan ***Safety Dropper Holder*** senang disarungkan pada botol reagen dan senang dikeluarkan untuk proses pembersihan bagi mengelakkan pencemaran larutan *Lucas Reagent* pada penitis.

5) Langkah 1 hingga 3 diulangi untuk pembuatan *Safety Dropper Holder* seterusnya.

Dalam projek inovasi ini, sebanyak 12 set SDH dihasilkan dalam masa 2 jam untuk kegunaan 6 makmal Kimia semasa ujian kelas amali yang menggunakan Eksperimen 5.

KEPUTUSAN

DAPATAN SOAL SELIDIK

Berikut menunjukkan hasil analisa soal selidik bagi beberapa item yang berfokus terhadap Safety Dropper Holder (SDH) mengikut skala Likert 4 mata. Soal selidik ini dilaksanakan kepada kesemua 6 orang responden yang terdiri daripada pembantu makmal kimia. Kebanyakan amat berpuas hati dengan fungsi kegunaan Safety Dropper Holder ini. Mereka berpendapat Safety Dropper Holder (SDH) ini dapat memudahkan proses kerja di makmal. Merujuk jadual dibawah min purata bagi keseluruhan soal selidik ialah 3.67.

Item soal selidik khusus kepada Alat Inovasi (SDH)	***Min***
Safety Dropper Holder (SDH) amat membantu mengelakkan pencampuran larutan kimia dan mengurangkan kecederaan di dalam kebuk wasap.	**3.57**
Pencemaran larutan kimia akibat penggunaan penitis yang banyak dan bercampur mengakibatkan pembaziran bahan kimia dan kos.	**3.71**
Safety Dropper Holder (SDH) dapat mengurangkan kos penyelenggaraan dan menjimatkan masa pembersihan alat radas.	**3.71**
Pembantu makmal mengambil masa yang lebih lama untuk proses pembersihan alat radas yang telah bercampur aduk tanpa penggunaan Safety Dropper holder (SDH).	**4.00**
Penggunaan Safety Dropper holder (SDH) dapat mengurangkan penggunaan alat radas dan jimat ruang.	**4.00**
Min Purata	**3.79**

TEMURAMAH BERSAMA PEMBANTU MAKMAL KIMIA

Berdasarkan hasil temuramah bersama pembantu makmal kimia, melalui pemerhatian dan pengalaman mereka dalam penggunaan *Safety Dropper Holder (SDH)*, mereka bersetuju SDH dapat membantu dalam penjimatan masa dan tenaga dalam proses cucian alat radas, mengurangkan risiko alat radas pecah, mengelakkan pembaziran bahan kimia akibat terlarutcampur dan melancarkan perjalanan eksperimen pelajar.

PERBINCANGAN

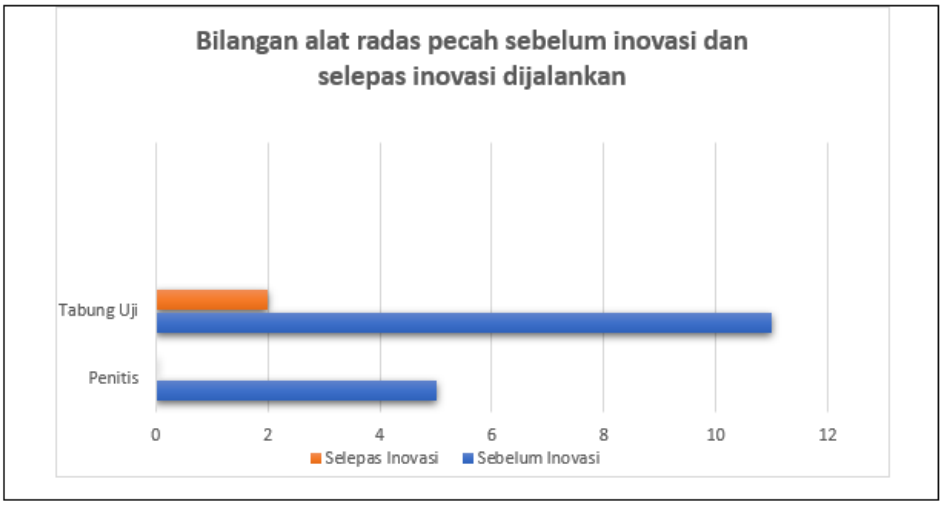
Penggunaan *Safety Dropper Holder* sebagai alat inovasi ini semasa melakukan kerja mampu meningkatkan proses kerja pembantu makmal dan memudahkan perlaksanaan amali oleh pensyarah dan pelajar. Beberapa impak telah dikenalpasti di antaranya:

Penjimatan masa penyelenggaraan alat radas dan bahan kimia.

Sebelum Inovasi	*Selepas Inovasi*
Penggunaan tenaga dan masa yang lama dalam proses cucian alat radas dan penyediaan bahan kimia dalam kebuk wasap (**30 minit**)	Penggunaan tenaga dan masa dalam proses cucian alat radas dan penyediaan bahan kimia dapat dijimatkan dalam kebuk wasap (**10 minit**)
Pelajar terdedah kepada risiko kesilapan dalam keputusan eksperimen kerana terlarutcampur bahan kimia melalui penggunaan penitis yang banyak.	Tiada pelajar yang tertukar penggunaan penitis melalui penggunaan Safety Dropper Holder.
Ruang kerja dalam kebuk wasap dipenuhi dengan alat radas dan botol reagen.	Ruang kerja dalam kebuk wasap lebih kemas dan teratur.
Pelajar dan pembantu makmal terdedah dengan risiko kecederaan akibat radas pecah dan tumpahan bahan kimia yang bahaya dalam kebuk wasap.	Ciri-ciri keselamatan dapat ditingkatkan dan risiko kemalangan semasa kerja dapat dikurangkan.

Penjimatan kos alat radas melalui pengurangan risiko alat radas pecah dalam makmal.

Dapatan hasil laporan menunjukkan perbandingan bilangan alat radas yang pecah bagi kesemua makmal kimia yang mengakibatkan kos yang tinggi. Berdasarkan graf didapati tabung uji dan penitis antara alat radas yang tertinggi dan kerapkali pecah sepanjang eksperimen dijalankan. Ini menunjukkan Safety Dropper Holder (SDH) dapat membantu mengurangkan risiko alat radas pecah. Berdasarkan histogram bawah, terdapat pengurangan radas alat pecah selepas Inovasi dijalankan. Data dikutip berdasarkan penggunaan kelas amali dalam eksperimen 5 dan semasa ujian kelas amali yang menggunakan eksperimen untuk tahun 2022 (sebelum inovasi) berbanding tahun 2023 (selepas inovasi).



Rajah 4: Bilangan alat radas pecah sebelum dan selepas inovasi

Anggaran penjimatan kos

Penggunaan Safety Dropper Holder (SDH) dalam setiap enam makmal kimia di Kolej Matrikulasi Perak, ianya dapat menjimatkan kos penyelenggaraan pada Jadual 1.

Jadual 1: Penjimatan kos penyelenggaraan Eksperimen 5.

Perkara	Alat radas	Kos (6 makmal)	Jumlah (RM)
Sebelum inovasi	Glass Dropping bottle with stopper	**RM 12.00 X 12 set x 6**	**720.00**
Selepas inovasi	*(Safety Dropper Holder)* -Tabung uji (RM1.80) -Besi dawai halus (40 sen) -Botol air mineral (plastik barangan terbuang)	**RM 2.20 x 12 set X 6**	**158.40**
		Anggaran penjimatan kos	**720.00-158.40 = 561.60**

Berdasarkan perbandingan di antara kos penyelenggaraan dengan penggunaan SDH dan tanpa penggunaan SDH, penjimatan kos sebanyak RM561.60 dapat menampung kos pembelian di mana setiap makmal kimia di Kolej Matrikulasi Perak dapat dilengkapi dengan Safety Dropper Holder (SDH). Sekiranya kos yang sama diaplikasikan ke semua kolej matrikulasi di Malaysia, maka jumlah wang yang telah dijimatkan adalah RM561.60 x 14 kolej = RM7862.40 di peringkat Bahagian Matrikulasi, Kementerian Pendidikan Malaysia (Pengiraan penjimatan kos berdasarkan kepada Eksperimen 5 sahaja). Sekiranya pengiraan yang sama diaplikasikan kepada eksperimen yang memerlukan penggunaan SDH, maka ia dapat memberi penjimatan yang lebih tinggi berbanding dengan penjimatan di atas.

Kesimpulan

Penggunaan SDH di dalam makmal, khususnya dalam Eksperimen 5 bagi jurusan Sains Semester 2, Sistem Dua Semester, dalam Program Matrikulasi KPM dapat mengurangkan berlakunya kes kecederaan dan kemalangan di dalam makmal. Kelancaran perlaksanaan Eksperimen 5 oleh pelajar terjamin kerana ia dapat mengurangkan penggunaan alat radas serta menjimatkan ruang di dalam kebuk wasap. Ini juga menjadikan perlaksanaan Eksperimen 5 lebih teratur dan selamat. Di samping itu, penggunaan SDH juga boleh mengelakkan pencemaran berlaku terhadap bahan kimia yang digunakan. Selain itu, pengurangan kes radas pecah, terutamanya tabung uji dan penitis, dapat menggurangkan kos penyelenggaraan alat radas. Dapatan kajian dan temubual bersama pembantu makmal juga membuktikan penggunaan SDH dapat menjimatkan masa penyediaan dan pembersihan alat radas serta bahan kimia yang digunakan.

Rujukan

Abate Jote, C. (2019). Major factors that influencing experiments of Chemistry Courses in Nekemte College of Teacher Education, Oromia Region, Ethiopia. *Annals of Social Sciences & Management Studies*, 3(2). https://doi.org/10.19080/asm.2019.03.555610

Emendu, N. B., & Okoye, C. (2015). Identifying problems associated with studying of chemistry in Anambre State, Nigeria. *International Journal of Scientific and Reseacrh Publications*, *5*(6), 1–7.

Herdini, Roza Linda, Abdullah, Nur Shafiani, Fitri 'Alaina D., Praslita D. (2018). Development of interactive multimedia based on Lectora Inspire in chemistry subject in junior high school or madrasah tsanawiyah. *Journal of Educational Sciences*. Vol. 2, No. 1, 2018, 46-55

Majlis Peperiksaan Malaysia. (2012). Garis panduan umum pengurusan dan pengendalian PBS. *Kementerian Pendidikan Malaysia*.

Nur Liyana A., Goh C. T., Sharifah Zarina S. Z., Mazlin M., Sharina A. H., Mazlin M., Lee K. E., & Lubna Alam (2014). Penilaian Kesedaran Keselamatan Makmal: Kajian Kes di Pahang, Malaysia. *Jurnal Pendidikan Malaysia 43(2)(2018): 73-80* http://dx.doi.org/10.17576/JPEN-2018-43.02-07

Kolej Kemahiran Johor E-Learning Portal

Muhammad Faisal Bin Sulaiman, Mahani Binti Mohd Azmin, Anis Ruwaida Binti Ahmad, Nurul Afika Binti Hamdan, Siti Esah Binti Mahzan
Kolej Kemahiran Johor, Johor Bahru, Malaysia
Email address : NAMASAYAFAISAL@gmail.com, ma_ha_ni@yahoo.com.my, anisruwaida@kpypj.edu.my, hexapro.afika@gmail.com, siti.esyah@yahoo.com

Abstrak: Portal e-Pembelajaran telah menjadi sebahagian daripada medium pembelajaran di Institusi Pendidikan Tinggi (IPT) dan kepentingannya sama seperti menghadiri kuliah, tutorial, kerja makmal, pembentangan tugasan, rujukan ke perpustakaan, lawatan luar termasuk latihan industri, praktikum dan seumpamanya. Sebaliknya aktiviti seharian para pelajar pada masa kini terlalu berkait dengan media sosial yang bersifat lebih interaktif dan berinformasi. Objektif utama kajian ini adalah untuk meningkatkan keupayaan pensyarah menghasilkan bahan pembelajaran berasaskan media digital dan penyertaan pelajar di portal e-Learning berdasarkan model Lima Fasa Needham (1987). Kajian tindakan ini berpandukan model Kemmis dan McTaggart (1988) yang melibatkan sekumpulan pelajar Diploma Kemahiran Malaysia di Kolej Kemahiran Johor. Dapatan kajian menunjukkan intervensi antara penggunaan saluran berasaskan laman web dan sistem berpangkalan data berjaya meningkatkan penyertaan pelajar dan variasi bahan pembelajaran berbentuk media digital di portal e-Learning. Pendekatan konstruktif model Lima Fasa Needham memberi kesan terhadap tahap intelektual dan sahsiah pelajar. Institusi disaran membangunkan dasar serta menyediakan fasiliti pembelajaran yang lebih komprehensif sekiranya model ini ingin diaplikasi untuk tujuan penilaian.

Kata kunci: Portal e-Learning; intervensi antara penggunaan portal berasaskan web dan sistem berpangkalan data; Model Lima Fasa Needham

Pengenalan

Portal e-Learning telah menjadi sebahagian daripada medium pembelajaran di Institusi Pendidikan Tinggi (IPT) dan kepentingannya sama seperti menghadiri kuliah, tutorial, kerja makmal, pembentangan tugasan, rujukan ke perpustakaan, lawatan luar dan seumpamanya. Aktiviti seharian para pelajar masa kini sebaliknya terlalu berkait dengan media sosial yang bersifat lebih interaktif dan berinformasi. Terma e-Learning membawa pelbagai maksud, iaitu pembelajaran dalam talian, elektronik, sumber web dan sebagainya dan topik ini mendapat perhatian di IPT Malaysia (Mohd Salleh, 2008). Kajian melibatkan 30 IPT Malaysia menunjukkan hanya 16 IPT (38.5%) mempunyai polisi dan 11 daripadanya mewajibkan pelaksanaan 70% e-Learning (Embi, 2011). Ketiadaan insentif dan kekurangan staf disebutkan sebagai antara kekangan utama pelaksanaan e-Learning. Walaupun majoriti pensyarah (73.5%) mengatakan aktiviti berkaitan e-Learning semakin meningkat tetapi maklum balas pelajar menunjukkan sepertiga (37.7%) akses kepada pembelajaran dalam talian sekali seminggu dan majoriti bergantung kepada capaian internet percuma (63.5%). IPT Malaysia terdiri daripada 20 Universiti Awam; 513 Universiti, Kolej Universiti dan Kolej Swasta; 34 Politeknik dan 93 Kolej Komuniti. Pendidikan tinggi di Malaysia dijangka menuju 70% pembelajaran teradun menjelang tahun 2025 yang tidak lama lagi (Tapsir, 2016). Hasrat ini memerlukan komitmen semua pihak terutama di Institusi Pendidikan Tinggi Swasta (IPTS) yang berorientasikan imbangan kewangan dalam melaksanakan apa jua strategi dan pendekatan pembelajaran. E-Learning di IPTS menawarkan dua perspektif yang bertentangan tetapi saling berkait, iaitu untuk mendorong peningkatan kemasukan melalui manipulasi minat generasi muda terhadap media sosial dan cabaran membangunkan sistem pengajaran dan pembelajaran (PdP) berasaskan internet yang berkesan.

Pernyataan Masalah

Hasrat kerajaan untuk melaksanakan pembelajaran teradun di IPT perlu bermula dengan menerapkan kesedaran dan kefahaman di kalangan pensyarah kerana mereka hanya akan terdorong melaksanakan e-Learning sekiranya diyakini ianya bermanfaat (Haron, Abbas & Abd Rahman, 2012). Kalangan pelajar juga dikatakan kecewa apabila portal e-Learning tidak menyamai media sosial seperti Facebook, Youtube, WhatsApp, Twitter atau Instagram yang telah biasa digunakan (Attaran & Zainuddin, 2018). Situasi ini membayangkan keberkesanan pembelajaran teradun belum dapat dikatakan sebagai berjaya sepenuhnya. Senario yang sama terjadi di institusi kajian. Pensyarah terikat dengan dasar institusi untuk mewujudkan pembelajaran teradun yang mewajibkan 30% penggunaan portal e-Learning, manakala para pelajar lebih tertarik kepada aplikasi media sosial. Permasalahan ini memberi dorongan kepada pengkaji untuk memperkenalkan intervensi di media elektronik, iaitu portal laman web dan sistem berasaskan pangkalan data sebagai pencetus pembelajaran untuk meningkatkan penglibatan pelajar di portal e-Learning.

Objektif Kajian

Objektif utama kajian adalah untuk meningkatkan keupayaan pensyarah menghasilkan material interaktif dan penyertaan pelajar di portal e-Learning melalui intervensi di platform laman web dan sistem berasaskan pangkalan data berdasarkan model Lima Fasa Needham (1987). Kajian ini juga bertujuan untuk membimbing pelajar agar bertindak lebih ilmiah dan berhemah apabila menyertai media sosial.

Persoalan Kajian

Rasional kajian didokong oleh aspirasi institusi untuk meningkatkan keberkesanan PdP di portal e-Learning agar ianya setimpal dengan pelaburan pembangunan fasiliti teknologi maklumat dan komunikasi (TMK) serta kepentingan pencapaian hasil pembelajaran. Persoalan yang ingin dijawab melalui kajian ini adalah:

(i) Adakah pensyarah berupaya membangunkan variasi material pembelajaran untuk dimuat naik di portal e-Learning?
(ii) Bagaimanakah intervensi pembelajaran di platform portal berasaskan web dan sistem berasaskan pangkalan data dapat meningkatkan penyertaan pelajar di portal e-Learning?
(iii) Adakah pendekatan konstruktif melalui model Lima Fasa Needham dapat meningkatkan intelektual dan personaliti pelajar di media sosial?

Kejayaan melaksanakan tindakan-tindakan yang disasarkan di atas dianggap sebagai inovasi dalam pengajaran dan pembelajaran (PdP) untuk diamalkan oleh pengkaji.

Tinjauan Literatur

e-Learning di IPT

Portal e-Learning di IPT Malaysia dirujuk dengan terma yang berbeza-beza. Sebagai contoh, sistem pengurusan pembelajaran di Universiti Terbuka Malaysia (OUM) dinamakan sebagai MyLMS, MMLS di Universiti Multimedia Malaysia (MMU), UNIEC Virtual di Universiti Tun Abdul Razak (UNITAR), WawasanLearn, Wawasan2u di Universiti Terbuka Wawasan (WOU) I-Campus di Kolej Yayasan Pelajaran Johor. Paradigma e-Learning telah berubah dan kini ia lebih bersifat konstruktif dan kolaboratif (Stern, t.th). Tiga dimensi e-Learning adalah manusia, teknologi dan perkhidmatan (Aparicio, Bacao & Oliveira, 2016). Terdapat beberapa model pembelajaran dalam talian antaranya dikemukakan oleh Garrison, Anderson dan Archer (2000), Siemens (2004) dan Harasim (2012). Tanpa disedari teknologi mudah alih, objek pembelajaran digital, jaringan pembelajaran peribadi (PLN) dan artifak lain telah mengubah suasana bilik darjah menjadi tidak seperti dahulu (Borba et al., 2016). Picciano (2017) mencadangkan model integrasi dinamakan Multimodal Model for Online Education, iaitu gabungan pengajaran bersemuka dan dalam talian yang kini semakin dominan di semua peringkat pendidikan.

Penuntut-penuntut di IPT Malaysia memiliki kemahiran teknologi dan bersedia mengikuti pembelajaran teradun namun mereka tidak yakin terhadap pembelajaran kendiri dan memerlukan bimbingan (Adams, Sumintono, Mohamed & Mohamad Noor, 2018). Daud (2017) membuktikan e-Learning yang diintegrasikan dengan strategi pengajaran berdasarkan model Konstruktivisme Lima Fasa (Nedham, 1987) dan e-moderating (Salmon, 2000) dapat meningkatkan prestasi pelajar. Terdahulu Haron, Abbas dan Abd Rahman (2012) mendapati tahap penerimaan kalangan staf akademik terhadap e-Learning adalah rendah dan ia berkait dengan tahap kesedaran dan kefahaman mereka terhadap kegunaan sistem, matlamat pembelajaran dan teknologi pendidikan. Pensyarah hanya akan terdorong melaksanakan e-Learning sekiranya mereka yakin teknologi tersebut memberi manfaat. Beberapa faktor dikenal pasti mempengaruhi penerimaan penuntut-penuntut terhadap e-Learning. Antaranya tanggapan kebergunaan, tanggapan mudah guna, ciri-ciri pensyarah, kualiti sistem, kualiti maklumat, dan sokongan teknikal (Umbit & Taat, 2016). Sifat kendiri pelajar merupakan antara faktor paling signifikan untuk menjayakan e-Learning (Mohd Najib, Abu Bakar & Othman, 2017). Penerimaan e-Learning di kalangan pelajar pascasiswazah juga didapati berbelah bahagi (Attaran & Zainuddin, 2018). Para pelajar berpendapat kandungan seperti maklumat kursus dan powerpoint yang dimuat naik sesetengahnya tanpa sebarang penerangan atau arahan. Ini menyebabkan mereka kecewa ia tidak menyamai media sosial yang telah biasa digunakan. Pada peringkat makro, kegagalan e-Learning disebabkan oleh kelemahan infrastruktur teknologi dan aspek kemahiran mengajar di kalangan pendidik, sikap buruk pelajar dan pengajar serta ketiadaan integrasi antara aplikasi mudah alih dengan sistem e-Learning di universiti (Kaliisa & Pichard, 2017). Kajian-kajian di atas menggambarkan bahawa keberkesanan pembelajaran teradun dalam meningkatkan kualiti PdP serta pencapaian hasil pembelajaran belum dapat dikatakan sebagai berjaya sepenuhnya. Masih terdapat ruang yang perlu diperbaiki terutamanya untuk meningkatkan komunikasi dan interaksi sesama pelajar bagi pembelajaran berkumpulan dan kendiri.

Pembelajaran teradun melalui telefon mudah alih

Pemilikan telefon mudah alih di kalangan pelajar IPT Malaysia disedari bermula pada tahun 2008 dan ianya beralih kepada telefon pintar pada tahun 2013. Sejak tahun 2010 telah terdapat kesedaran di kalangan pelajar akan kepentingan telefon mudah alih dalam aktiviti pembelajaran (Mohd Suki & Mohd Suki, 2010) dan terus meningkat (Che Kob, Kannapiran, Shah & Arasinah, 2017; Marwan, Mada & Fuad, 2013; Raja Harun & Subramaniam, 2013). Namun penggunaannya dalam konteks pembelajaran terancang adalah minimum (Song, Murphy & Farley, 2013) dan disyorkan agar lebih perhatian diberi terhadap pembangunan kerangka e-Learning, pembangunan perisian dan penerimaan pelajar (Masrom, Nadzari & Zakaria, 2016). Kajian oleh Ismail, Azizan dan Gunasegaran (2016) menunjukkan para pelajar di Universiti Awam masih tidak pasti untuk terlibat dengan kaedah pembelajaran menggunakan telefon mudah alih. Ketika ini pelajar IPT Malaysia masih kurang selesa untuk mengikuti pembelajaran menggunakan telefon mudah alih (Shuib, Azizan & Ganapathy, 2018). Walaupun mereka mengetahui manfaatnya namun tahap kesediaan mereka untuk terlibat dengan pembelajaran adalah rendah dan mengaitkannya kepada isu kos serta keraguan akan keberkesanan pembelajaran. Halangan-halangan penggunaan telefon mudah alih sememangnya disedari (Nik Mohammad, Mamat & Mohd Isa, 2011). Antaranya adalah saiz storan, memori serta kuasa bateri yang terhad di samping keupayaan untuk mengikuti keseluruhan pembelajaran dan berkongsi maklumat di kalangan pelajar (Al-Arabiat, Wan Ahmad & Sarlan, 2015) dan gaya pembelajaran berbeza individu dewasa (Safie, Mohd Arshad & Idris, 2017).

Tidak dapat dinafikan penggunaan aplikasi mudah alih semakin meluas dan ia turut mempengaruhi aktiviti pendidikan. Saluran media sosial seperti sistem pesanan ringkas (sms), Facebook dan sebagainya mampu meningkatkan keberkesanan PdP (Barreh & Abas, 2015) dan boleh disesuaikan dengan keperluan portal dalaman seperti e–Portfolio dan sebagainya (Md.Ghalib, Sahrir, Daud, Hassan & Mohin, 2014). Manfaat pembelajaran melalui teknologi mudah alih adalah ia memberi fokus kepada mobiliti pelajar, strategi pembelajaran, persekitaran situasi dan kesedaran berkumpulan secara maya (Jeng, Wu, Huang, Tan & Yang, 2010). Ia dianggap sebagai pembelajaran masa hadapan pada peringkat pendidikan tinggi (Ally & Prieto-Blazquez, 2014). Namun terdapat kajian menunjukkan ia tidak memberi kesan prestasi (Grenier, 2018; Ng, Che Hassan, Mohammad Nor & Abdul Malek, 2017) dan terdapat pelajar yang menerima dengan baik tetapi terdapat juga yang menderita dan kecewa (Xue, Zhang & Luo, 2017). Pengkaji-pengkaji mencadangkan agar perhatian diberikan kepada usaha untuk membangunkan strategi penyampaian yang sesuai dan berkesan. Figueredo & Villamizar (2015) mengemukakan model 6-peringkat manakala Sung, Chang dan Liu (2016) mencadangkan eksperimen untuk meningkatkan keupayaan pengajar menggunakan aplikasi mudah alih, kandungan pengajaran, kaedah pengajaran, dan matlamat pengajaran. Pembelajaran melalui aplikasi mudah alih akan memberi lebih kesan positif terhadap keupayaan kognitif pelajar sekiranya ia turut meningkatkan motivasi pelajar (Buchori et al., 2017), tetapi sekiranya tidak dirancang ia akan menjadi gangguan sekali gus memberi kesan negatif kepada pembelajaran (Pedro, Barbosa & Santos, 2018).

Model Lima Fasa Needham

Pembelajaran konstrukstif berdasarkan model Lima Fasa Needham telah dilakukan dalam pelbagai bidang teknikal (Lee, Mat Yusoff, Tan & Lim, 2019; Mohd Hashim & Kasbolah, 2012) dan sains sosial (Akpan & Beard, 2016; Mat Jasin & Shaari, 2012; Nair & Muthiah, 2005) di peringkat sekolah dan pendidikan tinggi. Teknik ini dikatakan berkesan untuk kumpulan pelajar lemah akademik yang perlu didedahkan dengan pelbagai teknik pembelajaran (Jamaludin & Zaidatun, 2003). Pendekatan pembelajaran teori konstruktivisme berteraskan kepada strategi untuk mendorong pelajar terlibat aktif dalam proses pengajaran dan pembelajaran. Ia merupakan proses mendapatkan ilmu pengetahuan daripada pengalaman yang dilalui dan bersangkutan dengan pengetahuan sedia ada (Driver & Bell, 1985). Pelajar seterusnya diharapkan dapat mengintegrasi dan mengaplikasi pengetahuan tersebut ke dalam situasi baru (Briner, 1999). Menurut teori konstruktivisme, konsep-konsep yang dibina pada struktur kognitif seseorang akan berkembang dan berubah apabila ia mendapat pengetahuan atau pengalaman baru khususnya untuk pembelajaran yang berlandaskan kepada konsep dan fakta (Nair & Muthiah, 2005). Ia berlaku melalui proses yang disebut sebagai analogi, penalaan, pengayaan dan penambahbaikan (Gagne, Yekovich & Yekovich, 1993; Rumelhart & Norman, 1978). Model ini terdiri daripada lima fasa, iaitu fasa orientasi, fasa pencetusan idea, fasa penstrukturan semula idea, fasa aplikasi idea dan fasa refleksi. Pendekatan konstruktivisme bermula dengan aktiviti untuk menggalakkan proses inkuiri di kalangan pelajar agar mereka dapat memberi cetusan-cetusan idea, membuat hipotesis dan berupaya untuk merancang aktiviti pembelajaran seterusnya. Pada peringkat ini para pelajar didorong untuk membuat perkaitan antara topik sebelum dan telah dipelajari, mengaitkannya kepada kehidupan seharian dan akhirnya dengan sendiri berkeupayaan untuk membuat ilustrasi keseluruhan proses pembelajaran (Abd Halim & Kamarudin, n.d.).

Rumusan

Pengiktirafan kerajaan terhadap pengendalian kursus-kursus dalam talian secara terbuka dan percuma (MOOCs) yang dinyatakan melalui beberapa dasar, warta dan pekeliling menunjukkan akan kepentingan pembelajaran dalam talian perlu segera dilaksanakan di IPT Malaysia. Pembelajaran teradun melalui aplikasi mudah alih diketahui semakin mendapat perhatian. Pendekatan konstruktif melalui model Lima Fasa Needham (1987) dalam

pembelajaran dapat membantu kalangan pelajar mengikuti pengajian dengan lebih sistematik terutama bagi kalangan mereka yang lemah akademik. Ia bukan sahaja dapat melibatkan pelajar dalam proses pembelajaran malah aplikasi dalam persekitaran kehidupan seharian. 6. Metodologi Kajian Kajian ini dilakukan mengikut model Kemmis dan McTaggart (1988). Kajian ini tercetus daripada pemerhatian terhadap isu dan masalah yang dikenal pasti daripada amalan PdP terdahulu. Pertimbangan untuk melakukan kajian telah mengambil kira peraturan-peraturan di peringkat institusi, keupayaan pengkaji serta latar belakang para pelajar. Sebagai permulaan, tinjauan dilakukan terhadap kalangan pelajar untuk mengetahui pengalaman pembelajaran menggunakan portal e-Learning. Pengkaji mendapatkan keterangan aspek teknikal portal e-Learning dan berbincang dengan Ketua Jabatan untuk mendapatkan senarai penawaran kursus serta perincian silibus. Pengkaji kemudiannya melaksanakan pengkuliahan, e-Learning serta intervensi menggunakan Portal laman web dan sistem berasaskan pangkalan data. Pengkaji menganalisa keberkesanan intervensi dan membuat refleksi termasuk mempertimbangkan pandangan para pelajar sebelum tindakan-tindakan baharu dilaksanakan untuk gelung kedua kajian.

Kajian tindakan berjaya membantu pengkaji sebagai seorang pensyarah kemahiran untuk membangunkan media bahan pengajaran yang dapat dikongsi di portal e-Pembelajaran dan media sosial. Intervensi 5M di platform WhatsApp dan Telegram terbukti dapat merangsang para pelajar untuk aktif di portal e-Pembelajaran serta berjaya membimbing mereka menjadi lebih berhemah ketika berada di platform media sosial.

Reka bentuk kajian

Reka bentuk kajian melibatkan tiga aktiviti, iaitu pengkuliahan, cetusan di media elektronik dan portal e-Learning. Perbincangan, kuiz dan pembentangan dilakukan pada minggu tertentu. Aktiviti di portal e-Learning antaranya memuat naik dan memuat turun nota kuliah, forum dan tugasan. Portal laman web dan sistem berasaskan pangkalan data dijadikan sebagai pencetus pembelajaran melalui pelbagai hantaran yang mengandungi berita, gambar, video dan sebagainya. Amnya saluran WhatsApp adalah saluran komunikasi bebas sesama pelajar dan pensyarah manakala Telegram untuk memuat naik atau memuat turun material yang berkaitan dengan pembelajaran sebelum tercetusnya Pembangunan portal ini.

Pemilihan peserta dan etika kajian

Berdasarkan kepada Rauch, Stefan dan Posch (2019) kajian ini merupakan kajian tindakan pendidikan tahap pertama, iaitu hanya melibatkan pengkaji sebagai seorang guru dan para pelajar dalam kelas yang sama. Pada tahap yang lebih tinggi ia melibatkan sekumpulan guru daripada jabatan tertentu seterusnya keseluruhan sebuah fakulti/sektor kursus dan IPT. Kajian kajian bersifat pedagogi yang dilakukan oleh pengkaji mematuhi dasar IPT di Kolej Kemahiran Johor yang menggalakkan staf akademik untuk mempelbagaikan kaedah pengajaran dalam talian dan menurut Lindsay, Breen dan Jenkins (2002) ia merupakan kelaziman di institusi pendidikan tinggi. Penyertaan pelajar adalah tidak diwajibkan kerana pelaksanaan kajian ini memerlukan pelajar memiliki peralatan komunikasi seperti telefon pintar dan capaian internet yang kemungkinan tidak semua pelajar memilikinya. Oleh yang demikian sebarang aktiviti yang dilakukan dalam kajian ini diberi pertimbangan sewajarnya agar tidak menjejaskan proses penilaian pelajar. Pengkaji mematuhi etika kajian iaitu memberi taklimat awal kepada pelajar berkaitan objektif dan prosedur kajian. Ia adalah untuk memastikan para pelajar menyedari peranan mereka sebagai rakan penyelidik untuk menambah baik amalan sedia ada. Bagaimanapun sebagai langkah berjaga-jaga untuk memastikan maklum balas peserta kajian, iaitu para pelajar adalah selari dengan matlamat dan objektif kajian, maka pengkaji mengadakan perbincangan secara berkala dengan pensyarah pakar (penyelia projek/Ketua Kursus/Ketua Sektor) seperti mana diingatkan oleh Entwistle dan Tait (1990), dan Shevlin, Banyard, Davies dan Griffiths (2000). Peserta kajian turut didedahkan dengan informasi daripada amalan dan kajian-kajian terdahulu untuk meningkatkan pengetahuan dan kemahiran mereka sebagai peserta dan penyelidik bersama seperti mana disarankan oleh Norton (2009).

Rujukan

Abd Halim, N.D., & Kamarudin, N.A. (n.d.). Aplikasi teori konstruktivisme dan model 5 fasa Needham dalam pembelajaran perisian ChemMol4. Muat turun pada 3/7/2023 daripada https://people.utm.my/noordayana/files/2012/10/paper-pappp-full-dr-dayana.pdf

Adams, D., Sumintono, B., Mohamed, A., & Mohamad Noor, N.S. (2018). E-learning readiness among students of diverse background in a leading Malaysian higher education institutions. Malaysian Journal of Learning and Instruction, 15(2), 227–256. Muat turun pada 4/7/2023 daripada http://mjli.uum.edu.my/images/vol.15no.2/227-256new.pdf

Akorful, V., & Abaidoo, N. (2014). The role of e-learning, the advantages and disadvantages of its adoption in higher education. International Journal of Education and Research, 2(12), 397– 410. Muat turun pada 31/7/2023 daripada https://www.semanticscholar.org/paper/The-role-of-e-learning%2C-the-advantages-and-of-its-Arkorful-Abaidoo/0a90939ce9c17fde3b86e66cd085530547bc6a6e

Akpan, J.P., & Beard, L.A. (2016). Using constructivist teaching strategies to enhance academic outcomes of students with special needs. Universal Journal of Educational Research, 4(2), 392–398. Muat turun pada 3/8/2023 daripada https://www.semanticscholar.org/paper/Using-Constructivist-Teaching-Strategies-to-Enhance-Akpan-Beard/e5911dac4c4a6d59276e7b6fbd93492a74c3823b

Al-Arabiat, D., Wan Ahmad, W.F., & Sarlan, A. (2015). The barriers to adoption of mobile learning by HEIs in Malaysia: An Exploratory Study. Journal of Advanced Research Design, 14(1), 1–9. Muat turun pada 4/8/2023 daripada http://www.akademiabaru.com/doc/ARDV14_N1_P1_9.pdf

Ally, M., & Prieto-Blázquez, J. (2014). What is the future of mobile learning in education? Mobile Learning Applications in Higher Education [Special Section]. Revista de Universidad y Sociedad del Conoci-miento, 11(1), 142–151. Muat turun pada 4/8/2023 daripada http://doi.dx.org/10.7238/rusc.v11i1.2033

Al-Rahmi, W.M., Othman, M.S., & Yusof, L.M. (2015). The effectiveness of using e-learning in Malaysian Higher Education: A case study Universiti Teknologi Malaysia. Mediterranean Journal of Social Sciences, 6(5), 625–637. Muat turun pada 31/8/2023 daripadahttps://www.researchgate.net/publication/281571575_The_Effectiveness_of_Using_E-Learning_in_Malaysian_Higher_Education_A_Case_Study_Universiti_Teknologi_Malaysia/link/5645472d08ae451880a8c4e2/download

Aparicio, M., Bacao, F., & Oliveira, T. (2016). An e-learning theoretical framework. Educational Technology & Society, 19(1), 292–307. Muat turun pada 31/8/2023 daripada https://www.semanticscholar.org/paper/An-e-Learning-Theoretical-Framework-Aparicio-Ba%C3%A7%C3%A3o/b03ec0d1398e261fa4be0c368c4268d45befa193

Easy Seam Ruler

[1]Nura'inul Fazleen bt Kamarudin, [2]Sariah Binti Gimen, [3]Siti Asmah Binti Ibrahim, [4]Siti Nurul Nadiah Binti Huslan, [5]Zulaikha Bt Nahar

[1,2,3,4,5]Kolej Vokasional Dato' Undang Hj. Muhamad Sharip, Negeri Sembilan, Malaysia

[1] sitiasmah172@gmail.com

Abstrak: Mendraf pola ialah salah satu kompetensi wajib lulus bagi pelajar Program Seni Reka Fesyen di Kolej Vokasional Dato' Undang Hj Muhamad Sharip (KV DUHMS). Pola digunakan sebagai templat untuk memotong kain yang sesuai dengan spesifikasi yang diperlukan untuk menjahit pakaian. Melalui pemerhatian semasa proses pengajaran dan pembelajaran (PdP) yang dijalankan mendapati, masalah garisan basi pola dihasilkan tidak lurus dan tidak sekata, penggunaan pelbagai peralatan yang banyak dalam satu masa dan kelebaran ukuran basi pola yang tidak tepat sering berlaku semasa mendraf pola. Tambahan pula, ukuran basi yang terdapat pada tepi garisan berfungsi sebagai tanda ukuran basi jahitan ia perlulah tepat supaya hasil yang dihasilkan lebih kemas dan tepat. *Easy Seam Ruler* satu produk inovasi yang dibangunkan untuk membantu mengatasi masalah mendraf pola untuk memudah dan mempercepatkan proses melakar basi. Objektif penghasilan produk bertujuan untuk menghasilkan garisan basi pola yang lurus dan sekata, meminimumkan penggunaan pelbagai alatan dan bahan mendraf dan menghasilkan kelebaran ukuran basi pola yang tepat. Secara keseluruhan mendapati *Easy Seam Ruler* sangat membantu pelajar dalam mengatasi masalah semasa mendraf pola pakaian dan sesuai digunakan oleh semua. Penambahbaikan pada bahagian maklumat ukuran boleh dibuat pada *Easy Seam Ruler* supaya lebih baik dan berpotensi untuk dipasarkan.

Kata kunci: Mendraf Pola; *Easy Seam Ruler; Basi Pola*

Pengenalan

Fesyen ialah istilah yang merujuk kepada gaya berpakaian, kosmetik, tingkah laku dan sebagainya yang menjadi kegemaran serta ikutan ramai dan berubah mengikut masa. Manakala berfesyen pula ialah menunjukkan atau mengikut sesuatu fesyen dalam cara berpakaian dan lain-lain. Fesyen merupakan keinginan untuk sesuatu perubahan dan ini menjadikan ia sebahagian daripada asas kehidupan manusia. Tujuan manusia menutup badan adalah untuk kelihatan sopan, tetapi perhiasan dan dekorasi terlebih dahulu telah menjadi aspek penting dalam berpakaian. Pakaian merupakan medium komunikasi yang paling jelas dan berpengaruh. Dengan melihat gaya seseorang kita boleh andaikan status sosial, identiti jantina, orientasi politik, etnik, gaya hidup juga mempengaruhi jenis perhiasan yang dapat diterima pada sesuatu masa, zaman atau kelompok masyarakat.

Pakaian yang cantik, kemas dan elok terletak apabila dipakai perlulah dihasilkan mengikut urutan dan susunan langkah-langkah yang perlu diikuti seperti mengambil ukuran badan, mendraf pola, menyusun atur pola pada fabrik, menggunting dan menjahit pakaian. Setiap aktiviti dan langkah ini perlu dibuat dengan baik untuk mendapatkan hasil pakaian yang berkualiti. Langkah kedua selepas mengambil ukuran badan adalah mendraf pola pakaian. Mendraf pola pakaian adalah satu aktiviti melakar pola dengan menggunakan teknik dan peralatan yang betul serta ukuran yang tepat untuk memastikan bentuk pakaian kelihatan cantik dan tiada masalah ketika proses menjahit dilakukan. Pola boleh diubahusai dan dibuat pembetulan mengikut stail atau rekaan yang dikehendaki. Ukuran dan kiraan yang tepat memainkan peranan penting bagi mendapatkan keseluruhan hasil pakaian melalui bahagian-bahagian pola yang dilakar dengan teliti seperti pola badan hadapan, badan belakang dan lengan.

Pola perlu ditanda dengan tepat bagi memastikan keseragaman pola ketika pengubahsuaian atau pemindahan pola ke atas kertas pola yang lain. Penggunaan alatan yang tepat dititiberatkan supaya pola yang dilakar betul dan mengikut ukuran yang sebenar. Alatan seperti pembaris lurus, pembaris melengkung, pembaris L, kapur tukang jahit, pensel dan pita ukur selalunya digunakan bersama setiap kali aktiviti mendraf dijalankan. Pelbagai alatan ini akan ditukar ganti penggunaannya semasa mendraf pola misalnya pola badan hadapan, pembaris lurus digunakan pada bahagian bahu manakala pembaris melengkung akan digunakan pada bahagian keruk lengan. Penggunaan pelbagai alatan ini akan lebih menyukarkan kepada mereka yang baharu dalam bidang jahitan.

Selain itu, garisan basi pola yang dihasilkan semasa mendraf tidak lurus dan tidak sekata. Kebiasaannya, pelajar akan menggunakan pita ukur dan pensel untuk meletakkan tanda dan seterusnya membuat garisan menggunakan pelbagai pembaris tersebut, ini memberi kesan kepada hasil pola yang didraf apabila tidak ditanda dengan betul. Kelebaran basi pola yang tidak tepat juga boleh memberi kesan kepada hasil pola yang mana akan menjejaskan aktiviti seterusnya seperti menggunting dan menjahit pakaian. Permasalahan ini sering berlaku semasa aktiviti mendraf dan memberikan impak kepada hasil pakaian yang akan dihasilkan.

Produk *Easy Seam Ruler* diinovasikan dan dibangunkan bagi mengatasi masalah yang berlaku terutamanya semasa aktiviti mendraf pola dijalankan. Objektif produk *Easy Seam Ruler* adalah untuk menghasilkan garisan basi pola pakaian yang lurus dan sekata, meminimumkan penggunaan pelbagai peralatan semasa aktiviti mendraf dan menghasilkan ukuran kelebaran basi pola yang tepat. Inovasi ini sangat membantu pensyarah dan pelajar di Kolej Vokasional Dato' Undang Hj Muhamad Sharip, Rembau, Negeri Sembilan kerana mendraf pola merupakan aktiviti dan kompetensi wajib lulus bagi semua pelajar Program Seni Reka Fesyen.

Penggunaan bahan akrilik menjadikan *Easy Seam Ruler* lebih tahan lama, kecerahan yang tinggi, ringan dan mudah diselenggara. Dengan adanya *Easy Seam Ruler* ini dapat membantu aktiviti mendraf pola pakaian dengan lebih baik dan dapat menghasilkan pakaian dengan lebih kemas dan cantik. *Easy Seam Ruler* mempunyai kelebihan yang tersendiri antaranya ialah dapat membantu pensyarah dan pelajar terutamanya semasa proses pengajaran dan pembelajaran (PdP), pelajar dapat menggunakan *Easy Seam Ruler* ini untuk menghasilkan garisan basi pola yang

lurus dan sekata. Garisan basi pola yang lurus dan sekata adalah sangat penting kerana ia juga akan mempengaruhi pakaian yang akan dihasilkan.

Malahan, dengan adanya *Easy Seam Ruler* dapat membantu pelajar meminimumkan penggunaan pelbagai alatan dan bahan seperti pembaris tukang jahit semasa aktiviti mendraf satu bahagian pola pakaian. Ia juga dapat menjimatkan masa yang diperlukan untuk menyiapkan satu-satu pola pakaian kerana kebiasaannya pelajar perlu menghasilkan polah pengubahsuaian dan pola akhir.

Kelebaran ukuran basi pola yang tepat dengan penggunaan *Easy Seam Ruler* kerana produk ini mempunyai ukuran disetiap sisi iaitu saiz 3 cm, 2 cm dan 1.5 cm. Dengan ini, pelajar dapat membuat kelebaran garisan basi pola dengan lebih baik berbanding cara lama yang memerlukan pelajar menanda sedikit dahulu dan kemudian garisan penuh dilakar. *Easy Seam Ruler* juga dapat membantu pelajar lebih fokus dan menambah minat pelajar untuk mendraf pola dengan kaedah yang lebih baik berbanding kaedah lama yang digunakan sebelum ini. Sekaligus, membantu pelajar menghasilkan tugasan kompetensi mendraf pola pakaian dengan lebih baik, kompeten dan terampil. Produk ini juga dapat membantu masyarakat dan orang ramai seperti tukang jahit dan pembuat pola pakaian untuk menghasilkan pola pakaian dengan lebih baik dan produk ini juga sesuai untuk dikomersialkan.

Deskripsi Produk

Rajah 1: Produk Inovasi *Easy Seam Ruler*

- Bahan akrilik- tahan lama, ringan, mudah dikendalikan
- Kos penghasilan minima
- 3 in1 pembaris - pembaris lurus, pembaris L dan melengkung
- Sesuai digunakan oleh semua lapisan masyarakat
- Mudah dibawa, disimpan dan digunakan

Dapatan & Perbincangan

Penggunaan produk *Easy Seam Ruler* kepada kumpulan sasaran iaitu seramai 12 orang pelajar Diploma Tahun 1 Program Seni Reka Fesyen adalah sangat baik dan dapat membantu mengatasi masalah yang sering berlaku semasa kompetensi mendraf pola pakaian.

Berdasarkan Jadual 1 menunjukkan bahawa hanya 6 orang pelajar sahaja daripada 12 orang pelajar dapat menghasilkan garisan pola yang lurus dan sekata serta menghasilkan kelebaran ukuran saiz basi pola yang tepat. Selain itu pelajar tidak dapat meminimakan penggunaan alatan dan bahan mendraf dan meminimakan masa dalam menghasilkan basi pola kerana mereka mengambil masa yang lama.

Berdasarkan Jadual 2 pula menunjukkan 12 orang pelajar tersebut dapat menggunakan *Easy Seam Ruler* dengan baik. Penghasilan garisan basi pola yang lurus dan sekata dapat didraf dengan baik berbanding keadaan sebelumnya. Malahan kelebaran ukuran basi pola yang lebih tepat juga dapat dihasilkan dan membantu proses seterusnya untuk menggunting fabrik dan menjahit pakaian.

Penjimatan masa adalah yang sangat ketara diperolehi kerana pelajar tidak memerlukan penggunaan pelbagai alatan dan bahan mendraf semasa mendraf satu pola pakaian. Ini menjadikan tugasan yang diberikan dapat diselesaikan dengan lebih cepat dan memenuhi kompetensi kursus.

Jadual 1: Tanpa Penggunaan *Easy Seam Ruler*

Perkara yang dinilai	Bil. Pelajar	Pencapaian pelajar	
		Kompeten	Tidak kompeten
1. Menghasilkan garisan pola yang lurus dan sekata	12	6	6
2. Meminimakan penggunaan alatan dan bahan mendraf	12	0	12
3. Menghasilkan kelebaran ukuran saiz basi pola yang tepat	12	6	6
4. Meminimakan masa dalam menghasilkan basi pola	12	0	12

Jadual 2: Penggunaan *Easy Seam Ruler*

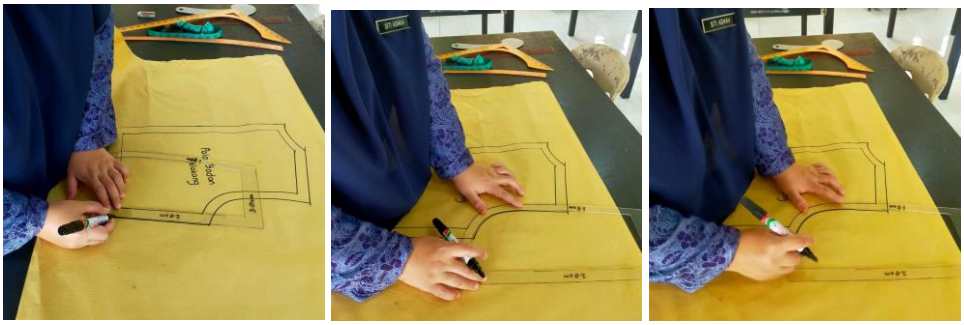
Perkara yang dinilai	Bil. Pelajar	Pencapaian pelajar	
		Kompeten	Tidak kompeten
1. Menghasilkan garisan pola yang lurus dan sekata	12	12	0
2. Meminimakan penggunaan alatan dan bahan mendraf	12	12	0
3. Menghasilkan kelebaran ukuran saiz basi pola yang tepat	12	12	0
4. Meminimakan masa dalam menghasilkan basi pola	12	12	0

Impak / Keberkesanan Produk

1. Memudahkan proses melakar garisan basi pola semasa proses mendraf pola.
2. Meminimumkan penggunaan pelbagai alatan dan bahan mendraf.
3. Garisan basi pola yang lebih kemas dan tepat.
4. Kos penghasilan produk yang murah.
5. Komponen produk yang ringkas dan mudah untuk dikendalikan
6. Meminimumkan masa dalam pembuatan mendraf pola.

Penggunaan Easy Seam Ruler

Rajah 2: Pelajar menggunakan *Easy Seam Ruler* dalam kerja amali mereka.



Rajah 3: Pensyarah menggunakan *Easy Seam Ruler* dalam PdP.

Kesimpulan

Produk inovasi *Easy Seam Ruler* telah terbukti dapat menyelesaikan masalah garisan basi pola yang tidak lurus dan tidak sekata. Produk ini juga dapat menghasilkan kelebaran ukuran basi pola yang tepat untuk proses menggunting dan menjahit pakaian. Selain itu *Easy Seam Ruler* telah mendapat maklum balas yang baik dari pelbagai pihak seterusnya diharap produk ini dapat dipasarkan dengan lebih meluas. Kami mengharapkan agar produk inovasi dapat memudahcarakan bagi target pasaran kami.

Berdasarkan dapatan yang dijalankan terhadap 12 pelajar Diploma Tahun 1 Seni Reka Fesyen dari Kolej Vokasional Dato' Undang Haji Muhamad Sharip, beberapa cadangan penambahbaikan boleh diaplikasikan bagi produk *Easy Seam Ruler* ini. Cadangan penambahbaikan tersebut adalah seperti berikut :

1. Mempelbagaikan saiz pembaris.
2. Menggunakan material yang lebih kukuh untuk mengelakkan daripada mudah patah.
3. Mempatenkan produk dan meluaskan pasaran produk.

Rujukan

Lamah binti Abdul Ghani, Azmawati binti Abdul Aziz (2015). *Pola Pakaian Tingkatan 4 & 5*. Dewan Bahasa & Pustaka. Kuala Lumpur.
Winifred Aldrich (2008). *Metric Pattern Cutting for Women's Wear*. Blackwell Publishing. UK.
Helen Joseph Armstrong (2014). *Patternmaking for Fashion Design*. Pearson. UK.

Meningkatkan Kemahiran Menghafal dan Memahami Format Penyata Kewangan dengan Menggunakan "Mini Whiteboard" Penyata Kewangan

[1]Siti Rodhiyah Shazilah Binti Jainol Abidin, [2]Hani Effa Atira Binti Mohd Subehi
[1,2]Kolej Vokasional Seberang Perai, Pulau Pinang, Malaysia
[1] sitishazilah@gmail.com, [2] hanieffaatirasubehi@gmail.com

Abstrak: Kajian ini dilaksanakan untuk meningkatkan kemahiran menghafal dan memahami format penyata kewangan dengan menggunakan "mini whiteboard" penyata kewangan. Fokus kajian adalah untuk meningkatkan kemahiran menyediakan dan memahami penyediaan penyata kewangan. Tinjauan awal telah dilaksanakan melalui kaedah analisis dokumen iaitu pemeriksaan Kertas Amali K1 dan praujian. Pelajar tidak dapat melengkapkan jawapan penyata kewangan dengan baik dan tidak sempurna. Malahan, analisis praujian menunjukkan pelajar tidak dapat menerangkan dan memahami format penyata kewangan dengan betul. Pelaksanaan tindakan difokuskan kepada inisiatif guru dalam memperkenalkan kaedah "mini whiteboard" penyata kewangan. Kaedah ini dapat membantu pelajar menyediakan dan memahami penyata kewangan tanpa membuat kesilapan dengan memasukkan satu amaun di bahagian lain yang menyebabkan kehilangan markah dan amaun di baki akhir tidak seimbang. Analisis pascaujian yang diadakan menunjukkan peningkatan skor yang ketara. Penggunaan kaedah "mini whiteboard" penyata kewangan dalam pengajaran dan pembelajaran dapat meningkatkan kefahaman dan daya ingatan pelajar dalam menyelesaikan soalan penyata kewangan.

Kata kunci: *Mini Whiteboard*; Penyata Kewangan; Perakaunan; Penyata Pendapatan

Pengenalan

Penyediaan penyata kewangan adalah satu topik yang penting dalam mata pelajaran prinsip perakaunan. Malah penyata kewangan bukan hanya penting bagi mata pelajaran ini tetapi juga penting untuk sesebuah perniagaan. Melalui penyediaan penyata kewangan untung, rugi, hasil dan belanja sesuatu perniagaan atau entiti itu dapat dikenalpasti. Disamping itu, penyata kewangan juga dapat membantu penpensyarah s untuk mengukur prestasi sesebuah perniagaan.

Penyata kewangan ini terbahagi kepada dua iaitu penyata pendapatan komprehensif dan penyata kedudukan kewangan. Mengikut urutan kitaran perakaunan iaitu daripada dokumen sumber, buku catatan pertama, lejar, imbangan duga dan penyata kewangan. Oleh itu, elemen-elemen didalam penyata kewangan perlu diambil daripada catatan didalam imbangan duga. Elemen dalam imbangan duga perlu diklasifikasikan kepada penyata pendapatan komprehensif dan penyata kedudukan kewangan.

Penyata pendapatan komprehensif akan menunjukkan untung atau rugi bersih sesuatu perniagaan itu. Dengan mengambil kira hasil dan belanja yang terlibat dalam perniagaan. Manakala penyata kedudukan kewangan akan memberi maklumat berkaitan dengan kedudukan kewangan perniagaan iaitu jumlah aset, liabiliti dan ekuiti pemilik perniagaan pada tarikh tutup perkaunan untuk tempoh tertentu. Pengkaji mengenalpasti bahawa pelajar lemah untuk menyediakan penyatta kewangan ini kerana tidak menghafal format dengan baik.

Oleh itu, bagi membantu pelajar untuk menghafal dan memahami format penyata kewangan ini dengan baik dan sistematik kajian ini akan dijalankan. Berdasarkan kajian ini juga dapat membantu pelajar lebih mahir dan cekap untuk menyediakan penyata kewangan dengan lebih baik.

Semasa pengkaji mengajar pelajar program perkaunan di kolej vokasional seberang perai, pengkaji telah mengenalpasti terdapat sebahagian besar pelajar program perakaunan yang tidak mahir untuk menyediakan penyata kewangan dengan baik dan punca utama kegagalan untuk menyediakan penyata kewangan adalah kerana mereka tidak menghafal dan memahami format penyata kewangan.

Pengkaji mengenalpasti masalah ini apabila pelajar gagal menjawab soalan yang meminta mereka menyediakan penyata pendapatan dan penyata kedudukan kewangan. Apabila pelajar tidak memahami konsep menyebabkan mereka tidak mampu untuk menyediakan penyata kewangan contohnya pengiraan untuk bersih, jualan bersih, kos barang untuk dijual dan modal kerja. Pelajar juga tidak menghafal format menyebabkan mereka memasukkan butiran yang salah kedalam penyata kewangan yang disediakan yang memberikan jawapan yang salah.

Disamping itu, pelajar juga tidak melibatkan diri dalam aktiviti yang dijalankan didalam kelas kerana mereka tidak memahami konsep-konsep penyata yang sedang diajar oleh pensyarah didalam kelas. Hal ini menyebabkan pelajar pasif dalam bilik darjah.

Seperti kita telah sedia maklum bahawa penyediaan penyata kewangan ini adalah satu topik yang penting dalam mata pelajaran prinsip perakaunan kerana tajuk utama yang biasa diutarakan dalam soalan penilaian akhir adalah pelajar diminta untuk menyediakan penyata pendapatan dan penyata kedudukan kewangan. Oleh itu, apabila pelajar gagal untuk menyediakan penyata kewangan dengan baik akan memberi kesan kepada keputusan penilaian akhir mereka.

Akhir sekali, pengkaji mendapati masalah ini perlu diambil tindakan yang sesuai untuk menyelesaikannya supaya pelajar dapat mahir dalam menyediakan penyata kewangan dan memahami "mini whiteboard" penyata kewangan adalah tindakan yang pengkaji guna untuk membantu pelajar menyelesaikan masalah ini.

Objektif Kajian

1. Mengenalpasti sejauh mana perlaksanaan "mini whiteboard" penyata kewangan dalam meningkatkan kemahiran pelajar menyediakan penyata pendapatan dan penyata kedudukan kewangan.
2. Mengenalpasti sejauh mana penggunaan "mini whiteboard" penyata kewangan dapat meningkatkan prestasi pelajar dalam menjawab soalan penyata kewangan.

Persoalan Kajian

1. Apakah kaedah yang perlu dilaksanakan untuk memahami dan menyediakan penyata kewangan dikalangan pelajar Program Perakauan, Kolej Vokasional Seberang Perai.
2. Bagaimanakah perlaksanaan "mini whiteboard" penyata kewangan dapat meningkatkan kemahiran menyediakan penyata pendapatan dan penyata kedudukan kewangan dikalangan pelajar Program Perakaunan, Kolej Vokasional Seberang Perai.
3. Adakah penggunaan "mini whiteboard" penyata kewangan dapat meningkatkan prestasi pelajar dalam menjawab soalan penyata kewangan dikalangan pelajar Program Perakaunan, Kolej Vokasional Seberang Perai.

Sorotan Literatur

Kajian tindakan ini dijalankan untk mengatasi masalah pelajar untuk menyediakan penyata kewangan dalam menjawab soalan perakaunan. Kajian ini dijalankan untuk membantu pensyarah -pensyarah menggunakan kaedah ini dalam pdp supaya masalah pelajar dapat diselesaikan. Pelajar juga dapat menyediakan dan memahami format penyata dengan baik dan berkesan.

Pengkaji akan menggunakan "mini whiteboard" penyata kewangan bagi membantu pelajar menyediakan dan memahami format penyata kewangan dengan baik. Terdapat beberapa kajian tindakan lepas yang telah dijalankan untuk menyelesaikan masalah penyediaan penyata kewangan ini salah satunya adalah kajian Nur Sahzlina Saat berkaitan penggunaan peta minda dalam meningkatkan kemahiran penyediaan penyata kewangan sebelum pelarasan. Kajian ini telah dijalankan keapda seramai 17 orang pelajar aliran perakaunan SMK Kota Bharu Kelantan. Hasil daripada kajian ini menunjukkan peningkatan dalam kemahiran pelajar untuk menyediakan penyata kewangan dan juga meningkatan pencapaian pelajar dalam mata pelajaran mrinsip perakaunan.

Selain itu adalah kajian Siti Sarah Ramli berkaitan Meningkatkan kemahiran dalam menyediakan penyata kewangan dengan menggunakan teknik magic huruf. Kajian ini juga telah dijalankan untuk menyelesaikan masalah penyediaan penyata kewangan dalam Kalangan pelajar oleh itu kajian ini telah dijalankan kepada seramai 5 orang pelajar 4 alpha SMK Salor. Dapatan kajian menunjukkan peningkatan dalam pencapaian pelajar kerana majority menunjukkan minat untuk menyediakan penyata kewangan selepas kajian ini dijalankan.

Oleh itu, kajian ini juga akan dijalankan untuk membantu pelajar lebih berminat untuk menjawab soalan penyata kewangan. Dengan bantuan penggunaan "mini whiteboard" penyata kewangan pelajar boleh memahami dan menghafal format penyata kewangan dengan baik.

Deskripsi Produk

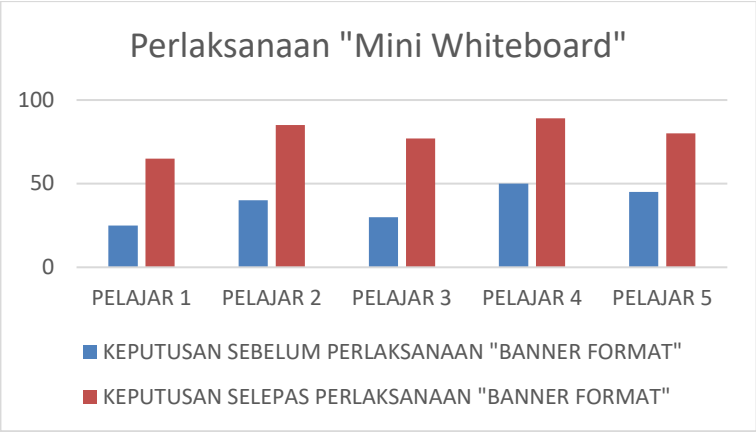
Produk "*mini whiteboard*" penyata kewangan ini dicipta bagi membantu pelajar-pelajar perakauan menyediakan dan memahami penyata kewangan dengan lebih baik. "*mini whiteboard*" penyata kewangan merangkumi satu penyata kewangan yang lengkap, pelajar hanya perlu mengisi amaun sahaja semasa penyediakan penyata kewangan dan membuat pengiraan. Sekiranya penyata yang disediaakan di "*mini whiteboard*" penyata kewangan tepat. Pelajar boleh terus melengkapkan jawapan, sekiranya salah, pelajar hanya perlu membuat pembetulan amaun. Produk ini juga menjimatkan masa pelaajr semasa membuat latihan penyata kewangan.

Dapatan & Perbincangan

Meningkatan kemahiran pelajar untuk menyediakan penyata pendapatan dan penyata kedudukan kewangan dengan baik dan mahir menggunakan "mini whiteboard" penyata kewangan.

Berdasarkan Rajah 1, pengkaji membuat pemerhatian dengan mengedarkan borang senarai semak kepada pelajar dan berikut merupakan keputusan yang diperolehi oleh pelajar sebelum dan selepas perlaksanaan "*mini whiteboard*" penyata kewangan.

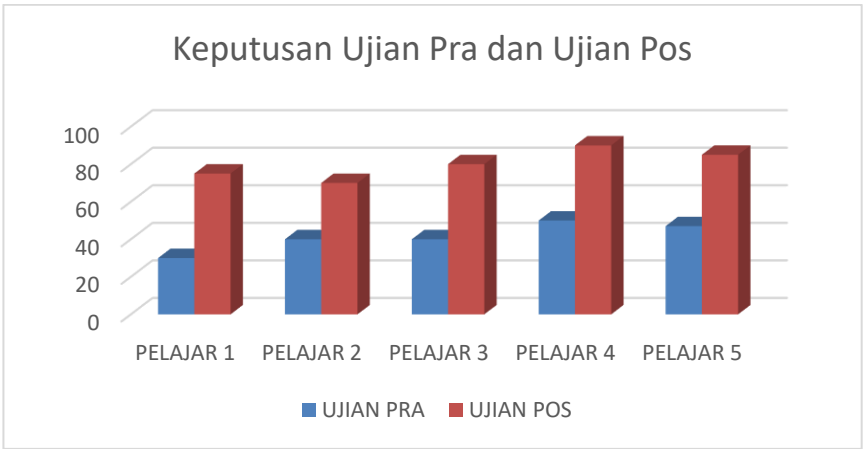
Melalui pemerhatian yang dibuat menggunakan borang senarai semak ini, terdapat peningkatan selepas pelaksanaan "*mini whiteboard*" penyata kewangan. Pelajar lebih mahir untuk menyediakan penyata kewangan selepas kaedah ini didedahkan keapda mereka berbanding sebelum. Pelajar juga dapat menyediakan dengan lebih cekap dan cepat.



Rajah 1: Keputusan sebelum dan selepas perlaksanaan "mini whiteboard" penyata kewangan.

Meningkatan prestasi pelajar dalam menjawab soalan yang memerlukan pelajar untuk menyediakan penyata kewangan dengan bantuan "mini whiteboard" penyata kewangan

Rajah 2 menunjukkan markah yang diperolehi oleh pelajar untuk ujian pra dan ujian pos yang dijalankan oleh pengkaji. Berdasarkan rajah 2, banyak peningkatan yang ditunjukkan oleh markah ujian pra dan ujian pos. Peningkatan ini menunjukkan kedah "mini whiteboard" penyata kewangan berkesan untuk membantu pelajar memahami dan menghafal format penyata kewangan. Disamping itu, kaedah ini juga telah membantu pelajar untuk menyediakan penyata kewangan dengan cekap dan cepat.



Rajah 2: Keputusan Ujian Pra dan Ujian Pos

Berdasarkan hasil dapatan kajian menunjukkan perlaksanaan "mini whiteboard" penyata kewangan ini sangat berkesan kepada pelajar-pelajar tingkatan empat sekolah menengah jenis kebangsaan krian. Melalui edaran borang senarai semak, ujian pra dan ujian pos menunjukkan keputusan yang memberangsangkan selari dengan objektif kajian. Kaedah "mini whiteboard" penyata kewangan ini telah membantu pelajar untuk memahami dan menghafal format penyata kewangan dengan berkesan.

Kesimpulan

Kesimpulanya, perlaksanaan produk inovasi ini sangat berkesan kepada pelajar-pelajar svm tahun 2, Kolej Vokasional Seberang Perai. Menurut hasil dapatan kajian yang dilaksanakan menunjukkan objektif kajian ini telah tercapai. Peningkatan dalam pencapaian dan prestasi pelajar selari dengan objektif yang telah ditetapkan untuk melaksanakan produk inovasi ini. Perlaksanaan kaedah "*mini whiteboard*" penyata kewangan " banyak membantu pelajar-pelajar untuk menyediakan dan memahami format penyata kewangan malah memudahkan mereka untuk menyediakan penyata kewangan dengan mahir, cekap dan cepat.

Rujukan

Nur Sahzlina Saat (2018). Penggunaan peta minda dalam meningkatkan kemahiran penyediaan penyata kewangan sebelum pelarasan.

Siti Sarah Ramli (2018). Meningkatkan kemahiran dalam menyediakan penyata kewangan dengan menggunakan teknik magic huruf.

Mereka bentuk *mini cold room* (MCR) bagi penggunaan PDPC pelajar Diploma Teknologi Penyejukan dan Penyamanan Udara di Kolej Vokasional Slim River

Muhammad Hambali Bin Ishak[1], Noraini Binti Mohd Sabri[2], Malim Ja'afar Bin Zainal Abidin[3], Mifzal Bin Sulaiman[4], Mohd Hazwan Bin Rosdi[5]
kvsrmpp@gmail.com

Abstrak: Alat Bahan Bantu Mengajar (ABBM) amat penting dalam proses Pengajaran dan Pemudahcara(PdPc) bagi meningkatkan kemahiran dan pemahaman pelajar. Justeru itu, satu produk inovasi iaitu *Mini Cold Room (MCR)* telah dibangunkan. Ia merupakan inisiatif pensyarah terhadap pelajar diploma Penyejukan dan Penyamanan Udara bagi Kursus DMC4323 *Commercial Refrigeration System*. *MCR* merupakan model simulasi bagi Kursus DMC4323 *Commercial Refrigeration System.* Hasil pemerhatian mendapati *MCR* dapat membantu pelajar mengenai sistem, komponen asas, aksesori, dan pemaipan. Kaedah analisis yang digunakan berbentuk kuantitatif menggunakan soal selidik yang telah diedar kepada pelajar. Diharapkan dengan inovasi MCR ini, kefahaman dan penguasaan pelajar terhadap kursus dapat ditingkatkan.

Kata kunci: bahan bantu mengajar; inovasi; pengajaran; kemahiran

Pengenalan

Pada era abad ke -21, sistem pendidikan di Malaysia telah melakukan transformasi seiring dengan perkembangan teknologi yang merujuk kepada Revolusi Industri 4.0 yang mana tenaga pekerja yang berkemahiran tinggi diperlukan untuk merealisasikan objektif IR 4.0.(Noor Nadhirah,2018). Perubahan teknologi IR 4.0 turut memberi impak yang besar terhadap sistem Pendidikan Teknik dan Vokasional (PTV) yang mana masyarakat sekarang memandang tinggi terhadap perkembangan sistem PTV. Dengan menyahut transformasi pendidikan yang seiring dengan perubahan teknologi yang mana pengajaran dan pembelajaran abad ke - 21 mementingkan pembangunan kemahiran seperti kemahiran pembelajaran dan inovasi, kemahiran maklumat, media dan teknologi serta kemahiran hidup dan kerjaya (Kementerian Pendidikan Malaysia, 2015). Oleh itu, guru memainkan peranan yang penting dalam pembangunan PdPc sama ada daripada segi pengetahuan, sahsiah atau kemahiran. Dalam melahirkan pelajar yang serba boleh, salah satu akauntabiliti tenaga pengajar dalam proses PdPc adalah untuk memastikan pelajar dapat memahami apa yang diajar (Noor Nadhirah,2018).

Penggunaan ABBM yang sesuai dapat membantu guru menerangkan sesuatu konsep pembelajaran dengan lebih berkesan dan dapat merangsang minat pelajar untuk terus belajar (Azman, Azli, Mustapha, Balakrishnan, & Mohd Isa, 2014). Pembudayaan inovasi dalam pendidikan perlu diterapkan oleh semua tenaga pengajar terutama dalam aspek pengetahuan dan aplikasi dalam pengajaran (Yahya & Lailinita, 2012). ABBM yang menarik yang menggunakan penerapan teknologi mampu meningkatkan keberkesanan proses PdPc yang dijalankan oleh guru.

Penggunaan ABBM dalam proses PdPc tidak terhad kepada pengajaran teori, malah ABBM ini boleh digunapakai dalam pengajaran amali. ABBM yang berfokuskan kepada pengajaran amali dapat membantu pelajar memahami isi pelajaran dengan cara lebih mudah dan efektif kerana merangkumi aspek teori dan amali (Hanif et al.,2016). Gabungan konsep teori dan amali dalam satu ABBM memudahkan guru melaksanakan proses PdPc. Guru dapat menerangkan sesuatu konsep sambil mengaplikasikan teori dalam bentuk amali. Justeru itu, proses PdPc akan lebih efektif kerana pelajar dapat melihat secara langsung pengaplikasian teori yang dipelajarinya melalui ABBM yang digunakan oleh guru tersebut.

Dengan pembangunan ABBM yang sesuai, maka bahagian teori dan amali bagi mata pelajaran ini dapat difahami oleh pelajar dengan berkesan. Kenyataan ini disokong oleh Mohd Sahap(2003) yang mana menyatakan bahawa pemahaman pelajar bergantung kepada gambaran sebenar yang jelas dapat diperhatikan dan dipegang oleh pelajar bagi meningkatkan penguasaan kefahaman pelajar terhadap sesuatu topik pembelajaran. Oleh itu, bantuan penggunaan ABBM merupakan salah satu cara proses PdPc yang mampu memberi kesan mendalam kepada pelajar.

Menurut Noor Nadhirah (2018), terdapat banyak kebaikan penerapan cara pengajaran guru dengan menggunakan ABBM yang sesuai semasa pengajaran berlaku. Penggunaan ABBM dalam proses PdPc bukan sahaja memberi faedah kepada pelajar, malahan guru juga dapat memberikan penerangan dengan baik kepada pelajar tentang topik yang diajar. Justeru itu, pengunaan ABBM yang sesuai itu perlu bagi melancarkan proses PdPc dalam kelas. Penggunaan ABBM dapat meningkatkan dan mempercepatkan kefahaman pelajar terutamanya pelajar-pelajar yang kurang pengetahuan akademik seperti pelajar KV (Abd Halim & Lai, 2013). Namun kekurangan ABBM di KV menyebabkan penggunaannya rendah dalam proses PdPc (Jamaludin, 2014).

Bengkel Penyejukan dan Penyamanan Udara Kolej Vokasional Slim River mempunyai kekangan untuk menyediakan *Cold Room* yang mencukupi disebabkan oleh harga yang mahal. Anggaran harga bagi sebiji *Cold*

Room adalah RM15,000 hingga RM 20,000. *Cold Room* ini diperlukan bagi memenuhi kursus DMC4323 *Commercial Refrigeration System.* Kursus ini memerlukan pelajar untuk menguasai kognitif dan psikomotor mengenai *Cold Room*.

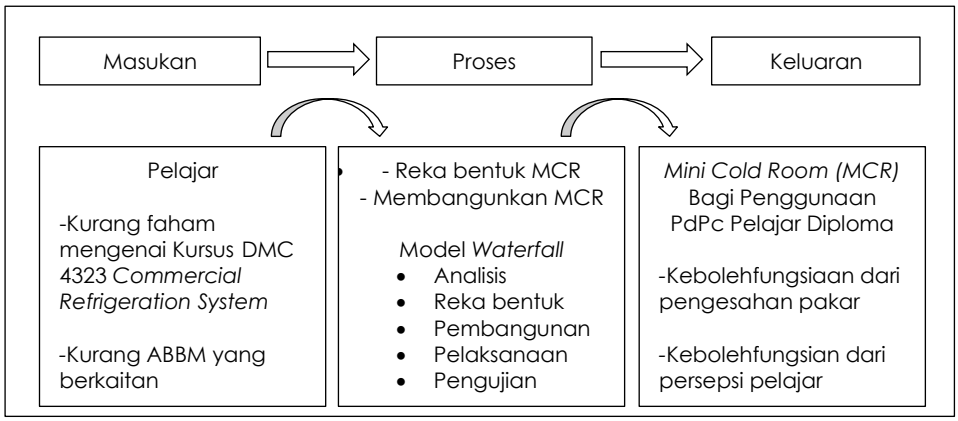
Ketinggian *Cold Room* adalah 2.5 meter. Ini telah menyukarkan guru untuk membuat penerangan sewaktu PdPc mengenai sistem, komponen dan aksesori yang terdapat pada sistem *Cold Room*. Ini adalah kerana tidak semua pelajar boleh menaiki *Cold Room* pada waktu yang sama disebabkan oleh kekangan ketinggian. Pelajar juga tidak dapat melihat dengan jelas apa yang disampaikan oleh guru semasa PdPc. Sekaligus ini menyebabkan pelajar sukar memahami sistem penyejukan bagi *Cold Room*. Bagi amali pula, pelajar menghadapi kekangan untuk melakukan amali atas isu keselamatan kerana perlu memanjat tangga untuk naik ke *Cold Room* yang tinggi bagi melakukan amali. Bagi pelajar yang gayat mereka takut untuk menaiki tangga dan kekangan juga timbul bagi pelajar yang mempunyai berat badan yang berlebihan. Semua faktor ini perlu diambil kira bagi memastikan PdPc berjalan dengan lancar.

Faktor keluasan bengkel juga merupakan kekangan untuk menyediakan unit ini disebabkan *Cold Room* mempunyai saiz yang besar. Setiap satu unit *Cold Room* memerlukan sekurang - kurangnya 4m^2 . Jadi jumlah ruang yang digunapakai untuk meletakkan 3 unit *Cold Room* sekurang-kurangnya 12m^2.

Penggunaan ABBM yang sesuai dapat membantu guru menerangkan konsep pembelajaran dengan lebih berkesan dan dapat merangsang minat pelajar untuk terus belajar (Azman,Azli,Mustapha,Balakrishnan&Mohd Isa, 2014). Disebabkan pemasalahan yang dinyatakan di atas, satu unit latihan mudah alih iaitu MCR direkabentuk bagi mengatasi masalah ini. Proses PdPc adalah amat berkesan sekiranya ianya melibatkan proses simulasi dan latihan praktikal dengan menggunakan alatan yang sebenar atau peralatan yang tertentu.

Penerangan Produk

Kerangka konsep dibentuk bagi membantu membangunkan projek supaya ia tidak tersasar daripada objektif sebenar. Kerangka ini mempunyai tiga elemen iaitu masukan, proses dan keluaran. Rajah 1 menunjukkan kerangka konsep bagi projek ini. Pada bahagian masukan adalah pelajar. Manakala pada bahagian pemprosesan adalah MCR. Proses pembangunanan produk ini berasaskan *Model Waterfall.* Seterusnya pada bahagian keluaran adalah kebolehfungsian MCR. Produk yang dihasilkan akan memberi impak kepada pelajar semasa proses pengajaran dan pembelajaran. Berikut adalah merupakan kerangka konsep produk:



Rajah 1: Kerangka Konsep

Pemilihan Model Waterfall adalah kerana ianya melibatkan semua elemen daripada menganalis sesuatu model tersebut kepada penilaian dan penyelenggaraan model reka bentuk yang dihasilkan. Model yang digunapakai ini adalah suatu proses yang sistematik melibatkan peringkat-peringkat *Model Waterfall* seperti yang diperincikan pada Jadual 1.

Jadual 1: Penerangan *Model Waterfall* (Presman,2015)

Fasa Model *Waterfall*	**Penerangan**
Analisis	i. Fasa ini melibatkan beberapa proses penentuan serta mengenalpasti masalah yang diselesaikan ii. Proses analisis perlu dilaksanakan bagi mencari punca atau factor yang berkaitan atau yang menimbulkan masalah tersebut.
Reka Bentuk	i. Menjelaskan pandangan keseluruhan mengenai rupabentuk, struktur, pendekatan teori dan teknologi yang terlibat.
Pembangunan	i. Melibatkan pembinaan model reka bentuk sebenar
Pelaksanaan	i. Model reka bentuk yang telah disiapkan akan dioperasikan. Melibatkan pembinaan model reka bentuk sebenar.
Pengujian	i. Melibatkan kebolehfungsian model reka bentuk tersebut.

MCR yang dibangunkan ini adalah bagi mengatasi masalah yang telah dikenalpasti sebelum ini. Rajah 2 menunjukkan MCR yang telah dibangunkan.

Rajah 2**:** MCR yang Dibangunkan

MCR yang dihasilkan mempunyai saiz yang kecil dan mempunyai roda bagi memudahkan pergerakan. Saiz yang kecil telah membantu guru untuk memberi kefahaman kepada pelajar sewaktu sesi PdPc. MCR ini dipasang dengan menggunakan komponen dan aksesori yang sama dengan sistem penyejukan bagi *Cold Room*. MCR ini telah dijadikan sebagai ABBM bagi membantu pelajar diploma untuk memahami kursus DMC4323 *Commercial Refrigeration System.* Jika sebelum ini pelajar perlu memanjat tangga bagi melihat komponen dan aksesori pada *Cold Room,* dengan adanya MCR pelajar tidak perlu memanjat tangga. Guru dapat menerangkan kepada semua pelajar mengenai teori sistem penyejukan pada *Cold Room.* Pelajar juga dapat membuat amali dengan mudah kerana tidak perlu memanjat untuk membuat amali. Selain itu, MCR ini bersaiz kecil. Ini dapat menjimatkan ruang. Kos untuk menghasilkan MCR ini adalah murah berbanding dengan harga sebenar bagi sebiji *Cold Room.* ABBM ini bukan sahaja menarik minat pelajar untuk mendalami kursus ini malah menjadikan sesi Pdpc berjalan lancar.

Hasil Kajian dan Perbincangan

Kajian penyelidikan adalah berbentuk kuantitatif. Soal selidik merupakan instrumen utama yang digunakan untuk memungut data. Sampel kajian adalah seramai 28 orang pelajar tahun 2 Diploma. Soal selidik ini telah disahkan oleh pakar bidang berkaitan. Data yang diperoleh daripada borang soal selidik yang dijalankan telah dianalisis menggunakan *Statistical Package For Social Science* (SPSS). Jadual 2 menunjukkan statistik deskriptif skor min bagi *Pre-Test dan Post Test.*

Jadual 2: Statistik Deskriptif Skor Min Bagi *Pre Test Dan Post Test*

	N	**Mean**	**Std. Deviation**
Mean_Pre_Test	28	12.0714	1.41234
Mean_Post Test	28	31.6071	1.44886

Jadual 3: Keputusan Ujian – t Sampel Tidak Berpasangan

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig.(2-tailed)	Mean Difference	Lower	Upper
Pre Test	45.227	27	.000	12.5238	11.5238	12.6191
Post Test	115.435	27	.000	31.60714	31.045	32.1690

Jadual 3 menunjukkan keputusan Ujian – t sampel tidak berpasangan dengan terdapat perbezaan skor min bagi *Pre Test* (M=12.0714, SP=1.41234) dan *Post Test* (M=31.6071, SP=1.44886, t(27)=115.435, p=.000). Nilai p kurang .05

menunjukkan MCR yang dibangunkan adalah berkesan digunakan bagi pengunaan PdPc DMC4323 *Commercial Refrigeration System.* Dapatan kajian ini selari dengan Khairul Anuar et.al,(2010 yang mana ABBM merangsang potensi individu dalam pembelajaran dan membolehkan pelajar memahami konsep teori dan amali dengan jelas.

Kesimpulan

ABBM penting dalam proses PdPc kerana ia dapat merangsang minat yang tinggi kepada pelajar untuk belajar. Penggunaan ABBM yang sesuai akan mendorong minat pelajar dalam mata pelajaran. Selain itu, penggunaan ABBM yang sesuai akan mendorong pelajar untuk melalui proses PdPc yang menyeronokkan. Pembelajaran yang menyeronokkan ini dapat membantu para pelajar mencapai objektif pembelajaran seperti yang telah dirancang. Penghasilan ABBM yang berkualiti mampu menjadikan pembelajaran yang lebih menarik dan menghasilkan pelajar yang bermotivasi dalam memahami sesuatu kursus. Penggunaan ABBM ini secara tidak langsung memberi aktiviti kepada guru untuk menjadi lebih kreatif dan berinovasi. MCR yang dibangunkan bagi tujuan Pdpc ini boleh ditambah baik dengan memasang peranti *Internet Of Things* (IOT) bagi mengikuti perkembangan teknologi IR 4.0. Teknologi IOT ini bergerak ke depan seiring dengan keadaan semasa. Ini dapat mendorong guru untuk meningkatkan kemahiran dan pengetahuan bagi menghasilkan ABBM yang dapat menarik minat pelajar sekaligus menambah pengetahuan dan kemahiran kepada setiap pelajar.

Rujukan

Ab. Halim, H.H.,& Lai, C. Sern. (2011). Penilaian Keberkesanan Kit Pengajaran Transistor Bagi Aliran Vokasional

Azman, Azli, Mustapha, Balakrishnan & Mohd Isa,(2014). Penggunaan Alat Bantu Mengajar Ke Atas Guru Pelatih Bagi Topik Kerja Kayu, Paip dan Logam (2000).

Jamaludin, J. (2014). Kesediaan Guru Kolej Vokasional Dalam Pengajaran Amali Teknologi Elektronik Di Negeri Pahang.

Hadijah (2003). Pembinaan Alat Bahan Bantu Mengajar (ABBM) Berbantukan Komputer Bagi Mata Pelajaran Pengurusan Kewangan.

Hanif, A.S., Azman, M. N., Pratama, H., Nazirah, N., & Iman, M.(2016). Kit Pemantauan Penyambungan Litar Elektrik: Satu Kajian efikasi Alat Bantu Mengajar Schematic Circuit And Circuit Connectivity Kits For Malaysian Science Students: An Efficiancy Study Of A Teaching Aid. Malaysian Jurnal of Society and Space, 12(3), 69-78 Retrieved from http://journalarticle.ukm.my/9896/1/7x.geografia-si-mac16-abdulsamad-edam.pdf

Hanin Falina (2021). Penggunaan Easy Learning Kit (ELK): Refrigerator System Bagi Pelajar Sijil Teknologi Penyejukan dan Penyamanan Udara (SPU) Di Kolej Komuniti Hulu Langat (KKHL). International Journal Of Humanities Technology and Civillization, Issue 10, Volume 2, Pages 83-92

Kementerian Pendidikan Malaysia, (2015). Pelan Pembangunan Pendidikan Malaysia 2015-2025 (Pendidikan Tinggi). Kuala Lumpur.

Khairul Anuar Hasnan, Che Ghani Che Kob, Abu Bakar Mamat, Arman Shah Abdullah (2018). Keberkesanan Alat Bantu Mengajar Bagi Tangan Kiri Flemingd Dalam Pengajaran dan TVET The Effectiveness Of Teaching Aids For Fleming Left Hand In TVET Teaching and Learning. Journal of Advanced Research in Social and Behavioural Sciences 12, Issue 1(2018) 77-88

Noor Nahirah (2018).Kesediaan Pelajar Terhadap Kit "SMART CCTV" Bagi Pelajar Teknologi Elektronik Di Kolej Vokasional

Nur Aliaa' (2019). Kit Sistem Konveyor Menggunakan *Programmable Logic Control* (PLC) Sebagai Alat Bahan Bantu Mengajar

Pressman, R.S (2015), Software Engineering: a practioner' approach, McGraw-Hill, New York, 68

Yahya Buntat, Lailinanita Ahamad (2012). Inovasi Pengajaran dan Pembelajaran dalam Kalangan Guru-Guru Teknikal di Sekolah Menengah Teknik Dari Perspektif Guru Journal of Technical, Vocational & Engineering Education, Volume 6, Pages 44-58/ISSN 2231-7376

Implementation of STRUKTOM in Improving Mental Models in Drawing Bohr's Atomic Structure Among Diploma Students in Kolej Vokasional Dato' Lela Maharaja

Nor Afifah binti Md Jamal, Nur Leenna bte Abdul Rahman
Kolej Vokasional Dato' Lela Maharaja, Rembau, Malaysia[1]
Bahagian Pendidikan dan Latihan Teknikal Vokasional[2]
afifahjamal91@gmaill.com[1]
nurleenna.abdul@moe.gov.my[2]

Highlights: An idea about Model-based Learning is introduced and applied during Science teaching in this project. The objective of the STRUKTOM is to enhance students' mental models and ability to draw Bohr's atomic structure diagrams. STRUKTOM serves as a cognitive scaffold in the development of representational competence. This interactive innovation has developed self-directed learning traits, collaboration and critical thinking skills among students. In addition, the tactile learning method fosters new concepts into memory besides becoming an appropriate teaching tool for students with tendency of practical or hands-on activities such as TVET students.

Key words: STRUKTOM; atom; chemistry; vocational college; TVET

Introduction

The Atomic Structure is a topic in Science course studied in vocational colleges among diploma level students. It is a challenging topic and usually causes misconceptions as it requires students to have strong mental models. According to Bhalwankara and Treur (2021), mental models is built by the individual's cognitive system. It represents simplification, illustration, analogy and simulation of natural objects. According to Noor Dayana, et al. (2013), providing tangible pictures of abstract sub-microscopic concepts like atoms and their structure can help students to understand new knowledge or phenomenon. Besides that, the Atomic Structure topic is a prerequisite to understand the next topic, such as isotopes and chemical bonding.

After lecture and demonstration on drawing Bohr's atomic structure was given, some students were struggled and expressed difficulty to visualize when required to draw the atomic structure of elements. This indicated that they still not yet fully mastered the concept or have low mental models. As results, students were expecting for the lecturer to repeat the explanations on how to draw the Bohr's atomic structure step by step. Based on analysis of the STRUKTOM worksheet, 68 percent of the students were facing difficulties to draw Bohr's atomic structure diagrams. Among the problems identified were students unable to determine the number of neutrons, protons and electrons, besides unable to place number of electrons on each shell correctly. These findings were aligned to Suryelita et al. (2019) who stated that teachers were facing difficulties in teaching the concept of atomic structure since the topic is abstract, thus challenging for students to comprehend things that cannot be seen.

Recognizing the importance of model-based learning in Science education, we developed STRUKTOM as an intervention especially for students with low mental models by providing an interactive learning experience using models. Since atoms cannot be observed with the naked eye, students often have difficulties visualizing atomic phenomena. Various research on mental models have shown that learning with the aid of visualization representations to explain the phenomenon of sub-micro effective to enhance the students' understanding of science concepts (Herga, et al., 2014). Therefore, STRUKTOM is an innovation that indoctrinated constructivism to improve students' mental models to increase students' ability to draw Bohr's atomic structure diagrams correctly.

This didactically atomic model greatly simplifies the teaching and understanding of Bohr's model of the atom. It is an engaging, time-saving and fostering kinesthetic learning experience. It is suitable for TVET students learning style as they are dominant in kinesthetic learning with tendency of practical or hands-on activities. The STRUKTOM kit includes (i) Bohr's model template, (ii) Instruction manual for teacher and student, (iii) Colored buttons representing protons, neutrons and electrons, (iv) R-20 wheel for students to self-assess and (v) Standard atomic notation for the first 20 elements. Figure 1 shows the STRUKTOM kit.

Figure 1 STRUKTOM kit

Project or Innovation Objectives

The objective of STRUKTOM is to improve students' mental models and ability to draw Bohr's atomic structure diagrams using the model-based learning approach among diploma students in Kolej Vokasional Dato' Lela Maharaja, Rembau.

Quality of the Innovation

Innovativeness

The innovative concept behind this innovation is the integration of tangible visualization into abstract concept of atomic structure. During teaching and learning, students use STRUKTOM to determine the number of protons, neutrons and electrons, as well as the electrons arrangement in the shell with different types of elements. This interactive teaching aid has developed their critical thinking and problem-solving skills. The effectiveness of instructional interventions using model-based learning approach has led to improvement in students' grades compared with before using STRUKTOM. Students were provided with thorough and coherent mental models of concepts as the concepts are learned from multiple representations. The physical enactment of nonvisual information enhances storage and retrieval of information in long-term memory (Madan & Singhal, 2012). In terms of 21st century skills, this innovation positively uncovered self-directed learning traits, collaboration and strategic thinking skills among students. This tactile learning method encourages new concepts into memory, making it an effective teaching tool for TVET students who learn best through hands-on activities.

Novelty

Model-based learning has been grabbing attention among Science educators for a long time as it is effective in improving students' achievement. STRUKTOM is designed by referring to model-based learning by Buckley (2012) where a model with defined learning objectives and outcomes was utilized to support the development of mental models. It is believed that the novel characteristics of model-based learning in STRUKTOM benefits students in terms of learning achievement which driven by interactive learning experience during the process. Distinct from the conventional teaching method, STRUKTOM integrates model-based learning to help students to conceptualize and understand atomic structure topic in interactive way. We believed that when atomic structure is rendered for visual representation, thereby reducing demand on spatial working memory, allowing cognitive effort to be better invested towards meaningful learning. Therefore, STRUKTOM implies reasoning and changes at a deeper and more significant level when learning atomic structure. This innovation is versatile as it can be used individually, with partner or as group work. Indirectly, STRUKTOM fosters 21st century skills such as collaboration, active learning and critical thinking.

Impact of the Innovation to Students' Learning

The findings demonstrate that model-based learning approach has successfully improved students' achievement through the engagement and empowerment aspects in STRUKTOM. Besides that, engaging STRUKTOM in group work has promoted positive social interactions that nurture students about teamwork and cooperation. Model serves as a cognitive scaffold in the development of representational competence. It supports better integration of spatial concepts by offering alternate representations of atoms, easing the demands on a student's spatial cognitive development and supporting physical enactment of the imagined processes (Stull et al., 2016). It also encourages students to be active in solving problems instead of being passive and just simply observing demonstrations or listening to theories.

Research Methodology

Research design

This innovation is to improve students' mental models to enhance the ability to draw Bohr's atomic structure correctly using STRUKTOM among diploma students in Kolej Vokasional Dato' Lela Maharaja, Rembau. Students' understanding on Atomic Structure topic were assessed using STRUKTOM worksheet.

Level 1 : Literature review of STRUKTOM and implementation in class.
Level 2 : Assign STRUKTOM worksheet to students before and after implementing the STRUKTOM.
Level 3 : Analyze the students' grades from the worksheet.
Level 4 : Writing paper and final report.

Sample

The sample for this study was involving 45 students of diploma students in Kolej Vokasional Dato' Lela Maharaja, Rembau, regardless gender and programmes. Feedback from these students on the implementation of STRUKTOM were also gathered.

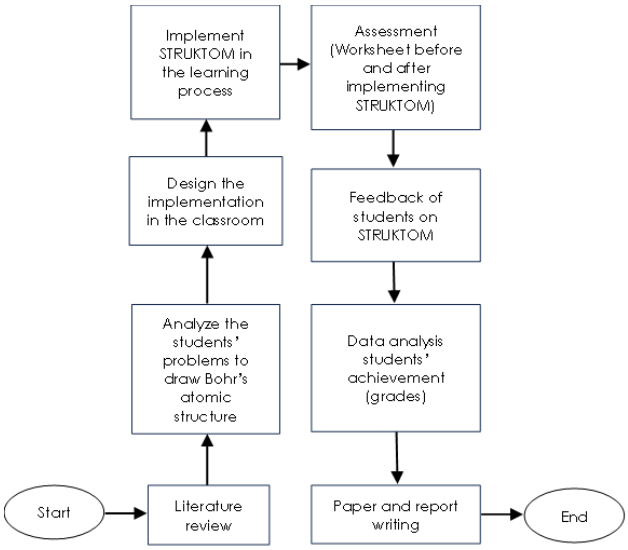


Figure 2 Research flow chart of STRUKTOM implementation

Findings and Discussion of the Innovation

This innovation objective is to improve students' mental models and ability to draw Bohr's atomic structure diagrams through the model-based learning approach in Atomic Structure topic using STRUKTOM among the diploma students of Kolej Vokasional Dato' Lela Maharaja, Rembau, Negeri Sembilan. Table 1 shows mean score of pre-test and post-test together with the paired sample t-test. The findings indicated a significant difference in students' ability to draw Bohr's atomic structure after the implementation of STRUKTOM. The paired sample t-test (Table 2) showed that there was a significant increase in the pre-test and post-test of STRUKTOM worksheet from (M = 83.96, SD = 19.16) to (M = 94.61, SD = 7.16) where is significant at t(44) = -3.380, p,0.02. This finding shows that STRUKTOM is effective in improving students' mental models.

Table 1 : Mean score of Pre-test and Post-test

	Mean	N	Std. Deviation	Std. Mean Error
PRE	83.9622	45	19.15676	2.85572
POST	94.6133	45	7.16233	1.06770

The Paired Sample t-Test

	Mean	Std. Deviation	Std. Mean Error	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
PRE-POST	-10.65111	21.13658	3.15085	-17.00124	-4.30098	-3.380	44	.002

Table 2 shows the descriptive analysis of students' feedback on STRUKTOM. Most students agreed that STRUKTOM helps them to form the atomic structure and write the electrons arrangement correctly. The solutions provided by STRUKTOM allow students to determine the number of electrons in a shell as well as the number of protons and neutrons in a nucleus. Students also agreed that STRUKTOM improves their ability to draw the atomic structure diagrams correctly.

Table 2 Students' feedback on STRUKTOM

No.	Items	Agree	Percentage (%)	Disagree	Percentage (%)
1.	I can form the atomic structure correctly using STRUKTOM	45	100	0	0
2.	I can determine the number of electrons in a shell using STRUKTOM	41	91.1	4	8.9
3.	I can determine the number of protons and neutrons in a nucleus using STRUKTOM	37	82.2	8	17.8
4.	I can draw the atomic structure diagrams correctly using the STRUKTOM	41	91.1	4	8.9
5.	I can write the electrons arrangement correctly using STRUKTOM	45	100	0	0

Based on the feedback from students on STRUKTOM (before, during and after the implementation of STRUKTOM), it is proven that STRUKTOM is impactful on the students' learning experience. Students are able to draw Bohr's atomic structure diagrams correctly with the aid of STRUKTOM which shows that STRUKTOM has improved students' mental models. Students also agreed that the STRUKTOM improves the enjoyment of science learning, speeds up the completion of tasks and saves time. By enabling students to visualize atomic structure concept, students feel at ease to study independently and develop 21st century learning skills such as lifelong learning, initiative and critical thinking. It is clear the model-based learning has significantly benefitted students' achievement in learning atomic structure. Therefore, STRUKTOM successfully improved students' mental models in drawing Bohr's atomic structure among diploma students of Kolej Vokasional Dato' Lela Maharaja. Figure 3 shows the pictures of students using STRUKTOM.

Figure 3 Students using STRUKTOM

Conclusion

STRUKTOM contributes to an outcome suggesting that the students' mental models can be developed. STRUKTOM utilizes a tactile learning approach to increase students' ability to draw Bohr's atomic structure. Pre-test and post-test scores of STRUKTOM worksheet were compared to determine the significant improvement in students' ability to draw Bohr's atomic structure correctly. The results showed that the pre-test and post-test of STRUKTOM worksheet have significant differences which revealed that this innovation has significantly improved students' mental models simultaneously. This innovation is designed to meet TVET students' learning style as their learning preference is on practical or hands-on activity or known as kinesthetics learning. It is recommended that STRUKTOM to provide standard atomic notations for all elements in periodic table, so it can be used for isotopes and chemical bonding topic. Implications for future research, STRUKTOM can employ game-based learning together with model-based learning approaches to enhance students' motivation and active participation in class. More research is also needed on the impact of STRUKTOM on students' interest, participation and attitude.

Award

Bronze Medal (Expert Innovator), Malaysia Invention & Innovation Expo (MIIX 2023)

References

Bhalwankar, R. & Treur, J. (2020). Modeling the Development of Internal Mental Models by an Adaptive Network Model. 2020 Annual International Conference on Brain-Inspired Cognitive Architectures for Artificial Intelligence: Eleventh Annual Meeting of the BICA Society. Procedia Computer Science 190 (2021) 90–101.

Buckley, B. C. (2012). Model-Based Teaching. In N. M. Seel (Ed.), Enclopedia of the sciences of learning. Vol. 5, pp. 2312-2315.

Herga, N. R., Grmek, M. I. & Dinevski, D. (2014). Virtual Laboratory as An Element of Visualization When Teaching Chemical Contents in Science Class. Turkish Online Journal of Educational Technology-TOJET, 13(4), 157-165.

Madan, C. R., & Singhal, A. (2012). Using Actions to Enhance Memory: Effects of Enactment, Gestures, And Exercise on Human Memory. Frontiers in psychology, 3, 507. https://doi.org/10.3389/fpsyg.2012.00507

Noor Dayana, A. H., Mohamad, B. A., Noraffandy, Y. & Mohd Nihra Haruzuan, M. S. (2013). Mental Model in Learning Chemical Bonding: A Preliminary Study. Procedia - Social and Behavioral Sciences. 97. 10.1016/j.sbspro.2013.10.226.

Stull, A. T., Gainer, Padalkar, M. S. and Hegarty, M. (2016). Promoting Representational Competence with Molecular Models in Organic ChemistryJournal of Chemical Education 2016 93 (6), 994-100. DOI: 10.1021/acs.jchemed.6b00194

Suryelita, S. & Guspatni, G. & Defriati, P. (2019). Description of learning difficulties on atomic structure and periodic table topics of tenth grade students in SMAN 7 Padang. Journal of Physics: Conference Series. 1317. 012147. 10.1088/1742-6596/1317/1/012147.

Merekabentuk model sistem Water Cooled Chiller sebagai alat bantu mengajar bagi pelajar Diploma Teknologi Penyejukan dan Penyamanan Udara di Kolej Vokasional Slim River (KVSR)

Ismi Shah Bin Ahmad Mokhtar, Ahmad Zairi Bin Abas, Sufiah Binti Mohamad, Muhammad Nurul Faiz Bin Zawil Anuar, Ahmad Jafarudeen Bin Abdul Talib

Kolej Vokasional Slim River, Perak[1,2,3,4,5]
ismishahahmad@gmail.com; g-86173727@moe-dl.edu.my; zairi_kupcai@yahoo.com;
faizzawil@gmail.com[1], ahmadjafarudeen@gmail.com[2]

Abstrak: Kreativiti dan kebijaksanaan para pendidik amat diperlukan dalam menghasilkan pembelajaran yang berkesan dengan melalui kepelbagaian strategi dan kaedah pengajaran. Salah satu modul yang terdapat di dalam program Teknologi Penyejukan Dan Penyamanan Udara adalah modul *ACMV Water Cool Chille*r di mana pelajar perlu mempelajari tentang cara sistem beroperasi, jenis dan fungsi komponen beserta dengan kaedah penyelenggaraan yang betul. Pemahaman pelajar berkenaan dengan sistem penyamanan udara jenis komersial ini bukanlah sesuatu yang mudah kena ia merupakan sebuah sistem yang tidak dapat dilihat secara langsung dengan menggunakan mata kasar tentang cara sistem beroperasi serta komponen-komponen yang terlibat di dalam sistem tersebut. Justeru itu, dengan merekabentuk Model Sistem *Water Cooled Chiller* dapat membantu pelajar melihat gambaran sebenar di dalam sistem tersebut. Analisis pengukuran yang diguna pakai dalam mengenalpasti tahap pemahaman pelajar adalah melalui markah amali pelajar sebelum dan selepas menggunakan alat bantu mengajar ini.

Kata Kunci: *water cool chiller*; alat bantu mengajar; cara sistem beroperasi

Pengenalan

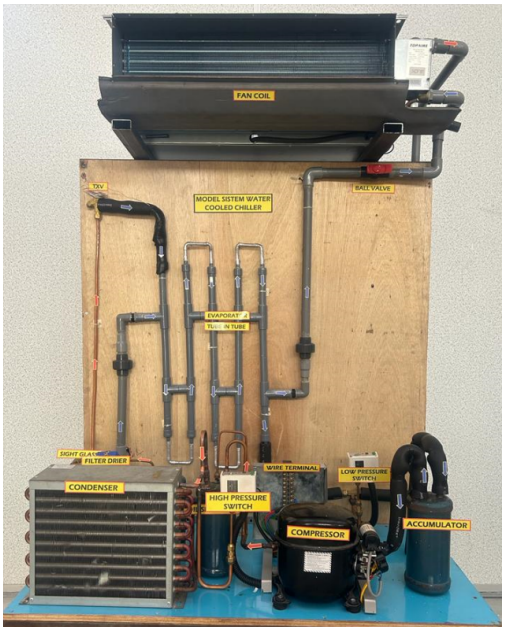
Setiap pelajar mempunyai tahap kemampuan yang berbeza dalam memahami sesuatu pengajaran dan pembelajaran. Oleh yang demikian kepelbagaian teknik dan kaedah pengajaran amat diperlukan oleh seorang guru dalam memastikan semua pelajar dapat menguasai pembelajaran yang diajar dengan baik. Kaedah pengajaran adalah merujuk kepada cara yang digunakan untuk mengelola dan menggunakan teknik, isi pelajaran, dan alat bantu mengajar untuk mencapai objektif pengajaran. Pembelajaran akan berjalan dengan lancar, menarik dan berkesan sekiranya guru menggunakan pelbagai kaedah yang bersesuaian dengan isi pembelajaran dan kemahiran yang akan dicapai oleh murid (Mohamad Johdi, 2007).

Pengaplikasian Alat Bantu Mengajar (ABM) berbentuk inovasi semasa proses penyampaian pengajaran dan pembelajaran (PdP) dijalankan merupakan salah satu kaedah pembelajaran yang menarik dan dapat merangsang minda pelajar berimaginasi (Hanin Falina, 2021). Selain itu, penggunaan alat bantu mengajar juga sebenarnya memberi peluang kepada pelajar untuk memperoleh pengetahuan melalui penggunaan pelbagai deria seperti deria penglihatan, deria sentuh dan deria pendengaran (Norma, 2004) Oleh yang demikian melalui inovasi merekabentuk model sistem water cooled chiller sebagai alat bantu mengajar ini pelajar dapat menggunakan deria penglihatan dengan melihat dengan lebih jelas tentang cara sistem beroperasi, dapat melihat dan menyentuh semua komponen yang ada, serta dapat mendengar pelbagai bunyi semasa sistem dihidupkan. Ini dapat memberi pendedahan sebenar tentang sistem water cooled chiller kepada pelajar.

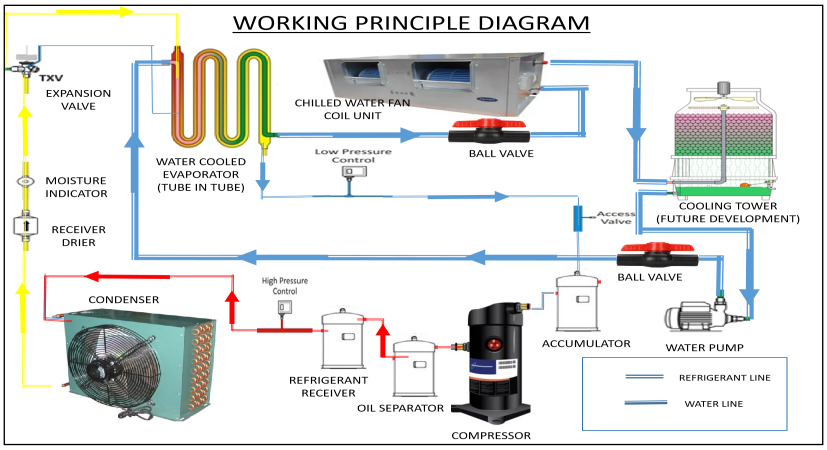
Objektif dalam merekabentuk model sistem *water cooled chiller* ialah:
1. Menggunakan kepelbagaian strategi dan kaedah dalam pengajaran
2. Membantu pelajar memperoleh pengetahuan melalui penggunaan pelbagai deria seperti penglihatan, sentuhan dan pendengaran melalui sistem yang telah dibangunkan.
3. Meningkatkan tahap kefahaman pelajar tentang kursus *water cooled chiller.*

Latar Belakang Produk

Di dalam Program Diploma Teknologi Penyejukan dan Penyamanan, Sistem water cooled chiller adalah merupakan salah satu kursus yang perlu diambil oleh pelajar bagi melengkapkan pengajian diploma mereka. Dalam memastikan pelajar memenuhi kompetensi untuk kursus ini, pelajar perlu memahami dan menerangkan cara sistem water cooled chiller ini beroperasi, nama dan fungsi setiap komponen yang ada di dalam sistem serta menentukan kaedah keperluan penyelenggaraan yang sesuai bagi setiap komponen tersebut. Pemahaman pelajar berkenaan dengan sistem penyamanan udara jenis komersial ini bukanlah sesuatu yang mudah kena ia merupakan sebuah sistem yang besar dan tidak dapat dilihat secara langsung dengan menggunakan mata kasar tentang cara sistem beroperasi serta komponen-komponen yang terlibat di dalam sistem tersebut. Justeru itu, dengan merekabentuk Model Sistem *Water Cooled Chiller* dapat membantu pelajar melihat gambaran sebenar di dalam sistem tersebut.



Rajah 1: Model sistem water cooled chiller yang telah dibangunkan



Rajah 2: Working principal diagram bagi model *water cooled chiller*

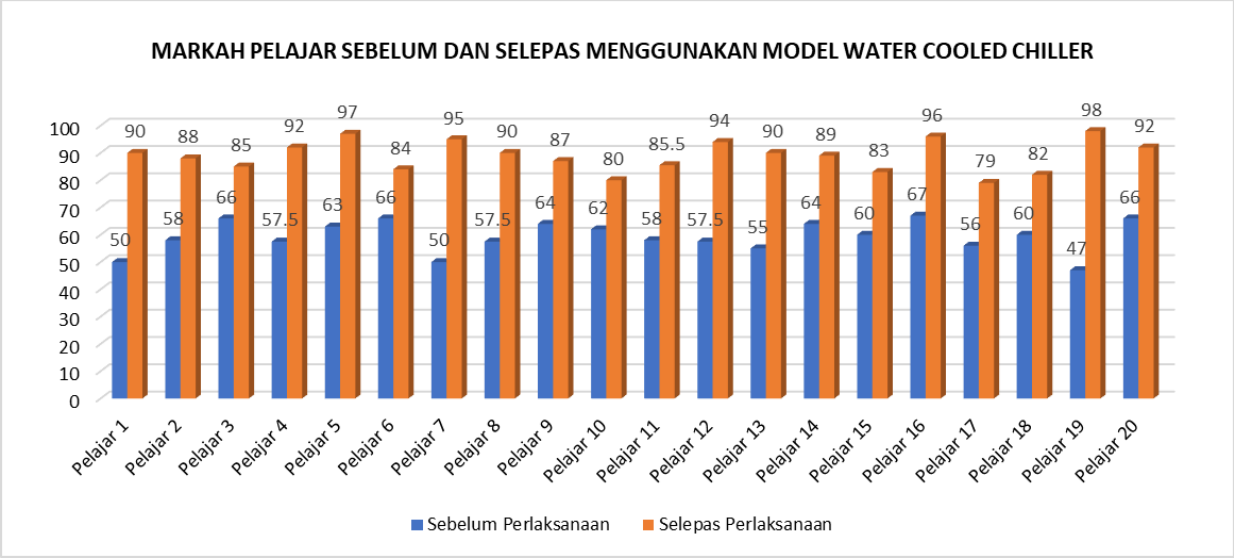
Keputusan dan Perbincangan

Bagi menentukan keberkesanan model sistem water cooled chiller yang telah dibangunkan, markah amali bagi kursus DMC 2333 iaitu Chiller System Maintenance dimana seramai 20 orang pelajar Diploma Teknologi Penyejukan Dan Penyamanan Udara Kolej Vokasional Slim River Semester 2 telah di ambil sebelum dan selepas menggunakan model sistem ini untuk di jadikan sebagai analisis. Data yang telah diperolehi adalah seperti di dalam jadual 1 dan rajah 3.

Jadual 1 : Markah amali pelajar sebelum dan selepas menggunakan model sistem *water cooled chiller*

BIL.	PELAJAR	MARKAH SEBELUM PERLAKSANAAN	MARKAH SELEPAS PERLAKSANAAN	PERATUS KENAIKAN (%)
1	Pelajar 1	50	90	40
2	Pelajar 2	58	88	30
3	Pelajar 3	66	85	19
4	Pelajar 4	57.5	92	34.5
5	Pelajar 5	63	97	34
6	Pelajar 6	66	84	18
7	Pelajar 7	50	95	45
8	Pelajar 8	57.5	90	32.5
9	Pelajar 9	64	87	23

10	Pelajar 10	62	80	18
11	Pelajar 11	58	85.5	27.5
12	Pelajar 12	57.5	94	36.5
13	Pelajar 13	55	90	35
14	Pelajar 14	64	89	25
15	Pelajar 15	60	83	23
16	Pelajar 16	67	96	29
17	Pelajar 17	56	79	23
18	Pelajar 18	60	82	22
19	Pelajar 19	47	98	51
20	Pelajar 20	66	92	26



Rajah 3: Perbezaan markah amali pelajar sebelum dan selepas menggunakan model sistem *water cooled chiller*

Hasil data yang diperolehi menunjukkan semua markah amali pelajar telah meningkat selepas menggunakan model sistem water cooled chiller. Peningkatan markah yang paling tinggi adalah sebanyak 51% daripada markah asal, manakala peningkatan markah yang paling rendah adalah 18% daripada markah asal. Terdapat 50% pelajar yang mendapat markah dalam gred C sebelum menggunakan model sistem water cooled chiller telah meningkat ke gred A dan A-, begitu juga yang selebihnya iaitu 50% lagi pelajar dimana sebelumnya mendapat gred B dan B- sebelum menggunakan model sistem ini telah meningkat ke gred A dan A- selepas menggunakan model sistem water cooled chiller ini. Ini membuktikan keberkesanan alat bantu mengajar model sistem water cooled chiller dalam meningkatkan kefahaman dan pengetahuan pelajar dengan lebih baik.

Kesimpulan

Secara keseluruhannya penghasilan alat bantu mengajar model sistem water cooed chiler ini berjaya meningkatkan kefahaman pelajar sekaligus dapat mengatasi masalah pembelajaran pelajar dalam kursus ini. Pemilihan bahan bantu mengajar yang bersesuaian memainkan peranan yang amat penting dalam memastikan objektif sesuatu pengajaran dan pembelajaran itu dapat dicapai. Selain itu keupayaan dalam mencipta inovasi melalui bahan bantu mengajar juga memberi kesan kepada prestasi akademik pelajar. Perkara ini juga telah diakui oleh Ah Meng (2003) dalam kajiannya yang menegaskan bahawa pemilihan pendekatan dan perancangan pengajaran akan memberi kesan kepada pemahaman pelajar dan proses pembelajaran. Penambahbaikan Model sistem water cooled chiller yang boleh dibuat pada masa akan datang adalah dengan menggunakan cooling Tower sebagai salah satu komponen untuk menyingkirkan haba ke udara sekeliling dan menyejukan air yang telah menjadi panas disebabkan oleh haba yang keluar dari pemeluwap.

Rujukan

Andrew D. Althouse & Carl H. Turnquist. (2019). Modern Refrigeration and Air Conditioning 21th Edition

Ee Ah Meng. (1997). *Amalan Dalam Bilik Darjah*. Kuala Lumpur: Syarikat Fajar Bakti Sdn. Bhd.

Kamarudin Husin. (1990). *Kaedah Pengajaran Dan Pembelajaran Bahasa*. Kuala Lumpur: Saujana

Ng Ying Shya. (2004). Penggunaan Alat Bantu Mengajar Di Kalangan Guru-Guru Teknikal Sekolah Menengah Teknik, Negeri Kedah. Universiti Teknologi Malaysia: Tesis Sarjana Muda

Omardin Ashaari. (1999). Pengajaran Kreatif Untuk Pengajaran Aktif. Kuala Lumpur: Dewan Bahasa Dan Pustaka

William C.Whitman. (2019). *Refrigeration & Air Conditioning Technology*. 8th Edition, Clifton Park.

CX-PeRT (Calculate Tax Expert) e-BBM Pembelajaran Berasaskan Kaedah Kajian Kes

Nurhuda Binti Md Tahir 1, Rohiza Binti Husain 2, Normaliza Binti Ahmad 3, Muhammad Ameen Bin Atan 4, Chau Jun Yi 5

Kolej Vokasional Perdagangan, Johor Bahru, Malaysia[1,2,3,4,5]

nurhudatahir@gmail.com[1]

Abstrak: Dalam kursus Percukaian 1 bagi pelajar Diploma Perakaunan semester 2, menunjukkan bahawa para pelajar tidak dapat membuat pengiraan cukai pendapatan kena bayar bagi individu dengan betul. Melalui pemerhatian awal, masalah utama bagi pelajar adalah tidak dapat mengenalpasti dan mengira pelepasan percukaian individu dengan betul. Ini menyebabkan majoriti pelajar membuat kesilapan dalam membuat pengiraan cukai pendapatan kena bayar. Bagi menyelesaikan masalah ini, satu inovasi telah dihasilkan dan diberi nama *CX-PeRT (Calculate Tax Expert)*. *CX-PeRT* dihasilkan bertujuan untuk meningkatkan kefahaman dan memudahkan pelajar membuat pengiraan cukai kena bayar dengan mudah dan cepat berdasarkan pelepasan cukai tahun taksiran semasa. *CX-PeRT* juga inovasi yang mesra pengguna dan zero kos. Hasil daripada pelaksanaan *CX-PeRT*, didapati bahawa pelajar dapat membuat pengiraan cukai pendapatan kena bayar bagi individu dengan betul berdasarkan kepada data Ujian Post. *CX-PeRT* telah disebarluaskan kepada 10 buah Kolej Vokasional seluruh Malaysia mendapat maklumbalas yang positif. Ia sangat membantu para pensyarah dan pelajar dalam PdPc sama ada secara *synchronous* atau *asynchronous*.

Kata kunci: Diploma Perakaunan; cukai, tahun taksiran ; synchronous ; asynchronous

Pengenalan

Pelaksanaan Struktur Program Diploma Perakaunan bagi Kolej Vokasional yang wajib diambil oleh pelajar semester 3 Program Diploma Perakaunan Kolej Vokasional seluruh Malaysia. Kursus ini mewakili 3 jam kredit dan semua pelajar program Diploma Perakaunan wajib lulus kursus ini untuk melayakkan mereka bergraduat sebagai graduan Diploma Perakaunan Kolej Vokasional, Kementerian Pendidikan Malaysia. Dalam kursus DBE 3333 ini, pelajar perlu mahir mengenalpasti maklumat percukaian individu untuk pengiraan cukai serta dapat melaksanakan pengiraan cukai pendapatan individu berasaskan dokumen sumber perniagaan. Selain itu, para pelajar perlu mematuhi kepada Akta Cukai Pendapatan 1967, ketetapan umum LHDN dan peraturan lain yang berkaitan dengan percukaian individu. Kursus ini sangat penting dan jelas termaktub dalam silibus dan perancangan kursus yang telah ditetapkan. Kursus ini memberikan pelajar kemahiran dalam pengiraan cukai pendapatan individu dan mengisi borang percukaian individu berdasarkan kepada dokumen sumber perniagaan. Justeru itu, E-BBM inovasi yang interaktif telah dicipta iaitu CX-PeRT (Calculate Tax Expert). CX-PeRT diaplikasikan bersama-sama dengan kaedah kajian kes dalam sesi pembelajaran dan pengajaran (PdPC) di kolej bagi mengukuhkan kefahaman para pelajar. CX-PeRT boleh digunakan dan diaplikasikan secara sychoronous atau asychoronous.

Pernyataan Masalah

Dalam pengajaran dan pembelajaran kursus DBE 3333 Percukaian 1 bagi pelajar Diploma Perakaunan semester 2, menunjukkan bahawa para pelajar tidak dapat membuat pengiraan cukai pendapatan kena bayar bagi individu dengan betul. Melalui pemerhatian awal, kami mengenalpasti bahawa masalah utama bagi pelajar adalah tidak dapat mengenalpasti dan mengira pelepasan percukaian individu dengan betul. Ini menyebabkan majoriti pelajar akan membuat kesilapan dalam membuat pengiraan cukai pendapatan kena bayar. Justeru itu, untuk menyelesaikan masalah ini, kami telah menghasilkan inovasi yang diberi nama CX-PeRT (Calculate Tax Expert). CX-PeRT merupakan inovasi berdasarkan kaedah kajian kes yang boleh digunakan oleh pelajar secara individu atau secara berkumpulan. CX-PeRT bertujuan untuk meningkatkan kefahaman pelajar dalam pengiraan cukai kena bayar. Dengan berteraskan kepada konsep gaya pembelajaran fleming VARK, CX-PeRT ni dicipta dan diinovasikan agar dapat memenuhi keperluan pelbagai pelajar.

Objektif

Objektif bagi projek inovasi ini adalah untuk :

I. Meningkatkan kefahaman dan kemahiran pelajar dalam membuat pengiraan cukai pendapatan dan mengenalpasti pelepasan cukai pendapatan individu dengan tepat.

II. Meningkatkan kefahaman dan kemahiran pelajar dalam mengisi borang nyata cukai pendapatan invidu (borang BE dan B) dengan tepat.

III. Menghasilkan E-BBM yang interaktif, kreatif dan berpusatkan pelajar untuk memenuhi keperluan pelbagai latar belakang kognitif pelajar.

Penerangan Produk

Dalam proses menghasilkan CX-PeRT (*Calculate Tax Expert*), kami telah mengaplikasikan semua peringkat Model ADDIE iaitu: Analisis (*Analysis*) , Reka bentuk (*Design*), Pembangunan (*Development*) , Pelaksanaan (*Implementation*) dan Penilaian (*Evaluation*).

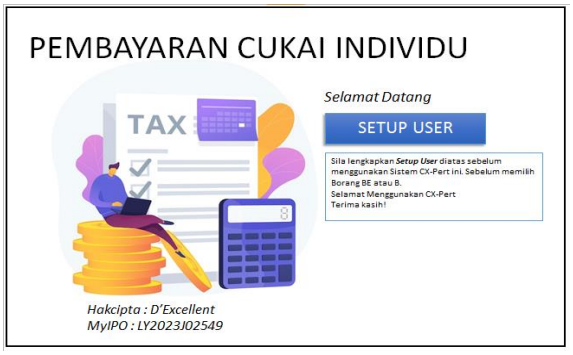
Model ADDIE merupakan model rekabentuk yang berfungsi sebagai garis panduan untuk menghasilkan perisian atau bahan pengejaran dan pembelajaran. Modul ini diasaskan oleh Rosset (1987). Pada fasa Rekabentuk, CX-PeRT yang dihasilkan perlu memenuhi keperluan analisis yang dilaksanakan dan memenuhi pembelajaran yang interaktif selain mudah dan cepat untuk digunakan. Pada peringkat awal, lakaran secara manual di Microsoft Excel telah dibuat seperti berikut.

a) Lakaran bahagian pertama

Pada lakaran bahagian pertama, pembinaan borang dibina dengan memasukkan butiran-butiran penting yang diperlukan dalam pengiraan cukai menggunakan Microsoft Excel.

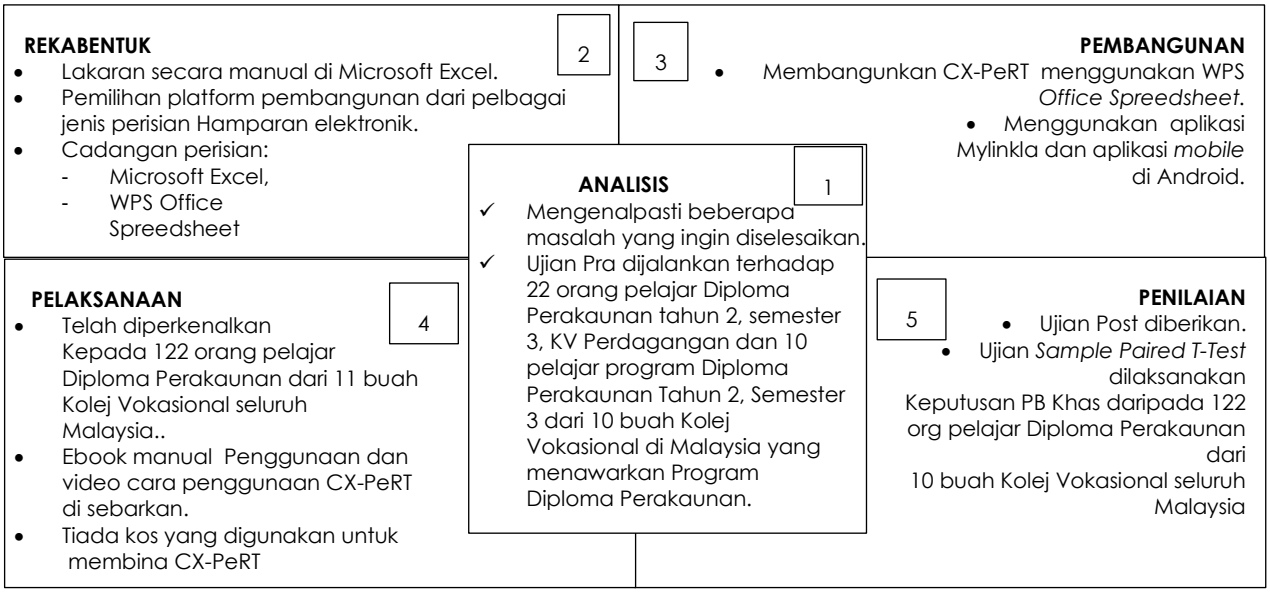
b) Pemilihan Platform Pembangunan

Pada fasa Pembangunan, ia melibatkan pembinaan sebenar CX-PeRT dengan elemen yang dipilih iaitu menggunakan WPS *Office Spreedsheet* dan memasukkan elemen-elemen yang membantu memudahkan penggunaan sistem ini. Kerja-kerja pembangunan CX-PeRT dibina berdasarkan fasa analisis dan rekabentuk mengikut spesifikasi keperluan yang telah dipersetujui.



Rajah 1: Muka Hadapan CX-PeRT

Dalam memastikan CX-PeRT ini dapat diguna pakai oleh semua lapisan masyarakat dan tidak tertumpu kepada PdPC bagi kursus Percukaian 1 sahaja, Kami telah mengadakan sesi uji cuba prototaip ini dan berkolaborasi dengan pihak industri iaitu AZEDGE Sdn Bhd. Syarikat ini merupakan sebuah syarikat perakaunan yang menyediakan pelbagai perkhidmatan berkaitan perakaunan, percukaian, pengauditan, sistem perakaunan dan setiausaha syarikat. Sebelum kami menyebarluaskan CX-PeRT ini, kami telah mendapatkan khidmat nasihat daripada En Aizat Bin Abdul Gafar selaku Pengarah Urusan Syarikat AZEDGE Sdn Bhd bagi memastikan CX-PeRT bersesuaian dengan objektif kami dan memenuhi kehendak industri untuk diaplikasikan lebih meluas.



Rajah 2: menunjukkan aplikasi Model ADDIE dalam penghasilan projek ini.

Keputusan Dan Perbincangan

Impak bagi projek inovasi CX-PeRT ini dapat diterangkan melalui fasa penilaian yang mana ianya merupakan fasa terakhir didalam Model ADDIE bagi memastikan CX-PeRT yang dihasilkan berkesan untuk menyelesaikan masalah para pelajar. Pada fasa ini, kami telah memberikan soalan post pada fasa pelaksanaan, dan pada fasa penilaian, kami melihat dapatan yang diperolehi. Soalan yang diberikan adalah soalan yang sama semasa ujian pra di mana kami ingin melihat tahap pengetahuan pelajar dan keberkesanan CX-PeRT dalam menyelesaikan masalah. Perkembangan dan pelaksanaan ini juga merupakan fasa penambahbaikan. Berdasarkan Ujian Pra yang dilaksanakan, hasil analisis menunjukkan bahawa pelaksanaan CX-PeRT telah dapat membantu pelajar membuat pengiraan cukai dan mengisi borang nyata cukai pendapatan individu dengan betul tanpa merujuk kepada pensyarah

Seterusnya, bagi mengetahui adakah terdapat perbezaan yang signifikan antara Ujian Pra dan Ujian Post, satu analisis *Paired Sample T -Test* telah dijalankan. Berdasarkan kepada analisis yang diperolehi didapati bahawa terdapat perbezaan yang signifikan antara Ujian Pra dan Ujian Post dengan nilai t=0.00 ($p<0.05$). Oleh itu, perlaksanaan CX-PeRT memberikan kesan kepada pencapaian pelajar bagi Kursus DBE 3333 Percukaian 1. Justeru itu, hipotesis H_0 ditolak dan H_1 diterima (lihat Jadual 1).

Jadual 1: Jadual Hipotesis Perbezaan Ujian Pra dan Ujian Post

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Mar_Pre & Mar_post	122	.109	.231

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Mar_Pre - Mar_post	-3.063E1	26.56197	2.40481	-35.40030	-25.87839	-12.741	121	.000

Jadual 2: Keputusan Penilaian Akhir bagi 22 orang pelajar Diplma Perakaunan KV Perdagangan

LAPORAN PENCAPAIAN HASIL PEMBELAJARAN KURSUS (CLORR) 1

1. MAKLUMAT KURSUS

PROGRAM: PERAKAUNAN

KOD & NAMA KURSUS: DBE 3333 PERCUKAIAN 1

SEMESTER & TAHUN PENGAJIAN: 3DVM / 2023

2. SASARAN PENCAPAIAN	PERATUS SASARAN	PERATUS PENCAPAIAN
PERATUS PELAJAR YANG MENCAPAI GRED C DAN KE ATAS	100	100.00

3. PERATUS PENCAPAIAN PELAJAR BERDASARKAN BILANGAN DAN GRED

GRED	A	A-	B+	B	B-	C+	C	C-	D+	D	E	F	T	JUM
BIL	12	8	2	0	0	0	0	0	0	0	0	0	0	22
%	54.55	36.36	9.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00

Daripada keputusan Penilaian Akhir di atas, 20 orang pelajar KV Perdagangan mendapat gred A manakala hanya 2 orang pelajar mendapat gred B+ di mana ini menunjukkan keberkesanan terhadap penggunaan CX-PeRT dalam pengajaran dan pembelajaran.

Kesimpulan

Pembinaan CX-PeRT telah berjaya meningkatkan kemahiran dan kefahaman pelajar untuk merekod butiran cukai dengan betul, mengenalpasti pelepasan percukaian dan dapat membuat pengiraan cukai pendapatan individu dengan tepat. Pelajar juga mempunyai pengalaman untuk merekod dan mengisi borang nyata cukai pendapatan individu dalam bentuk aplikasi yang mudah dan menarik. Selain itu juga, dengan penggunaan CX-PeRT dapat mewujudkan persekitaran pembelajaran yang interaktif dan menarik minat pelajar

untuk mempelajari kursus Percukaian 1 dan seterusnya mendapat pencapaian yang cemerlang dalam pentaksiran berterusan dan penilaian akhir . Di samping itu juga, CX-PeRT merupakan alat bantu mengajar e-pembelajaran secara praktikal bagi Kursus DBE 3333, Diploma Perakaunan di Kolej Vokasional seluruh Malaysia dalam kemahiran pengiraan cukai dan pengisian borang nyata cukai pendapatan individu yang berkesan, zero kos pembinaan, mudah dikendalikan dan mesra pengguna.

Penerbitan, Anugerah dan Harta Intelek

1. Keberkesanan Penggunaan Inovasi CX-PeRT Dalam Mempelajari Kursus Percukaian di Kolej Vokasional.
2. GOLD AWARD - International Science And Social Science Innovation Competiton (I-SIC V) 2023.
3. GOLD AWARD - The 6th Asia Pacific Conference On Educational Management & Leadership (APCEMaL 2023)
4. CX-PeRT telah mendapat kelulusan pendaftaran hak cipta daripada Perbadanan Harta Intelek Malaysia (MyIPO) dengan no pendaftaran LY2023JO2549.

Rujukan

Ahmad, N. L., Looi, S. S., Abdul Wahid, H. & Yusof, R. 2019. The significance of 21st century teaching and learning practices toward student's development. International Journal of Education, Psyhology and Counseling 4(28): 28-51.

Berenyi, L. & Deutsch. N. 2018. Effective teaching methods in business higher education: A student's perspective. International Journal of Education and Information Technologies 12: 37-45.

Raba, A. A. 2017. The impact of effective teaching strategies on producing fast and good learning outcomes. International Journal of Research – Granthaalayah 5(1): 43-58.

Unal, M. 2017. Preferences of teaching methods and techniques in mathematics with reasons. Universal Journal of Educational Research 5(2): 194-202. doi: 10.13189/ujer.2017.050204

Tajuk : Kit Kemahiran Penyambungan Pendawaian Elektrik Satu Fasa Menggunakan Kaedah '*My Why - Ring Kit*'

Noor 'Aliaa Awang, Nur Alia Farina Mohamad Nasir, Nurulhuda Ngasiman, Alina Azamuddin, Ruzana Motaji
Kolej Vokasional Klang1,2,3,4,5
noor.aliaa.awang@gmail.com, nuralianasir@gmail.com, nurulhudangasiman@gmail.com, alinaazamuddin@gmail.com, ruzanamotaji@gmail.com

Abstrak: Pendawaian elektrik satu fasa merupakan satu kursus utama yang disediakan dalam program Teknologi Elektrik di Kolej Vokasional bagi pelajar Sijil Vokasional Malaysia semester 1. Pendawaian elektrik satu fasa ialah satu sistem yang digunakan di kediaman kecil dan sederhana yang digunakan adalah di kawasan perumahan dalam sistem pendawaian memerlukan set pelan khas yang dinamakan pelan pendawaian elektrik. Pelan ini digunakan sebagai rujukan kepada pendawai untuk membuat kerja-kerja pendawaian dengan mengambil kira simbol pada kedudukan fizikal sebenar aksesori dan peranti sesuatu pendawaian elektrik. Selain daripada penempatan kedudukan sebenar, segala sambungan juga ditunjukkan dengan jelas pada semua punca tamatan dan aksesori serta peranti. Berdasarkan pengalaman para pensyarah di Kolej Vokasional yang mengajar kursus pendawaian elektrik, didapati bahawa pelajar sukar untuk memahami sistem pendawaian secara menyeluruh ketika kerja amali pendawaian dijalankan yang menggunakan kaedah pengajaran konvensional yang lebih dikenali 'chalk and talk' yang membosankan, turut menjadi salah satu penyumbang pelajar tidak mampu untuk menguasai salah satu topik penyambungan litar pendawaian. Rentetan daripada permasalahan ini, saya telah mencipta satu kit panel simulasi pendawaian yang direka bagi membantu pensyarah kaedah melukis litar pendawaian yang juga bertindak sebagai alat bantu mengajar yang dinamakan sebagai My Why-Ring Kit. Kit alat bahan bantu mengajar (ABBM) ini diharapkan dapat menarik minat dan seterusnya suntikan semangat pelajar untuk mendapatkan kemahiran dalam membuat penyambungan litar pendawaian satu fasa. Pelajar akan terlibat secara langsung dalam membuat tugasan amali secara individual dan perbincangan dengan pelajar lain bagi menggalakkan komunikasi pelbagai hala. Hasilnya, tugasan amali pra dan post menunjukkan peningkatan 100% dalam kalangan pelajar. Kit ini juga dapat meningkatkan lagi minat pelajar untuk mendalami asas penyambungan litar pendawaian dan seterusnya melonjakkan prestasi pelajar. Penggunaan My Why-Ring Kit ini telah memenuhi hasrat Kementerian Pendidikan untuk memenuhi keperluan pembelajaran abad ke 21 yang mengandungi ciri-ciri kreatif, kritis, kolaboratif, komunikasi dan nilai.

Key words: Alat bahan bantu menjagar (ABBM), pendawaian elektrik; pendawaian satu fasa; kit pendawaian;

Pendahuluan

Pengajaran dan pembelajaran bagi kursus pendawaian elektrik satu fasa di Semester 1, Program Sijil Teknologi Elektrik, Kolej Vokasional Klang didapati pelajar kurang berminat dan kurang kefahaman yang mendalam terhadap kursus ini. Mereka juga menghadapi masalah dalam kemahiran kerja-kerja praktikal bagi sistem pendawaian satu fasa. Berdasarkan pengalaman para pensyarah yang mengajar kursus pendawaian elektrik satu fasa, pelajar lambat memahami dan menguasai untuk membuat penyambungan litar pendawaian satu fasa secara terus di papan pendawaian berdasarkan gambarajah litar skematik litar satu fasa yang diberikan dalam kertas soalan. Keadaan ini bukan sahaja mengganggu perancangan sesi pengajaran dan pembelajaran, ia juga mengakibatkan pembaziran masa, mengurangkan sesi latihan dan pembaziran bahan pendawaian akibat kesalahan-kesalahan semasa membuat kerja-kerja praktikal pendawaian di papan pendawaian di bengkel. Selain dari itu, kesalahan penyambungan pendawaian elektrik ini akan menjadi salah satu sebab pelajar terdedah kepada risiko kemalangan (Said, 2019).

Penerangan konsep pendawaian yang terdahulu, didapati bahawa antara sebab pelajar tidak berminat mengikut pengajaran dan pembelajaran di dalam bengkel disebabkan corak dan pola pengajaran guru kolej vokasional yang membosankan mereka. Ini disebabkan kebanyakan guru menggunakan strategi pengajaran konvensional secara 'chalk & talk' iaitu secara kuliah tanpa sebarang alat bahan bantu mengajar (ABBM) kecuali kapur dan papan hitam serta kaedah latih tubi yang membosankan (Abd Samad, 2018). Masalah yang lain juga dihadapi oleh guru kolej vokasional ketika ini ialah kaedah pengajaran sedia ada memperuntukan masa yang lama serta membebankan pelajar dari segi penyambungan litar berulang untuk setiap pengujian yang dibuat. Disamping melibatkan kos penggunaan kabel yang banyak untuk setiap litar yang dipasang (Rashid 2012).

Oleh itu, alat bantu mengajar seperti My Why-Ring Kit merupakan sebuah kit litar pendawaian elektrik satu fasa mudah alih yang dibangunkan bagi menggantikan papan pendawaian sebenar. Kit ini dihasilkan bagi memudahkan pengajaran dan pembelajaran di dalam bengkel yang menjimatkan masa, tenaga dan kos penggunaan kabel oleh para guru dan pelajar selain meningkatkan kefahaman dan kemahiran para pelajar. Melalui penggunaan kit ini, pelajar lebih berkeyakinan dalam membuat pendawaian terus ke papan pendawaian yang sebenar kerana mereka boleh membuat penyambungan pendawaian terlebih dahulu dan pelajar dapat memastikan sambungan yang dibuat adalah tepat.

Deskripsi Produk

My Why-Ring Kit merupakan sebuah kit yang mudah alih, ringan dan mudah dibawa bertujuan bagi memudahkan para pelajar untuk menggunakan kit ini sebagai salah satu proses pembelajaran kendiri. Hal ini dapat membuatkan pelajar lebih memahami dan mengingati cara untuk membuat penyambungan pendawaian elektrik satu fasa dengan betul dengan secara langsung para pelajar dapat menyiapkan kerja-kerja praktikal di bengkel dengan lebih efisyen. Kit ini dihasilkan menggunakan bahan-bahan yang mudah diperoleh. Kit ini direkabentuk menggunakan kotak serbaguna di mana di dalamnya dilengkapi dengan gambar aksesori dan peranti pendawaian elektrik yang sebenar; pin kertas; benang berwarna merah, hitam dan hijau yang mewakili wayar hidup, neutral dan bumi. Ia dibangunkan dengan mengambil kira simbol pada kedudukan fizikal sebenar aksesori dan peranti sesuatu pendawaian elektrik agar mudah difahami oleh pelajar. Selain daripada penempatan kedudukan sebenar, segala sambungan juga boleh ditunjukkan dengan jelas pada semua punca tamatan dan aksesori dan peranti. Terdapat juga lembaran soalan litar skematik bagi pendawaian elektrik satu fasa. Pelajar boleh menyemak jawapan penyambungan pendawaian elektrik pada kod QR yang disediakan oleh pensyarah setelah selesai membuat penyambungan pendawaian menggunakan kit interaktif tersebut.

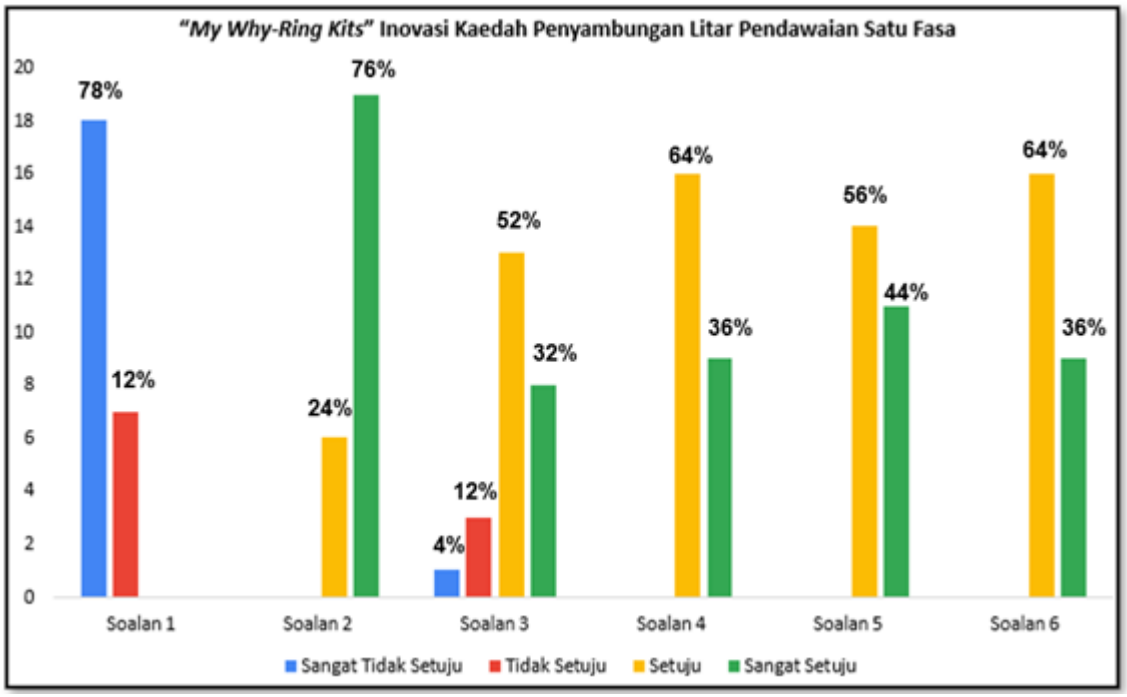
(a)

(b)

Rajah 1. (a) My Why-Ring Kit, (b) Kod QR jawapan

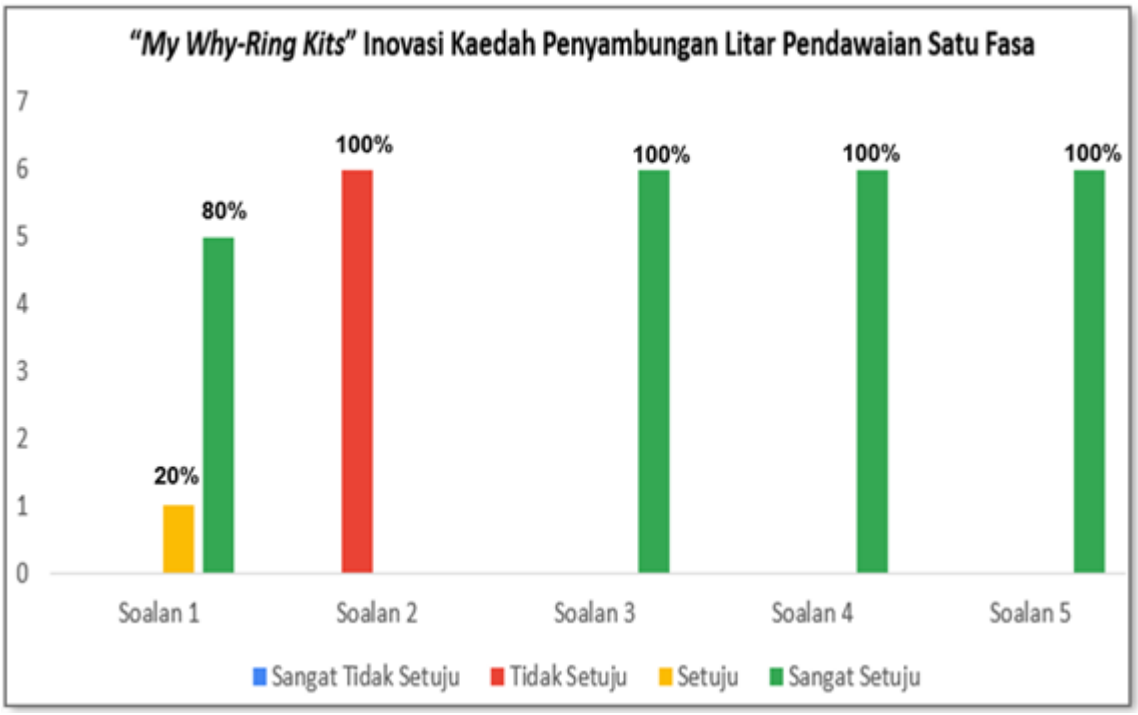
Keputusan & Perbincangan

Tinjauan masalah dalam pengajaran dan pembelajaran bagi kursus pendawaian elektrik satu fasa ini telah dilakukan semasa awal semester sebelum memperkenalkan kaedah My Why-Ring Kit kepada para pelajar. Para pelajar dilihat menghadapi masalah dalam menentukan cara penyambungan litar pendawaian elektrik satu fasa dengan betul. Dari masalah ini menyebabkan pelajar membuat kesalahan dalam pendawaian sebenar di papan pendawaian semasa tugasan praktikal dijalankan. Keberkesan kit ini ditentukan melalui kaji selidik dan pemerhatian yang dibuat semasa ujian pra yang dilakukan kepada pelajar SVM Semester 1 dan para pensyarah. Hasil yang diperolehi didapati sebanyak 78% pelajar tidak boleh membuat penyambungan elektrik tanpa bimbingan daripada pensyarah. Peratusan ini menunjukkan bahawa kebanyakkan pelajar belum yakin dan mahir untuk membuat pendawaian elektrik kendiri tanpa dibantu oleh pensyarah. Selain daripada itu, peratusan bagi menyiapkan tugasan menggunakan kaedah "chal and talk" juga menunjukkan pelajar sukar untuk menyiapkannya iaitu dengan peratusan sebanyak 24% dan 76%, masing-masing adalah setuju dan sangat setuju. Akan tetapi masih ada segelintir pelajar yang boleh mengikuti kaedah pembelajaran secara 'chalk and talk' iaitu 4% dan 12%, sangat tidak setuju dan tidak setuju. Setelah pelajar didedahkan dengan kit ini sebagai bahan PdP, didapati pelajar mampu membuat lukisan/draf pendawaian elektrik sebelum mereka membuat pendawaian sebenar pada papan penawaian di bengkel dengan peratusan sebanyak 64% dan 36%, masing-masing adalah setuju dan sangat setuju. ini menunjukkan bahawa produk ini telah menarik minat para pelajar untuk lebih fokus dalam kelas serta memupuk keyakinan dalam diri pelajar untuk membuat pendawai elektrik tanpa bimbingan pensyarah sewaktu proses PdP berlangsung.



Rajah 2. Analisis dapatan kajian secara keseluruhan daripada pelajar

Selain itu, kajian tindakan dapatan daripada tinjauan pensyarah terhadap produk My Why-Ring Kit Dapatan kajian ini menunjukkan hasil yang positif daripada para pelajar selepas menggunakan produk ini dimana hampir semua pensyarah bersetuju dengan produk ini iaitu dengan peratusan antara 80% hingga 100%. Dengan menggunakan produk ini sebagai bahan PdP, pelajar mudah untuk menyiapkan tugasan yang diberi oleh pensyarah. Selain daripada itu, kit ini juga dapat memupuk minat pelajar untuk memahami dan membuat lukisan atau draf litar pendawaian elektrik sebelum memulakan mendawai. Pada masa yang sama, kit ini dapat meningkatkan keyakinan pelajar untuk melakukan tugasan yang diberi dan telah mengalakkan pelajar untuk lebih menonjol di dalam kelas atau bengkel dengan sukarela untuk menjawab soalan sekiranya penyarah mengajukan soalan. Malah, dengan wujudnya kit ini, ia telah memudahkan proses PdP kepada pensyarah yang mengajar kursus ini.



Rajah 3. Analisis dapatan kajian secara keseluruhan daripada pensyarah

Penutup

Kemunculan My Why-Ring Kit ini mampu menjadi alternatif yang boleh menarik minat pelajar dan meningkatkan kefahaman mereka dalam penyambungan pendawaian elektrik satu fasa. Selain daripada itu pelajar dapat memahami konsep pendawaian asas dengan lebih mudah. Aktiviti pengukuhan semasa menggunakan kit ini dapat menghasilkan modal insan yang sentiasa ingin maju kehadapan. Oleh itu, My Why-Ring Kit ini dapat dikomersilkan dan menjadi bahan bantu mengajar yang boleh membantu pelajar dan pensyarah dalam PdP

Rujukan

Said, S. B., & Ahmad, W. A. B. W. (2019). Wiring Trainer. Journal on Technical and Vocational Education, 4(1), 138-146.
Abd Samad, N., Ahmad, W. M. R. W., Harun, H., Amiruddin, M. H., Hashim, S., & Jaâ, F. (2018). Bahan bantu mengajar (BBM) dalam pengajaran dan pembelajaran (P&P) di Sekolah Menengah Kebangsaan (SMK) Daerah Pontian. Online Journal for TVET Practitioners.
A Rashid, A. N., bin Salleh, Z., & bin Halim, M. A. R. (2012) Inovasi dan Teknologi dalam P&P: Pengesan Korosakan Pendawaian Elektrik Domestik Satu Fasa.

Magic Ruler

Irra Zahira Ishan, Saidah Noralifah Norazman, Nurul Izzati Rosman, Arma Ibwana Ibrahim Yahya, Ummul Khairi Fatima Mohd Redza
Kolej Vokasional Dato Undang Haji Muhammad Sharip, Rembau, Negeri Sembilan, Malaysia[1,2,3,4,5]
irra.zahira@gmail.com

Abstrak: Aktiviti mendraf pola menggunakan pemberat dan beberapa peralatan pembaris yang berbeza saiz. Pembaris tradisional yang seringkali digunakan bukan sahaja panjang, tetapi terlalu sukar dibawa ke mana-mana. Melalui pemerhatian, pelajar seringkali mengalami masalah kehilangan atau kecicirian salah satu pembaris jahitan untuk digunakan semasa kelas amali, sekaligus mengganggu proses pembelajaran dan pengajaran (PdP). *Magic Ruler* merupakan inovasi pembaris multi fungsi dan penekan yang direka khas khususnya untuk mendraf pola pakaian. Berdasarkan Ujian Pra dan Ujian Pos, *Magic Ruler* bukan saja dapat memudahkan pelajar membuat pelbagai garisan menggunakan satu pembaris sahaja malah menjadikan proses mendraf pola lebih cepat dan praktikal.

Key words: Draf Pola Pakaian; Pembaris; Penekan; Pemberat

Pengenalan

Mendraf pola adalah salah satu daripada tujuh kompetensi wajib lulus bagi pelajar Sjil Vokasional Malaysia (SVM), Program Fesyen dan Pembuatan Pakaian (FMP) di Kolej Vokasional Dato' Undang Haji Muhammad Sharip (KV DHMS). Proses ini penting untuk dilakukan sebelum melaksanakan proses berikutnya seperti menyusun atur pola pada fabrik, menggunting fabrik dan seterusnya. Rajah 1 menunjukkan aliran kompetensi bagi pelajar SVM program FMP.

Rajah 1 : Aliran kompetensi SVM

Mendraf pola merupakan proses utama dalam penghasilan sesebuah pakaian. Pola akan disusun di atas permukaan meja yang rata, dimana pola berfungsi sebagai acuan atau penanda ke atas fabrik sebelum proses menggunting pakaian dijalankan. Menurut Purnamasari (2015), pola merupakan templat untuk memotong fabrik mengikut spesifikasi yang diperlukan. Kaedah mendraf pola yang menjadi amalan untuk pelajar SVM di KV DUHMS ialah menggunakan pola bentuk 2D, berbeza dengan sesetengah institusi pendidikan Teknikal dan Vokasional yang lain dimana aktiviti mendraf pola dijalankan menggunakan kaedah 3D atau *drapping*. Kaedah pola bentuk 2D merupakan kaedah mendraf pola yang paling biasa digunakan oleh rata-rata institusi pendidikan (Othman, Zakaria & Zainuddin, 2021).

Menurut (Jaafar, 2017), pola bentuk 2D dilakukan dengan menggunakan beberapa peralatan mendraf pola seperti pembaris lurus, pembaris melengkung, pembaris sesiku L, kertas pola, kertas surih, roda surih, jarum peniti, kapur tukang jahit, pita ukur, pembaris lengkuk perancis dan pensil. Setiap pelajar perlu membawa setiap alatan mendraf pola semasa sesi amali dijalankan. Hal ini menjadikan proses mendraf pola pakaian agak rumit melalui penggunaan pelbagai peralatan mendraf pola yang perlu dibawa (Castro, Andres & Prestoza, 2018).

Pembaris tradisional yang dijadikan amalan selama ini bukan sahaja panjang, kadangkala terlalu sukar dibawa ke mana-mana. Malah ramai dalam kalangan pelajar yang menghadapi kesukaran melukis pola pakaian (Razali, 2018). Lebih parah lagi apabila salah satu daripada alatan mendraf terutamanya pembaris yang mempunyai pelbagai saiz dan jenis seperti pembaris lurus, pembaris sesiku L dan pembaris melengkung, terlupa untuk dibawa pasti akan mengganggu proses pembelajaran dan pengajaran (PdP). Bukan saja proses PdP tidak dapat dijalankan dengan lancar, malahan sesetengah pola pakaian tidak dapat disiapkan sepenuhnya mengikut tempoh yang ditetapkan. Berdasarkan pemerhatian ke atas pelajar semester 3, Program (FMP) di KV DUHMS, pelajar seringkali berhadapan dengan masalah kehilangan atau terccir salah satu daripada tiga pembaris tersebut untuk mendraf pola sama ada pembaris lurus, pembaris melengkung atau pembaris sesiku L.

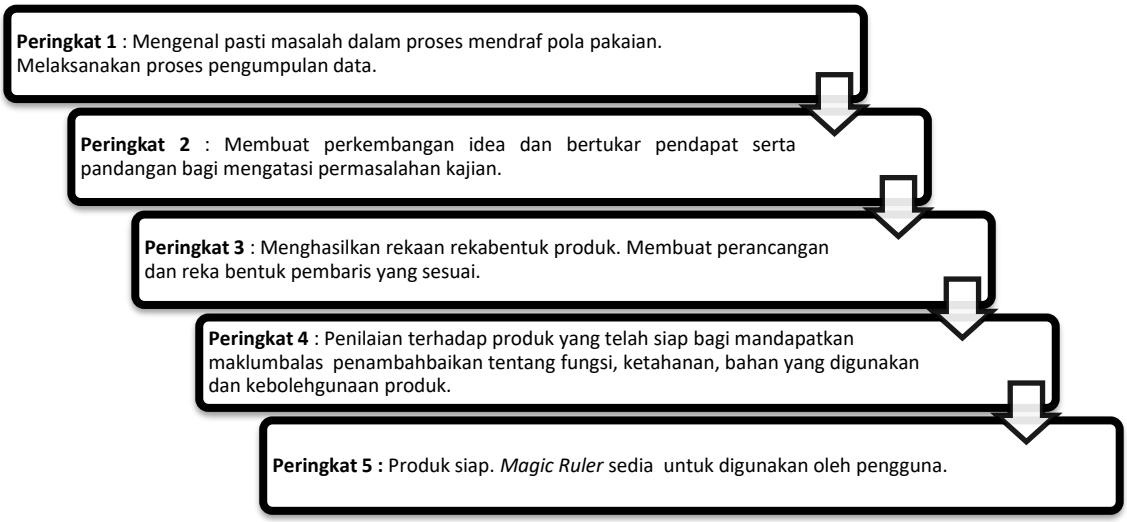
Pembaris inovasi *Magic Ruler* merupakan produk yang dibangunkan untuk membantu dalam memudahkan proses mendraf pola menggunakan peralatan yang telah digabungkan menjadi satu produk. Selain itu, pembaris inovasi ini turut dilengkapkan dengan saiz basi tertentu seperti satu inci, setengah inci dan suku inci. Secara tidak langsung, ini dapat memudahkan penggguna untuk membuat basi pada pola tanpa memerlukan pita ukur mahupun roda surih untuk proses memindahkan tanda pola selepas selesai mendraf pola. Lebih mudah lagi, produk inovasi ini menggunakan konsep *all in one*.

Magic Ruler menggabungkan tiga jenis pembaris jahitan iaitu pembaris lurus, pembaris melengkung dan pembaris berbentuk L dan penekan yang bertindak sebagai pemberat jahitan. Pemberat yang terdapat pada bahagian tengah *Magic Ruler* ini, boleh ditanggalkan dan dipasang semula sesuai dengan keperluan pelajar atau tenaga pengajar yang menggunakan produk inovasi ini. Selain itu, pemberat tersebut juga boleh digunakan sebagai alat untuk penekan fabrik semasa proses kemasan akhir bagi memastikan kedudukan kelim terletak elok dan kemas.

Penerangan Produk

Magic Ruler merupakan satu pembaris pelbagai fungsi yang telah diinovasikan daripada gabungan tiga fungsi pembaris iaitu pembaris lurus pembaris sesiku L dan pembaris melengkung. Dengan hanya mengunakan satu magic ruler ini sahaja dapat menghasilkan ketiga-tiga garisan sama ada garisan lurus, melengkung atau garisan bersudut tepat yang digunakan untuk mendraf pola atau menambahkan basi pada pola. *Magic Rule*r ini juga telah ditambahkan dengan pemberat yang dapat berfungsi sebagai pemberat juga boleh dijadikan sebagai alat penekan semasa proses menekan pakaian. Pemberat yang terdapat pada bahagian tengah *Magic Ruler* ini boleh ditanggalkan dan dipasang semula sesuai dengan keperluan pelajar atau tenaga pengajar.

Dengan inovasi yang dihasilkan ini dapat memudahkan pengguna khususnya pengguna yang terlibat dalam bidang jahitan dapat memudahkan dan mempercepatkan proses mendraf pola. Selain daripada pembaris mulfungsi juga, *Magic Ruler* ini amat praktikal dengan saiznya yang ringan mudah dibawa dan disimpan. Pengguna dapat menjimatkan ruang penyimpanan dan tidak perlu membawa peralatan yang banyak kerana dengan satu *Magic Ruler* ini sahaja sudah dilengkapi dengan tiga fungsi pembaris yang berbeza dan boleh dijadikan sebagai pemberat. *Magic Ruler* telah melalui lima peringkat penghasilan sebelum produk akhir siap untuk digunakan. Rajah 2 menunjukkan aliran kerja penghasilan *Magic Ruler*.

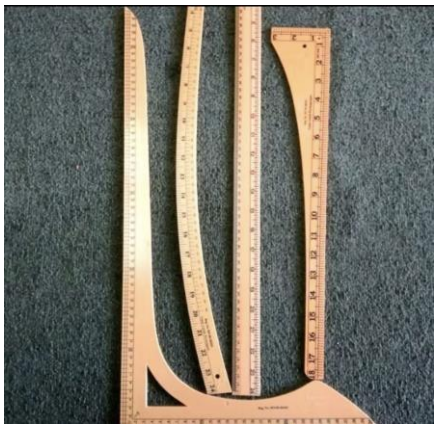
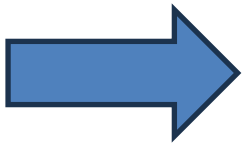
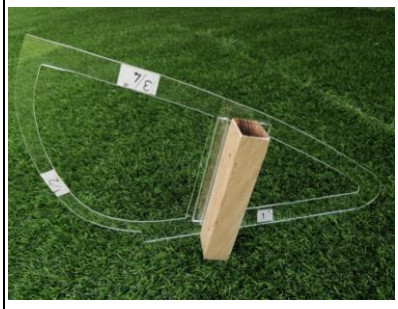


Rajah 2 : Aliran kerja penyediaan produk inovasi *Magic Ruler*

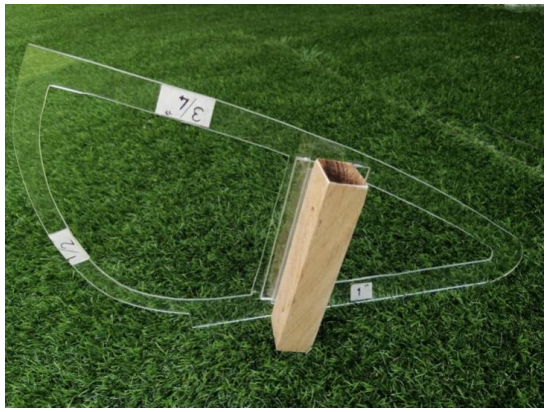
Reka Bentuk Produk

Magic Ruler direka khas dengan reka bentuk yang ringkas dan ringan, maka ia mudah untuk dibawa. Penghasilan produk inovasi ini menggunakan bahan-bahan yang mudah diperolehi seperti *Acrylic Clear Casting* serta bahan kitar semula seperti lebihan kayu, skru dam gam *acrylic*. Produk inovasi ini tidak memerlukan masa yang lama untuk dihasilkan dan produk ini boleh terus digunakan serta dapat membantu dalam melestarikan alam sekitar yang lebih mapan. Bahan *acrylic* yang digunakan untuk menghasilkan *Magic Ruler* ini adalah tahan lama dan mempunyai jangka hayat penggunaan yang tinggi. Rajah 3 menunjukkan pandangan hadapan, belakang dan lakaran 3D *Magic Ruler*.

Rajah 3 : Reka bentuk *Magic Ruler*

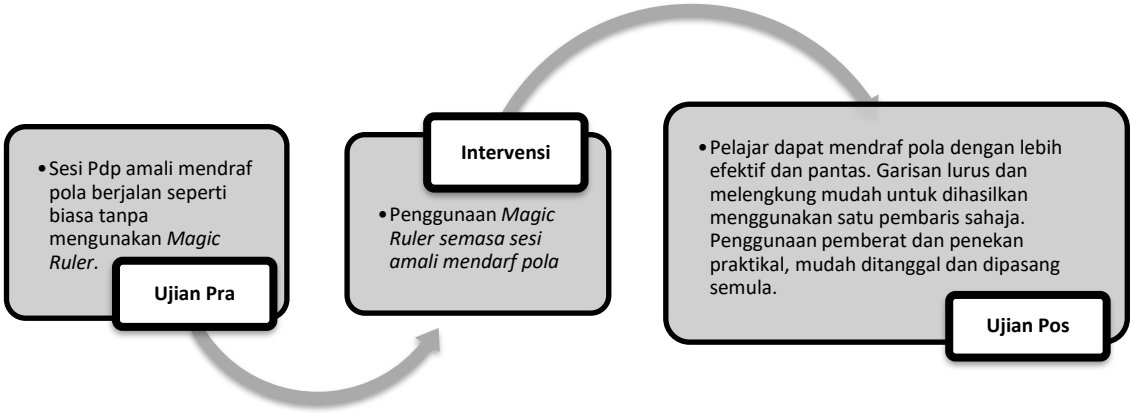
Produk sedia ada di pasaran		Produk inovasi *Magic Ruler*
 		
Peralatan mendraf dan pemberat sedia ada dipasaran		*Magic Ruler* yang telah diinovasikan dari segi fungsi yang telah dilengkapi segala fungsi pelaratan mendraf dan alatan menekan dan juga pemberat dalam satu produk.

Rajah 4 : Perbezaan produk sedia ada di pasaran untuk pembaris jahitan dan pemberat dengan produk inovasi *Magic Ruler.*

Penerangan Fungsi Bahagian *Magic Ruler*	
	
1.	Bahagian melengkung berfungsi untuk menghasilkan lakaran garisan melengkung membentuk bahagian pinggul dan garis peher
2.	Bahagian bersudut tepat dapat menghasilkan garisan bersudut tepat 90 darjah
3.	Mempunyai kelebaran saiz yang berbeza-beza untuk menghasilkan saiz basi yang berbeza pada pola pakaian
4.	Mempunyai pemberat dan penekan yang berfungsi untuk menahan kepingan pola atau fabrik daripada bergerak semasa proses mendraf atau menggunting fabrik.

Hasil Dapatan dan Perbincangan

Dapatan kajian ini telah diperoleh berdasarkan Ujian Pra dan Ujian Pos yang telah dilaksanakan kepada pelajar semester 3 Program FMP, KV DUHMS. Fokus kajian tertumpu kepada 30 orang pelajar yang dipilih secara rawak. Intervensi yang digunakan didalam kajian ini ialah penggunaan *Magic Ruler* semasa sesi amali mendraf pola pakaian dilakukan.



Rajah 3 : Reka bentuk penyelidikan inovasi *Magic Ruler*

Hasil dapatan kajian mendapati bahawa penghasilan terhadap sesuatu pola pakaian memerlukan pemahaman yang meluas kepada setiap peralatan untuk mendraf pola. Menurut Othman, Zakaria Zainuddin (2021) proses mendraf pola memerlukan penguasaan dan pemahaman tentang penggunaan peralatan yang betul didalam proses mendraf pola. Dapatan kajian juga mendapati bahawa penggunaan pembaris tradisional memerlukan banyak peralatan tambahan seperti penggunaan pelbagai saiz pembaris, pita ukur dan penekan, Berbeza dengan hanya menggunakan satu pembaris sahaja iaitu *Magic Ruler.*

Dapatan kajian seterusnya mendapati bahawa *Magic Ruler* memudahkan proses mendraf pola dengan adanya pembaris pelbagai fungsi ini dan memudahkan proses untuk menanda basi jahitan pada pola. Fungsi utama yang paling ditekankan dalam inovasi *Magic Ruler* ini adalah pembaris yang berkonsepkan *all in one* dimana ianya direka tanpa had umur dan direkabentuk untuk membolehkan kerja-kerja mendraf pola pakaian sama ada kepada golongan dewasa mahu pun juga kanak-kanak dengan hanya menggunakan satu pembaris. Dalam kajian ini, responden yang terdiri daripada pelajar semester tiga iaitu golongan dewasa memberi maklumbalas yang positif. Penggunaan pembaris inovasi ini dapat memudahkan proses mendraf pola bukan sahaja kerana ianya telah menggabungkan pelbagai fungsi pembaris malahan juga memudahkan proses untuk menanda basi dengan adanya saiz ukuran basi pada *Magic Ruler.* Penekan yang terletak pada bahagian tengah

pembaris ini juga boleh boleh ditanggalkan sekaligus memudahkan pengguna untuk menggunakannya. Pengguna khususnya pelajar, tenaga pengajar mahupun pereka dapat menggunakan satu alatan tetapi pelbagai fungsi.

Dapatan kajian seterusnya mendapati bahawa, Magic Ruler menjimatkan masa untuk mendraf pola. Produk *Magic Ruler* juga direka sebagai produk multifungsi. *Magic Ruler* mempunyai satu sudut khas iaitu sudut tepat 90 darjah di mana ianya dapat membentuk garisan pola sama ada garisan menegak dan melintang yang dapat dilukis dengan tepat Inovasi pembaris ini juga dilengkapkan dengan maklumat tentang saiz basi jahitan sama ada satu inci, setengah inci atau suku inci. Dengan adanya ukuran basi jahitan ini, penggguna seperti pelajar dan tenaga pengajar dapat menjimatkan masa untuk menanda kelonggaran dan garisan untuk memulakan jahitan agar pakaian dapat terbentuk dengan elok dan dipakai dengan selesa oleh pengguna. Disamping itu, Magic Ruler bukan sahaja boleh membuat garisan lurus malahan garisan melengkung dan juga garisan bersudut 90 darjah.

Kesimpulan

Produk *Magic Ruler* yang diinovasikan ini dapat membantu pengguna mempercepatkan proses mendraf pola dan melalui gabungan tiga jenis pembaris jahitan, memudahkan proses menanda basi pada pola dan membolehkan pengguna menggunakan pemberat dan penekan yang mudah ditanggal dan dipasang semula. Selain itu, produk ini juga dapat membantu meringankan pengguna untuk membawa peralatan mendraf yang mempunyai pelbagai saiz dan bentuk melalui satu produk sahaja.

Penambahbaikkan yang boleh dibuat pada produk ini ialah dari segi ketebalan pembaris dan pembungkusan. Ketebalannya boleh ditambah supaya tidak mudah patah dan kotak yang khas supaya pembaris tidak mudah rosak. Selain itu, *Magic Ruler* ini akan ditambah baik dengan menambahkan saiz ukuran yang lebih besar. Selain itu, produk *Magic Ruler* ini juga akan didatangan dengan dua warna akrilik yang sesuai untuk warna fabrik iaitu hitam dan putih disamping menggunakan ukuran matriks yang berbeza iaitu sentimeter dan juga inci. Keseluruhannya, penerimaan positif dalam kalangan pelajar dan tenaga pengajar menunjukkan bahawa produk *Magic Ruler* berpotensi untuk dipasarkan secara lebih meluas.

Rujukan

Castro, M. R. D., Andres, P. D., & Prestoza, M. J. R. (2018). The Teaching Techniques and Strategies Use by the Dressmaking Teachers Perceive by the Dressmaking Students. Asian Journal of Assessment in Teaching and Learning, 8, 48-56. https://doi.org/10.37134/ajatel.vol8.5.2018.

Jaafar, R. (2017, October, 21). Pola Pakaian Ciptaan Rosita Jadi Rujukan Tiga Negara. Berita Harian Online. Retrieved January 15, 2021, from https://www.bharian.com.my/wanita/fesyen/2017/10/340072/pola-pakaian-ciptaan-rosita-jadi-rujukan-tiga-negara

Othman, N. H., Zakaria, M. H., Zainuddin, N. (2021). Inovasi Simply Curve:Alat Bantu Mengajar Dalam Pembuatan Pola Pakaian. *ANP Journal of Social Science and Humanities,* Vol 2, No. 2 (2021) P. 52 – 62

Purnamasari, N, S, I. (2015). Pengembangan Multimedia Interaktif Pembuatan Pola Dasar Busana Wanita. Retrieved February 27, 2021 from http://repository.upi.edu/18069/4/S_PKK_1000446_Chapter1.pdf

Razali, N. (2018, February 23). Cipta Pembaris Pola Mudahkan Jahit Pakaian. *Berita Harian Online*. Retrieved March 1, 2021, from https://www.bharian.com.my/wanita/fesyen/2018/02/391845/cipta-pembaris-pola-mudahkan-jahit-pakaian

Needle Trap

Nurul Fahani Binti Mohd Shapia1, Nurul Farahin Binti Che Nor Azlizan2, Nuranis Sofia Maisarah Bt Azairy Azuady3, Nurulfarhanah Binti Andrisal4

Kolej Vokasional Dato' Undang Haji Muhamad Sharip,71300 Rembau, Negeri Sembilan[1,2,3,4]
nurulfahanimohdshapia@gmail.com, farahinnazlizan@gmail.com, maisarahazairy2004@gmail.com & nuruladrisal@gmail.com

Abstrak: Faktor keselamatan dan kebersihan perlu dititikberatkan terutamanya semasa sesi amali dibengkel berjalan. Tambahan pula, waktu amali atau SLT bagi amali para pelajar sangat lama antara lima hingga tujuh jam sehari. Kebiasaannya, bengkel akan berada dalam keadaan bersepah dengan barang dan peralatan yang jatuh ke lantai seperti jarum peniti, kacip benang dan sebagainya. Melalui pemerhatian yang dijalankan semasa proses pengajaran dan pembelajaran (PdP) mendapati, masalah sering berlaku adalah jarum peniti tertumpah atau jatuh ke atas lantai. Malahan, permasalahan ini akan menyebabkan pelajar mengumpulkan jarum secara manual iaitu satu per satu. *Needle Trap* merupakan salah satu produk yang ditambah fungsinya dalam menangani permasalahan yang dihadapi. Objektif penghasilan produk ini adalah untuk memudahkan proses pengumpulan jarum peniti yang tumpah atau terjatuh ke atas lantai. *Needle Trap* dihasilkan dengan menggunakan bahan buangan atau kitar semula iaitu set mop. Ianya tidak memerlukan tempoh masa yang lama untuk dihasilkan dan produk ini boleh terus digunakan serta dapat membantu dalam melestarikan alam sekitar yang lebih mapan. Kos penghasilan *Needle Trap* yang sangat minimum menjadikan ia produk mudah dan senang untuk dimiliki oleh semua lapisan masyarakat dan pengguna. Maklum balas yang diperolehi membuktikan *Needle Trap* merupakan satu produk yang sangat baik dan dapat mengatasi masalah untuk mengumpulkan jarum peniti yang jatuh bertaburan di atas lantai serta tidak perlu menunduk semasa mengumpulkannya. *Needle Trap* sangat berpotensi untuk diperluaskan dan dipasarkan.

Kata kunci: Needle Trap; SLT; PdP

Pengenalan

Revolusi Industri 4.0 (IR4.0) merupakan revolusi digital yang merujuk kepada proses pembangunan teknologi bagi sesebuah industri khususnya, ia melibatkan sektor pengeluaran dan automasi ke tahap yang lebih pintar dan sistematik. IR4.0 juga merujuk kepada transformasi disruptif dalam industri melalui penggunaan teknologi yang menggabungkan alam fizikal, digital dan biologi yang memberi kesan kepada semua bidang, industri dan ekonomi. Dalam mendepani cabaran pendidikan IR4.0, Kementerian Pengajian Tinggi dengan usahasama IPT telah membangunkan satu sistem pendidikan yang dapat memenuhi keperluan ekonomi negara dengan menumpukan aspek kemahiran, teknologi, kreativiti dan inovasi.

Bagi merealisasikan era Revolusi Industri 4.0 (IR4.0), inovasi dalam PdP mampu melahirkan graduan yang berinovasi dan berkemahiran tinggi yang dapat memenuhi keperluan dalam pasaran kerja. IPT harus memastikan bahawa kurikulum yang disediakan serta kursus yang ditawarkan adalah relevan dan mampu mengisi ruang pekerjaan yang diperlukan oleh pihak industri pada masa akan datang. Produk inovasi *Needle Trap* dapat menerapkan unsur dari segi kemahiran dalam penggunaan teknologi terutamanya dalam melakar lakaran 3D menggunakan aplikasi berteknologi. Idea kreatif dan sikap kreativiti dalam kalangan pelajar dapat dicungkil dan dipupuk melalui percambahan idea dalam mereka cipta produk serta menggunakan bahan-bahan sedia ada yang mampu melestarikan alam sekitar disamping dapat mengaplikasikan keselamatan dalam sesuatu pekerjaan.

Menurut Abdul Rahman & Abdul Wahab (2011) menyatakan bahawa bagi mengurangkan serta meminimakan risiko kemalangan di bengkel atau ditempat kerja akta keselamatan perlu ditubuhkan bertujuan untuk mejamin cara kerja serta persekitaran kerja yang selamat kepada para pelajar. Pekerja dilindungi daripada bahaya dalam kerja-kerja industri serta dikawal dari segi penyakit pekerjaan dan meletakkan piawai minimum persekitaran kerja yang diperlukan (Akta Kilang dan Jentera ,1967). Akta yang dibuat adalah untuk mencegah kemalangan daripada berlaku, (Akta Keselamatan dan Kesihatan Pekerja, 1994).

Semasa sesi pengajaran dan pemudahcaraan (PdPc) di bengkel jahitan, keselamatan dan kebersihan perlu dititikberatkan. Tambahan pula, waktu amali atau SLT bagi amali para pelajar sangat lama antara lima hingga tujuh jam sehari. Kebiasaannya, bengkel akan berada dalam keadaan bersepah dengan barang, peralatan dan perca-perca kain milik pelajar. Sebagai contohnya, bekas dan jarum peniti yang digunakan oleh pelajar mudah terjatuh ke atas lantai dan akan mengambil masa yang lama untuk dikumpulkan kembali. Hal ini akan menyebabkan risiko terhadap keselamatan para pelajar. Menurut Abdul Rahman & Abdul Wahab (2011) menyatakan bahawa pengetahuan tentang aspek-aspek keselamatan ketika berada serta bekerja dibengkel adalah satu perkara yang amat penting. Kekurangan pengetahuan ini boleh menyebabkan pelbagai masalah berlaku terutamanya kemalangan. Menurut Longley (1969) pekerja yang kurang latihan terhadap bidang tugasnya lebih cenderung melakukan kesilapan dan lebih terdedah terhadap kemalangan

Oleh itu, untuk mengatasi masalah ini, satu produk telah diberi nilai tambah dari segi fungsi dan kegunaannya bagi membantu dalam menangani permasalahan ini. Produk yang dihasilkan ini diberi nama "*Neddle Trap*" yang berfungsi untuk menarik jarum yang berselerak atau berterabur di atas lantai tanpa perlu

mengumpulkannya satu per satu atau dalam erti kata lain adalah dengan menggunakan cara manual. Tujuan utama penghasilan produk inovasi ini adalah untuk memupuk dan melahirkan modal insan yang kreatif dan inovatif dalam menyelesaikan sesuatu masalah, memastikan jarum peniti dapat dikumpulkan dengan mudah apabila jatuh ke lantai, mengumpulkan jarum yang jatuh dengan masa yang lebih singkat serta menghasilkan produk yang mesra pengguna dan mudah dikendalikan.

Huraian Produk

Tercetusnya idea untuk menghasilkan produk inovasi ini melalui lontaran idea dan perbincangan dalam kalangan ahli kumpulan. Penghasilan produk inovasi *Needle Trap* adalah hasil usaha dan kerjasama dalam kalangan ahli kumpulan. Malaysia merupakan negara pengguna plastik yang ke-2 terbesar di rantau Asia secara purata penggunaannya adalah sebanyak 16.78 kg setahun. Menurut kajian yang dijalankan oleh Prof Madya Dr. Haliza Abdul Rahman dari UPM mendapati bahawa rakyat Malaysia telah membuang sumber kitar semula bernilai RM476 juta. Bahan-bahan seperti kaca, besi, plastik dan kertas perlu dikumpulkan dan diasingkan serta dihantar ke pusat pemprosesan untuk ditukarkan kepada produk atau bahan baharu. *Needle Trap* merupakan salah satu produk inovasi yang telah dibangunkan dengan menggunakan bahan buangan atau bahan kitar semula iaitu mop terbuang.

Selain penggunaan mop yang tidak digunakan, bahan lain yang digunakan ialah magnet dan *hot glue gun*. Menurut Sidoarjo (2018) menyatakan bahawa magnet adalah suatu objek yang mempunyai suatu medan magnet yang yang memiliki sifat serta dapat menarik besi atau bahan yang bersifat logam. Medan magnet ialah kawasan di sekitar magnet yang wujud kesan daya oleh magnet. Ciri-ciri garisan medan magnet ialah garisan medan magnet mengarah dari kutub utara ke kutub selatan magnet, garisan medan magnet tidak akan bertemu atau bersilang dan garisan medan magnet lebih rapat antara satu sama lain di kawasan yang mempunyai medan magnet yang lebih kuat. Medan magnet di antara dua kutub yang sama jenis akan menghasilkan satu titik neutral dan tidak mempunyai sebarang medan magnet.

Magnet boleh wujud secara semulajadi dalam bentuk magnet. Walau bagaimanapun terdapat juga magnet buatan manusia yang diperbuat daripada gabungan bahan seperti besi, keluli, kobalt dan nikel yang digunakan secara meluas dalam kehidupan seharian. Sifat magnet ialah menarik bahan magnet, berkutub kutub utara dan kutub selatan, kutub sama jenis menolak manakala kutub berlainan jenis akan menarik dan menunjukkan arah utara-selatan apabila digantungkan secara bebas.

Dapatan & Perbincangan

Penggunaan produk inovasi *Needle Trap* ini mempunyai pelbagai kemudahan iaitu dapat memudahkan proses mengumpul jarum peniti yang terjatuh di atas lantai, mudah dibawa dan disimpan dengan cara menggantungkannya, menggunakan bahan kitar semula sekaligus mengelakkan pencemaran dan melestarikan alam sekitar yang mampan, kos penghasilan produk yang rendah, komponen produk yang ringkas serta bersifat ergonomic dari segi penggunaannya.

Dari segi komersialisasi pula, nilai komersial yang tinggi dapat memberi faedah kepada pelajar dan industri pembuatan pakaian, multifungsi iaitu selain mengutip jarum, produk ini boleh juga mengutip item kecil berasaskan besi, inklusif iaitu boleh digunakan oleh semua golongan masyarakat serta mempunyai komponen produk yang ringkas dan kos yang rendah.

Produk inovasi ini juga telah mendapat maklum balas yang memberangsangkan daripada pelbagai pihak terutamanya para pensyarah dan pelajar yang menyatakan bahawa produk *Needle Trap* yang sangat membantu para pelajar dalam menjimatkan tempoh masa untuk mengumpulkan jarum peniti yang terjatuh ke lantai, senang digunakan, menjimatkan masa serta bersifat ergomomik. Selain itu, pengiktirafan daripada pakar industri iaitu Encik Azman Bin Soh dari AZMAN MAT SOH SDN. BHD yang berpangkalan di Senawang, Negeri Sembilan yang memperakui bahawa *Needle Trap* mempunyai nilai untuk dikomersialkan dalam Industri Pembuatan Pakaian.

Kajian ini telah melibatkan 29 orang pelajar program Sijil Vokasional Malaysia Seni Reka Fesyen Tahun 1 semester 1 dan 31 orang pelajar program Sijil Vokasional Malaysia Seni Reka Fesyen Tahun 2 semester 3 di Kolej Vokasional Dato' Undang Haji Muhamad Sharip terdiri daripada lingkungan umur 16 dan 17 tahun. Boleh merujuk kepada jadual 1 yang disertakan dibawah:

Jadual 1 : Demografi Responden

FAKTOR DEMOGRAFI	KEKERAPAN	PERATUSAN (%)
Umur		
16 tahun	29	48%
17 tahun	31	51%
Jantina		
Perempuan	60	100
Lelaki	0	0
Kelas		
SVM 1 FMP	29	48%
SVM 2 FMP	31	51%

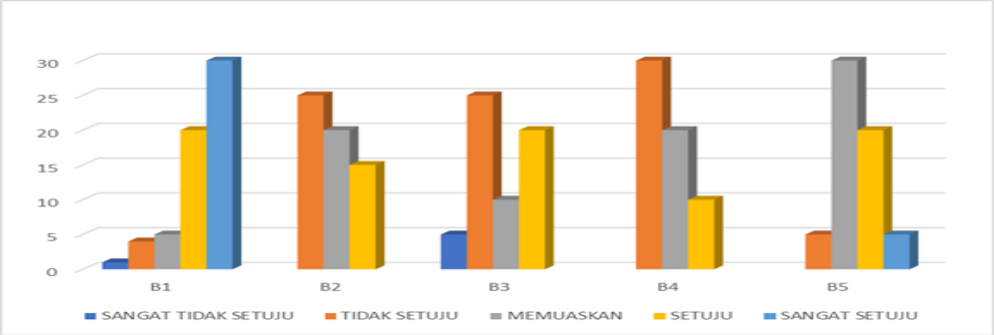
Berdasarkan Jadual 1 bilangan responden yang menjawab soal selidik keberkesanan penggunaan *Needle Trap* dalam kalangan pelajar Sijil Vokasional Malaysia di Kolej Vokasional Dato' Undang Haji Muhamad Sharip berumur 16 tahun seramai 29 orang bersamaan 48% serta berumur 17 tahun seramai 31 orang bersamaan 51%.

Dari segi jantina responden, kesemuanya adalah perempuan seramai 60 orang bersamaan 100%. Pemboleh ubah ketiga ialah kelas responden iaitu seramai 29 orang mewakili kelas SVM 1 FMP bersamaan 48% manakala SVM 2 FMP 31 orang bersamaan 51%.

Jadual 2: Analisis data keberkesanan di mana peratusan responden maklum balas sebelum penggunaan *Needle Trap* dalam kalangan pelajar Sijil Vokasional Malaysia

Soalan	Sangat Tidak Setuju	Tidak Setuju	Memuaskan	Setuju	Sangat Setuju
	1	2	3	4	5
Soalan B1	1	4	5	20	30
Soalan B2		25	20	15	
Soalan B3	5	25	10	20	
Soalan B4		30	20	10	
Soalan B5		5	30	20	5

Carta 1: Taburan bilangan dan peratus responden tentang maklum balas sebelum penggunaan Needle Trap

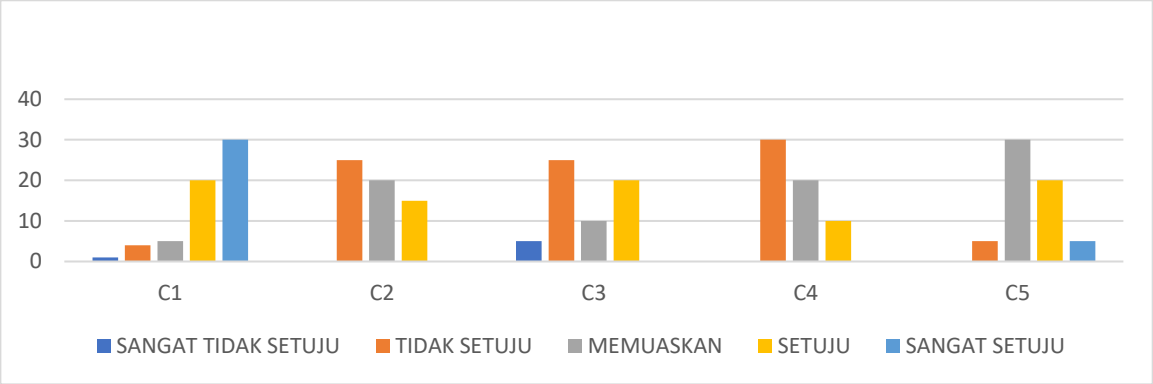


Berdasarkan Jadual 2 dan Carta 1 di atas, bagi soalan B1 terdapat 30 orang responden yang menyatakan sangat setuju bahawa jarum peniti dibiarkan bersepah di atas lantai bengkel, manakala hanya seorang responden menyatakan sangat tidak setuju bahawa jarum peniti dibiarkan bersepah di atas lantai bengkel. Bagi soalan B2, 25 orang responden menyatakan tidak setuju serta 15 orang responden setuju bengkel dalam keadaan yang bersih sebelum ditinggalkan. Manakala bsoalan B3 pula 25 orang responden tidak bersetuju serta 20 orang responden setuju bengkel dalam keadaan yang selamat sebelum ditinggalkan. Disamping itu, bagi soalan B4, 30 orang responden tidak bersetuju dan hanya 10 orang responden setuju bahawa jarum diletakkan pada tempat asal selepas digunakan. Akhir sekali, bagi soalan B5 pula, 30 orang responden menyatakan memuaskan dan 10 orang responden sangat setuju bahawa kemalangan boleh berlaku akibat daripada jarum yang bertaburan.

Jadual 3: Analisis data keberkesanan di mana peratusan responden maklum balas selepas penggunaan *Needle Trap* dalam kalangan pelajar Sijil Vokasional Malaysia.

Soalan	Sangat Tidak Setuju	Tidak Setuju	Sederhana	Setuju	Sangat Setuju
	1	2	3	4	5
Soalan C1			5	5	50
Soalan C2			5	10	45
Soalan C3				10	50
Soalan C4				5	55
Soalan C5			10	40	10

Carta 2: Taburan bilangan dan peratus responden tentang maklum balas sebelum penggunaan *Needle Trap*



Berdasarkan Jadual 3 dan Carta 2 di atas, kebanyakan responden bersetuju dengan soalan yang dikemukakan dalam bahagian C ini mengenai keberkesanan selepas penggunaan *Needle Trap*. Keseluruhan responden sangat bersetuju bahawa dengan menggunakan *Needle Trap*. ini dapat membantu pelajar mengumpulkan jarum peniti yang bersepah di atas lantai serta meningkatkan aspek keselamatan dan kebersihan di bengkel.

Kesimpulan

Produk inovasi *Needle Trap* merupakan salah satu produk yang sangat membantu dalam mengatasi masalah dalam mengumpulkan jarum yang terjatuh semasa proses pengajaran dan pembelajaran amali di bengkel jahitan. Bahan yang digunakan semasa menghasilkannya adalah berkualiti dan semestinya akan menjadikannya satu produk yang tahan lama serta mempunyai jangka hayat penggunaan yang lebih tinggi. Penggunaan produk ini bukan hanya tertumpu pada warga Kolej Vokasional Dato' Undang Haji Muhamad Sharip sahaja sama ada guru dan pelajar, malahan turut digunapakai oleh guru-guru dari sekolah berhampiran serta pengusaha industri pembuatan pakaian di sekitar Daerah Rembau.

Pelbagai maklumat telah dihebahkan melalui perantaraan media sosial melalui aplikasi *Telegram*, *WhhatsApp, Instagram* dan sebagainya. Selain itu, penjualan produk secara walk in juga dijalankan bertujuan memperkenalkan produk inovasi kepada komuniti setempat yang merangkumi pengusaha industri pembuatan pakaian dalam usaha membantu memudahkan proses mengumpulkan jarum peniti yang terjatuh.

Konklusinya, *Needle Trap* merupakan satu produk yang sangat *membantu* dan dapat mengatasi masalah untuk mengumpulkan jarum peniti yang jatuh bertaburan di atas lantai serta tidak perlu menunduk semasa mengumpulkannya. *Needle Trap* sangat berpotensi untuk diperluaskan dan dipasarkan.

Pencapaian dan Anugerah

Antara anugerah yang diperolehi ialah:-

i. Tempat pertama Pertadingan Inovasi peringkat KV DUHMS.
ii. Anugerah khas video terbaik Pertandingan Inovasi peringkat KV DUHMS.
iii. Pingat perak Pertandingan Inovasi UPSI (Seminar Kebangsaan Pengajian Am 2022).
iv. Pingat emas Pertandingan Inovasi I3DC 2023.
v. Penyertaan Pertandingan IDEA 2023.

Rujukan

Abdul Rahman & Abdul Wahab, N. (2021). Pengetahuan Dan Pengamalan Keselamatan Bengkel Di Kalangan Pelajar Di Sebuah Institut Kemahiran Belia Negara Di Negeri Terengganu (Fakulti Pendidikan Universiti Tekologi Malaysia).

Abdul Rahman & Abdul Wahab, N. (2021). Pengetahuan Dan Pengamalan Keselamatan Bengkel Di Kalangan Pelajar Di Sebuah Institut Kemahiran Belia Negara Di Negeri Terengganu (Fakulti Pendidikan Universiti Tekologi Malaysia).

Akta Keselamatan dan Kesihatan Pekerjaan (1994). "Peraturan-peraturan Keselamatan dan Kesihatan Pekerjaan "(Jawatankuasa Keselamatan dan Kesihatan Malaysia).

Longley, S. (1969). Safety Education and Training, Safety on Construction Site. London: The Institution of Civil Engineering.

Tajuk : Kotak ilusi unjuran ortogon

Fatin Nasuha Mohd Razaki
Kolej Vokasional Muadzam Shah, Muadzam Shah, Malaysia
fatin.nasuha@moe.edu.my

Abstrak: Objektif utama penghasilan produk inovasi ini ialah pelajar dapat memahami konsep lukisan unjuran ortogon dengan lebih mudah dan dapat melukis objek menggunakan lukisan unjuran ortogon dari pelbagai arah pandangan dengan tepat. Produk ini mempunyai gabungan objek geometri tiga dimensi di dalamnya dan sebuah kotak lutsinar di luarnya untuk pelajar melakar lukisan unjuran ortogon daripada pelbagai arah pandangan. Penggunaaan produk ini dalam proses PdPc dapat meningkatkan kefahaman pelajar dalam topik Pelan dan Dongakan. Kesimpulannya, produk yang dihasilkan sangat membantu proses PdPc serta dapat menarik minat pelajar untuk mempelajari matematik terutamanya topik melibatkan objek tiga dimensi.

Kata Kunci: *Kotak ilusi unjuran ortogon; Bahan bantu mengajar; Tiga dimensi*

Pengenalan

Kotak Ilusi Unjuran Ortogon merupakan produk inovasi yang difokuskan untuk mata pelajaran matematik yang melibatkan objek tiga dimensi. Idea untuk menghasilkan Kotak Ilusi Unjuran Ortogon terhasil apabila terdapat pelajar menghadapi kesukaran untuk membayangkan bentuk tiga dimensi dan menukarkan kepada lukisan unjuran ortogon. Masalah yang dihadapi oleh guru ialah tidak mempunyai model yang sebenar untuk ditunjukkan kepada pelajar bagi Topik Bab 2 Pelan dan Dongakan, Matematik Tingkatan 5 Aliran Kemahiran. Masalah pelajar pula berpunca daripada kegagalan untuk membayangkan bentuk 3 dimensi dan menukarkan kepada lukisan unjuran ortogon. Kebanyakan bentuk- bentuk geometri yang diperkenalkan dalam bab ini ialah gabungan bentuk- bentuk geometri seperti silinder, kuboid, sfera dan piramid.

Justeru itu, kebanyakan pelajar yang tidak menguasai topik tersebut ialah pelajar yang mahir dalam matematik tetapi mereka kurang daya imaginasi terhadap bentuk-bentuk 3 dimensi yang tidak dihasilkan melalui prototaip atau bahan konkrit. Oleh itu, pelajar tersebut gagal untuk melukis lukisan unjuran ortogon dan kurang menguasai topik yang menggunakan objek-objek 3 dimensi. Oleh itu, Kotak Ilusi Unjuran Ortogon ini mempunyai gabungan objek geometri 3 dimensi di dalamnya dan sebuah kotak lutsinar di luarnya untuk pelajar melakar lukisan unjuran ortogon daripada pelbagai arah pandangan. Kemudian pelajar boleh melukis pelan tersebut di atas kertas yang disediakan. Penggunaan bahan konkrit di dalam produk ini dapat memberi ransangan dan kefahaman kepada pelajar untuk memahami bentu geometri objek tersebut sebelum melukis lukisan unjuran ortogon dari pandangan pelan, depan dan sisi.

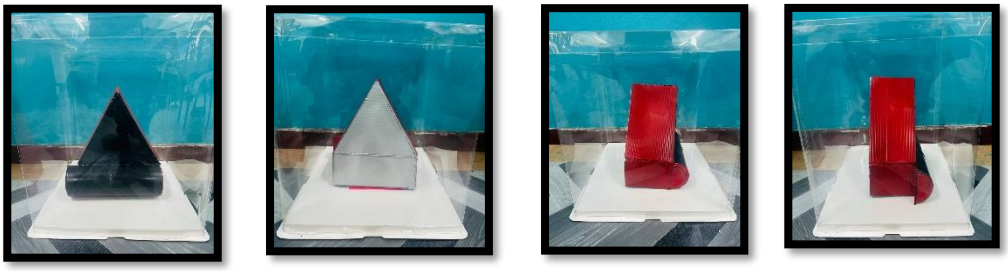
Deskripsi Produk

Proses penyediaan produk inovasi ini iaitu "Kotak Ilusi Unjuran Ortogon" dimulakan dengan membeli dan mencari peralatan- peralatan utama iaitu *board*, kotak lutsinar, bekas plastik silinder, pisau, gunting, gam, *Velcro tape* dan cat. Bahan-bahan ini dikumpulkan untuk proses pembinaan dijalankan.

Rajah 1: Peralatan atau bahan untuk penyediaan "Kotak Ilusi Unjuran Ortogon"

Proses pembinaan produk inovasi ini terbahagi kepada dua iaitu pembinaan objek yang berbentuk geometri yang mengandungi bentuk kuboid, segi tiga dan silinder sebagai model. Ketiga-tiga bentuk 3 dimensi ini digabungkan menggunakan gam sehingga membentuk satu objek yang berbentuk geometri yang berstuktur.

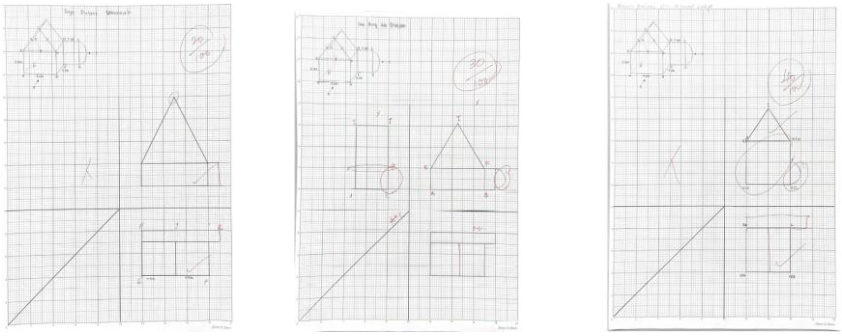
Pembinaan kedua ialah pembinaan kotak ilusi yang berbentuk segi empat sama menggunakan kotak lutsinar. Seterusnya, objek yang berbentuk geometri tersebut akan dilekatkan di dalam kotak lutsinar menggunakan "velco tape" untuk memastikan ianya tidak bergerak. Penggunaan " velco tape" juga adalah untuk memudahkan jika ingin meletakkan objek yang berbentuk geometri yang lain untuk projek seterusnya.



Rajah 2: Kotak Ilusi Unjuran Ortogon yang telah siap dibina

Hasil & Perbincangan

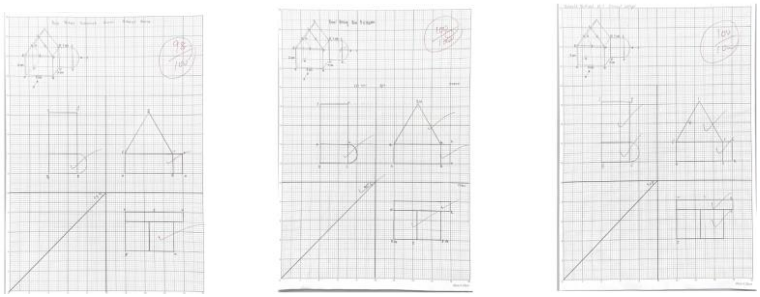
Latihan Pra untuk topik Unjuran Ortogon telah diberikan kepada pelajar sebelum perlaksanaan projek inovasi ini bagi menilai pengetahuan sedia ada pelajar terhadap topik Bab 2 Pelan dan Dongakan.



Rajah 3: Markah latihan pra

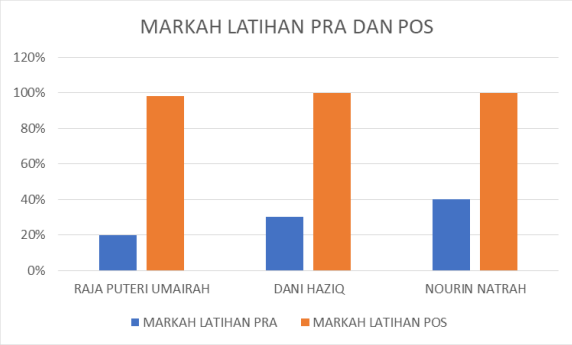
Rajah 3 menunjukkan markah Latihan Pra bagi pelajar 2 SLDN. Raja Puteri Umairah memperoleh 20%, Dani Haziq mendapat 30%, dan Nourin Natrah mendapat markah 40%.

Setelah mendapat keputusan markah latihan pra pelajar, projek inovasi "Kotak Ilusi Unjuran Ortogon" ini dilaksanakan kepada pelajar yang didapati mendapat markah terendah. Oleh itu, pelajar yang terpilih sahaja yang dijadikan peserta kajian untuk melihat keberkesanan projek inovasi ini. Kemudiannya, latihan pos dijalankan selepas perlaksanaan kepada pelajar untuk membuat perbandingan markah latihan pra dan pos.



Rajah 4: Markah latihan pos

Berdasarkan Rajah 4, ketiga-tiga pelajar menunjukkan peningkatan markah dalam latihan pos yang diberikan. Ini menunjukkan peningkatan kepada pencapaian pelajar dalam memahami konsep unjuran ortogon dan melukis objek geometri menggunakan lukisan unjuran ortogon dari pelbagai arah pandangan dengan tepat.



Rajah 5: Markah latihan pra dan pos

Berdasarkan Rajah 5, markah latihan pra dan pos, terdapat perbezaan yang ketara dalam markah antara sebelum dan selepas projek inovasi ini diperkenalkan. Hal ini menunjukkan bahawa pencapaian kepada objektif projek inovasi yang kedua iaitu pelajar memahami konsep lukisan unjuran ortogon dan yang ketiga iaitu pelajar dapat melukis objek menggunakan lukisan unjuran ortogon dari pelbagai arah pandangan dengan tepat. Objekif yang pertama dapat dilihat melalui pemerhatian iaitu pelajar seronok melukis unjuran ortogon bagi objek geometri tersebut pada kotak ilusi. Ini menunjukkan pencapaian yang baik kepada ketiga-tiga objektif dalam perlaksanaan projek inovasi ini.

Refleksi penggunaan projek inovasi yang telah diperkenalkan ini diakui mempunyai kekuatan dan kelemahan tersendiri. Kekuatan utama kaedah ini ialah dapat memberi semangat dan menarik minat pelajar untuk mempelajari subjek matematik terutamanya topik-topik yang melibatkan objek 3 dimensi. Temu bual bersama peserta kajian telah menunjukkan bahawa mereka seronok dan gembira mempelajari Bab 5 Pelan dan Dongakan menggunakan "Kotak Ilusi Unjuran Ortogan".

Kesimpulan

Kesimpulannya, produk yang dihasilkan sangat membantu proses PdPc serta dapat menarik minat pelajar untuk mempelajari mata pelajaran matematik terutamanya topik yang melibatkan objek 3 dimensi. Berdasarkan peningkatan tahap minat dan pencapaian pelajar yang meningkat dalam topik Pelan dan Dongakan, terdapat cadangan penambahbaikan yang boleh dilakukan kepada projek inovasi 'Kotak ilusi Unjuran Ortogon" ini iaitu mempelbagaikan bentuk geometri 3 dimensi di dalam kotak ilusi agar dapat memperbanyakkan latihan melukis lukisan unjuran ortogon kepada pelajar.

Rujukan

Noraini Ahmad. (2003). *Menguatkan Ingatan.* Muat turun pada 14 Dis 2023 https://www.google.com.my/books/edition/Menguatkan_ingatan/CDd4cR6nrVcC?hl=en&gbpv=0

Salhah Abdullah. (2009). *Kecerdasan Pelbagai*. Kuala Lumpur:PTS Professional Publishing Sdn Bhd.

Shahril @ Charil Marzuki, & Habib Mat Som. (1999). *Isu Pendidikan di Malaysia, Sorotan dan Cabaran*. Kuala Lumpur: Utusan Publications & Distrutions Sdn. Bhd.

Yong, L.M.S., & Biramiah, K. (1996). Dalam *Guru Yang Kreatif: Isu-Isu Teorikital dan Aplikasi Praktikal.* Kuala Lumpur: Arenabuku Sdn. Bhd.

Kembangan: Kaedah Mickey Mouse

Sariah binti Chole, Raja Norhaliza binti Raja Ismail, Fatma Nur Liyana binti Alluwi, Nurul Najwa binti Mohd Shukri
Kolej Vokasional Setapak, Kuala Lumpur, Malaysia

sariah5560@gmail.com, rajaeija@gmail.com, nana.alluwi91@gmail.com, najwamath91@gmail.com

Highlights:
The Mickey Mouse method can help students form quadratic expressions correctly and accurately while learning in a relaxed atmosphere. Through the pre and postal tests that were done, it was clear that this method taught to the experimental group showed a greater mean increase in scores (4.0) compared to the control group which had a mean increase in scores of 1.46. The rank test also showed that the experimental group received a total positive rank of 4083 compared to the control group of 3379. This method is also especially suitable for the skill of multiplication of two complex numbers.

Key words: Formation of quadratic expression; product of two complex numbers

Introduction

According to Rusita & Effandi, 2016, students consider the method of multiplying two expressions to be quite difficult to master. This is because students are weak in multiplication skills and are often confused to form a multiplying process especially those involving two expresions with negative sign. Usually students often think that algebraic expressions are not only difficult but they are also an uninteresting and boring topic. This is often because most concepts for algebraic expressions involve many abstract concepts.

The objective of this innovation is to help students form quadratic expressions correctly and accurately while learning in a fun environment. This skill is also required by students when making multiplication of two complex numbers.

Product Description

This method is originally comes from FOIL method.

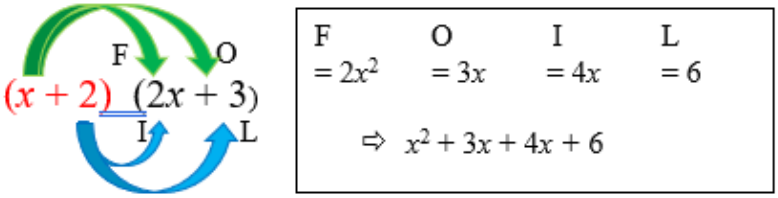


Figure 1: Expansion using FOIL method

Using the FOIL method, students are not aware of the existence of like terms that need to be summarized. Students are also often careless with negative signs when expressions involve minus operations. Therefore, the obtained quadratic expression is incorrect.

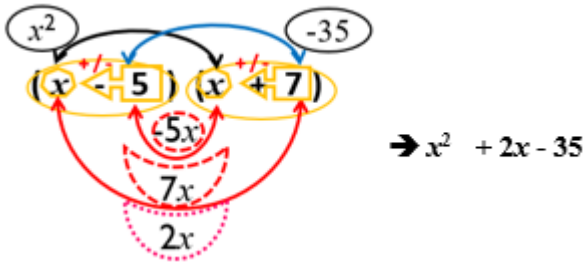


Figure 2: Expansion using Mickey Mouse method

Figure 2 shows the latest material for Mickey Mouse method. Before, we just used tongue area, then we add in pupil. Now we changed the tongue with nose, mouth and chin.

When using the Mickey Mouse method, the position of the curves is arranged so that it resembles the face of Mickey Mouse. Students easily notice like terms on the nose and mouth area. Thus, the chin area is the sum of the nasal area and the oral area. Two things that need to be emphasized to students which are

a) Write both expressions in a same order. For example (x + 5)(x – 1) or (5 + x)(-1+ x). This is to avoid the position of like terms located in the ear area.
b) Write the '+' or '-' operation sign on the arrow area so they don't forget the sign for the second term they need to multiply.

When the Mickey Mouse method is used to multiply two complex numbers, the ear area gives a real part while the chin gives the imaginary part.

During lesson in class, teacher will show the method using teacher material. Then students will be given materials for students as well as the list of questions so they can discuss in groups. There are four level of questions. Students have to answer all the questions correctly from the lowest level before the can proceed to the next level.

To make it easier for students to remember the steps in the application of this method, bookmark is given to each student. On the front page of the bookmark displays the curves that need to be multiplied as well as the chin area that needs the addition of the nose and mouth. On the back page, a QR Code is provided for a YouTube link for students to see a video regarding this method.

Results & Discussion

Pre and post test were conducted in our college. Eight classes of semester 1 students were randomly divided into two groups, Experimental group and Control group. Four classes of students in the experimental group were taught by using Mickey Mouse method but not for control group. Both tests consist of 5 questions with total of 10 marks.

Table 1: Wilcoxon test results for comparison of pre-test with post-test between the control group and the experimental group.

Test	Group	N	Mean	Standard deviation
Pre	Control	110	5.05	3.57
	Experimental	103	3.50	3.18
Post	Control	110	6.51	2.68
	Experimental	103	7.50	2.51

Table 1 shows that the mean for the Control group has increased from 5.05 marks to 6.61 marks (an increment of 1.46 marks). The Experimental group however shows an increment of 4.00 marks, from 3.50 marks in the pre test to 7.50 marks in the post test.

Table 2: Rank test of pre-test with post-tests.

Ranks

		N	Mean Rank	Sum of Ranks
Control Pre – Control Post	Negative Ranks	22	32.52	715.50
	Positive Ranks	68	49.70	3379.50
	Ties	20		
	Total	110		
Experimental Pre - Experimental Post	Negative Ranks	6	17.17	103.00
	Positive Ranks	85	48.04	4083.00
	Ties	12		
	Total	103		

Table 2 shows that the number of students who got increment in their marks for Experimental group is higher (85 students with total sum of ranks = 4083.00) than the Control group (68 students with total sum of ranks = 3379.50). On the contrary, the number of students who got decrement in their marks for Experimental group is less (6 students with total sum of ranks = 103.00) than for Control group (22 students with total sum of ranks = 715.50)

Conclusion

The use of the Mickey Mouse method has successfully stimulated students to explore and master the topics studied. To that end, this method needs to be widely spread to teachers and students especially secondary schools. The bookmark preparation may be provided by the supplier so that it is of better quality.

Publication, Award and Intellectual Property

1. Silver Award – Pertandingan Inovasi PdPC Stem Maya 2020
2. Silver Award – International Science and Social Science Innovation Competition (i-SIC V)
3. Gold Award - Innovation Competition GVoc 2023

References

Abdullah,M. F. N. L., Low, C. P., & Dollah, M. U. (2016). Pembinaan instrumen penilaian kendiri pembelajaran algebra Tingkatan Empat. Jurnal Pendidikan Sains dan Matematik Malaysia (JPSMM UPSI), 6(2), 54-68

Adam, N. A., & Halim, L. (2019). Cabaran pengintegrasian pendidikan STEM dalam kurikulum Malaysia. Seminar Wacana Pendidikan, September, 1–10

Aleksandra B., Ruzica Z.P., Anja G., Bojana A., & Dragana M.P. (2021), Creativity in Teaching Math To Students With Intellectual Disabilities. International Journal for Innovation Education and Research, Vol. 9 No.6

Alshatri, S. H., Wakil, K., Jamal, K., & Bakhtyar, R. (2019). Teaching aids effectiveness in learning mathematics. International Journal of Educational Research Review, 4(3), 448-453.

Basic, A. (2021) Creativity In Teaching Math To Students With Intellectual Disabilities. International Journal for Innovation Education and Research. 9(6), 1-6

Castro, S. (2017). Algebra Tiles Effect on Mathematical Achievement of Students with Learning Disabilities. Master thesis, California State University.

Egodawatte, G. (2011). Secondary School Students' Misconceptions in Algebra. Tesis Doktor Falsafah, University of Toronto.

Garderen, D. Van. (2006). Spatial visualization, visual imagery, and Mathematical problem solving of students with varying abilities. Journal Of Learning Disabilities, 39(6), 496–506.

Garzón, J., & Bautista, J. (2018). Virtual algebra tiles: a pedagogical tool to teach and learn algebra through geometry. Journal of Computer Assisted Learning, 34(6), 876–883.

Hidayat. (2019). Pengaruh media Komik terhadap hasil belajar matematika siswa pada materi persamaan linear satu variabel di kelas VII MTS Al-Ittihadiyah di desa Percut (Doctoral dissertation, Universitas Islam Negeri Sumatera Utara).

Jeannine E. Turner, Banban Li, Maipeng Wei, (2021). Exploring effects of culture on students' achievement motives and goals, self-efficacy, and willingness for public performances: The case of Chinese students' speaking English in class, Learning and Individual Differences, Volume 85,

Jubri, N. Z. M., Zakaria, E., & Matore, M. E. M. (2020). Penggunaan Teknik Jubin Algebra Dalam Penguasaan Kemahiran Pendaraban Ungkapan Algebra Bagi Pelajar Tingkatan 2. Jurnal Dunia Pendidikan, 1(3), 74-88.

Jumadi, J. (2018). Peranan Motivasi Belajar Matematika, Persepsi Terhadap Pelajaran Matematika, dan Tingkat Pendidikan Orang Tua Terhadap Prestasi Belajar Matematika. AKSIOMA: Jurnal Matematika dan Pendidikan Matematika, 9(1), 54-68.

Kanapathy, G. A. (2016). Kemahiran visualisasi dalam mata pelajaran matematik dalam kalangan murid tahun 5 di sebuah SJKT daerah Kuala Muda Yan, Kedah. International Seminar on Generating Knowledge Through Research. UUM-UMSIDA, 1 Oktober

Kribbs, E. E., & Rogowsky, B. A. (2016). A review of the effects of visual-spatial representations and heuristics on word problem solving in middle school Mathematics. International Journal of Research in Education and Science (IJRES), 2(1), 65–74

Maslinah Lasiun & Effandi Zakaria. (2017). Kaedah Visualisasi Meningkatkan Tahap Pencapaian Pelajar Dalam Menyelesaikan Masalah Matematik Berayat. 1st Melaka International Conference On Social Sciences 2017. Melaka, 29-30 Julai.

Myer, A., & Hensen, C. (2006). Experimental Psycology. (6, Ed.) California: Thomson Wadsworth

Nooraini Idris, (2013). Penyelidikan Dalam Pendidikan Matematik. Kuala Lumpur: Utusan Publications & Distributors.

Nor'ain Mohd. Tajudin (2015) Mathematical Knowledge And Higher Order Thinking Skills For Teaching Algebraic Problem Solving. Proceedings of SOCIOINT15- 2nd International Conference on Education, Social Sciences and Humanities, 8-10 June 2015-Istanbul, Turkey, ms. 26-35, ISBN: 978-605-64453-3-0.

Nor'ain Mohd Tajudin, Marzita Puteh, Mazlini Adnan, Mohd Faizal Nizam Lee Abdullah & Amalina Ibrahim (2015). Persepsi dan amalan pengajaran guru Matematik dalam penyelesaian masalah algebra. Jurnal Pendidikan Sains & Matematik Malaysia, 5(2), 12–22.

Nur Zila M. J., Effandi Z., Mohd Effendi, (2020), Penggunaan Teknik Jubin Algebra Dalam Penguasaan Kemahiran Pendaraban Ungkapan Algebra Bagi Pelajar Tingkatan 2. Jurnal Dunia Pendidikan. Vol. 1, No. 3

Omar, M. S., Saad, N. S., & Dollah, M. U. (2017). Penggunaan bahan bantu mengajar guru matematik sekolah rendah. Jurnal Pendidikan Sains & Matematik Malaysia, 7(1), 32-46

Othman Mohamed. (2001). Penulisan Tesis Dalam Bidang Sains Sosial Terapan. Serdang: Universiti Putra Malaysia.

Ramdhani, S. (2018). Variasi cara pembelajaran persamaan linear satu variabel. Prosiding Seminar Nasional Matematika dan Pendidikan Matematika (SNMPM) ,2(1), 262-275

Rusiman, M. S., Mohamad, M., Him, N. C., Kamardan, M. G., Othaman,S., Shamshuddin, M. H., Samah, M., & Aziz, N. (2017). The use of concrete material in teaching and learning mathematics. Journal of Engineering and Applied Sciences, 12(8), 2170- 2174

Rusita Mohd Nor & Effandi Zakaria (2016). Meningkatkan kemahiran pelajar dalam pendaraban ungkapan algebra melalui penggunaan teknik 'Kotak Ajaib Algebra'. Seminar Antarabangsa Pendidikan Global IV. Selangor, 8-9 Ogos.

Smaldino, S. E., Lowther, D. L., & Mims, C. (2018). Instructional Technology And Media For Learning (12th Edition). Boston: Pearson Education Inc.

Smith, Jonathan, Fanny-Alexandra Guimond, Julie Bergeron, Jérôme St-Amand, Caroline Fitzpatrick, and Mathieu Gagnon. (2021). "Changes in Students' Achievement Motivation in the Context of the COVID-19 Pandemic: A Function of Extraversion/Introversion?" Education Sciences 11, no. 1: 30. https://doi.org/10.3390/educsci11010030

Model O.P.I (Model Objek Pusat Imej)

Nurhafizah binti Zaidi1 Azmeer bin Sharingat2, Siti Hajar binti Salikan3, Aslam bin Hud4, Mohamad Raziq Syahmi bin Rosdi5
Kolej Vokasional Pasir Gudang
jha1004@moe.edu.my

Abstrak: Model O.P.I membantu meningkatkan minat murid terhadap topik putaran. Putaran merupakan subtopik bagi Matematik Sijil Vokasional Malaysia (SVM) Semester 3. Kebanyakan murid lemah dan sederhana sukar untuk menguasai subtopik ini. O.P.I merujuk kepada Objek, Pusat, Imej yang digunakan sebagai kaedah pantas untuk murid mengenal pasti imej bagi objek apabila diberi pusat putaran dengan hanya menggunakan kertas dan pensel. Ia diaplikasi bagi memastikan murid dapat menyelesaikan soalan bagi subtopik berkaitan. Dapatan daripada Ujian pra dan ujian pasca yang dijalankan ke atas 10 murid telah menunjukkan julat skor meningkat sebanyak 70%. Dapatan menunjukkan kemahiran murid meningkat dalam menentukan imej bagi putaran 90^0.

Kata kunci: Putaran ; Imej ; Objek

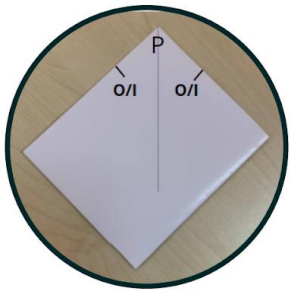
Pengenalan

Model O.P.I merupakan singkatan bagi Objek, Pusat, Imej. Model ini dibina menggunakan kertas berbentuk segi empat. Penggunaan model ini difokuskan kepada topik putaran. Dalam subtopik putaran, ketiga-tiga istilah objek, pusat dan imej terlibat dalam menentukan imej bagi suatu putaran 90 darjah. Penggunaan model ini merupakan kaedah pantas dalam menyelesaikan soalan melibatkan penentuan imej bagi putaran 90 darjah apabila diberi pusat putaran. Kaedah ini sangat membantu pelajar lemah dan sederhana untuk meningkatkan prestasi pelajar dalam Penilaian Akhir Sijil Vokasional Malaysia.

Huraian Produk

Model O.P.I merupakan singkatan bagi Objek, Pusat, Imej. Model ini dibina menggunakan kertas berbentuk segi empat. Penggunaan model ini difokuskan kepada topik putaran. Dalam subtopik putaran, ketiga-tiga istilah objek, pusat dan imej terlibat dalam menentukan imej bagi suatu putaran 90 darjah. Dalam pemerhatian yang dibuat semasa Pembelajaran dan Pemudahcaraan (PdPc), murid tidak menunjukkan minat dalam mata pelajaran Matematik. Tambahan itu, murid dilihat mengalami kesukaran memahami subtopik putaran kerana tidak mengusai dan sukar mengingati teknik penentuan imej yang kompleks.

Bahan yang digunakan adalah kertas berbentuk segi empat. Bahagian bucu kertas dilabel sebagai 'P', sisi kertas kiri dan kanan dilabel sebagai 'O' dan 'I' masing-masing. Tiada kos dalam penghasilan model ini. Bahan yang digunakan juga merupakan bahan kitar semula. Gambaran model adalah seperti berikut :



Berikut merupakan kaedah penggunaan model :

1. Ambil sehelai kertas dan tulis 'P' di bucu kertas tersebut.
2. Lipat kertas di tengah 'P' sehingga sisi bertemu sisi.
3. Lihat pada soalan, tentukan pergerakan putaran (lawan jam atau arah jam). Tandakan anak panah pergerakan putaran objek.
4. Bucu 'P' diletakkan pada pusat putaran dan berada di atas arah anak panah pergerakan putaran.
5. Laraskan sisi kertas itu selari antara pusat, P dan objek.
6. Tandakan dengan pensel pada bahagian kertas yang menyentuh titik objek dan dilabel dengan 'O'.
7. Kertas dilipat pada sisi bertanda dan pastikan bucu 'P' bertemu pada garisan tengah lipatan sehingga membentuk segi tiga sama kaki.
8. Tanda lipatan dengan pen pada sisi bertentangan dengan 'O' dan dilabel dengan 'I'.
9. Ambil kertas itu dan letakkan bucu kertas yang bertanda P pada pusat,P di atas satah Cartes.
10. Laraskan kertas supaya titik 'P' bertemu pusat dan titik 'O' bertemu dengan objek. Tandakan imej selari dengan 'I'.
11. Tentukan koordinat bagi imej. Ulang langkah yang sama untuk menentukan imej/objek bagi bucu yang lain.

Model inovasi ini dilaksanakan berdasarkan 5 fasa untuk memastikan keberkesanan penggunaannya dalam membantu pelajar menyelesaikan soalan melibatkan putaran.

Fasa 1 : Tinjauan Awal

Dalam sesi pembelajaran dan pemudahcaraan (PdPc) melibatkan bahan bantu mengajar adalah penting bagi memastikan murid memahami konsep matematik dengan mudah dan berkesan. Selain itu, murid juga lebih menunjukkan minat untuk belajar jika dalam melalui proses pembelajaran secara 'hands on'. Bagi subtopik putaran, mempunyai bahan bantu belajar dapat memudahkan pelajar untuk menentukan imej suatu putaran 90o.

Fasa 2 : Sesi Input

Sesi input dilaksanakan dalam kelas seperti mana yang terdapat dalam buku panduan/modul yang disediakan. Murid diberi penerangan tentang konsep putaran mengikut arah jam atau melawan jam selain mengenal pasti koordinat bagi titik objek dan pusat putaran. Seterusnya murid diperkenalkan dengan beberapa teknik yang biasa digunapakai dalam penentuan imej suatu putaran.

Fasa 3 : Pelaksanaan Ujian Pra

Murid diberikan lima (5) soalan melibatkan putaran 90 darjah dan diminta menjawab soalan secara individu berdasarkan kepada sesi input yang dilaksanakan sebelumnya. Bilangan soalan yang dijawab betul dan masa menjawab dicatatkan.

Fasa 4 : Pelaksanaan Inovasi

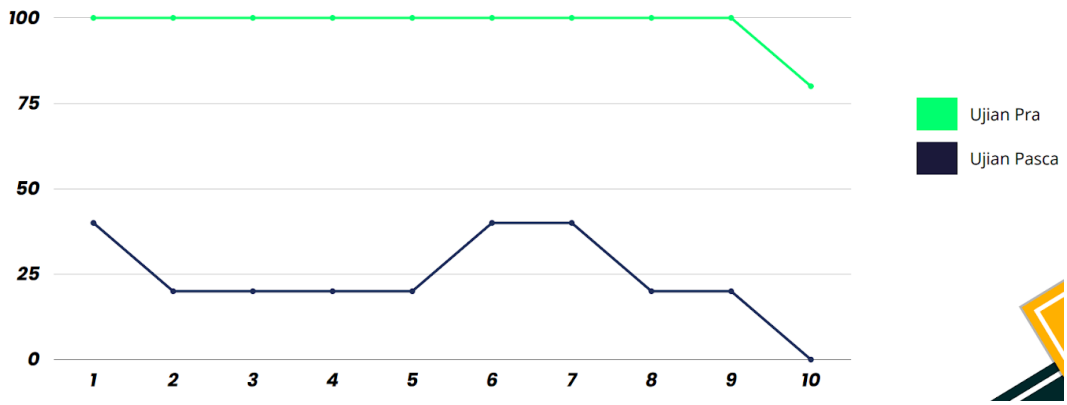
Murid diberi penerangan tentang kaedah penggunaan inovasi terhadap beberapa soalan melibatkan putaran 90 darjah.

Fasa 5 : Pelaksanaan Ujian Pasca

Ujian pasca dilaksanakan berdasarkan kepada 2 aspek iaitu bilangan soalan yang dijawab betul dan masa digunakan untuk menjawab soalan dicatatkan. Perbandingan antara ujian pra dan pasca dibuat.

Dapatan & Perbincangan

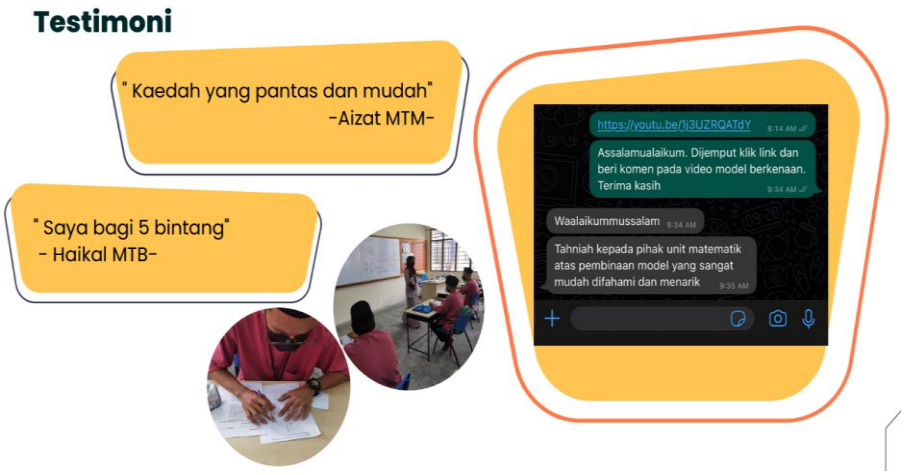
Graf 1 : Perbandingan Skor Ujian Pra dan Ujian Pasca



Berdasarkan analisis data daripada ujian pra dan pasca yang dijalankan, didapati bahawa murid menunjukkan minat dan menguasai konsep putaran dengan mudah. Bukan itu sahaja, murid juga dapat menentukan imej bagi putaran 90 darjah dengan cepat. Berikut adalah perbandingan skor murid dalam ujian pra dan ujian pasca yang dijalankan. Julat purata skor murid menunjukkan peningkatan sebanyak 70 % berbanding sebelum ujian pasca dijalankan.

Model O.P.I turut mendapat maklum balas positif daripada murid dan guru. Berikut merupakan petikan dan tangkap layar yang diperoleh sebagai bukti produk inovasi ini mencapai objektifnya.

Rajah 1: Maklumbalas melalui tangkap layar terhadap inovasi yang dilaksanakan



Produk inovasi ini telah dibuat secara digital bagi menyebarluas penggunaannya kepada pihak lain terutamanya murid serata dunia. Model O.P.I ini telah dimuat naik ke dalam pelantar *Youtube Channel*. Seperti sedia maklum, *Youtube* merupakan medium pembelajaran yang mesra pengguna bagi semua lapisan masyarakat. Berikut merupakan Kod QR dan pautan Model O.P.I :

Rajah 2: *QR Code* ke pelantar YouTube bagi Model O.P.I

Model O.P.I ini turut menerima penghargaan daripada pihak pengurusan kolej dan telah mendapat pengiktirafan di peringkat kolej.

Kesimpulan

Melalui penggunaan produk inovasi ini, murid dapat menguasai teknik menentukan imej bagi suatu putaran 90 darjah dengan mudah. Selain itu, model O.P.I juga dapat membantu meningkatkan prestasi markah Penilaian Akhir bagi mata pelajaran Matematik Semester 3 Sijil Vokasional Malaysia.

References

Kementerian Pendidikan Malaysia (KPM) (2020). Kurikulum Standard Kolej Vokasional (KSKV).

Ng. Seng How, Neo Geok Kee, Goh Jia Haur (2020). Buku teks Matematik Tingkatan 5. Penerbitan Pelangi Sdn. Bhd.

Chiu Kam Choon, Vincent De Selva A/L Santhanasamy, Punithah Krishnan, Raja Devi Raja Gopal (2018). Buku Teks Matematik Tingkatan 3. Pustaka Yakin Pelajar Sdn. Bhd.

BBM: Susunan Elektron (Jadual Berkala Unsur Moden)

Faradiela Rumi, Syazana Ismail, Sartini Shafie, Aslina Aziz
Kolej Vokasional Kajang, Selangor, Malaysia[1,2,3,4]
g-50189268@moe-dl.edu.my[1], syazana1191@gmail.com[2], sartinishafie@gmail.com[3], aslina.aziz@gmail.com[4]

Abstrak: Segelintir pelajar subjek Sains Tahun 1 Sijil Vokasional Malaysia (SVM) mempunyai masalah dalam menvisuali lakaran dan susunan elektron unsur dalam kumpulan. Mereka memerlukan masa yang lebih lama untuk mewajarkan pendermaan dan penerimaan elektron untuk mencapai susunan yang stabil. Inovasi ini bertujuan untuk mengenal pasti kebolehgunaan bahan bantu mengajar (BBM) berdasarkan bidang Pendidikan Sains, Teknologi, Kejuruteraan, Seni dan Matematik (STEAM) dalam subjek sains Tahun 1 Sijil Vokasional Malaysia (SVM) tajuk Bab 7.0 Unsur dan Bahan. BBM: Susunan elektron dibina untuk membantu murid yang lemah melakar dan menulis susunan elektron unsur dalam kumpulan. Pelajar dibahagikan kepada kumpulan kecil pelbagai kebolehan dan dikehendaki menggunakan BBM tersebut sebagai latihan pengukuhan. Hasilnya, bahan bantu mengajar yang telah dibina mencapai tujuan, di mana para pelajar dapat mengaplikasikan disiplin STEAM untuk memupuk penyelesaian masalah yang kreatif, kolaborasi dan pemikiran kritis.

Kata kunci: Bahan bantu mengajar (BBM); Susunan elektron; Ion positif; Ion negatif; STEAM

Pengenalan

Melalui idea STEAM, BBM: Susunan Elektron diwujudkan untuk membantu dan memberi kefahaman yang mendalam kepada pelajar yang lemah dalam melakar dan menulis susunan elektron. Selain seni, konsep teknologi (T) dalam BBM yang dicipta seperti lembaran kerja secara langsung di mana pelajar boleh melihat soalan melalui pautan laman web yang disediakan. Pelajar diagihkan ke dalam kumpulan kecil dan melalui pengajaran dan pembelajaran secara kolaboratif dan koperatif, pelajar bertukar-tukar idea semasa perbincangan atau menyumbang kemahiran masing-masing dengan tujuan menyelesaikan masalah berkenaan susunan elektron. Guru membimbing pelajar di dalam kumpulan pelbagai kebolehan manakala pelajar bekerjasama membantu semasa sendiri (*peer-to-peer*) untuk lebih memahami sekaligus mewajarkan pendermaan dan penerimaan elektron untuk mencapai susunan elektron yang stabil. Pelajar juga boleh menggunakan sebarang kemudahan atau gajet untuk melayari laman web atau apa sahaja rujukan yang boleh membantu. BBM ini dapat memberi guru dan pelajar menggunakan masa yang diperuntukkan semasa kelas dengan berfaedah sepenuhnya kerana pelajar yang lemah memerlukan masa yang lama untuk pelajar melukis sendiri susunan elektron. Justeru, pelajar boleh mengaplikasikan konsep yang digunakan dalam BBM untuk menjawab soalan berkaitan.

Deskripsi Produk

Helaian bercetak saiz kertas A3 berlamina dengan soalan asas susunan elektron dan petala elektron.

Hasil Dapatan Projek

Pelajar boleh mewajarkan pendermaan dan penerimaan elektron untuk mencapai susunan elektron setelah berjaya melakar, menulis dan menjelaskan susunan serta pembentukan ion positif dan ion negatif unsur dalam kumpulan melalui pembelajaran kolaboratif dalam masa yang singkat.

Kesimpulan

Kesimpulannya, BBM yang berlandaskan prinsip STEAM dapat membantu pelajar mengikuti abad pembelajaran masa kini. Pembelajaran masa kini perlu sentiasa dimodifikasi agar lebih menarik agar pelajar dapat memupuk kaedah penyelesaian masalah yang kreatif, kolaborasi dan pemikiran kritis. Berdasarkan aplikasi BBM yang digunakan bersama pelajar, lukisan elektron boleh diganti menggunakan pelekat bulat berwarna-warni atau pelekat bercetak berlamina atau pompom yang dilekatkan bersama *Velcro dots*.

Rujukan

Bertrand, M. G., & Namukasa, I. K. (2020). STEAM education: student learning and transferable skills. Journal of Research in Innovative Teaching & Learning.

Noraini Abdullah, Nor Mazliana Abdul Hashim, Mohamad Amirul Adnan, & Shamsulikram Abdul Hamid. (2019). *Buku Teks Sains Tingkatan 4*. Selangor: Odonata Publishing Sdn. Bhd.

Tan, W.-L., Samsudin, M. A., Ismail, M. E., Ahmad, N. J., & Abdul Talib, C. (2021). Exploring the Effectiveness of STEAM Integrated Approach via Scratch on Computational Thinking. *Eurasia Journal of Mathematics, Science and Technology Education, 17*(12), em2049. https://doi.org/10.29333/ejmste/11403

Rak pintar merombak rawat enjin

Mohamad Izzat Bin Satar[1], Akmal Danish Bin Yussof[2], Muhammad Arif Muslih Bin Mustafa[3], Muhammad Husain Syah Bin Muhammad Syah Irrwan[4], Ikram Hakim Bin Faizul[5]
Kolej Vokasional Pasir Gudang, Johor, Malaysia[1,2,3,4,5]
m.izzatsatar@gmail.com[1,2,3,4,5]

Sorotan: Penilaian amali merupakan salah satu elemen yang dinilai di dalam kurikulum Kolej Vokasional. Sebelum pelajar dapat dinilai, pelajar perlu melaksanakan latihan amali bagi menguasai kaedah dan prosedur amali. Di dalam kursus Sistem Enjin Marin, pelajar perlu melakukan latihan amali merombak rawat enjin untuk penilaian mengikut ketetapan masa yang diberi. Namun begitu, hasil dari penelitian dan analisis data, kami mendapati hampir 80% (26 orang) pelajar gagal untuk melaksanakan amali dalam tempoh yang diberikan kerana pelajar sukar untuk mengingat komponen yang perlu dipasang semula mengikut susunan yang tepat. Justeru, satu inovasi produk telah dibina dan dinamakan sebagai Rak Pintar Merombak Rawat Enjin yang merupakan sebuah rak pintar bagi kegunaan semasa sesi latihan merombak rawat enjin. Rak ini dapat membantu pelajar mengingat dan menyusun komponen enjin dengan lebih teratur dan tempoh masa latihan amali merombak rawat enjin dapat dikurangkan.

Kata Kunci: Rombak rawat; enjin; amali; latihan; masa

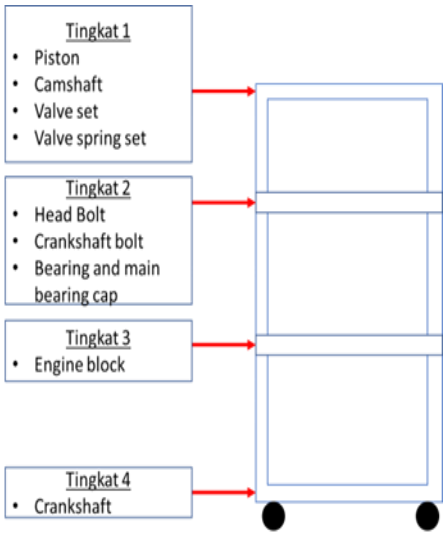
Pengenalan

Di dalam Dokumen Pentaksiran Standard Kompetensi Kolej Vokasional, pelajar perlu melaksanakan beberapa latihan amali mengikut kursus sebagai Penilaian Berterusan. Hal ini merupakan ketetapan yang telah ditetapkan oleh Lembaga Peperiksaan Malaysia. Bagi kursus Sistem Enjin Marin, pelajar perlu melaksanakan amali merombak rawat enjin mengikut tempoh masa yang telah ditetapkan. Namun begitu, pada setiap sesi latihan amali merombak rawat enjin, tempoh masa sesi latihan kerap menjadi panjang dari 2 jam kepada 3 hingga 4 jam setiap sesi. Hal ini kerana pelajar sukar mengenal pasti dan mengingat susunan dan silap memasang komponen enjin yang telah ditanggalkan. Masalah ini telah mengganggu sesi pengajaran dan proses kelancaran latihan.

Untuk mengatasi masalah tersebut, sebuah rak pintar merombak rawat enjin telah dibina. Objektif pembinaan rak pintar merombak rawat enjin ini adalah untuk:

i) Memudahkan pelajar menyusun dan mengingat komponen enjin yang telah ditanggalkan.
ii) Memasang komponen dengan mudah serta mengurangkan tempoh sesi latihan amali

Penerangan Produk



Rajah 1

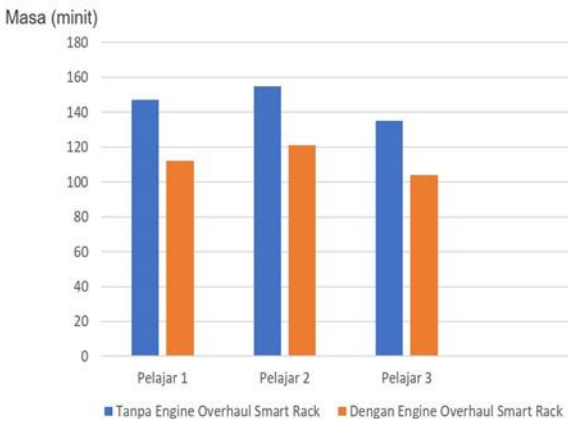
Rak Pintar Merombak Rawat Enjin dibina bermula dengan lakaran beberapa cadangan reka bentuk dan kemudian dipilih menggunakan alat analisis rajah pokok. Segala kelebihan dan kekurangan pada reka bentuk telah dikenal pasti dan akhirnya satu reka bentuk akhir telah dipilih seperti di dalam Rajah 1. Rak ini mempunyai 4 tingkat yang digunakan untuk meletak dan Menyusun komponen enjin yang telah ditanggalkan.

Rajah 2

Setiap tingkat mempunyai label bagi nama dan susunan komponen seperti *valve spring, piston, valve* dan lain-lain. Selain itu, rak ini juga direka dengan roda fleksibel bagi memudahkan pengguna untuk menolak atau menarik rak tersebut ke mana sahaja. Tidak seperti rekaan sedia ada yang hanya focus kepada bahagian *head* enjin sahaja, rak pintar ini direka dengan kelainan iaitu mampu untuk meletakkan semua komponen enjin dengan tersusun.

Uji lari produk telah dilaksanakan kepada tiga orang pelajar yang telah dikenal pasti dan mewakili 10% dari keseluruhan pelajar di dalam kelas. Uji lari dilakukan dengan menetapkan masa amali kepada 120 minit dan melalui dua kaedah iaitu tanpa rak pintar dan dengan menggunakan rak pintar

Keputusan & Perbincangan



Rajah 3

Berpandukan graf perbandingan di Rajah 3, ternyata dengan menggunakan Rak Pintar Merombak Rawat Enjin, masa sesi latihan amali telah menjadi lebih singkat, seragam dan mencukupi. Ini menjadikan sesi pembelajaran lebih lancar dan mengikut jumlah jam yang diperuntukkan. Justeru, inovasi ini telah mencapai matlamat dan objektif.

Kesimpulan

Sebagai kesimpulan, Rak Pintar Merombak Rawat Enjin telah direka bentuk dan diuji dan hasil dari pengujian telah menunjukkan bahawa masa sesi latihan dengan menggunakan rak pintar telah menjadi lebih singkat berbanding tanpa menggunakannya. Dengan menggunakan rak pintar ini akan dapat menyelesaikan masalah gangguan sesi pengajaran.

References

Binti Biden, N., Bin Kamin & Y. (2013). Implikasi Penjenamaan Semula Sekolah Menengah Vokasional (SMV) Kepada Kolej Vokasional (KV).

Gupta, R., Sharma, S., Gupta, S., & Gupta, D. (2019). Stackable smart footwear rack using infrared sensor. Journal of Computational and Theoretical Nanoscience, 16(10), 4232-4235.

Light Box

[1]Amerul Akmal, [2]Adam Rayyan, [3]Afif Danish, [4]Faizaan Hanif, [5]Zulfizz Farizz
[1,2,3,4,5]SMK Agama Bandar Penawar 81930 Kota Tinggi, Johor
[1] amerulfizik@yahoo.com

Highlights: Topik penambahan warna dalam silibus KSSM Sains merupakan salah satu topik yang memerlukan murid untuk mengingat dan mengenalpasti hasil tambah warna-warna primer iaitu merah, hijau dan biru. Berdasarkan kepada kajial awal terhadap ujian dan peperiksaan Sains tingkatan 1, terdapat permasalahan dalam kalangan murid-murid untuk memahami dan menggambarkan bagaimana penambahan warna ini berlaku secara sebenar. Tambahan lagi, berdasarkan kepada aktiviti di dalam kelas, murid-murid masih belum menguasai kemahiran tersebut. Justeru, Light Box ini dihasilkan bagi membantu murid-murid untuk melihat keadaan sebenar apabila warna tersebut ditambah. Inovasi yang menelan kos RM20.00 ini mempunyai kelebihan untuk menunjukkan keadaan sebenar apabila sesuatu warna ditambah. Hasilnya inovasi ini berjaya meningkatkan kefahaman murid terhadap topik penambahan warna tersebut.

Kata kunci: Penambahan Cahaya; Warna Primer; Warna Sekunder

Pendahuluan

Kemahiran mengingat dalam mata pelajaran Sains adalah sangat penting dalam mata pelajaran Sains Tingkatan 1. M. Kaviza (2019) telah menyatakan bahawa motivasi pelajar akan berkurangan sekiranya beban tugas dalam sesuatu mata pelajaran meningkat. Ini menyebabkan pelajar berasa cepat bosan dan tidak berminat dengan mata pelajaran tersebut. Selain itu, penyediaan radas untuk aktiviti ini adalah rumit dan memerlukan pelajar menyusun beberapa set radas untuk menjalankan aktiviti ini secara praktikal. Kebanyakan radas di makmal sentiasa rosak, tidak mencukupi dan tidak mesra pengguna.

Berdasarkan pemerhatian yang dibuat dalam bab ini, kami telah mengenal pasti bahawa murid menghadapi kesukaran untuk menyatakan warna asas dalam cahaya. Oleh itu, mereka juga sukar untuk menyatakan warna sekunder yang terbentuk daripada warna primer. Daripada jumlah keseluruhan murid seramai 29 orang, hanya 19 orang sahaja yang berjaya menyatakan warna primer dan warna sekunder dengan tepat manakala 10 orang murid masih pada tahap lemah, tidak dapat menyatakan warna primer, warna sekunder dan gabungan warna primer untuk membentuk. warna sekunder. Hasil jawapan pelajar apabila ditanya mengapa mereka masih tidak dapat mengenal pasti warna primer dan warna sekunder ialah "Saya tidak dapat mengingati warna primer dan warna sekunder" dan "Saya tidak menghafal gabungan warna primer untuk membentuk warna sekunder."

Analisis hasil latihan ulang kaji dalam kelas menunjukkan 10 orang pelajar menunjukkan statistik skor rendah dengan 0 markah daripada 5 markah keseluruhan bagi soalan. Ini menunjukkan tahap penguasaan topik ini berada dalam zon kritikal pelajar. Oleh itu, mereka harus diberi intervensi untuk meningkatkan penguasaan subtopik tersebut. Walaupun peralatan yang boleh digunakan untuk menjalankan aktiviti bagi subtopik tersebut, peralatan yang disediakan tidak lengkap menyebabkan aktiviti tersebut tidak dapat dijalankan. Pelajar hanya didedahkan dengan simulasi melalui tayangan video. Terdapat dua objektif inovasi:

1. Meningkatkan kefahaman murid tentang topik penambahan warna
2. Menarik minat pelajar terhadap mata pelajaran Sains

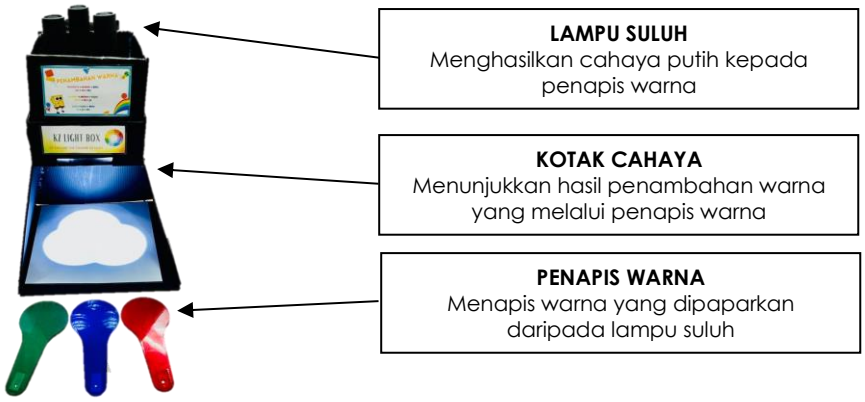
Deskripsi Produk

Idea asal untuk menghasilkan inovasi ini adalah daripada masalah kekurangan peralatan kotak cahaya yang terdapat di makmal sains. Selain itu, penciptaan inovasi ini tertumpu kepada pembentukan kemahiran murid menghafal penambahan warna primer dan sekunder.

Jadual 1: Kos Inovasi

No	Bahan	Harga Seunit (RM)	Kuantiti	Kos (RM)
1	Penapis Warna	2.10	1 set	2.10
2	Papan Plastik	6.90	1	6.90
3	Penyembur Warna	7.00	1	7.00
4	Gam	1.20	1	1.20
	JUMLAH			17.20

Seperti yang dijangkakan daripada kos di atas, inovasi ini akan dijual dalam harga RM25.00 dengan keuntungan sebanyak RM7.80 seunit. Harga jualan yang dijangkakan juga mungkin lebih rendah jika alat ini dihasilkan dalam kuantiti yang banyak.



Rajah 1: Rekabentuk dan fungsi inovasi

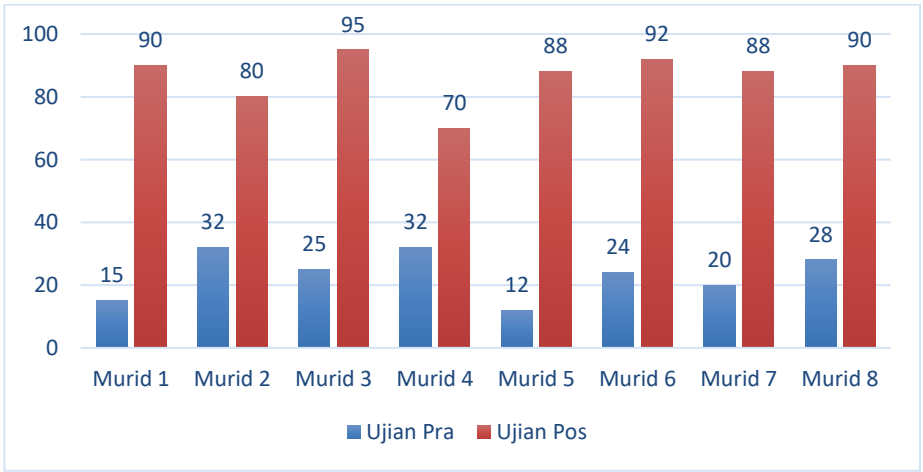
Bagaimana untuk menggunakan Light Box?

1. Hidupkan lampu suluh
2. Letakkan penapis warna dalam slot yang disediakanSee the color result on the display below the box

Rajah 2: Cara guna inovasi

Dapatann & Perbincangan

Berdasarkan analisis ujian pra dan pos di bawah menunjukkan peningkatan yang ketara dalam tahap pencapaian ujian pos berbanding ujian pra. Analisis juga menunjukkan bahawa semua pelajar menguasai lebih daripada 70% daripada keseluruhan 100% markah ujian.



Rajah 3: Analisis ujian pra dan pos

Bagi tujuan menilai keberkesanan penggunaan inovasi Light Box ini untuk meningkatkan kefahaman pelajar terhadap topik tambah warna, soal selidik penilaian projek telah dijalankan untuk melihat respon pelajar terhadap penggunaan inovasi tersebut.

Jadual 2: Soal selidik penggunaan inovasi

No	Soalan	Peratus
1	Inovasi Light Box boleh digunakan tanpa masalah teknikal.	100
2	Inovasi Light Box mudah digunakan oleh semua peringkat umur	100
3	Inovasi Light Box mudah diakses	100
4	Inovasi Light Box mampu memaparkan hasil penambahan warna dengan jelas dan realistik	100
5	Inovasi Light Box menggunakan reka bentuk yang mesra pengguna	100
6	Inovasi Light Box ini menjimatkan penggunaan elektrik	100
7	Inovasi Light Box mudah digunakan oleh pelajar di dalam kelas	100
8	Inovasi Light Box mudah dibawa ke mana-mana oleh pelajar	100

Berdasarkan jadual di atas, menunjukkan peratusan keseluruhan bagi semua soalan soal selidik penggunaan inovasi. Dapat dirumuskan secara keseluruhan bahawa responden bersetuju dengan semua soalan soal selidik dengan nilai peratusan yang sama iaitu 100% bagi setiap soalan. Kesimpulannya, semua responden bersetuju bahawa inovasi Light Box ini membantu dalam meningkatkan kefahaman pelajar tentang topik penambahan warna.

Kesimpulan

Penghasilan inovasi ini mampu meningkatkan tahap pencapaian pelajar dalam mata pelajaran Sains dan membentuk kemahiran pelajar dalam memahami kemahiran penambahan warna. Ini akan membantu menghasilkan lebih banyak inovasi untuk topik kritikal, terutamanya yang kurang dikuasai oleh pelajar. Selain itu, penghasilan inovasi ini juga secara tidak langsung dapat memberi implikasi kepada perkembangan kerja profesional seorang guru dalam mengintegrasikan strategi pembelajaran yang sesuai dalam proses pembelajaran berasaskan teknologi kini selaras dengan 6 aspirasi pelajar dalam PPPM 2013-2025. Inovasi ini berjaya membuktikan bahawa dengan mengintegrasikan penggunaan inovasi bersama elemen teknologi dapat menarik minat pelajar terhadap proses pembelajaran yang telah dilaksanakan dan seterusnya kepada mata pelajaran Sains.

Penerbitan, Anugerah dan Harta Intelek

International Invention, Innovation and Design 2023
Tarikh : 11 April 2023
Tempat : Online
Pencapaian : Gold Award
Peringkat : National

International Conference on Business Studies and Education 2022
Tarikh : 1 August 2022
Tempat : Online
Pencapaian : Champion
Peringkat : National

Rujukan

Avra Jumasha Refri Asih, Uli Wahyuni. (2019). Penggunaan Singkatan Dan Akronim Dalam Berita Kriminal Harian Tribun Jambi Pada Bulan Maret 2019. http://aksara.unbari.ac.id/index.php/aksara/article/view/128

M. Kaviza. (2019). Motivasi Intrinsik Dalam Kalangan Murid Tingkatan Empat Yang Mengambil Mata Pelajaran Sejarah. http://www.ijepc.com/PDF/IJEPC-2019-31-06- 18.pdf

Nur Aqilah Rozali dan Noor Dayana Abd Halim. (2020). Kesan Pembelajaran Berasaskan Inkuiri Dengan Integrasi Video Terhadap Pencapaian Pelajar Dalam Pembelajaran Matematik. http://161.139.21.34/itlj/index.php/itlj/article/view/42

Siti Hajar Taib, Mohd Azaharin Ismail dan Maimun Aqsha Lubis Abdin Lubis. (2019). INOVASI Kesepaduan Dan Strategi Pengajaran Dan Pembelajaran Di Era Revolusi Industri 4.0. https://spaj.ukm.my/acerj/index.php/acer-j/article/viewFile/50/50

Kaedah Think-Answer Station (TAS) dalam subjek Sains

Jesinta Macsie Jaimis
SMK Desa Wawasan, Tambunan, Sabah, Malaysia
Jesintamacie@gmail.com

Abstrak: Objektif utama kajian ini adalah untuk menerapkan eleman PAK-21, iaitu komunikasi, kolaboratif dan pemikiran kritis yang mana pembelajaran lebih berpusatkan pelajar. Kaedah *Think-Answer Station* (TAS) digunakan sebagai intervensi untuk kajian ini. Intervensi ini melibatkan seramai 37 pelajar daripada Tingkatan 4 dan 5 yang mengambil subjek Sains. Data dikumpulkan dengan menggunakan pemerhatian, temubual, dan analisis data yang dilaksanakan selama 3 bulan. Dapatan kajian menunjukkan bahawa pelaksanaan kaedah TAS ini dapat menggalakkan penglibatan pelajar yang lebih aktif, menggalakkan pelajar untuk berinteraksi dan berkolaborasi sesama rakan, menjana idea dan menyatakan pendapat sendiri serta meningkatkan kemahiran komunikasi pelajar.

***Kata Kunci*:** *Think-Answer Station* (TAS); pembelajaran abad ke-21; berpusatkan pelajar; Sains

Pengenalan

Pendidikan negara masa kini amat menekankan kepada Pembelajaran Abad ke-21 (PAK-21) yang memfokuskan kepada pembelajaran berpusatkan pelajar. Guru perlu mendidik pelajar untuk berjaya dalam masyarakat yang moden menggunakan kemahiran yang paling penting, iaitu kemahiran pemikiran kritis, kolaboratif, komunikasi dan penyelesaian masalah. Kemahiran ini akan membantu pelajar untuk menggunakan pola pemikiran yang baru, bekerja, dan hidup di dunia yang menggunakan aplikasi teknologi zaman moden (Liudmyla & Oksana, 2019). Oleh itu, penggunaan kaedah pengajaran dan pembelajaran abad ke-21 di dalam kelas adalah sangat penting dalam meningkatkan kemahiran abad ke-21 pelajar. Pelajar boleh mempelajari dan menguasai kesemua kemahiran ini semasa melakukan aktiviti pengajaran dan pembelajaran di dalam kelas.

Namun demikian, guru dan pelajar yang berada di luar bandar menghadapi beberapa kekangan dalam mengaplikasikan kaedah pengajaran dan pembelajaran abad ke-21, terutama sekali dari aspek akses kepada ICT dan internet. Guru mempunyai masalah dalam mengaplikasikan kaedah pengajaran dan pembelajaran abad ke-21 semasa sesi pengajaran dan pembelajaran di dalam kelas kerana tidak mempunyai instrumen untuk melaksanakannya di dalam kelas. Ini mengakibatkan pelajar menjadi pasif semasa sesi pengajaran dan pembelajaran di dalam kelas, walaupun kaedah pembentangan berkumpulan telah digunakan. Pelajar hanya mengharapkan guru semata-mata sebagai sumber utama bagi mendapatkan pengetahuan dan kemahiran. Ini menjadikan pembelajaran di kelas lebih kepada berpusatkan guru. Oleh itu, kaedah *Think-Answer Station* (TAS) telah digunakan sebagai salah satu intervensi untuk mengatasi isu ini.

Untuk melihat impak pelaksanaan aktiviti TAS dalam sesi pengajaran dan pembelajaran di dalam kelas, data dikumpulkan menggunakan pemerhatian, temubual tidak berstruktur, dan analisis dokumen yang merangkumi tugasan pelajar, rekod dalam borang point, rekod pencapaian dalam PBD, dan gambar sepanjang aktiviti ini dilaksanakan.

Prosedur

Aktiviti TAS ini dilaksanakan menggunakan 5 langkah, iaitu:

Langkah 1: Persediaan Stesen

Penjaga stesen dilantik oleh guru secara berkumpulan. Penjaga stesen yang dilantik terdiri daripada 2 atau 3 pelajar bagi setiap stesen. Kemudian, penjaga stesen akan membuat persiapan awal terlebih dahulu sebelum kelas untuk memahami topik yang diberi kepada stesen mereka. Jumlah stesen yang dilaksanakan dalam sesi pengajaran dan pembelajaran bergantung kepada topik dan masa PdP.

Langkah 2: Pelaksanaan Aktiviti

Guru memberi kad manila dan soalan (Rajah 2) kepada penjaga stesen yang mana soalan tersebut disediakan oleh guru sendiri. Pelajar lain menjawab soalan di stesen (Rajah 1). Jumlah soalan yang dijawab oleh pelajar lain bergantung kepada jumlah soalan yang diberikan kepada penjaga stesen.

Langkah 3: Pelajar Menjawab Soalan

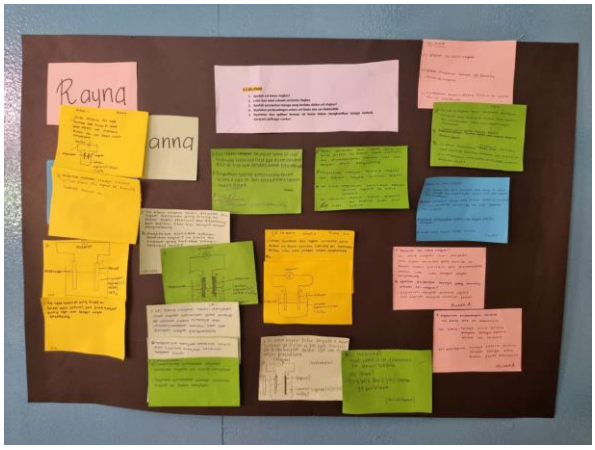
Masa yang diperuntukkan untuk pelajar menjawab soalan di stesen ialah 40 minit. Pelajar menulis jawapan dalam "*sticker note*" dan seterusnya menampal jawapan mereka di stesen.

Langkah 4: Pembentangan

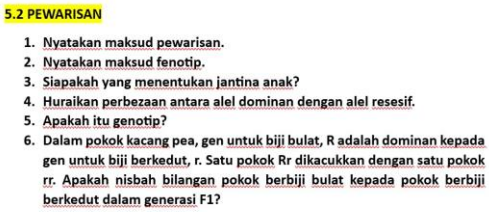
Penjaga stesen membaca soalan dan jawapan rakan dalam "*sticker note*" yang menjawab soalan tersebut. Soalan yang tidak dijawab oleh pelajar akan dijawab oleh penjaga stesen. Pelajar lain turut memberi komen dan pendapat mereka sendiri semasa penjaga stesen membentang.

Langkah 5: Penilaian dan Rumusan

Point diberi oleh penjaga stesen kepada pelajar yang menjawab dengan betul. Setiap jawapan yang betul diberikan 1 point. Point dicatat dalam borang Point (Rajah 3). Di akhir pembelajaran, penjaga stesen membuat rumusan keseluruhan dan guru akan memberi komen tambahan sekiranya perlu.



Rajah 1: Stesen untuk aktiviti TAS



5.2 PEWARISAN

1. Nyatakan maksud pewarisan.
2. Nyatakan maksud fenotip.
3. Siapakah yang menentukan jantina anak?
4. Huraikan perbezaan antara alel dominan dengan alel resesif.
5. Apakah itu genotip?
6. Dalam pokok kacang pea, gen untuk biji bulat, R adalah dominan kepada gen untuk biji berkedut, r. Satu pokok Rr dikacukkan dengan satu pokok rr. Apakah nisbah bilangan pokok berbiji bulat kepada pokok berbiji berkedut dalam generasi F1?

Rajah 2: Contoh soalan di stesen

NAMA STESEN: _____

TAJUK STESEN: _____

PENJAGA STESEN: _____

BIL.	NAMA	MARKAH (POINT)

* Satu soalan betul yang dijawab 1 point.
* Tiada soalan betul yang dijawab 0 point.
(*Point bergantung kepada jumlah soalan yang dijawab oleh pelajar*)

ULASAN PENJAGA STESEN:

_____
_____
_____
_____
_____
_____
_____

Rajah 3: Borang Point

Keputusan dan Perbincangan

Secara keseluruhannya, pelaksanaan aktiviti ini tidak melibatkan kos yang tinggi, mudah digunakan, penyediaan yang mudah, dan tidak mengambil masa yang lama. Bahkan, pelaksanaan aktiviti ini semasa sesi pengajaran dan pembelajaran dalam kelas lebih kepada berpusatkan pelajar yang mana turut menekankan Kemahiran Berfikir Aras Tinggi (KBAT). Tambahan lagi, elemen PAK-21, iaitu kemahiran komunikasi, kolaboratif dan pemikiran kritis berjaya diterapkan melalui aktiviti TAS ini.

Selain itu, impak pelaksanaan aktiviti TAS ini turut melibatkan pelajar dan guru. Dari aspek pelajar, pelaksanaan aktiviti TAS ini terbukti dapat menggalakkan penglibatan pelajar yang lebih aktif, menggalakkan pelajar untuk berinteraksi dan berkolaborasi sesama rakan, pelajar dapat menjana idea dan menyatakan pendapat sendiri serta dapat meningkatkan kemahiran komunikasi pelajar. Pengaplikasian aktiviti TAS ini semasa sesi pengajaran dan pembelajaran di dalam kelas membantu meningkatkan kemahiran pembelajaran abad ke-21 pelajar. Aktiviti TAS membantu guru melaksanakan sesi pengajaran yang melibatkan kaedah pengajaran dan pembelajaran abad ke-21 di dalam kelas. Menurut Joseline M Santos (2017), disebabkan kekurangan instrumen di sekolah, guru mempunyai masalah untuk mengaplikasikan kaedah pengajaran dan pembelajaran abad ke-21 di dalam kelas sehingga tidak dapat menyampaikan topik pembelajaran yang sepenuhnya kepada pelajar. Ini menyebabkan pelajar tidak dapat menguasai kemahiran abad ke-21, iaitu pemikiran kritis, komunikasi, kolabortif, dan penyelesaian masalah dengan baik.

Aktiviti TAS ini boleh dijadikan sebagai salah satu instrumen untuk membantu guru dalam mengaplikasikan kaedah pengajaran dan pembelajaran abad ke-21 di dalam kelas dengan lebih efektif. Selain itu, aktiviti TAS turut digunakan sebagai salah satu instrumen penilaian PBD. Menurut Bahagian Pembangunan Kurikulum (2018), Pentaksiran Bilik Darjah (PBD) ialah penilaian berterusan yang membolehkan guru mengumpul maklumat tentang perkembangan,

kemajuan dan penguasaan pelajar terhadap Standard Kandungan dan Standard Pembelajaran yang ditetapkan dalam Dokumen Standard Kurikulum dan Pentaksiran (DSKP) bagi setiap mata Pelajaran. Melalui aktiviti ini, didapati tahap penguasaan pelajar dalam PBD menunjukkan peningkatan yang baik. Malah, sukatan pelajaran subjek juga dapat dilaksanakan seiring dengan RPT melalui pelaksanaan aktiviti TAS ini.

Kesimpulan

Pelaksanaan Pembelajaran Abad Ke-21 (PAK-21) bukan bergantung kepada teknologi semata-mata sahaja, tetapi boleh dilaksanakan melalui aktiviti yang relevan. Penambahbaikan dalam aktiviti ini di masa depan adalah pelajar membina soalan sendiri dan skema jawapan dengan bimbingan guru yang mana dapat menerapkan elemen kreatif semasa sesi pengajaran dan pembelajaran. Selain itu, Aktiviti *Think-Answer Station (*TAS) ini akan diperluaskan lagi kepada pelajar menengah rendah untuk melihat impak secara menyeluruh aktiviti ini dalam subjek Sains.

Anugerah

Mendapat anugerah EMAS dalam Pertandingan Inovasi, Amalan Terbaik dan Kajian Tindakan Program STEM Fiesta Peringkat Negeri Sabah Tahun 2023 dalam kategori Inovasi dan Amalan Terbaik.

Rujukan

Bahagian Pembangunan Kurikulum. (2018). *Panduan Pelaksanaan Bilik Darjah*. Putrajaya: Kementerian Pelajaran Malaysia.

Joseline M. Santos. (2017). 21st Century Learning Skills: A Challenge in Every Classroom. *International Journal of Emerging Multidisciplinary Research, 1*(1), 31-35.

Liudmyla Lazorenko & Oksana Krasnenko. (2019). The Importance of Developing 21st Century Skills for Advanced Students. *Pedagogical sciences*, 249-288.

USING P.E.EC TECHNIQUE TO HELP IMPROVE STUDENTS' WRITING SKILL

CHOW WUI CHUNG, ROSNI CHONG CHEN VUN, NUR ADHILA HARUN, TEO POO SING
SMK MUHIBBAH SANDAKAN, SANDAKAN, SABAH, MALAYSIA
chowchow770603@gmail.com, g-36519376@moe-dl.edu.my, g-54519945@moe-dl.edu.my, g-42262469@moe-dl.edu.my

Highlights: This study was conducted to determine and improve the students' ability to extend ideas in essay writing. A total of 42 Form 1 students were involved in this study. This action research focuses on the implementation of P.E.E.C technique to improve the students' ability in writing composition. The implementation of the P.E.E.C technique allows the establishment of rapport with students by stimulating their problem-solving and critical thinking skills (Abdulbaki, Suhaimi, Alsaqqaf & Jawad, 2018; Mckeachie & Svinicki, 2006) The objectives of this research are to study the P.E.E.C technique to improve students' ability to expand ideas in essay writing and to investigate the students' perception of the implementation of the P.E.E.C technique. The findings showed that the implementation of the P.E.E.C technique does help to increase the students' ability to expand ideas in essay writing. Besides that, the students also have overall positive feedback toward the implementation of the P.E.E.C technique

Key words: writing technique; essay writing; ESL classroom; p.e.e.c technique

Introduction

In this new era of globalisation, 21st-century skills such as problem-solving, communication, cooperation, teamwork, critical thinking, creative thinking, and communication technologies are crucial to the development of the education field. Writing is one of the most prominent productive English skills that should be mastered by an ESL student. According to Fareed, Ashrad, and Bilal (2016), writing has a vital role in language production that is used as an indicator for language learning. Students are required to produce a well-structured essay to show their progress in language learning (Ceylan, 2019). Meanwhile, according to Arkoudis and Tran (2017) as cited by Mahendran and S. Vijayalachemy (2019), writing as a form of thinking is fundamental for the academic success of students.

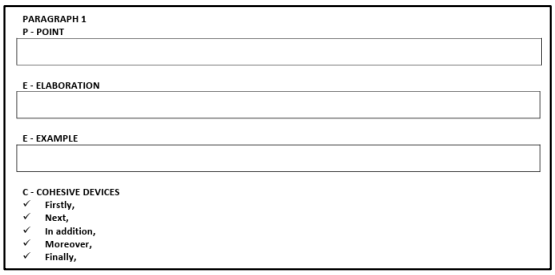
However, despite the importance of writing skills for students, it has become a burdensome skill for students to master. According to Toba et al. (2019), some of the most challenging aspects of writing are structural, grammatical, mechanical, and vocabulary. Students, especially those with lower proficiency faced difficulties in writing because they have limited vocabulary to express and expand their ideas. However, intermediate to proficient students are facing difficulty to elaborate their essay efficiently. Thus, an early survey was conducted by taking the the samples' past examination marks as a pre-test. The test showed that most of the students were unable to achieve high marks and most of the students received an average of 12 out of 20 marks. In order to solve this problem, P.E.E.C writing technique was introduced as a guide to help the students to elaborate their essay more efficiently. The post-test result showed great improvement in the students' marks thus proving that this writing technique can be used to improve students' writing ability in an ELS classroom.

Product Description

WRITING (P.E.E.C TECHNIQUE)

P - POINT
E - ELABORATION
E - EXAMPLE
C - COHESIVE DEVICES

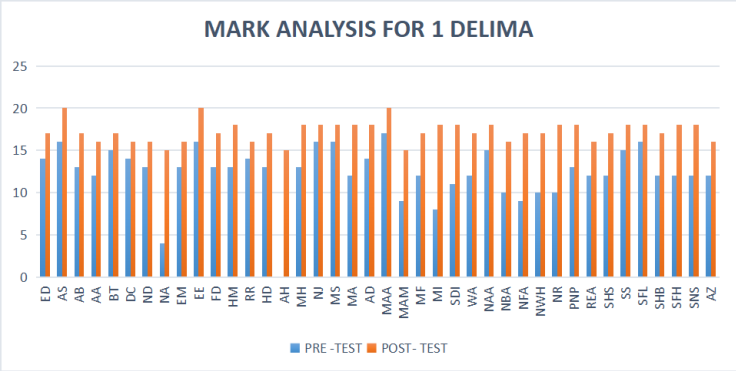
The researchers have come out with a writing technique called P.E.E.C technique. P.E.E.C stands for Point, Elaboration, Example and Cohesive devices. This writing technique can be used for most type of essay such as Email, message, directed writing, review, report, article and any type of writing that needed the students to give some answer based on the questions. The researchers decided to come out with this technique based on their experience with their students in the classroom. Their students are having difficulties elaborating their essay in a coherent and cohesive way. They tend to write long sentences without any elaborations or example to support their answer thus making them loss marks in their written work. This writing technique is very easy to use and remember as it uses simple acronym to help the students to remember this technique.



The researchers drafted a few templates to help the students to familiarized themselves with this particular technique and the final draft of the template is a very simple template that includes all the components of the technique and some empty spaces to allow students to immediately write down their answer in the space provided. This technique can be used to help students to elaborate and organise their essay. The students just need to identify the point to answer the question and write the point down in the space provided. Next, they need to write down some elaboration to help them support their point. They may also add some example to help further support their point and elaboration to ensure that their answer are well supported and well elaborated. Finally, they can choose any of the cohesive device to write at the beginning of their paragraph. The students may used the template as a guide for them to draft their answer before combining all of the components into one complete essay.

Results & Discussion (The impact/potential impact of product/project/idea towards education stakeholder(s))

To measure the effectiveness of this writing technique, post-test are conducted to determine the marks obtained by the students after the implementation of the P.E.E.C writing technique. The results of the post-test compared to the pre-test shows that the marks obtained by the students after the implementation of the P.E.E.C technique improved tremendously. All of the students are able to score better compared to pre-test, and some of students even write down the acronyms into their exam paper as a draft before converting their draft into a written essay. This shows that the students are able to adapt and adopt this writing technique to help enhance their writing ability. The data collected are analysed with IBM SPSS statistics and bar chart.



A paired samples t-test was performed to evaluate whether there is a difference between pre-test score and post-test score.

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PraTest - PascaTest	-4.92500	2.67359	.42273	-5.78006	-4.06994	-11.650	39	.000

A paired samples t-test showed a very significant differences between pre-test and post-test marks. The marks obtained by the students in the post-test are significantly higher compared to the marks obtained in the pre-test. Therefore, it can be concluded that this writing technique does help in improving the students' ability to elaborate their essay thus scoring higher marks in their written examination.

Conclusion

The research aimed to study the correlation between the introduced method, P.E.E.C writing technique and the students ability to elaborate their essay, as well as to identify the effectiveness of the method in improving the students' marks in their written essay. SPSS data analysis of pre-test and post-test is presented in this research and the result has proved that this technique has helped students to improve their writing skills and able to elaborate their

essay more effectively. The P.E.E.C writing technique focused on helping ESL students especially lower proficiency students to elaborate their essay more effectively using the P.E.E.C template. The results obtained throughout this action research shows significant improvement in the students' marks thus making this technique applicable to students from various proficiency. There are several recommendations that the researcher would like to propose that are related to improving students' writing ability in an ESL classroom. First and foremost, the researchers hope that more ESL teachers are willing to experiment with alternative strategies in their classroom. This is crucial as to periodically reflect on the effectiveness of strategy implementation. Next, Teachers must conduct a Needs analysis to help identify the students' language needs and requirements. Teachers must be able to cater to all of the students' learning needs to ensure equal opportunity for all students, despite their language proficiency.

References

Abdulbaki, Khalid & Taat, Muhamad Suhaimi & Alsaqqaf, Asmaa & Jawad, Wafa. (2018). The Use of the Discussion Method at University: Enhancement of Teaching and Learning. International Journal of Higher Education. 7. 118. 10.5430/ijhe.v7n6p118.

Ceylan, O. N. (2019). Student Perceptions of Difficulties in Second Language Writing n. Journal of Language and Linguistic Studies, 15(1),151-157. Doi:10.17263/jlls.547683

Fareed, Muhammad & Ashraf, Almas & Bilal, Muhammad. (2016). ESL Learners' Writing Skills: Problems, Factors and Suggestions. Journal of Education and Social Sciences. 4. 81-92. 10.20547/jess0421604201.

Maniam, M., & Subramaniam, S. V. (2019). Improving ESL Students' Essay Writing in Malaysia. Strength for Today and Bright Hope for Tomorrow Volume 19: 6 June 2019 ISSN 1930-2940, 424.

TEKNIK *P.S.G* BAGI TAJUK PENYELESAIAN SEGITIGA DALAM SUBJEK MATEMATIK TAMBAHAN

Mohamad Zulhanif bin Idris[1], Noor Diana binti Haromi[2]
Guru Cemerlang Matematik Tambahan, Sek Men Integrasi Sains Tahfiz MAIWP, Kuala Lumpur[1]
Guru Matematik Tambahan, Sek Agama Menengah Bandar Baru Salak Tinggi, Sepang, Selangor[2]
mohamadzulhanif@gmail.com[1], g-00335373@moe-dl.edu.my[2]

Abstrak: Tajuk Penyelesaian Segitiga ini merupakan satu topik yang seringkali disoal dan ditanya dalam Sijil Pelajaran Malaysia (SPM) bagi Kertas 2 Bahagian C. 10 markah penuh telah diperuntukkan kepada murid khusus bagi topik Penyelesaian Segitiga ini. Atas sebab itu, kajian ini dijalankan bagi membantu murid mendapat markah penuh dalam Kertas 2 Bahagian C peperiksaan Sijil Pelajaran Malaysia (SPM). Tinjauan awal telah dilaksanakan melalui pemerhatian terhadap markah peperiksaan pertengahan tahun muridyang dinamakan sebagai Ujian 1 dan juga pemerhatian tidak berstruktur yang dilakukan di dalam kelas dan didapati bahawa ramai murid yang tidak mendapat markah penuh sepuluh markah ini sebenarnya masih belum dapat memahami kehendak soalan dan kaedah bagaimana untuk memulakan langkah-langkah bagi menjawab soalan yang berkaitan dengan tajuk ini. Bagi mengatasi masalah ini, saya telah memperkenalkan Teknik P.S.G dan kaedah ini telah ditadbir kepada 20 orang murid dan juga telah dikongsikan kepada 172 orang guru Matematik Tambahan seluruh Sekolah Menengah Kebangsaan Agama (SMKA) dan Sekolah Agama Bantuan Kerajaan (SABK) satu Malaysia secara atas talian. Aktiviti pengajaran dan pemudahcaraan (PdPc) dijalankan dalam tempoh seminggu sahaja dan telah dapat membantu murid menyelesaikan soalan yang melibatkan tajuk Penyelesaian Segitiga ini.

Kata Kunci: Matematik Tambahan; Penyelesaian Segitiga; Teknik P.S.G; Sijil Pelajaran Malaysia.

Pengenalan

Usaha untuk membangunkan modal insan yang mempunyai jati diri yang kukuh, berketerampilan, berpengetahuan dan berkemahiran tinggi, salah satu jalannya adalah melalui pendidikan dan aspek Pendidikan ini memainkan peranan yang penting dalam usaha ini. Untuk tujuan itu, sistem Pendidikan di Malaysia sedang mengalami satu proses peralihan bagi memaksimumkan peranannya untuk membentuk dan melahirkan generasi yang berilmu pengetahuan selaras dengan hasrat Kementerian Pendidikan Malaysia untuk melahirkan anak yang bijak lagi cerdik (ABC). Justeru, pembelajaran Matematik Tambahan merupakan salah satu usaha bagi mencapai hasrat yang diimpikan kerana subjek Matematik Tambahan ini merupakan satu bidang ilmu yang berteraskan konsep, fakta, sifat peraturan, corak dan proses secara berstruktur. Oleh sebab itu, strategi yang digunakan dalam Pengajaran dan Pemudahcaraan (PdPc) Matematik Tambahan menuntut guru-guru merancang aktiviti dengan teliti yang membolehkan murid memahami kandungan yang disampaikan secara mendalam.

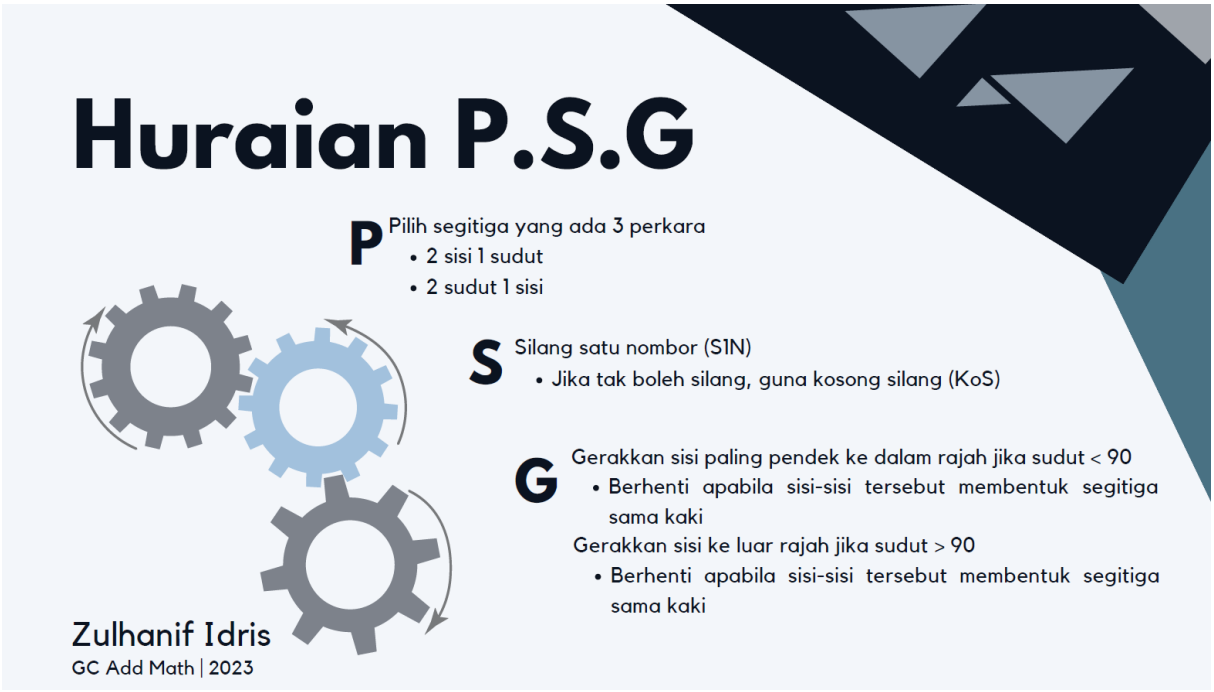
Menurut Leonard & Lawrence (1999), mata pelajaran Matematik telah mula diajar sejak tahun 500 Masihi lagi. Kaedah-kaedah penyelesaian dan rumus-rumus telah banyak dihasilkan dan dicipta oleh ilmuan Matematik yang datang dari seluruh pelosok dunia.Selain itu, kita juga telah didedahkan dengan pelbagai konsep Matematik dalam proses pembelajaran sejak dari bangku sekolah rendah lagi. Pelbagai kaedah dan teknik yang digunakan oleh para guru bagi memastikan proses pembelajaran murid berjalan dengan lancar.

Menurut Idris (2001), terdapat beberapa keperluan untuk menghasilkan pengajaran yang berkesan dan antaranya adalah pemahaman yang mendalam bagi seorang guru terhadap proses pembelajaran tersebut. Sulaiman (2004) pula menyatakan pengajaran yang berkesan ialah pengajaran yang mengambil kira pelbagai aspek seperti aspek pedagogi dan juga aspek professional. Dalam usaha untuk memudahkan kefahaman murid, guru perlu bijak menggunakan daya kreativitinya dalam menyediakan peluang pembelajaran kepada murid agar mereka bersedia mendepani cabaran yang mendatang (Yahya, 2010). Maka, atas dasar itulah inovasi perlu menjadi amalan para guru dalam usaha untuk menambah baik amalan pengajaran guru dalam kelas. Hal ini kerana, setiap murid mempunyai sikap dan kebolehan yang berbeza di antara satu sama lain dlam menguasai mata pelajaran yang dipelajari oleh mereka di sekolah (Ahmad, 2006).

Product Description

Inovasi yang dihasilkan ini berfokuskan kepada teknik mudah menjawab soalan dan mendapatkan markah maksimum dalam tajuk Penyelesaian Segitiga. Soalan yang diberi kebiasaannya meminta untuk mencari sama ada sudut, atau garis dengan menggunakan hukum Sinus dan hukum Kosinus dan kemudian murid perlu melakar satu segitiga baru dengan syarat-syarat yang diberi. Seringkali murid hanya dapat menyelesaikan masalah yang melibatkan hanya salah satu hukum sahaja dan markah yang mereka perolehi kebiasaannya tidak akan lebih daripada separuh. Justeru itu, teknik P.S.G telah diilhamkan bagi memudahkan murid mendapat markah maksimum sepuluh markah. Berikut adalah butiran teknik ini.

Rajah 1 : Huraian teknik P.S.G



Keputusan & Perbincangan

Berikut adalah markah Ujian 1 dan Ujian 2 bagi murid-murid yang terlibat dalam Teknik P.S.G ini.

Jadual 1: Markah Ujian 1 dan Ujian 2

Bil	NAMA	Markah	
		Ujian 1	Ujian 2
1.	ADAM DARWISY BIN SUHAIDI	0	10
2.	ADIB BIN SHAFIE	6	10
3.	AHMAD ZAFIRRULHAQ BIN NOR AFENDI	1	8
4.	AKMAL HAZIQ BIN RAZALI	1	10
5.	AMIERUL DANIEL BIN NOOR HIDZUAN	3	8
6.	MUHAMMAD ADIB SYAKIRIN BIN SHAHRIL	0	10
7.	MUHAMMAD AIMAN HASYIM BIN SHAZRIL HASYIM	3	10
8.	MUHAMMAD AMSYAR HADI BIN AHMAD SYUKRI ZAIN	0	9
9.	MUHAMMAD FARID NAUFAL BIN FADHLULLAH	2	10
10.	ADRIANA AMALIN BINTI CIK KAZIDI	1	8
11	DIYANA SYAFIRA GOH BINTI DANIAL ISKANDAR GOH	3	9
12.	DURRATUN AIMUNI BINTI IMRAN RAMZI	5	10
13.	HAJAR NAFISAH BINTI AMINUDIN	0	9
14.	IRDINA ZAFIRAH BINTI RUSLEN	6	10
15.	KAYISHA AMIRA BINTI MUHAMAD	4	8
16.	NUR 'AATHIFAH ADRINA BINTI SHAHABUDDIN	0	9
17.	NUR ALYA AIDA BINTI AB KADIR	6	10
18.	NUR ATIKAH BINTI MOHD AZREE	2	8
19.	NURUL NADIAH BINTI HAIRUL NIZAM	0	10
20.	SHADZREEN NADZIRAH BINTI HADZRUL FITRI	5	10

Dapatan kajian menunjukkan pencapaian murid dalam Ujian 2 menunjukkan peningkatan yang sangat ketara jika dibandingkan dengan pencapaian mereka dalam Ujian 1. Secara keseluruhannya, taburan markah murid untuk Ujian 2 ini sekurang-kurangnya berada pada 8 markah yang mana sangat hampir dengan markah penuh 10 markah. Justeru itu, dapatan ini secara tak langsung telah menunjukkan bahawa Teknik P.S.G ini jika difahami dan dapat diaplikasikan oleh murid akan mampu membantu murid mendapat markah yang maksimum dalam peperiksaan Sijil Pelajaran Malaysia (SPM) yang mereka akan hadapi pada masa akan datang. Selain itu, murid juga telah diedarkan dengan borang soal selidik sebelum dan selepas diperkenalkan teknik P.S.G ini. Berikut merupakan analisis borang soal selidik yang diedarkan kepada murid.

Jadual 2: Analisis Soal Selidik **SEBELUM** Teknik P.S.G

BIL	SOALAN	SKALA				
		Sangat tidak setuju	Tidak Setuju	Memuaskan	Setuju	Sangat Setuju
1	Saya seronok belajar bab Penyelesaian Segitiga	2.5%	19.5%	17%	27%	34%
2	Bab Penyelesaian Segitiga ini mudah difahami	2.4%	17.1%	26.8%	29.3%	24.4%
3	Langkah-langkah penyelesaian dalam bab ini mudah difahami	4.9%	17.1%	31.7%	29.2%	17.1%
4	Saya yakin dapat menjawab soalan bab ini dan mendapat markah penuh 10 markah.	17%	12.2%	29.3%	29.3%	12.2%
5	Mempelajari bab ini membolehkan saya mengaitkannya dengan mata pelajaran lain.	4.8%	9.8%	36.6%	29.3%	29.3%

Jadual 3: Analisis Soal Selidik **SELEPAS** Teknik P.S.G

BIL	SOALAN	SKALA				
		Sangat tidak setuju	Tidak Setuju	Memuaskan	Setuju	Sangat Setuju
1	Saya seronok belajar bab Penyelesaian Segitiga	-	-	4.9%	19.5%	73.2%
2	Bab Penyelesaian Segitiga ini mudah difahami	2.4%	-	12.2%	17.1%	68.3%
3	Langkah-langkah penyelesaian dalam bab ini mudah difahami	2%	-	17%	20%	61%
4	Saya yakin dapat menjawab soalan bab ini dan mendapat markah penuh 10 markah.	-	4.9%	14.7%	39%	39%
5	Mempelajari bab ini membolehkan saya mengaitkannya dengan mata pelajaran lain.	-	2.4%	14.6%	34.1%	48.8%

Kesimpulan

Susulan daripada teknik P.S.G yang telah diilhamkan ini, secara tak langsung telah berjaya meningkatkan tahap profesionalisme penulis kerana dengan adanya teknik ini, penulis telah banyak menerima jemputan memberikan ceramah dan bengkel-bengkel Matematik Tambahan oleh sekolah-sekolah sekitar Kuala Lumpur dan Selangor dan seterusnya penulis dapat menggunakan peluang ini untuk berkongsi teknik ini dengan murid-murid berlainan sekolah.

Secara keseluruhannya, setelah intervensi dijalankan terhadap murid-murid tersebut, didapati pencapaian mereka meningkat berbanding dengan sebelumnya. Justeru itu, data yang didapati secara tidak langsung telah menunjukkan bahawa teknik P.S.G yang difahami oleh murid akan mampu membantu mereka mendapat markah maksimum dalam peperiksaan SPM yang akan mereka hadapi kelak.

Publication, Award and Intellectual Property

Pingat Gangsa, Pertandingan Inovasi dalam Kolokium Pendidikan Guru Cemerlang peringkat Kebangsaan Tahun 2023

Rujukan

Ahmad, S. (2006). *Kemahiran Belajar Berkesan*. Kuala Lumpur: Utusan Publication and Distributor

Idris, N. (2001). *Pedagogi dalam Pendidikan Matematik*. Kuala Lumpur: Utusan Publications.

Leonard, C.B & Lawrence, B.W. (1999). *Math and Mathematician: The History of Math Discovery Around the World.* Detroit MI: UXL

Yahaya, A. (2010). Kepentingan Kefahaman Konsep dalam Matematik. *Jurnal Pendidik dan Pendidikan*. 20, 43-52.

Canva as a Classroom Tool for Students: Enhancing Creativity, Engagement, and Visual Communication

NUR AFATIN RAHMAT BINTI SARIF, NOR ZAM ZURAINI BINTI MOHD YUSOFF
SMK(P) Taman Petaling,
g-68372955@moe-dl.edu.my, g-52527928@moe-dl.edu.my

Highlights: The research explores the integration of Canva, an online graphic design platform, into educational settings, showcasing its potential to revolutionize traditional teaching methods. By referring to Jean Piaget, Constructivist Theory emphasizes that learning is an active process where learners construct their own understanding through interactions with their environment. Canva is revealed as a catalyst for nurturing creativity among students by providing them with an intuitive platform for creating visually captivating content, thereby enhancing the quality of their work and promoting imaginative design processes. This study underscores Canva's effectiveness in increasing student engagement; in contrast to conventional teaching methods, Canva's interactive and visually stimulating environment successfully intrigues students, motivating them to actively participate in various learning activities. Additionally, Piaget emphasized the importance of providing learners with opportunities to explore and manipulate objects to develop their cognitive abilities. Canva's interactive features and multimedia resources provide students with the opportunity to explore and manipulate visual elements, enhancing their cognitive development and understanding of concepts Canva is shown to significantly enhance visual communication within the learning process, allowing students to create visually compelling presentations, infographics, and educational materials that facilitate better comprehension and knowledge sharing among peers. Acknowledging the common challenge of students having short attention spans for reading, speaking, and listening tasks using traditional methods, Canva is proposed as an effective solution to pique student interest and address this issue. The research offers valuable insights into the benefits and potential challenges of incorporating Canva into education, highlighting the importance of thoughtful instructional design and comprehensive training for both educators and students alike. In summary, this study illuminates Canva's potential as a classroom tool for improving student creativity, engagement, and visual communication skills, while also addressing issues related to attention spans, ultimately offering innovative ways to enhance the quality of education.

Key words: Canva ; Classroom tool ; Education technology ; Creativity enhancement ; Student engagement

Introduction

The integration of technology in educational settings has gained prominence, with educators continuously seeking innovative tools to enrich the teaching and learning experience. This extended abstract explores the impact of integrating Canva, a versatile online graphic design platform, in educational environments. Beyond traditional abstracts or intention proposals, this submission presents a comprehensive overview of the research, emphasizing novelty, innovativeness, and the potential impact on teaching and learning.

In today's educational landscape, a pressing challenge is the apparent lack of student engagement and interest in traditional teaching methods. These conventional approaches often rely heavily on teachers, textbooks, and passive learning, which may not effectively cater to the diverse learning styles and preferences of modern students. A significant portion of the student population thrive on hands-on experiences, physical activity and visual aids. For these students, the static and passive nature of traditional teaching can be uninspiring and fail to harness their full potential. Many students seem disengaged, reluctant to participate actively, and may only truly invest themselves in their education when a subject or learning method deeply intrigues their interest. By incorporating Canva into the learning process, educators can create a student-centered environment that aligns with Piaget's Constructivist Theory. Students are actively involved in the learning process, constructing their own knowledge through hands-on experiences, collaboration, and creative expression. Therefore, by integrating Canva-enhanced learning into the classroom, educators can support Piaget's Constructivist Theory and provide students with a dynamic and engaging learning experience that fosters their cognitive development and understanding

The problem this research seeks to address is how to get engagement from all type of learners. The disconnection in traditional teaching method often results in reduced student engagement, which can hinder their academic progress. Furthermore, many students only exhibit genuine interest and active participation when the learning experience is personally intriguing. The challenge is to find innovative and effective ways to integrate educational tools and techniques that ultimately rekindling their enthusiasm for learning and fostering a more participative and engaged student body.

This research examines the potential benefits of Canva, including its ability to foster creativity, increase student engagement, and improve visual communication during reading, speaking, and listening tasks. Moreover, the study investigates Canva's influence on students' attention spans, addressing the challenge of sustaining focus in conventional teaching methods.

This product leverages the power of Canva, an intuitive online graphic design platform, to create a dynamic and interactive learning experience. Below are the key components and features of this educational product:

1. Interactive Learning Activities:

- Integration of Canva's interactive features for students to create visual content collaboratively or individually.
- Activities designed to stimulate physical movement and active participation

2. Multimodal Learning Resources:

- Integration of multimedia elements (images, videos, infographics) created using Canva to enhance comprehension and retention.
- Multimedia resources to accommodate diverse learning styles and preferences.

This educational product harnesses the versatility of Canva to transform traditional teaching methods into dynamic, interactive, and kinaesthetic-friendly learning experiences. By combining technology, creativity, and adaptability, it addresses the challenge of rekindling student interest, engagement, and participation, ultimately enhancing the quality of education for all learners.

Results & Discussion

Table 1.0 Students' preference. (Students real answer)

Do you prefer to do writing and speaking task using Canva?	Why? (Referring to your answer in Question 1)	You prefer to do writing task using…	You prefer to do speaking task using…
Yes	It is fun and interesting	Canva	Canva
Yes	More fun and engaging	Canva, Worksheet	Canva, Typical classroom assessment
Yes	easy access of materials	Canva	Canva
Yes	more enjoyable	Canva, Writing book	Typical classroom assessment
Yes	1) more interesting 2) student have to write less 3) save papers 🙅🏻‍♀️📝 and trees 👍🏻🌴🧘🏻‍♀️. (#savetheearth 🦥) 4) student don't easily get bored during class	Canva, Writing book	Canva
Yes	Its is much more easier and fun	Canva, Writing book, Worksheet	Canva
Yes	easy to communicate and more explanation with teammate	Canva, Worksheet	Canva, Typical classroom assessment
Yes	it's because im shy	Canva	Canva
Yes	Much easier and if we ever going to present it, we'll make it aesthetic since so far Canva is the only app/website could make it more entertainment and interesting	Canva, Writing book, Worksheet	Canva, Typical classroom assessment
Yes	It makes the task more interesting.	Canva, Writing book, Worksheet	Typical classroom assessment
Yes	Because its a fun and exciting way to learn English	Canva	Canva
Yes	Because its easier. And there are many things you can do in canva such as poster,brochure and more. Its also quite aesthetics.	Canva, Writing book, Worksheet	Typical classroom assessment
Yes	Because Canva can help me to better in writing and speaking and easy to use/easy to understand.	Canva	Canva
Yes	Easy to do and we can share with our friends. Can edits the task if we want add something.	Canva	Typical classroom assessment
Yes	Everyone will be excited because it's more interesting the lessons.	Canva, Worksheet	Canva
Yes	I can do more research before presenting/talking/sharing about some topic	Canva, Writing book, Worksheet	Canva, Typical classroom assessment
Yes	It's interactive	Canva	Canva

Based on the table, it can be concluded that students are willing to be more participative in classroom activities as Canva is included in the lesson. It is more interactive, intrigues their interest and give them more freedom to express their opinion and answers. Assessment isn't as burdensome as traditional assessment as it seems like another way of expressing themselves.

Conclusion

In conclusion, this research has provided valuable insights into the integration of Canva as an innovative educational tool to address the challenge of student engagement Our study has highlighted the potential of Canva-enhanced learning modules to transform traditional teaching approaches into dynamic and interactive experiences. By leveraging Canva's user-friendly interface, gamification elements, real-world applications, and personalized learning paths, we have demonstrated its efficacy in capturing student interest and participation.

The results of this research underscore the importance of recognizing and accommodating diverse learning preferences within the modern educational landscape. They also emphasize the power of technology, exemplified by Canva, in creating engaging and impactful learning environments.

While this research has provided a solid foundation, there are several avenues for future efforts to improve and expand upon this work:

1. Teacher Training and Support:
   - Develop comprehensive teacher training programs to ensure educators are proficient in implementing Canva-enhanced learning effectively. Provide ongoing support to address any challenges they encounter.

2. Feedback Loops:
   - Establish feedback mechanisms involving students and educators to continuously refine and adapt Canva-enhanced learning modules based on user input and evolving educational needs.

By pursuing these future efforts, we can further enhance the effectiveness and inclusivity of Canva-enhanced learning and continue to address the evolving challenges and opportunities in modern education. Ultimately, our aim is to create a dynamic, engaging, and student-centric educational landscape that empowers all learners to thrive.

References

Piaget, J. (1926). The language and thought of the child. Harcourt, Brace.

Piaget, J. (1926). The language and thought of the child. Harcourt, Brace.

Multi-Legged Lego Box in Solving Linear Equations in One Variable

KALAIARASAN SUBRAMANIAM
SMK Long Lama, Baram, Sarawak, Malaysia[1]
arasanlondon@gmail.com[1]

Abstract

Algebra plays vital role in secondary Mathematics curriculum especially in Standard Curriculum of Secondary School (*KSSM*) in Malaysia. One of the biggest challenge students are facing is solving linear equation especially in one variable by balancing the equation and the ability to solve the value of the unknown in the equation. This innovation will ease the students in finding the solution to the linear equation in one variable and develops the problem-solving skills that essential for this topic. The samples of this study are Form 1 students of Class 1 Bestari from SMK Long Lama, Baram, Sarawak. This study is a quantitative study using the pre - experimental design whereby only one group of samples was studied. Based on the analysis of the Pre-Test and Post-Test conducted in teaching and learning to the students, these students showed a positive result towards using the innovation in this topic, Solving Linear Equation in One Variable.

Key words: Linear ; Equations ; One-Variable

Introduction

All Mathematics teachers find it difficult to teach and learn mathematics, especially in Malaysia where teachers are tying mathematical ideas to practical applications. Teachers are coming up with a variety of techniques to teach mathematical ideas depending on the students' level of comprehension, social background, and economic background in order to promote students' critical and creative thinking skills.

Algebra is a relatively popular area of mathematics where students experience difficulty. Finding the unknowns is a crucial aspect of algebra in mathematics. When students enter equations, they have a very difficult time understanding and figuring out the unknowns. The motivation of pupils to understand linear equations is negatively impacted by routine and non-routine difficulties as well as problem-solving questions. As a result, this invention will make it easier for them to determine the value of the equation's unknown.

The innovation was named Multi-Legged Lego Box. This innovation is aimed to solve linear equations in one variable. This innovation will engage students' cognitive thinking in order to find for the solution for a linear system. This innovation is made of recycled boxes, recycled papers, Lego sets and marbles.

Product Description

Recycled cardboard, recycled papers, marbles, and Lego sets are used to make the Multi-Legged Lego Box. It is both economical and environmentally beneficial. Inside and out, it serves two purposes. Lego sets and marbles are kept within the innovation box, and when it is turned upside down, the innovation will be utilized as the foundation to solve numerous problems using linear equations in one variable. It is easy to carry this innovation anywhere and anytime to classes.

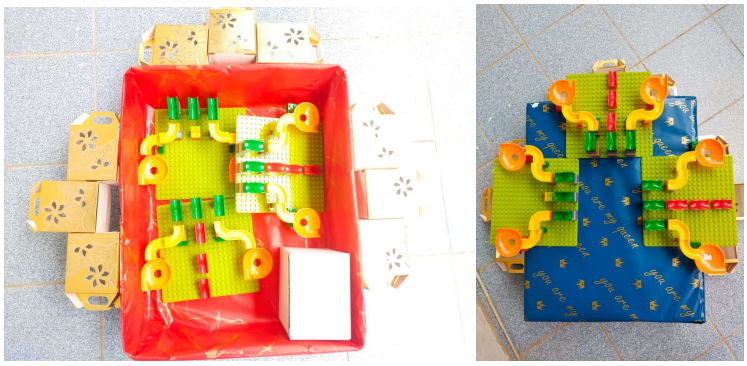


Figure 1: Multi-Legged Lego Box (Inside and Out)

The invention process is as Figure 1. The box containing the Lego Sets has been tipped on its side before being removed. Each slide in the Lego set represents a positive integer that is the coefficient of the unknown. Each box represents an unknown value in a single variable of a given linear equation. Students will utilize marbles and place the marbles evenly on the slide depending on the coefficient of the unknown. Each box's marble count and the total number of unknowns will be known.

Results & Discussion

A total of 25 respondents answered the Pre-Test and Post-Test questions. The test results are shown below in Table 1 and comparison of Pre-Test and Post-Test results is shown in Figure 2.

Table 1: Pre-Test and Post-Test Marks and Differences Between the Marks

No	Samples	Pre-Test Marks	Post-Test Marks	Difference in Marks
1	Sample 1	0	10	10
2	Sample 2	4	16	12
3	Sample 3	2	14	12
4	Sample 4	0	12	12
5	Sample 5	6	12	6
6	Sample 6	8	14	6
7	Sample 7	20	20	0
8	Sample 8	0	14	14
9	Sample 9	10	18	8
10	Sample 10	0	12	12
11	Sample 11	0	12	12
12	Sample 12	6	14	8
13	Sample 13	8	16	8
14	Sample 14	4	10	6
15	Sample 15	0	10	10
16	Sample 16	2	12	10
17	Sample 17	8	18	10
18	Sample 18	6	14	8
19	Sample 19	0	10	10
20	Sample 20	16	20	4
21	Sample 21	18	20	2
22	Sample 22	0	12	12
23	Sample 23	8	18	10
24	Sample 24	0	12	12
25	Sample 25	0	10	10

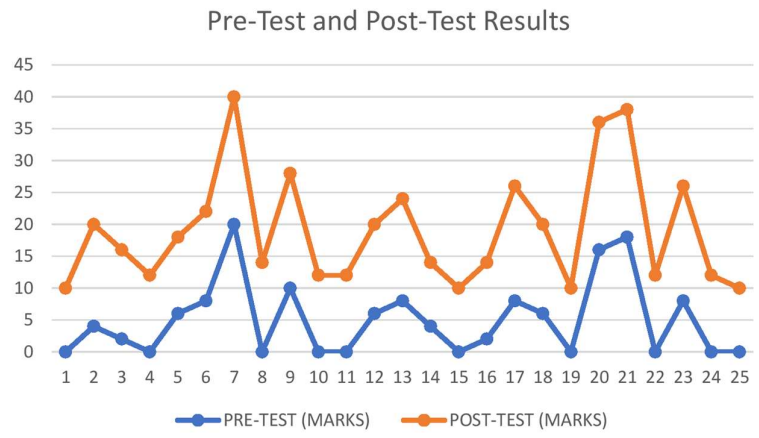


Figure 2: Comparison of Pre-Test Marks and Post-Test Marks

It is clear from Table 1 and Figure 1 that the samples' post-test scores were greater than their pre-test scores. Some students' grades increased significantly. This student improved their score from 0 on the pre-test to 14 on the post-test, according to Table 1, sample number 8. This indicates that sample number 8 did not attempt any of the pre-test questions. Those who received a score of 0 on the pre-test never attempted any of the pre-test questions because they had grown bored with mathematics, particularly with linear equations in one variable. After being informed of this breakthrough, students are eager and enthusiastic to learn. This innovation eases student's calculation and cultivates students' motivation in learning simple linear equations in one variable.

Table 2: Pre-Test and Post-Test Achievement Range

Achievement Range (%)	Pre-Test Marks (%)	Post-Test Marks (%)
1 -20	14	0
21 - 40	7	0
41 - 60	1	12
61 - 80	1	7
81 -100	2	6
TOTAL	25	25

It was found that the students' achievement during the post-test had a better quality because at the lowest percentage range of 1 − 20 the number of students decreased from 14 students to none of the students obtained percentage from 1 − 20. Most students were in the range of 1 − 20 and 21 − 40 during the pre-test however there was an increase in achievement during the post-test where most students were in the range of 41 − 60 and 61 − 80 percentage. It is observed and analyzed that during the pre-test, 2 students obtained excellent percentage in the range of 81 − 100 marks, but during the post-test, there were in total 6 students who managed to gain an excellent achievement.

Conclusion

Better overall results in the educational setting can result from innovative teaching practices. Students in cutting-edge classrooms are increasing their capacity for peer engagement and honing their communication abilities. Lessons that apply the use of innovations in the classroom need to be designed and created so that the level of education, especially for the subject of Mathematics in our country in line with the requirements of globalization. This is because the process of integrating technology in education requires commitment and effort by educators in order to improve the quality of teachers. The existing approach which is more focused on 'chalk and talk' and only to pass the exam makes the knowledge acquired by students temporary and puts pressure on students and teachers. Educators should always be open to learning the new techniques and innovative ideas in order to improve the quality of teaching and learning as well as to help students improve their understanding of the subjects studied. Basically, students' lack of mastery of mathematical solving questions, especially for students who have a low to moderate level of achievement such as the characteristics of the study sample. Therefore, researchers feel that the use of innovative ideas in classroom can provide added value to improve student achievement in solving mathematical problems by doing mathematical exploration and connect ideas to real life problem solving.

This innovation can be improved to find solution for linear equations in two variables and finding solution for simultaneous linear equations of two or three equations. This innovation can be improved with additional tool such as traditional game, *Congkak* to find solution for two linear equations of two variables simultaneously. This innovation is mainly created to attract students' interest in solving algebraic equations, especially simple linear equations. Researchers and mathematics teachers are highly encouraged to spread their knowledge in developing this innovation to further level and apply this innovative idea in classes to attract students' interest towards STEM subjects.

The study mentioned above is recommended so that more improvements can be made to studies that use creative thinking in the classroom to tackle mathematical issues. Additionally, future researchers might refer to this study as a guide. The researcher also expects that future researchers and math teachers would use the study's recommendations in a subsequent study that has a favourable effect. As a result, it can assist pupils in developing mathematical thinking and skills to solve mathematical issues more successfully. Researchers will have achieved significant achievement if the kids can master the ability to solve mathematical puzzles. This is because questions in the mathematics curriculum are now nearly exclusively focused on solving mathematical problems that focus on developing mathematical thinking and mathematical skills. In order to cultivate such skill among the students, innovative ideas are the best tools.

References

Bhgn Pembangunan Kurikulum. (2001) *Pembelajaran secara konstruktivisme*. Edisi Pertama. (ms. 5-17). Kuala Lumpur: Pusat Perkembangan Kurikulum.

Havelock, R. G. (1970). A guide to innovation in education.

Hoyles, C. (1992). Mathematics teaching and mathematics teachers: A meta-case study. *For the learning of mathematics, 12*(3), 32-44.

KPM. (Mac 2016). Panduan Pelaksanaan STEM Dalam P&P. *Bahagian Pembangunan Kurikulum*.

KPM. (September 2018). Dokumen Standard Kurikulum dan Pentaksiran KSSM Matematik Tambahan T4 dan T5. *Bahagian Pembangunan Kurikulum.*

Lim, C. S. (2006). In search of good practice and innovation in mathematics teaching and learning: A Malaysian perspective. *Tsukuba journal of educational study in mathematics, 25*, 205-220.

Looney, J. (2009). Assessment and innovation in education.

Russell, D. L., & Schneiderheinze, A. (2005). Understanding innovation in education using activity theory. *Journal of Educational Technology & Society, 8*(1), 38-53.

Syafitri, Q., Mujib, M., Netriwati, N., Anwar, C., & Wawan, W. (2018). The mathematics learning media uses Geogebra on the basic material of linear equations. *Al-Jabar: Jurnal Pendidikan Matematika,* 9(1), 9-18.

Vincent-Lancrin, S., Urgel, J., Kar, S., & Jacotin, G. (2019). *Measuring innovation in education 2019*. OECD: Organisation for Economic Co-operation and Development.

Enhancement of Number Base Conversion in Mathematics using Stacked Division Base Value (SDV) Method

Ahmad Haadzal Bin Kamarulzalis
SMKA Al-Mashoor (Lelaki), Georgetown, Penang, Malaysia
g-27525003@moe-dl.edu.my

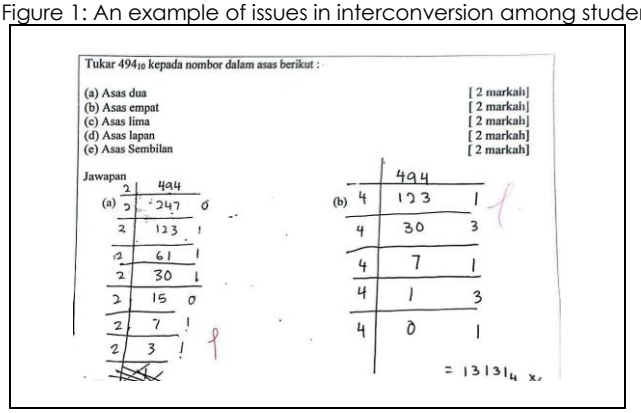
Abstract: The binary number system acts as a core pillar delivery agent in a technological system. This paper aims to introduce an enhanced innovation method called as Stacked Division Based Values (SDV) for converting decimal systems to other number systems, i.e., binary, octal, hexadecimal and others. The second aim is to measure the effect of the SDV method with classical approach in terms of time and performance among students. The results indicates that the SDV method shows an increase of 23% marks and 23% decay of time consuming that represent SDV are effective and for educational purpose.

Key words: Conversion Method; Number system; Stacked Division Based Values

Introduction

Our daily lives in the digital era involves various data and numbers such as binary, octal, decimal, and hexadecimal (Thein et al, 2019). Increment high volume of technology changes and demand also affect academical circle especially teaching and learning. Hence, we deal with interconversion method in many applications. The interconversion process demanded various steps which caused students to generally confuse with those method and compute carelessly as shown in Figure 1. Therefore, educators need to play a role in motivating students by simplifying the concepts of matematics, specifically interconversion process involving number systems as highlighted in this innovation.

Figure 1: An example of issues in interconversion among student



An enhanced innovation method called Stacked Division Based Values (SDV) for converting decimal systems to another number systems [Binary, Octal, Hexadecimal and etc] was developed. Apart from introducing this innovation, this paper also amins to measure the robustness of the SDV method and classical approach in terms of time and performance.

This SDV method was evaluated using a pre and post-test involving interconversion of number systems. The SDV performance was tested upon nine students from Form 4 Usamah at SMKA Al-Mashoor (Lelaki), Penang. The nine students consisted of three different groups of students which are excellent, medium and weak, selected based on the Assessment Test score. All students were tested using the same items taken from the Form Four Mathematics Text Book (Ministry of Education, MOE). They were given 10 minutes to answers all questions where the full mark is 10. The major indicator to determine its effectiveness is based on their progress in performance and time taken to complete the both pre and post-test.

Product Description

The most common number systems are the decimal, binary, octal and hexadecimal. SDV is an enhanced innovation method for converting decimal systems to another number systems such as, binary, octal, hexadecimal and others. This method allows users to update the quotient respect to base values. Table 1 and Table 2 show the processes involved using the classical approach and SDV in terms of algorithm and visual.

Table 1: Classical conversion method

Conversion from decimal number system to other number systems [Binary, Octal, Hexadecimal]
To convert a given number from decimal number system to any other number system, follow these steps: 1. Divide the decimal number by r i.e. base of the other system (2, 8, or 16). Remember the quotient and the remainder of this division. 2. After that, divide the quotient (from the first division) by r, again remembering the quotient and the remainder. 3. Keep dividing your new quotient by r until you get a quotient of 0. After each division, keep track of the remainder. 4. When you reach a quotient of 0, the remainders of all the divisions (written in reverse order) will be the equivalent number in base r number system. [Reverse order mean that, the first remainder that you got in step-1 will be the least significant digit (LSD) of the number in base r number system].

Table 2: Stacked Division Base Value (SDV) Method

Conversion from decimal number system to other number systems [Binary, Octal, Hexadecimal]
Algorithms: 1. Divide the decimal number by r i.e. base of the other system (2, 8, or 16). Remember the quotient and the remainder of this division. 2. After that, divide the quotient (from the first division) by r, again remembering the quotient and the remainder. 3. Keep dividing your new quotient by r until you get a quotient of 0. After each division, keep track of the remainder. **(Update the quotient by multiple number which result quotient = base and followed by remainder)** 4. When you reach a quotient of 0, the remainders of all the divisions (written in reverse order) will be the equivalent number in base r number system.

Figure 2: Illustration of SDV method

Nombor			Asas

Nombor			Asas
563	187	2	3
187	62	1	3
62	20	2	3
20	6	2	3
.	.	.	3
0	0	0	3

The SDV method is simple and easy to understand by the student. SDV method allow the users to update the quotient respect to base number (Figure 2 base 3). The computation ends when the quotient is equal to zero. Besides, it gives the students a systematic method to reduce carelessness.

Results & Discussion

Table 3 : Comparison of Pre and Post Test

Student Category		Pre-test		Post-test	
		Mark	Time (minutes)	Mark	Time (minutes)
Excellent	Student 1	8	8	10	7
	Student 2	10	6	10	4
	Student 3	10	7	10	6
Moderate	Student 4	10	9	10	8
	Student 5	8	6	10	6

	Student 6	10	10	10	6
Low	Student 7	4	10	10	6
	Student 8	6	10	8	10
	Student 9	4	10	8	6

The students achievement in the pre - and post-test showed a significant improvement. The ability of students to convert numbers to any base using SDV showed an increase in scores and a reduction in time taken even though it involves converting different base numbers.

Conclusion

Based on the research conducted, it can be concluded that the SDV method is able to improve students' skills in converting ordinary numbers (decimal system) to any number bases. This finding is also in line with the findings of Puteri et al, 2021, where mathematics skills through enhancement method was able improve students' abilities particularly in improved scores and reduced answer time which reflects the lack of confusion during the answering process. The results showed that the SDV method helped students improve self-confidence, memory and understanding of basic number conversion concepts as well as making classes more cheerful and fun

References

Adam, N. A., & bt Halim, L. (2019). Cabaran pengintegrasian pendidikan STEM dalam kurikulum Malaysia. *Seuntai Kata*, 252.

Putera, T. N. T., & Rosli, A. N. (2021). Pembangunan Koswer Interaktif Asas Sains Komputer Sistem Nombor Perduaan Menggunakan Animasi Jari: Development of Basic Computer Science Interactive Courseware Binary Number System Using Finger Animation. *Journal of Information and Communication Technology in Education*, *8*(3), 60-75.

Ramadhani, R., Sihotang, S. F., Bina, N. S., Harahap, F. S. W., & Fitri, Y. (2021). Undergraduate Students' Difficulties in Following Distance Learning in Mathematics Based on E-Learning During the Covid-19 Pandemic. *TEM Journal*, *10*(3).

Ramli, N. A. B. M., & Awang, M. B. (2020). Analisis Faktor Risiko Dalam Pelaksanaan Pendidikan Stem Di Sekolah: Aplikasi Teknik Fuzzy Delphi. *JuKu: Jurnal Kurikulum & Pengajaran Asia Pasifik*, *8*(1), 1-10.

Thein, M. M., Han, T. T., & Hlaing, N. N. (2019). Interconversion of Various Number Systems In Digital Technology. *University Journal of Research and Innovation*, 316.

Tajuk : Penggunaan *InterMath* Dalam Pelaksanaan Operasi Penambahan dan Penolakan Integer

Suhaida Shahar Zaman, Auni Aliya Imani Mohamad Asri, Nurin Adlyna Husna Shahrizal, Sharifah Arinatasya Syed Mohd Rizuan
SMA Maahad Al-Aziz, Parit, Malaysia[1,2,3,4]
khuzaida99@gmail.com[1]

Abstrak: Dapatan menunjukkan terdapat beberapa kelemahan murid dalam tajuk Integer. *InterMath* telah dibangunkan bagi membantu murid melaksanakan operasi asas penambahan dan penolakan integer dengan lebih seronok dan menarik. '*InterMath*' diperbuat daripada kadbod, kertas A4 keras dan stiker nombor serta dibangunkan dalam dua set iaitu bagi operasi tambah dan operasi tolak. *InterMath* mudah digunakan. Dua baris kadbod yang dilekatkan stiker nombor digerakkan supaya dua nombor soalan berada pada kedudukan bertentangan dan jawapan muncul pada lubang kertas A4. Inovasi ini boleh diaplikasikan bagi setiap tingkatan di sekolah menengah. Dapatan analisis data penggunaan '*InterMath*' dalam mampu menarik minat murid sekaligus menguasai integer.

Kata kunci: Penambahan Integer; Penolakan Integer; Matematik; Bahan inovasi; Sekolah Menengah

Pengenalan

Produk inovasi '*InterMath*' merupakan satu alat yang digunakan bagi membantu murid melaksanakan operasi asas penambahan dan penolakan integer dengan lebih seronok dan menarik. '*InterMath*' dibangunkan bagi mencapai objektif-objektif yang berikut:

1. Membantu murid memahami konsep penambahan dan penolakan nombor integer positif dan negatif,
2. Mempelbagaikan kaedah pengajaran dan pembelajaran (PdP) bagi tajuk integer agar lebih menarik,
3. Memberi pengalaman baharu kepada guru dan murid bagi melaksanakan projek inovasi dalam PdP.

Penerangan Produk

Projek inovasi '*InterMath*' dibangunkan berpandukan model MICUP yang diperkenalkan oleh Siti Rosni (2019). Model MICUP merangkumi lima fasa iaitu;

i. Pengenalpastian masalah (M)
ii. Penjanaan idea inovasi (I)
iii. Penciptaan produk (C)
iv. Pengujian produk (U)
v. Penjenamaan produk (P)

Fasa 1: Pengenalpastian masalah (M)

Pada fasa ini, pasukan inovasi dibentuk yang terdiri daripada seorang guru matematik dan tiga orang murid tingkatan dua yang diberikan nama kumpulan SueClan. Guru memberi rangsangan kepada murid untuk memikirkan satu inovasi bagi satu tajuk yang dapat membantu rakan-rakan mereka belajar. Temu bual telah dijalankan kepada murid-murid kelas tingkatan dua. Selain itu soal jawab antara guru dan murid turut dilaksanakan. Fokus dapatan adalah terhadap operasi asas penambahan dan penolakan integer. Analisis dapatan data terhadap masalah murid dalam integer ialah:

a. Murid tersilap tanda positif (+) dan negatif (-), menyebabkan kesilapan dalam operasi.
b. Murid menghadapi kesukaran untuk mengaplikasikan operasi tambah dan tolak nombor positif dan negatif dalam menyelesaikan masalah matematik.
c. Murid salah membuat pertukaran operasi yang digunakan, seperti menukar penambahan kepada penolakan atau sebaliknya.
d. Murid tidak memahami konsep operasi penambahan dan penolakan integer.

Justeru, bagi menyelesaikan masalah ini, peneguhan terhadap konsep asas bagi operasi penambahan dan penolakan integer perlu dilaksanakan dengan menggunakan bantuan bahan bantu mengajar yang menarik.

Fasa 2: Penjanaan idea inovasi (I)

Pada fasa ini, idea-idea inovasi dikenal pasti melalui rujukan dari buku teks dan perbandingan produk inovasi di pasaran melalui pencarian di google. Selain itu, faktor utama seperti kos bahan juga dititikberatkan. Setelah idea membangunkan satu inovasi diperolehi, nama bagi produk tersebut turut ditentukan. Maka sebuah inovasi yang berbentuk maujud yang akan dibangunkan dikenali sebagai '*InterMath*'. 'Inter' merupakan ringkasan bagi integer manakala 'Math' adalah ringkasan bagi matematik. Seterusnya, proses lakaran dilaksanakan sebelum '*InterMath*' dibangunkan seperti yang ditunjukkan dalam Rajah 1.

Rajah 1: Proses Lakaran *InterMath*

Fasa 3: Penciptaan produk (C)

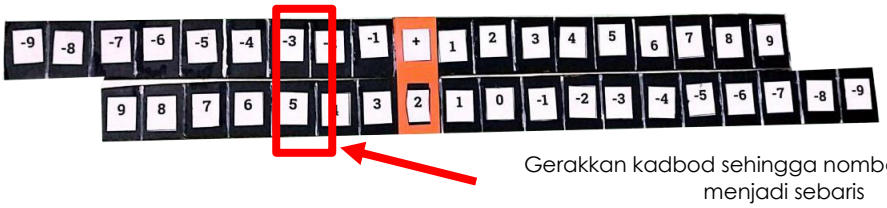
Pada fasa ini, produk inovasi dibentuk. Jadual 1 menunjukkan proses pembangunan *InterMath*.

Jadual 1: Proses Pembangunan *InterMath*

Langkah-langkah	Gambar
Langkah 1: Penyediaan bahan. a. 1 keping kadbod bersaiz A3 (dipotong dan dibuat garis seperti dalam gambar) b. 1 keping kertas A4 tebal c. 1 keping sticker bernombor (ditaip) d. Gunting e. Gam f. Pembaris	
Langkah 2: Melekatkan nombor di atas kadbod.	 
Langkah 3: Potong kertas A4 kepada beberapa bahagian yang sama panjang.	
Langkah 4: Lipat bahagian kertas A4 yang telah dipotong dan lilit pada bahagian tengah satu potongan kadbod.	
Langkah 5: Tanggalkan lilitan dan buatkan satu lubang pada bahagian kertas A4.	 
Langkah 6: Lilit kembali potongan kertas A4 yang dilubangkan di bahagian tengah satu potongan kadbod dan gam.	
Langkah 7: Gabungkan lilitan kepada potongan kadbod yang kedua dan gam.	 
Langkah 8: Dua '*InterMath*' dihasilkan yang melibatkan operasi penambahan dan penolakan.	

Seterusnya, Jadual 2 menunjukkan langkah-langkah penggunaan *InterMath*.

Jadual 2: Langkah-langkah Penggunaan *InterMath*

Langkah-langkah
Contoh soalan integer; (-3) + 5 = Langkah 1: Gunakan '*InterMath*' bagi operasi penambahan. '*InterMath*' bagi operasi tambah 
Langkah 2: Gerakan ke kiri atau ke kanan kadbod bawah sehingga nombor -3 pada kadbod atas terletak sebaris dengan nombor 5 kadbod bawah.  Gerakkan kadbod sehingga nombor pada soalan menjadi sebaris
Langkah 3: Jawapan terletak pada bahagian kertas A4 yang dilubangkan. (-3) + 5 = 2 

Fasa 4: Pengujian produk (U)

Inovasi '*InterMath*' telah diuji di kelas tingkatan dua SMA Maahad Al-Aziz. Sejumlah 17 orang murid telah terlibat dalam fasa ini. Justifikasi pemilihan murid tingkatan 2 adalah kerana kelas tersebut merupakan kelas bagi ahli kumpulan SueClan dan integer telah dipelajari oleh mereka. Sebelum pengujian '*InterMath*' dilaksanakan, soalan-soalan yang melibatkan penambahan dan penolakan integer disediakan, disusun dan digabungkan menjadi satu modul seperti yang ditunjukkan pada Rajah 2.

Rajah 2: Modul *InterMath*

Seterusnya, proses pengujian dilaksanakan. Jadual 3 menunjukkan proses pengujian bagi *InterMath*.

Jadual 3: Proses Pengujian *InterMath*

Langkah-langkah	Gambar
Langkah 1: Penerangan '*InterMath*' daripada guru.	

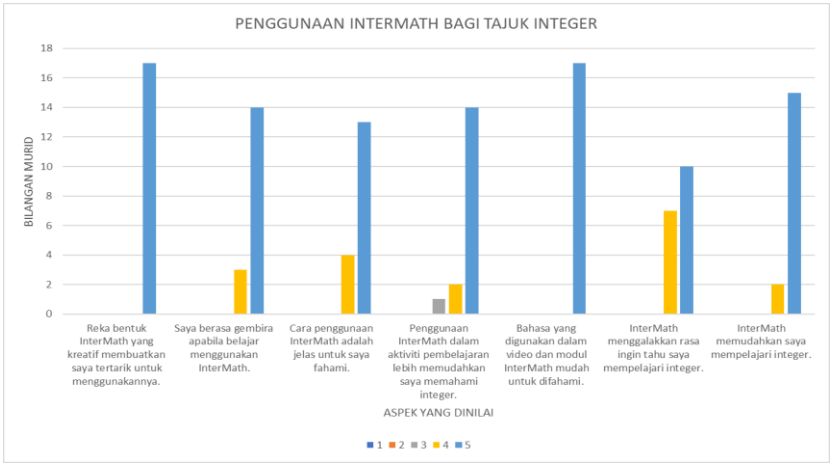
Langkah 2: Murid kelas tingkatan 2 dibahagikan kepada 4 kumpulan. Setiap kumpulan diberikan satu set '*InterMath*' (untuk operasi penambahan dan penolakan) beserta modul.	
Langkah 3: Murid berbincang dalam kumpulan untuk menjawab soalan pada modul yang disediakan.	

Fasa 5: Penjenamaan produk (P)

Inovasi *InterMath* telah didaftarkan di bawah Perbadanan Harta dan Intelek (MyIPO).

Keputusan dan Perbincangan

Melalui penggunaan *InterMath*, murid dilihat seronok dan yang paling utama, mereka dapat memahami dan menguasai proses penambahan dan penolakan integer yang melibatkan nombor positif dan negatif. Jika pendekatan sebegini digunakan maka murid akan berasa lebih seronok untuk belajar mata pelajatan matematik tanpa bosan. Rajah 3 menunjukkan analisis data bagi persepsi murid setelah menggunakan *InterMath*.



Rajah 3: Persepsi Murid Terhadap *InterMath*

Seterusnya, impak selepas menggunakan *InterMath* berdasarkan objektif adalah seperti berikut:

a. Pemahaman konsep operasi integer dengan mudah.
b. Menggalakkah perasaan ingin tahu tentang integer.
c. Murid gembira menggunakan *InterMath*.
d. Cara penggunaan yang jelas dan mudah diaplikasi dalam kelas.
e. Murid tertarik dengan reka bentuk yang kreatif.

Kesimpulan

Produk inovasi '*InterMath*' merupakan satu alat yang digunakan bagi membantu murid melaksanakan operasi asas penambahan dan penolakan integer agar lebih seronok dan menarik. Dengan menggunakan *InterMath*, murid dapat memahami dan menguasai proses penambahan dan penolakan integer yang melibatkan nombor positif dan negatif. Jika pendekatan sebegini digunakan maka murid dapat mempelajari tajuk Integer khasnya dan mata pelajaran matematik amnya tanpa bosan.

Anugerah dan Harta Intelek

Inovasi *InterMath* telah didaftarkan di bawah Perbadanan Harta dan Intelek (MyIPO). Nombor pendaftaran hakcipta ialah FM2023W03936. *InterMath* sedia dikomersialkan dan sasarannya adalah kepada murid sekolah menengah.

InterMath juga terpilih ke pembentangan dan penilaian akhir bagi Anugerah Inovasi Sekolah Menengah (AISM) Peringkat Negeri Perak.

Rujukan

Siti Rosni (2019). Buku Manual Kajian Tindakan, 158.

Title: AR-PP Book: Using Augmented Reality (AR) to Bring Pages Alive

Wong Chu Hui, Ng Li Min, Lau Ann Joe, Melor Md Yunus
Universiti Kebangsaan Malaysia, Faculty of Education, Selangor, Malaysia[1,2,3,4]
wongchuhui519@gmail.com, trisciapatriscia97@gmail.com, annjoe997@gmail.com, melor@ukm.edu.my

Highlights

Augmented Reality Pop-Up book (AR-PP) book is an innovation that integrates augmented reality (AR) into pop-up books. This innovation is to be used in the classroom to pique Year 1 until Year 3 pupils' interest and focus on learning English's phonics process. Furthermore, the AR-PP book offers a fresh method to aid pupils in recognizing words by helping them differentiate, enunciate, and combine phonemes. It also provides visual and auditory stimulation to aid pupils in learning phonics.

***Keywords*:** Augmented reality; pop-up book; phonics; language learning; young learners.

Introduction

Augmented reality (AR) has been widely adopted in the field of education, particularly in English teaching and learning classrooms, to enhance the quality of education, which is emphasized in Sustainable Development Goal 4 (SDG 4). Rafiq et al. (2019) assert that technology's influence has expanded into a variety of disciplines, including education. The connection between the teaching and learning materials and real-world situations encourages pupils to gain knowledge in a realistic way. For pupils of all ages to learn all the necessary abilities, there are numerous educational apps available that incorporate augmented reality technology.

English is a crucial component of our educational system in Malaysia. Our Ministry of Education (MoE) mandates that all pupils in Malaysia acquire English as their second language. MoE even established English as a second language in Malaysia. According to our current KSSR curriculum, phonics instruction is required for lower primary pupils (Years 1-Year 3). The difficulty that English teachers are having with their lower primary pupils' inability to discriminate, enunciate, and mix phonemes in order to understand words is, however, a growing problem (Ahmad & Yunus, 2019). Therefore, this innovation is designed to improve pupils' understanding of phonics. AR has been creatively integrated into a traditional teaching tool—the pop-up book, also known as Augmented Reality Pop-Up book (AR-PP).

This study aims to investigate the effect of using AR-PP books on pupils' phonics learning. The participants of this study were 30 lower primary pupils with elementary to lower average English proficiency level. The research method used in this study is the Design and Development Research (DDR) method. Through this method of research, quantitative data from pre-test, post-test and thumb surveys are collected to assess the effectiveness of the innovation and the participants' perceptions of the learning tool's usability. The findings reveal that the use of AR-PP books are able to help the pupils in articulating the targeted English words accurately and it brings positive effects on pupils' phonics learning.

Product Description

AR-PP book is a set of pop-up books which consists of six different themes that are covered from the Year 1-Year 3 English syllabus based on the English Language Curriculum (DSKP) for primary school. Pupils can scan the pop-up graphic by using the recommended AR app, Artivive to watch a short video. The short video contains articulations of the particular word that represent the graphic, as well as the fun fact about the graphic to tackle the pupils at the end by answering some questions that are available in the AR-PP book.

The initial idea of this innovation is derived from pop-up books and AR books that are available on the market to pique the interest of pupils in reading. Pop-up books incorporate three-dimensional, interactive elements that "pop up" when the pages are opened, and are popularly used in the classroom to pique pupils' interest in learning English. While the AR books available are kid's stories meant to pique kids' enthusiasm in reading from an early age. Therefore, the combination of pop-up books and AR technology are put into this innovation, AR-PP, to improve the teaching and learning of phonics to become more effective, interactive and fun for teachers and pupils.

Results & Discussion

Table 1: Analysis of data from pre-test and post-test

No	Clarification	Score	Pre-test		Posttest		Gain
			Frequency	%	Frequency	%	
1.	Very poor	0-10	12	40	4	13.33	-8
2.	Poor	11-20	8	26.67	11	36.67	3
3.	Moderate	21-30	7	23.33	9	30	2
4.	Good	31-40	3	10	4	13.33	1
5.	Very Good	40-50	0	0	2	6.67	2

Through the analysis of the data collected through pre-test and post-test, the impact of AR-PP book is proven to be significant and highly beneficial towards the phonics learning of the English language among lower primary pupils with elementary to lower average English proficiency level. With the help of the audio elements in this AR-PP innovation, the phonics awareness of the pupils have improved. Pupils were able to listen to the correct pronunciation repeatedly and practice the phonics, helping with the speaking and listening skills. According to Ng (2020), pupils learn phonics the best when they have a model to repeat after. This can be clearly seen from the result of the post-test among the pupils with very poor English proficiency, in which the result decreased by 8 pupils compared to the pre-test. Pupils showed improvement in articulating the targeted words when they were provided with the opportunities to listen and practice their pronunciation of the words repeatedly.

Besides, AR engages multiple senses, which can aid memory and comprehension (Nugraha et al., 2019). The AR elements in the AR-PP book provide an accessible learning approach to the pupils. This innovation will be a valuable resource for pupils with different learning styles or even special needs, by providing alternative ways to access and understand the content (Sanfilippo et al., 2022). It can be adapted to individual pupils' needs, such as providing multiple learning modalities to the pupils during their process of learning. The content of the AR-PP book included various formats, such as text, audio, video and interactive simulations. Therefore, pupils can see, hear and interact with content according to their own learning style, which reinforces the phonics learning experience.

Table 2: Analysis of data from Thumb Survey

No	Questions	Thumb Up		Thumb Down	
		Frequency	%	Frequency	%
1	Do you think you can speak English better?	25	83.33	5	16.67
2	Do you think your English improved after using AR-PP?	27	90	3	10
3	Do you think AR-PP is easy to use?	27	90	3	10
4	Do you think AR-PP is good and useful?	28	93.33	2	6.67
5	Will you use AR-PP outside of the classroom?	28	93.33	2	6.67

Moreover, the AR-PP book encourages self-learning among the pupils in English phonics learning. Cai et al. (2021) stated that pupils' self-efficacy and self-control in learning can be significantly promoted through AR technology integration. By integrating AR within the AR-PP book, it offers on-demand support when pupils face challenges. The audio elements in the AR video included in this innovation act as a scaffolding and support for the pupils to learn the correct

pronunciation even without the presence of a teacher. This will help promote independent learning by gradually reducing the support and pupils will be more prominent and confident in using the English language in their daily life. Based on the analysis of data in the thumb survey, 90% of the pupils agreed their English improved after using this AR-PP book in their English language learning process. While, 83.33% of the pupils have more confidence in using the English language as they felt their speaking of English language is better. This has further supported the data collected from the pre-test and post-test, which the result of the post-test shows improvement in the accuracy in the pronunciation of the targeted words.

The design of the AR-PP book is in the form of a flappable big book. Therefore, AR-PP book provides time and place flexibility for the pupils in learning the English language. It allows pupils to access the AR-PP book at their preferred time and place by accommodating diverse schedules and learning styles. AR-PP book promotes self-paced and self-directed learning in which pupils are able to learn at their pace and level of proficiency. With the consistent navigation and structure of the content throughout the AR elements in the innovation, clear and predictable navigation enable pupils to know the expected learning outcomes from them. The learning process of using AR-PP book is consistent with the upgrading of vocabulary difficulty. The pupils will undergo the cycle for each level and they are able to carry out the learning process by themselves at anywhere and anytime. The direct and explicit way of viewing the short videos through scanning the pop-up graphic improves pupils' efficiency in learning phonics (Huang et al., 2021). Pupils can revisit the content they find challenging or move quickly through materials they have mastered. This self-paced approach accommodates different learning speeds and preferences. Regardless of the time and place, pupils can expect consistent and immersive learning experiences with the AR-PP book, as the AR content in the innovation remains the same regardless of where the pupils access it. Thus, educational product integrated with AR can help pupils to enhance and increase their learning ability and effectiveness (Alzahrani, 2020).

For instance, this AR-PP book brings a great impact towards the educational stakeholders, such as educators, institutions and the curriculum developer. This AR-PP book is an enhanced innovative teaching tool to make the lesson more engaging and interactive. Educators can use the AR to tailor lessons to pupils' individual needs, helping struggling pupils and challenging the advanced pupils. It can illustrate abstract concepts and bring real-world applications into the classroom and make the learning more relevant to pupils. Educators can use this AR-PP book as an innovative tool in doing formative and summative assessment of pupils' English language learning.

Besides, institutions, such as schools and libraries, can incorporate AR-PP into their collection of books to demonstrate a commitment to modern and innovative education methods. By having this type of engaging and tech-savvy educational product, it will attract more pupils and learners. Institutions can gather data on pupils' interactions and preferences, which can inform curriculum decisions and improvement for the curriculum developer. Moreover, AR-PP book can be used across various subjects and age groups. Therefore, it holds market opportunities, where curriculum developers and book publishers can tap into a growing market for AR-enhanced educational materials. They can even collaborate with the educators and institutions to create content aligned with curricular standards and drive innovation in the education technology sector by creating more immersive and interactive learning experiences for the pupils in the school.

Conclusion

Based on the findings, positive results gained from the pre-test, post-test and thumb survey have highlighted the effectiveness of the AR-PP book in improving the pupils' phonics fluency and accuracy. However, there are some gaps in this AR-PP book. There are some improvements that can be made to make this innovation even better. First and foremost, the themes covered in the AR-PP book are selected purposely for lower primary school pupils and there are many more interesting themes that can be covered for upper primary school. Besides, the integration of AR into this innovation can be made more vivid by advanced technology skills in making 3D videos instead of 2D videos to pique the interest of pupils and make it more interactive and live. Furthermore, the AR-PP book only focuses on phonics, however, this is not its limit. This innovation can focus on more skills such as reading comprehension, grammar, writing, listening, and more. AR-PP book evolves into a storybook to enhance pupils' reading. Moreover, this innovation is implemented in English language classrooms, whereas it can be used in other subjects such as Science, Mathematics, Arts and Music, Language and Literacy, and more. To sum up, the AR-PP book is a practical and highly usable innovation in the education field. Plus, it can be taken into the classroom as one of the teaching aids that are able to create an effective, interactive, and fun classroom in learning phonics.

References

Ahmad, Z. & Yunus, M. M. (2019). The Effectiveness of Using Jolly Phonics Blending Phonemes to Year 3 English Language Classroom. *International Journal of Humanities, Philosophy, and Language, 2*(8), 150-162.

Alzahrani, N. M. (2020) Augmented Reality: A Systematic Review of Its Benefits and Challenges in E-learning Context. *Applied Sciences, 10*(16), 5660.

Cai, S., Liu, C., Wang, T., Liu, E., & Liang, J. C. (2021). Effects of learning physics using Augmented Reality on students' self-efficacy and conceptions of learning. *British Journal of Educational Technology, 52*(1), 235-251.

Huang, X., Zou, D., Cheng, G., & Xie, H. (2021). A systematic review of AR and VR enhanced language learning. *Sustainability, 13*(9), 4639.

Ng, P. M. H. (2020). Learning Articulation, language and literacy (ALL) through echo poems for young children. *Asia Pacific Journal of Developmental Differences, 7*(1), 113-125.

Nugraha, I., Suminar, A. R., Octaviana, D. W., Hidayat, M. T., & Ismail, A. (2019). The application of augmented reality in

learning English phonetics. *Journal of Physics: Conference Series,* 1402(7).

Rafiq, K. R. M., Pazilah, F. N., Yunus, M. M., Hashim, H., & Sabri, M. H. M. (2019b). Gamified-learning brings out the hero in you! Proceedings International Invention, Innovative & Creative Conference, 2019, 67-71. ISBN: 978-967-17324-4-1

Sanfilippo, F., Blažauskas, T., Salvietti, G., Ramos, I., Vert, S., Radianti, J., Majchrzak, T. A., & Oliveira, D. A. (2022). A Perspective Review on Integrating VR/AR with Haptics into STEM Education for Multi-Sensory Learning. *Robotics*, 11(2), 41.

Sifirians In Congkak

Logeswari A/P Krishnan Kutty[1], Saritha A/P Krishnan Kutty[2], Nur 'Iffah Mahfuzah Binti Mushiwan[3], Mages A/P Panjaman[4], Govintharaj A/L S.Sidambaram[5]

SJKT Ldg Nam Heng[1], SJKT Ldg Shanghai[2], SJKT Jalan Tajul[3], SJKT Ldg Telok Sengat[45], Johor, Malaysia

logesbaby.1025@gmail.com, sarikutty81@gmail.com, nuriffahmahfuzah@gmail.com, nancypanjaman@yahoo.com, govin4sag@gmail.com

Abstrak: Pendaraban merupakan salah satu kemahiran asas matematik yang perlu dikuasai pada peringkat sekolah rendah, bagi membantu penguasaan pada peringkat yang lebih tinggi. Maka, satu inovasi dibuat untuk mengenal pasti perbezaan antara kaedah pengajaran secara tradisionall berbanding dengan kaedah congkak sifir. Seramai 10 orang murid daripada tiga buah sekolah dengan tahap pencapaian yang hampir sama dipilih, iaitu SJKT Ladang Nam Heng, SJKT Jalan Tajul dan SJKT Ladang Teluk Sengat. Sampel dibahagikan kepada tiga kumpulan. Kumpulan A menggunakan kaedah tradisional manakala kumpulan B dan C menggunakan kaedah congkak sifir. Perbezaan di antara ujian pra dan ujian pos mendapati bahawa peningkatan min markah kaedah tradisional ialah 19.68%, manakala kaedah congkak sifir ialah 42.96%. Secara keseluruhannya, kaedah congkak sifir ini berkesan berbanding dengan kaedah tradisional.

Key words: congkak sifir; pendaraban; fakta asas darab

Pendahuluan

Menurut Hamdan (2000), semestinya kita semua perlu akur bahawa penguasaan dan kecemerlangan dalam matematik adalah prasyarat bagi negara kita mencapai kemajuan khususnya dalam dunia yang mengarah kepada orientasi teknologi maklumat. Generasi bijak matematik akan menjadi generasi penentu dalam arus pembangunan negara. Melalui ilmu matematik, pelbagai bidang ilmu lain dapat digarap dan diterjemahkan untuk faedah semua pihak. Aplikasi fakta asas kira darab juga amat penting dalam menyelesaikan masalah lain dalam matematik seperti tajuk pecahan, perpuluhan, ukuran jarak, matematik harian, wang, timbangan, masa dan waktu. Lantaran itu, seharusnya semua murid di sekolah rendah perlu menguasai matematik terutamanya fakta asas kira darab untuk mereka mengaplikasikan kemahiran matematik dalam bidang ilmu yang lain.

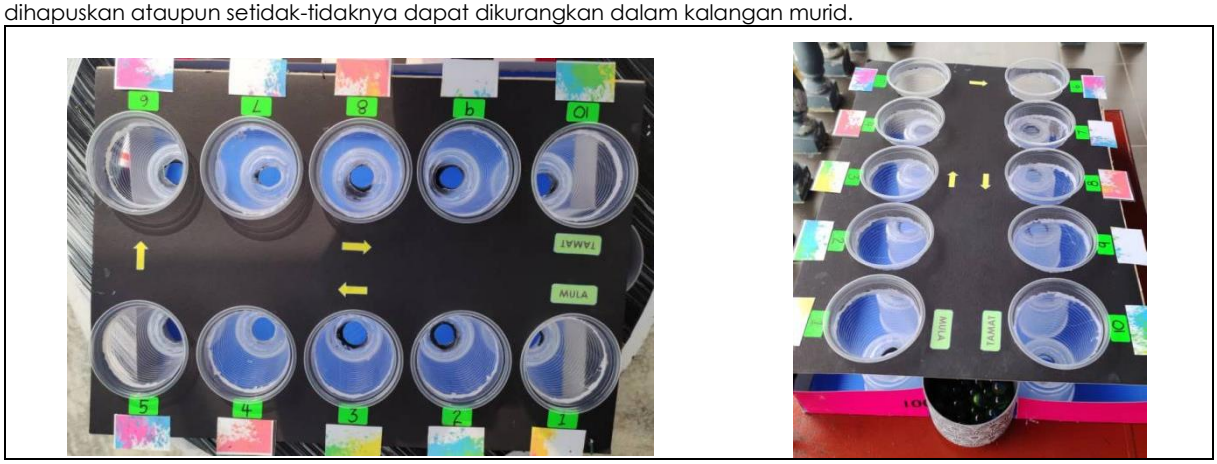
Congkak Sifir dibangunkan untuk mencapai objektif berikut:

1. Mengenal pasti tahap kemahiran penguasaan fakta asas darab murid.
2. Mengenal pasti kesan kaedah congkak sifir dalam menyelesaikan masalah kira darab dan bahagi murid.
3. Mengenal pasti perbezaan kaedah congkak sifir dengan kaedah tradisional dalam kemahiran menyelesaikan masalah kira darab dan bahagi murid

Deskripsi Produk

Congkak Sifir dapat dijadikan panduan dan kaedah baru dalam penghafalan sifir. Murid yang selama ini tidak nampak akan kaedah lain untuk menguasai fakta asas darab, akan mempunyai alternatif yang baru. Dengan pengetahuan kira tambah yang sudah sedia ada kepada murid itu, maka bolehlah dikembangkan kepada bentuk kira darab. Murid tidak lagi terikat dengan satu cara sahaja iaitu hafalan nombor secara semata-mata.

Inovasi ini juga dapat membantu guru mewujudkan PdPc yang mampu menarik perhatian murid. Jika selama ini guru hanya menggunakan kaedah yang lama, dengan adanya kaedah yang baru ini akan memberikan pilihan kepada guru berkenaan untuk memilih dan melaksanakan dalam PdPc mereka sekaligus membantu pelaksanaan PdPc yang melibatkan tahap pencapaian murid yang berlainan. Maka, masalah fakta asas darab ini dapat dihapuskan ataupun setidak-tidaknya dapat dikurangkan dalam kalangan murid.



Rajah 1: Congkak Sifir

Model Congkak ini telah disediakan dengan perkataan 'Mula' dan 'Tamat' supaya murid tidak keliru. Setiap lubang itu telah dinyatakan dengan nombor satu hingga 10. Kad kecil turut disediakan di bawah setiap nombor bagi membolehkan murid menulis jumlah guli yang telah dimasukkan dalam setiap lubang. murid diberikan arahan untuk mengisi lubang congkak itu dengan nilai sifir yang telah diarahkan. murid akan menggunakan guli yang tersedia di dalam bekas yang ada di bahagian tepi congkak. Contohnya, sifir 2. Murid perlu memasukkan dua guli dalam lubang pertama dulu dan menulis nilainya pada kad kecil yang disediakan. Seterusnya, pada lubang kedua, murid akan memasukkan dua guli lagi dengan menambah jumlah yang terdapat dalam lubang pertama iaitu 2. Murid akan menulis 4 di kotak kedua. Murid akan mengulangi proses ini sehingga kotak ke-10. Selepas siap diisi, guru membimbing murid untuk mengenali sifir 2. Selepas murid mahir, guru menyediakan dua model 'Sifirian Congkak' dan mengadakan pertandingan dalam kalangan murid. Murid yang mengira dan memberitahu jawapan dengan cepat semasa diajukan soalan oleh guru ialah pemenangnya. Hadiah akan diberi kepada pemenang. Lama-kelamaan, mereka akan mula mengingati sifir itu dengan betul, cepat dan tepat. Jadi, begitulah seterusnya murid boleh mahir dalam operasi darab dengan menggunakan congkak sifir ini. Apabila congkak sifir ini sudah lengkap, pengkaji akan menerangkan pula cara membaca dan menggunakan congkak sifir tersebut

Dapatan & Perbincangan

Jadual 1 menunjukkan keputusan perbandingan markah ujian pra dan ujian pos untuk ketiga-tiga kumpulan dibandingkan untuk mencari perbezaan peningkatan antara dua kaedah tersebut.

Jadual 1: Perbandingan Ujian Pra dan Pos bagi Tiga Kumpulan

Kumpulan	Markah	
	Ujian Pra	Ujian Pos
A (Kaedah Tradisional)	7/10	7/10
B (Kaedah Congkak Sifir)	4/10	8/10
C (Kaedah Congkak Sifir)	3/10	7/10

Conclusion

Congkak Sifir dapat dijadikan panduan dan kaedah baru dalam penghafalan sifir. Murid yang selama ini tidak nampak akan kaedah lain untuk menguasai fakta asas darab, akhirnya sudah mempunyai alternatif yang baru. Dengan pengetahuan kira tambah yang sudah sedia ada kepada murid itu, maka bolehlah dikembangkan kepada bentuk kira darab. Murid tidak lagi terikat dengan satu cara sahaja iaitu hafalan nombor secara semata-mata. Dapatan daripada inovasi ini dapat digunakan oleh Panitia Matematik daerah untuk diperluaskan kepada semua sekolah yang berada di dalam daerah tersebut. Jika terdapat sekolah lain yang menghadapi masalah yang sama, pengerusi panitia daerah boleh menyampaikannya kepada sekolah berkenaan untuk dipraktikkan. Dengan penyebaran dapatan ini, semua sekolah di dalam daerah tersebut akan mendapat kaedah dan maklumat tambahan dalam menyelesaikan masalah fakta asas darab.

References

Cosby S. Rogers and Janet K. Sawyer, (1834). *Play in the lives of Children*, National Association for the Education of Young Childern. Connecticut Avenue.

Fauziah Md Jaafar, (2008). *Kepentingan Aktiviti Bermain Dalam Pendidikan Prasekolah*, Jurnal Pendidikan 1 – 8.

Juliani Abdullah, (2008), *Kiralah Sayang*, Kuala Lumpur : Kreatif Kembara Sdn. Bhd.

Nor Hashimah Hashim & Yahya Che Lah, (2003) *Panduan Pendidikan Sekolah*, Selangor: PTS Publications & Distributors Sdn. Bhd.

Peti ilmu" / 'knowledge box

Tibasry Arumugam

Sjk (Tamil) Bekok

Highlights: This innovation titled "Knowledge Box" is made of a box with colored paper that includes low expenses but fulfills high benefits. This box is not only an empty box, but also helps students learn knowledge, language, counting, differences, similarities, numbers, comparisons and more. Not only that, this game uses the "Knowledge Box" as an exercise for students' eyes and hands. "Knowledge Box" helps teachers to attract students' interest in PdP. Weak students can also fully learn the skills taught by the teacher.

Key words: Low expenses; Language; Differences; Similarities; Comparisons

Introduction

"Knowledge Box" is an auxiliary material that was created. The purpose of this name is for students to explore knowledge while playing this game. The researcher, as a primary school Language Teacher who teaches Language, created these teaching aids to solve the problems of students who are faced with the problem of lack of understanding, lack of interest and class teaching and learning is not fun. The researcher is also a Mathematics teacher. I also use this teaching aids to teach Mathematics subjects. These colorful Teaching Aids, various pictures and words help students have fun learning in class. Assessment can also record successfully in every teaching activity.

Product Description

To create this knowledge box, I only use recycled boxes, colored paper, paper clips, cards and pictures. I didn't spend a lot of money on this box. The color paper used to wrap this box must attract students' interest. This teaching aids is square shaped. Pupils must want to explore in the box. Interesting cards and interesting pictures must help students to become interested in the lesson. All students and all teachers can use this Knowledge Box. This box is also very helpful for all subjects and there is no limit to its use.

Results & Discussion

Table 1: Malay class Year 2

Name	Pre		Pos	
Jaiyaganesh	5	10	10	10
Sashmitha	4	10	10	10
Thosika	4	10	10	10
Saranniya	2	10	8	10

The table 1.1 above shows a test that I have implemented for year two students. very different results. Students understand the lesson more easily with the help of the knowledge box.

Table 2: Mathematic Class Year 2

NAME	PRA		POS	
Jaiyaganesh	15	25	25	25
Sashmitha	12	25	25	25
Thosika	10	25	25	25
Saranniya	6	25	25	25

Table 2 above shows a test that I have implemented for same class year two students. Very different results. Students understand the lesson more easily with the help of the knowledge box.

Conclusion

Teaching Aid's "Knowledge Box" is suitable, economical, easy to take to class and everywhere, attracts students' interest, colorful and can be used for Pre School, Level 1 and Level II. All teaching steps or even teaching interludes can be used. The "Knowledge Box" can also be kept in a separate corner for easy students to play on their own because the back of the Picture Card has answers for reference. Without the help of the teacher, students can play and learn on their own.

References

BBM Bahasa Melayu. (n.d.). https://www.cikguhijau.com/p/bahan-bantu-mengajar.html

Kamihakamis. (2021, January 27). *BBM BAHASA MELAYU PEMULIHAN*. cikgukamiha.com. https://cikgukamiha.com/portfolio/bahan-bantu-mengajar-bahasa-melayu-pemulihan-khas/

DINAR dalam tajuk pengaratan

Siti Nur Farahie Binti Buhari
SK Taman Cahaya Masai, Pasir Gudang
g-54033647@moe-dl.edu.my

Sorotan: Program sekolah juga banyak berlaku penambahbaikan untuk menyiapkan generasi muda dengan kemahiran abad ke-21. Antaranya adalah pemikiran kreatif. Kini pengajaran dan pembelajaran perlu mempunyai kaitan dengan kemahiran berfikir murid. (Sharma & Kumar, 2023)menyatakan wujudnya hubungan antara kreativiti dan pembelajaran. Usaha ini memerlukan guru mempunyai pengetahuan yang tinggi dalam strategi pengajaran supaya kemahiran berfikiran kreatif murid dapat dibina. DINAR merupakan satu strategi pengajaran yang dibina untuk menggalakkan murid berfikir secara kreatif dalam menyelesaikan sesuatu masalah bersesuaian dengan pendapat (Burnard & Colucci Gray, 2020) menyatakan melalui aktiviti STEAM murid akan lebih mengetahui sains dan alam sekitar.

Kata kunci: asemblaj; robot; kreatif

Pengenalan

Murid didedahkan tentang pengaratan. Dalam tajuk ini murid menghadapi masalah dalam menguasai dan menghubungkait semua maklumat berkaitan pengaratan. Dalam tajuk ini terdapat beberapa sub tajuk iaitu ciri-ciri objek yang berkarat, faktor-faktor yang menyebabkan pengaratan, cara mencegah pengaratan dan kepentingan pencegahan pengaratan. Murid didedahkan dengan topik pengaratan namun berdasarkan pemerhatian murid sekadar menghafal fakta. Objektif inovasi ini adalah meningkatkan penguasaan murid dalam topik pengaratan. Objektif kedua adalah mewujudkan suasana belajar secara kolaboratif dan menyeronokkan tanpa tekanan.

Penerangan Produk

DINAR merupakan strategi yang diadaptasi dari teknik provokasi dua peringkat oleh Edward De Bono pada tahun 1993. Inovasi yang dilakukan adalah menggabungkan teknik provokasi ini dengan teknik asemblaj yang murid pelajari dalam subjek Pendidikan Seni Visual untuk mempelajari tajuk pengaratan. DINAR merupakan satu strategi yang dibina untuk menghubungkaitkan semua sub tajuk tersebut supaya murid dapat menguasai tajuk tersebut dengan baik.

Jadual 1: Strategi DINAR

TAHAP 1	**TAHAP 2**	**TAHAP 3**
Guru menetapkan satu projek iaitu Asemblaj Robot. Dalam projek ini, murid perlu menghasilkan replika robot menggunakan bahan-bahan terbuang. Projek ini harus dibuat dalam kumpulan.	Murid menghasilkan replika robot dalam kumpulan. Konsep penghasilan Asemblaj Robot ini adalah, tiada yang salah. Rajah 1: Projek Asemblaj Robot 	Murid dikehendaki membentangkan hasil projek mereka. Pembentangan projek mereka dibimbing dengan soalan-soalan berikut: 1. Nyatakan ciri-ciri alat yang kamu gunakan dalam projek kamu? 2. Adakah objek yang kamu pilih itu boleh berkarat? 3. Jika kamu menggunakan bahan yang boleh berkarat apa yang kamu lakukan untuk elakkan Asemblaj Robot kamu rosak? 4. Adakah kamu rasa selamat asemblaj robot kamu digunakan jika boleh berkarat?

Dapatan & Perbincangan

Untuk mengenalpasti sama ada inovasi ini mencapai objektifnya. Sebanyak 3 kelas menjadi sampel untuk inovasi ini. Kelas 1 terdiri daripada 33 orang murid, Kelas 2 terdiri daripada 32 orang murid dan Kelas 3 terdiri daripada 33 orang

murid. Secara keseluruhan, dapatan berdasarkan Jadual 2 jelas menunjukkan penggunaan DINAR dalam pengajaran dapat meningkatkan penguasaan murid dalam topik pengaratan.

Jadual 2: Keputusan Praujian dan Ujian Pos.

Sub Tajuk	**Praujian**			**Ujian Pos**		
	1	**2**	**3**	**1**	**2**	**3**
Ciri-ciri objek yang berkarat	14	13	10	28	30	26
Faktor-faktor yang menyebabkan pengaratan	8	6	7	30	32	30
Cara mencegah pengaratan	9	8	6	29	27	24
Kepentingan pencegahan pengaratan	7	6	7	29	30	30

Merujuk kepada objektif kedua, soalan terbuka diberikan untuk mengukur adakah DINAR dapat mewujudkan suasana belajar secara kolaboratif dan menyeronokkan tanpa tekanan. Proses menganalisis data soalan terbuka telah dapat dijalankan dengan baik dan setiap butiran soalan terbuka ditulis semula mewujudkan 3 tema iaitu Tema 1 adalah seronok semasa belajar, Tema 2 adalah belajar secara kolaboratif dan Tema 3 adalah tiada tekanan.

Jadual 3: Keputusan Soalan Terbuka

Tema	**KELAS 1**		**KELAS 2**		**KELAS 3**	
	f	**%**	**f**	**%**	**f**	**%**
Seronok semasa belajar	28	84	29	87	28	84
Belajar secara kolaboratif	30	90	28	88	30	90
Tiada tekanan	27	81	31	93	27	82

Berdasarkan Jadual 3 jelas menunjukkan inovasi DINAR ini dapat mewujudkan suasana belajar secara kolaboratif dan menyeronokkan tanpa tekanan.

Kesimpulan

Inovasi DINAR ini, tidak terhad kepada pengajaran dan pembelajaran kepada satu topik pembelajaran sahaja, malah ia boleh diubah suai dengan menggantikan kandungan bahan mengajar dengan topik-topik lain namun projek yang bersesuaian. Oleh itu, potensi inovasi ini disebarluaskan kapada pihak lain adalah tinggi. Ini kerana DINAR direka khas untuk guru-guru bagi meningkatkan lagi pembelajaran berasaskan projek. Ini disokong oleh kenyataan (Liu & Wu, 2022)menyatakan dalam elemen seni dalam pengajaran murid perlu faham tentang fakta yang diterangkan. Pembelajaran berasaskan projek digabungkan dengan teknik penyoalan yang sesuai dapat meningkatkan kemahiran berfikir secara kreatif murid.

Rujukan

De Bono, E. (1995). Serious creativity. *The Journal for Quality and Participation*, *18*(5), 12.

Colucci-Gray, L., & Burnard, P. (2019). (Re-) Configuring STEAM in Future-Making Education. In *Why science and art creativities matter* (pp. 1-13). Brill.

Liu, C. Y., & Wu, C. J. (2022). STEM without art: A ship without a sail. Thinking Skills and Creativity, 43(September 2020), 100977. https://doi.org/10.1016/j.tsc.2021.10097

Sharma, G. V. S. S., & Kumar, S. (2023). Thinking Through Art–A creative insight into mechanical engineering education. *Thinking Skills and Creativity*, 101341.

Subtracting with Regrouping using BFF with Candy Bars Method

Aminah binti Wahab, Ainie @ Norainie binti Mojunting, Leong Lai Kwoon,
Muhammad Kashfi bin Kamsah, Chow Wui Chung
Sekolah Kebangsaan Pasir putih, Sandakan, Malaysia
sekolah-7002@@moe-dl.edu.my

Abstract: This research was carried out to solve the subtraction with regrouping problem that students were having whereby they had difficulty in deducting one digit number from two digits numbers using the basic subtraction standard method. The basic subtraction standard method requires students to "b*orrow*" from the "neighbour" and minus two digits number with one digit number and researchers found out that a small part of students in Year 5 have problems with that. A total of 8 students Year 5, 1 Headmistress, 3 Mathematics Teachers and a SISC+ Education Officer were involved in this research. Researchers had introduced an alternative method for students to subtract. The result of data analysis clearly shown that students shown great improvement in subtraction after research had been carried out.

***Keywords*:** subtraction; regrouping; improvement

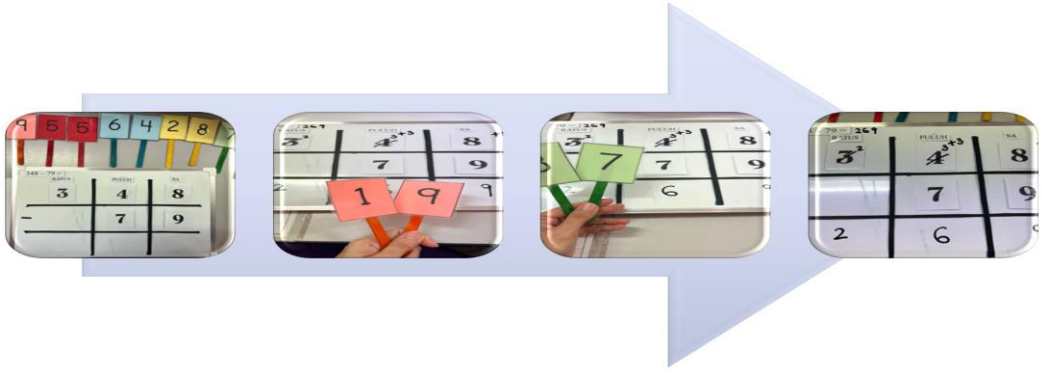
Introduction

Mastering the basic skills of Mathematics is very important for a student because of daily routine task. For example, determining time to complete a job, determining how many things needed to be bought, transactions at shops and canteen, transport fee and many others. This is why it is crucial for students to master all basic Mathematics skills so that they can live more comfortably and with more confidence. Therefore, all students should be able to add, subtract, multiply and divide as these are the basic skills of Mathematics. During Mathematics lesson in the class, a problem has been detected which is that a few students have difficulty in subtracting with regrouping using the standard subtraction method, in other words the take-away method. Thus, an early survey has been carried out by conducting a Pre-Test as indicator in this research. The Pre-Test has 6 questions consist of subtraction with regrouping of 4 digit numbers. The test result showed that all 8 students were unable to answer correctly because the questions involved subtraction with regrouping. In order to solve this problem, BFF method is introduced as an alternative way of subtracting numbers whereby they need to "add" numbers instead of deducting numbers. Post Test result showed great improvement from students in solving subtraction with regrouping questions. Research findings also showed students have more confidence in answering them.

Research Focus

This research focused on the 8 students in Class Year 5 which all of them are remedial students that have not mastered the minimum level in Classroom Assessment for the Mathematics Subject. 5 boys and 3 girls in Year 5 had difficulty in subtracting with regrouping of 4 digit numbers. They scored low in Pre-Test ranging from 16.66% to 33.33% only. Therefore, BFF with Candy Bars method was introduced as a resort to overcome this problem. This research was carried out to find out the effectiveness of BFF with Candy Bars in overcoming subtraction with regrouping problem.

Product Description



Picture 1

Researchers had come out with a subtraction method which is named BFF with Candy Bars. BFF stands for Best Friend Forever. The pair of numbers added up becomes ten are called BFF of each other. Pairs of BFF are labelled with same colour cards. These cards are called Candy Bars. The cards are also prepared in candy bar form as another way to entice students to memorize the pair of numbers when added up will be equal to ten. Students will refer to

these cards when solving subtraction questions. BFF method is derived from part-whole method, where students need to find the numbers added up to ten. These pair of numbers are the best friend of each other and students can find the BFF numbers using the candy bars provided. Starting with ones, 8 minus 9, students refer to candy bar to find best friend of number 9, which is 1, add 1 to 8. Answer is 9.Next, for the tens, 3 minus 7, students find best friend of 7 which is 3, add to 3 becomes 6.

Results & Discussion

Post-test was given to find out the scores of the students after the teaching experiment and what they have learned. By comparing the result from pre-test and post-test, it showed the development of students' ability to subtract; using the BFF with Candy Bars method. After exposing the students to this method, Post-Test had been carried out. Post-test was done after 3 weeks of teaching the method. Based on the result of the tests, the students showed clear improvement in subtraction with regrouping using BFF with Candy Bars method. The data collected was analyzed with Wilcoxon Signed Rank Test because the data is non-parametric and there were only 8 respondents involved in the test.

Table 1: Descriptive Statistics

						Percentiles	
	N	Mean	Std. Deviation	Minimum	Maximum	25th	50th (Median)	75th
Pre-test	8	16.6162	8.90787	.00	33.33	16.6000	16.6000	16.6000
Post-test	8	58.3000	23.57699	16.60	100.00	50.0000	58.3000	66.6000

Students were given pre-test before they were introduced to BFF with Candy Bars model. After weeks of training respondents of using the model in subtracting, the post-test was given. The pre-test and post-test had identified set of questions which were randomized to avoid the students memorizing the answers. Refer to the table above, the results shown that mean of the achievements of 8 students improved from 16.61 to 58.30 with all the positives ranks.

Table 2: **Test Statistics**[a]

	Post-test – Pre-test
Z	-2.410[b]
Asymp. Sig. (2-tailed)	.016

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Based on Table 2, BFF with Candy Bars model can enhance the ability to subtract with regrouping among the 8 pupils which the test has shown ($p<0.05$) highly significant and value Z of -2.41[b] means that there is a difference or change in between pre-test and post-test after applying the method. [b] means Post-test is greater than pre-test.

Conclusion

The research aimed to determine the correlation between the introduced method; BFF with candy bars and the students ability to subtract with regrouping, as well as to identify the effectiveness of the method. Wilcoxon Signed Ranks Test data analysis of pre-test and post-test is presented in this research and has proved the method has indeed manage to help students in subtracting with regrouping. BFF method in this study focused on improving students' basic subtracting skill in Mathematics subject. The students ability to subtract with regrouping and the usage of BFF method with Candy Bars is interrelated; the results of this action research supported that statement. This method provides short term solution in helping the students to subtract. Once they master the skill, they will solve subtraction questions without using candy bars. Researchers are hopeful to carry out this method on other levels of underperforming students, as well as other schools in the whole district. Nevertheless, researchers find that the method may not work as well for the students that have mastered the subtraction skill as it may add up their confusion.

References

Kirkpatrick, Donald L. (1994). Evaluating training programs : the four levels. San Francisco : Emeryville, CA :Berrett-Koehler ; Publishers Group West [distributor],

Campbell, J. I. D. (2008). Subtraction by addition. *Memory & Cognition, 36*, 1094-1102. doi:10.3758/MC.36.6.1094

Torbeyns, J., Ghesquière, P., & Verschaffel, L. (2009). Efficiency and flexibility of indirect addition in the domain of multi-digit subtraction. *Learning and Instruction, 19*, 1-12. doi:10.1016/j.learninstruc.2007.12.002

Spelling Builder: The Acrostic Way

Chieng Siew Kiong, Chieng Hie Ling, Connie Chieng Hie Tyng, Catherine Hii Ru Jia, Cindy Hii Ru Jing

SJK Kwong Hua, Pejabat Pendidikan Daerah Sibu, SJKC Methodist, SMK Saint Elizabeth

chard9113@gmail.com, ling5590@yahoo.com, connie_chieng@hotmail.com, cathhii37@gmail.com, cindyhii0825@gmail.com

Highlights: This study was conducted with the aim of improving the spelling skills of Year Five students. The main focus of the study was on students who had difficulty spelling long, commonly misspelled (high-frequency) words or words exceeding three syllables. The study involved 27 Year Five students at SJK Kwong Hua. The research instruments consisted of a Pre-Test and a Post-Test. The "Acrostic Way" was introduced to the students. The pre-test was conducted to assess the extent to which they could spell specific words correctly. The post-test was used to determine if students could correctly spell most words. As a result, this method was able to improve students' spelling proficiency.

Keywords: *spelling skills, long vocabulary words, Acrostic way, Year 5 students, pre-test and post-test*

Introduction

The students in Year 5 at SJK Kwong Hua are less competent and have a relatively low academic achievement record. These students are lacking motivation in learning and have very short memory spans, often forgetting newly taught vocabulary. Spelling errors (exceeding 3 syllables) frequently occur, causing them to lose marks in assessments.

This study focuses on students' ability to master and remember the spelling of vocabulary words. Based on exercises from textbooks and oral exams, the teacher found that most of the 27 students in the class could hardly answer or spell correctly. Most of them relied on luck during spelling tests. Vocabulary words with more than three syllables, such as "dinosaur," were taught using the Acrostic Generator Technique.

Various methods were used to conduct this action research, including Problem Survey, Observation, Pre-Test, Post-Test and Analysis of Problem Survey.

Table 1: Pre-test achievement data (initial)

Question Number	Correct Answers	Incorrect Answers	Percentage Correct
Question 1	5	22	16%
Question 2	7	20	26%
Question 3	2	25	7%
Question 4	4	23	15%
Question 5	6	21	22%
Question 6	0	27	0%
Question 7	0	27	0%

Question Number	Correct Answers	Incorrect Answers	Percentage Correct
Question 8	0	27	0%
Question 9	0	27	0%
Question 10	0	27	0%
Question 11	8	19	30%
Question 12	7	20	26%
Question 13	7	20	26%

Table 2: Pre-test achievement results (initial)

No.	Name	Number of correct answers
1	Student 1	3
2	Student 2	0
3	Student 3	0
4	Student 4	3
5	Student 5	1
6	Student 6	0
7	Student 7	4
8	Student 8	8
9	Student 9	0
10	Student 10	2
11	Student 11	2
12	Student 12	0
13	Student 13	1
14	Student 14	0

No.	Name	Number of correct answers
15	Student 15	2
16	Student 16	2
17	Student 17	2
18	Student 18	0
19	Student 19	0
20	Student 20	4
21	Student 21	1
22	Student 22	1
23	Student 23	0
24	Student 24	4
25	Student 25	6
26	Student 26	2
27	Student 27	2

Based on the above data, it is evident that most students could not spell correctly. Vocabulary words with more than three syllables made it difficult for them to remember the spellings, which was a major factor in their mark losses during assessments. Thus, the teacher identified that the students needed motivation to use the Acrostic Way to improve their spelling.

Product Description

The innovation demonstrates a solid quality of ideas and showcases innovativeness. The study addresses a clear educational challenge, focusing on improving spelling skills for students struggling with complex words. The introduction of the "Acrostic Way" technique, specifically tailored to overcome syllabic challenges, is a novel and innovative approach. The research methods, including Problem Survey, Pre-Test, Post-Test, and Observation, reflect a thoughtful and comprehensive methodology. The study's findings highlight significant improvements and boosted confidence among students. Overall, the product description shows a well-considered strategy to address a specific learning issue with creative solutions.

Results & Discussion

Table 3: Post-test achievement data (final)

Question Number	Correct Answers	Incorrect Answers	Percentage Correct
Question 1	18	9	67%
Question 2	18	9	67%
Question 3	16	11	59%
Question 4	16	11	59%
Question 5	16	11	59%
Question 6	15	12	56%
Question 7	17	10	63%

Question Number	Correct Answers	Incorrect Answers	Percentage Correct
Question 8	18	9	67%
Question 9	17	10	63%
Question 10	16	11	59%
Question 11	15	12	56%
Question 12	17	10	63%
Question 13	16	11	59%

Table 4: Post-test achievement results (final)

No.	Name	Number of correct answers
1	Student 1	13
2	Student 2	10
3	Student 3	7
4	Student 4	11
5	Student 5	13
6	Student 6	13
7	Student 7	13
8	Student 8	13
9	Student 9	1
10	Student 10	13
11	Student 11	8
12	Student 12	10
13	Student 13	13
14	Student 14	11

No.	Name	Number of correct answers
15	Student 15	9
16	Student 16	11
17	Student 17	13
18	Student 18	13
19	Student 19	9
20	Student 20	13
21	Student 21	11
22	Student 22	13
23	Student 23	11
24	Student 24	13
25	Student 25	13
26	Student 26	12
27	Student 27	13

Based on the data above, we can conclude that there is a significant improvement compared to the pre-Test. It appears that students remember words with more than 3 syllables well.This action research was carried out within two weeks after the Pre-Test was conducted. Review sessions were held every day to ensure that students always remember the spelling of each word they learned. Students showed significant improvement, as evidenced by their performance in the Pre-Test and Post-Test assessments. The findings of this study have helped students master spelling skills more easily and boost their confidence.

Conclusion

Every success requires diligent and persistent effort to achieve. The attitude of constantly seeking new knowledge and nurturing students' interest should be instilled in them from a young age. The Acrostic Way is highly suitable for adaptation to other students who require continuous guidance. Several steps need to be followed, including presenting the Acrostic Way to English language subject teachers during the English Language Panel meeting besides widely disseminated to weaker classes. However, it should be noted that this method is not the best technique for all students, but it can certainly assist students with short memory spans and those who have difficulty mastering the spelling of long words.

References

Arikunto, Suharsimi. 2006. Procedure Penelitian : Suatu Pendekatan Praktik.Jakarta: Rineka.

Hiebert, E.H. & Kamil, M.L. (2005). Teaching and Learning Vocabulary. London: Lawrence Erlbaum Associates, Publishers.

Trathen, W. & Schlagal, B. (2010). "Extending Acrostic Poetry into Content Learning: A Scaffolding Framework", Journal of The Reading Teacher, 63

LCoViL as Effective Online Learning Pedagogical Setting for Mathematics Learners

Ziham Zawawi bin Mazlan
Sekolah Kebangsaan Desa Pandan, Kuala Lumpur
g-91223866@moe-dl.edu.my

Highlights: LCoViL is a pedagogical setting designed to suit online learning for primary and secondary school students in teaching and learning Mathematics. It is a portmanteau of LMS - Communication Tools - Video Conference – LMS, the flow whereas online learning environment adapted to suit individual needs, the teachers, the parents, the students, and the stakeholders. A few studies have been conducted to determine the effectiveness of this innovation, namely action research and single case qualitative study.

Keywords: Communication tools; video conferencing; learning management system; online class.

Introduction

The dynamic evolution of technology in education has called the question of which technology should and could be implemented into the pedagogical approach amid the pandemic of COVID-19 (Teräs et. al., 2020). Teachers have the responsibility to understand how students engage with technology for teaching and learning since how they interact with technology is constantly evolving (Ferri et. al., 2020). However, it is noticed that the lack of teacher's knowledge and skills to integrate technology into online learning has resulted to the poor quality of online learning engagement (Lie et. al., 2020). Thus, it impacted the student's turn up amid the pandemic (UNESCO, 2021). Malaysia also impacted with this current situation whereas only 80% student turn up during the earlier phase of MCO (Khalid, 2021).

Even though the pandemic is declared ended as a global health emergency (UN News, 2023), nobody knows when the next pandemic or the next global recession or crisis is that put education at halt. Thus, a proper framework for execution of online learning is needed before it happens again. Making used of movement control order (MCO) where all level of education is shifting to online learning, the use of digital tools reaches its peak. But which digital tools is the most preferable by the Malaysian teacher? Mazlan et al., (2022) found that Google Classroom is the most preferable to be used for Learning Management System (LMS), WhatsApp for communication tools and Google Meet for video conferencing by Malaysian teachers.

Many scholars found that the usefulness of Google Classroom noting its ease of use, better interaction, and overall satisfaction of the students (see Abdullah Saimi & Mohamad, 2022; Ahmad et. al., 2020; Piaralal et. al., 2023; Mat Yusoff & Mohamad Marzaini, 2021). On the other hand, Moses et al. (2022) found that integrating Google Classroom into online learning arises few challenges such as students' attitude problems, insufficient ICT training for the teachers, poor network connection and the increase of teacher's workload.

Google Meet is not replacing traditional face-to-face classroom instructions (Souheyla, 2022). Due to the pandemic, all level of education system has come to the practice of video conferencing such as Google Meet. Google Meet is found to the useful to ensure students are not negatively affected by the flaw of online learning and having deeper understanding of the lesson (Alagu Geetha & Kalaiarasi, 2023) to avoid the so called 'lost generation'. Amid the pandemic, Malaysian teachers and students recorded the greatest number of usages to both Google Classroom and Google Meet in the Asia-Pacific region (The Star, 2021).

WhatsApp as the most preferable communication tools by Malaysian teachers (Mazlan et al., 2022) has come to the point that it is a culture to create a WhatsApp group for any occasion, event, program, or task in Malaysia. Thus, its feasibility to be use during online classroom has resulting to may studies being conducted to discern this trend. This communication tool is beneficial in locating information for tasks and connecting with peers (Yoke, 2023), can be used anytime and anywhere (Indiran et. al., 2022), and stand as a platform for extending learning in blended learning classroom (Annamalai, 2021) by promoting asynchronous communication. On the other hand, Zainol and Mohd Samingin (2022) discovered that excessive use of this apps can reduce students' achievement noting that the greater engagement with the WhatsApp app, students' achievement is declining.

However, if these digital tools are being used together, it could provide such engaging and meaningful mathematics online learning environment to the students. Furthermore, the convenience of these digital tools is beneficial to all the stake holders including students, parents, teachers, and school administrators. Students turn up during online classes has increased if LMS, communication tools, and video conference are being used ended with LMS for asynchronous communication to suit individual timing. Student can relearn the shared materials on LMS at their own pace and have discussion (asynchronous communication) with friends and teachers. Teachers on the other hand can have peace of mind. They can set their own time to respond and monitor discussion thread on LMS. Furthermore, they can monitor student's progress, this act promotes the digitalization where students' work is kept in one curated and organized place (LMS). Parent can monitor their kids' learning progress, homework and so on while providing privacy to the teacher. School administrator can monitor teacher's teaching work without disturbing teachers, avoiding unnecessary stress towards the teachers. LCoViL provides online teaching model for the school administrator to be implemented at their school level.

Product Description

Teaching mathematics in online learning mode might be challenging. By making use of digital tools and execute it in correct order might providing such conducive and meaningful online learning. LCoViL is designed to suit individual needs and preferences. There are four stages of LCoViL pedagogical setting shown in Figure 1.

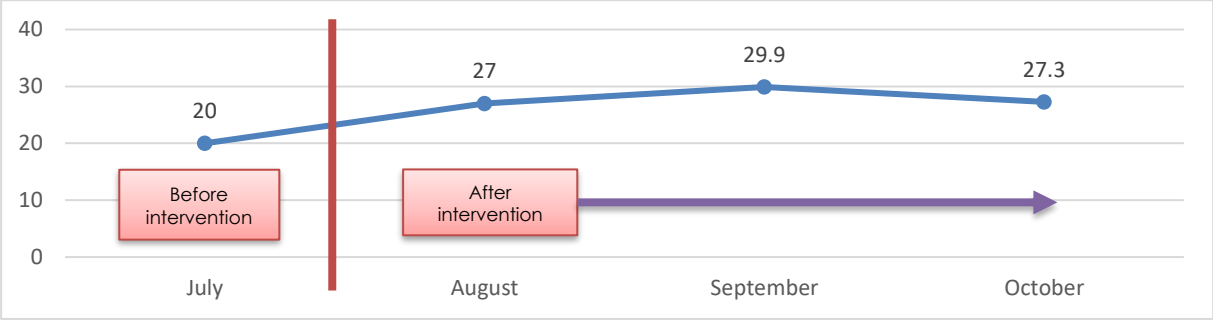
Figure 1: LCoViL pedagogical setting

Firstly, teacher shares all learning materials in the chosen LMS such as notes, exercises, and videos before the class. By using chosen communication tools, teacher reminds parents and students about the online classes one day before it is being conducted and to check out all shared learning materials in the LMS. This will provide prior knowledge to the student before online class. The link for the chosen video conference also shared using the same message. Teachers are suggested to make the message on point and as simple as possible and within that one message. During the online class, ask permission from the students to record the learning session. The recorded session is then shared using the chosen LMS. Teacher creates a thread to discuss about today's Mathematics lesson. Students are asked to turn in their homework using the chosen LMS. By during this, it is easier for the teacher to monitor, grade, and assess student progress and attendance. For those who unable to join the video conference session, they can retrieve the recorded session through LMS. In fact, they can read the on-going discussion by reading the discussion thread and ask further question using the same thread. By doing this, no one is left behind and mathematics learning objectives could be achieved.

Results & Discussion

Document analysis was used to determine the changes of student turn up in Mathematics class by using LCoViL pedagogical setting. Attendance reports were retrieved automatically from Google Meet Attendance Report from each online class session. Controlled engagements between teacher with students and teacher with parents has resulted the increase of student turn up during Mathematics online classes.

Table 1: Mean percentage of students' turn up during Mathematics online classes for four months of 3 Delima.



Observation on the hand has been used to noted individual behavioural pertaining the use of LCoViL pedagogical setting. The use of asynchronous communication between teachers and student using LMS and communication tools has resulted more engaging online learning environment. By using LCoViL, students' engagement between learning environment is controlled, monitored, and well curated resulted to excessive use of digital tools namely communication tools and LMS. This is coherent with Zainol and Mohd Samingin (2022) that excessive use of this apps can reduce students' achievement noting that the greater engagement with the WhatsApp app, students' achievement is declining. Whereas, for the parent, less stress is taken into account pertaining the use of LCoViL when asynchronous communication between teacher and parents is promoted.

Other notable observation with the use of LCoViL is less stress is seen by the teacher and parents. Teacher can curate their timing to respond to the parents and student and is it being done in controlled and recorded platform for future reference. Student in parallel occasion were having more engaging and meaningful Mathematics online learning. The use of discussion thread in LMS avoiding any student to left behind. They can catch up with their peers by reading the previous discussion and shared materials (recorded video conference, notes, and homework) and relearn at their pace time. Less stress also being seen by the teacher by using LCoViL when school administrators monitor teacher's teaching work without disturbing teachers. They can join the video conference to observe and monitor the teacher and check teacher teaching progress by using LMS. This can promote healthy relationship between teachers and school administrators.

Conclusion

LCoViL pedagogical setting has proven to be effective to increase students' turn up during mathematics online classes and positive behavioural were seen amid the intervention. However, further study on how LCoViL could help students' motivation and achievement are still unchartered. It is suggested to implement this online pedagogical setting in other demographic locality to obtain further understanding on how different demographic sets responding to this innovation.

It is also suggested to include other types of digital tools into LCoViL such as dynamic geometry software (DGS), assessment tool, and digital games into stage one and four of LCoViL to enhance the effectiveness of this pedagogical setting towards teaching and learning mathematics thus promoting digitalisation in education. The current state of LCoViL is seen to be suited for online learning pertaining varied subject (based on previous studies; see Mazlan Z. Z., 2023). Teaching and learning mathematics require more practical and hands-on activity, thus further study should be conducted to improvised and enhanced this online pedagogical setting to obtain the intended Mathematics learning objectives.

Publication, Award and Intellectual Property

Conference (Presenter)

The Effect of Using LMS, Video Conference, and Communication Tools to Increase Student Turn Up during Online Classes, Mini Kolokium Jurnal Penyelidikan Profesionalisme Guru KPM 2023, Hotel Excelsior Ipoh, 12 - 14 July 2023, Bahagian Profesionalisme Guru (BPG) Kementerian Pendidikan Malaysia (National), 2023. — **Best Presenter**

Increasing Student Turn Up during Online Classes using LMS, Video Conference, and Communication Tools: An Experimental AR, International Seminar 2022 Saratok Education District Office, Virtual, 5-7 Dec 2022, Saratok Education District Office & Kabong ADUN N. 40 Service Centre (International), 2022 — **Presenter**

Using LMS, Video Conference, and Communication Tools to Increase Student Turn Up during Online Classes, International Conference on Action Research (ICAR) 2022, Virtual, 3 - 6 Sept 2022, The Malaysian Action Research Network (MARNet) & Centre for Research in International and Comparative Education (CRICE), Universiti Malaya (International), 2022. — **Presenter**

Conference (Poster Presenter)

The Effectiveness of Digital Tools to Increase Students' Turn up during Online Classes, Seminar Kebangsaan Pendidikan Keguruan (SKPK) ke III, Hotel Grand Dorsett Subang, 15-17 Ogos 2023, Bahagian Profesionalisme Guru (BPG) Kementerian Pendidikan Malaysia (National), 2023. — **Consolation prize**

Publication

Mazlan, Z. Z., (2023). *The Effectiveness of Digital Tools to Increase Student Turn Up during Online Classes*. Jurnal Penyelidikan Profesionalisme Guru, 21 (1), xx-xx. (Peer-reviewed) (Accepted–in Copy editing stages).

References

Abdullah Saimi, W.M.S., & Mohamad, M. (2022). The Effectiveness of Google Classroom as a Virtual Learning Environment (VLE) for School Teachers: Literature Review. *International Journal of Linguistics, Literature and Translation, 5*(3), 172-175. doi:10.32996/ijllt.2022.5.3.22.

Ahmad, S., Abu Samah, N., Jumaat, N.F., Mohamad Ashari, Z., & Abdul Rahman, K.A. (2022). The Factors of Google Classroom Usage among Primary School Science Teachers. *Sains Humanika, 14*, 95-104. doi:10.11113/sh.v14n3-2.2024.

Ahmad, R.R., Hassan, Z., & A Wahab, N.H. (2022). The Ease of Use of Google Classroom Technology Among Secondary School Teachers in Malaysia. *Sains Humanika, 14*(2), 69-77. doi:10.11113/sh.v14n2.1936.

Alagu Geetha, A., & Kalaiarasi, N. (2023). Effectiveness of Google Meet Supported Instruction in Learning Polynomials among Secondary Students. *Scholarly Research Journal for Humanity Science & English Language, 11*(55), 1-11.

Annamalai, N. (2021). Using WhatsApp to Extend Learning in a Blended Classroom Environment. *Teaching English with Technology*, 3-20.

Ferri, F., Grifoni, P., & Guzzo, T. (2020). Online learning and emergency remote teaching: Opportunities and challenges in emergency situations. *Societies, 10*(4), 1-18.

Indiran, D., Ismail, H.H., & Ab Rashid, R. (2022). Exploring Opportunities and Challenges of Using WhatsApp in Teaching Reading: A Malaysian Rural Primary School Context. *Creative Education, 13*(5), 1689-1709. doi:10.4236/ce.2022.135107.

Khalid, M. (2021, June 25). *PdPr: Kehadiran tak sampai 80 peratus, di mana muridnya?*. Retrieved from Utusan TV: https://utusantv.com/2021/06/25/pdpr-kehadiran-tak-sampai-80-peratus-di-mana-muridnya/.

Lie, A., Tamah, S., Gozali, I., Triwidayati, K., Utami, T., & Jemadi, F. (2020). Secondary school language teachers' online learning engagement during the COVID-19 pandemic in Indonesia. *Journal of Information Technology Education Research, 19*, 803-832.

Mat Yusoff, S., & Mohamad Marzaini, A.F. (2021). The Effectiveness of Using Google Classroom Application the Teaching Efficiency During Malaysia Movement Control Order Among Secondary School teachers. *Proceeding of 5th International Conference on Teacher Learning and Development (ICTLD) 2021* (pp. 173-181). Institut Pendidikan Guru Malaysia.

Mazlan, Z.Z., Munakase, M., & Mohamad Ali, M. (2022). Unpacking Malaysian Teacher's Preferences in Using Technology During Covid-19 Pandemic. *International Technology and Education Journal, 6*(1), 1-13.

Moses, P., Cheah, P.K., Yap, P.S.Y., MD Khambari, M.N., & Wong, S.L. (2022). Behind-the-Scenes: Challenges to Integrate Google Classroom in Teaching and Learning. *Proceedings of the 30th International Conference on Computers in Education* (pp. 1-9). Asia-Pacific Society for Computers in Education.

Piaralal, S.D., Mohd Tahir, M.H, Mohd Adnan, A.H., Mohamad Shah, D.S., & Ya Shak, M.S. (2023). The Use of Google Classroom Among Secondary School Teachers. *Journal of Nusantara Studies, 8*(1), 310-332. doi:10.24200/jonus.vol8iss1pp310-332.

Souheyla, B. (2022). Google Meet during COVID 19 Pandemic: When Teachers Raise the Challenge. *Arab World English Journal*(2nd Special Issue on Cobid 19 Challenges), 169-182. doi:10.24093/awej/covid2.11. (Annamalai, 2021)

Teräs, M., Suoranta, J., Teräs, H., & Curcher, M. (2020). Post-COVID-19 education and education tehnology 'solutionism': A seller's market. *Postdigital Science and Education, 20*(2), 863-878.

The Star. (2021, August 8). *Malaysians log in the most to edu apps in Asia-Pacific*. Retrieved from thestar.com: https://www.thestar.com.my/news/education/2021/08/08/malaysians-log-in-the-most-to-edu-apps-in-asia-pacific.

UN News. (2023, May 5). *WHO chief declares end to COVID-19 as a global health emergency*. Retrieved from un.org: https://news.un.org/en/story/2023/05/1136367.

UNESCO. (2020, March 4). *290 million students out of school due to COVID-19: UNESCO releases first global numbers and mobilizes response*. Retrieved from unesco.org: https://www.unesco.org/en/articles/290-million-students-out-school-due-covid-19-unesco-releases-first-global-numbers-and-mobilizes.

Yoke, S. K. (2023). The Use of Whatsapp for Online Learning among Malaysian Students. *International Journal of Academic Research in Progressive Education and Development, 12*(1), 798-807. doi:10.6007/IJARPED/v12-i1/14498.

Zainol, Z., & Mohd Samingin, N. (2022). The Effect of WhatsApp Application Usage on Student Achievement in Business-based Subjects. *International Business Education Journal, 15*(2), 49-56. doi:10.37134/ibej.Vol15.2.4.2022.