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FOREWORD

It is with great pleasure and anticipation that we introduce this distinguished publication, a compilation of innovative ideas and creative insights born out of the International Creative Innovation Idea Competition (ICIIC) 2024.

In an era defined by rapid advancements and global interconnectedness, the need for creative solutions to complex challenges has never been more crucial. The ICIIC serves as a beacon, illuminating the path toward novel ideas that have the potential to reshape industries, societies, and the way we perceive the world around us.

This publication encapsulates the essence of innovation, featuring contributions that span a wide spectrum of disciplines and industries. From cutting-edge technological advancements to socially impactful initiatives, each project showcases the power of human intellect harnessed for the greater good.

We extend our heartfelt gratitude to all the contributors and organizers who have played a pivotal role in bringing this publication to fruition. Your dedication and passion have contributed to the success of the ICIIC, and we are confident that the ideas presented within these pages will inspire others to push the boundaries of what is possible.

May this publication serve as a source of inspiration, fostering continued collaboration and further innovation. Together, let us embark on a journey of discovery and transformation, guided by the profound ideas encapsulated by the ICIIC 2024.

Editors

Chapter 1
Double Head Laser Engraving Machine (DoHLEM)

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ABSTRACT

The integration of double head lasers into wood laser keychain souvenir engraving machines stands out as a groundbreaking advancement in engraving technology. This innovation brings forth a host of advantages, enhancing production efficiency with faster engraving times and increased throughput. The affordability of double head laser machines broadens market access, fostering entrepreneurship and innovation. The double head lasers' versatility allows for intricate designs and diverse material options, expanding creative possibilities for personalized souvenirs. Beyond the machines, there is a comprehensive commercialization potential, extending to the keychain products themselves. In conclusion, this incorporation of double lasers not only streamlines the engraving process but also presents a compelling opportunity for businesses to excel in a competitive market by delivering unique, customized, and high-quality souvenirs.

Keywords: double head lasers; laser engrave; wood keychain souvenir.

1. INTRODUCTION

Laser engraving has become a popular and versatile method for creating precise and intricate designs on various materials. In this project, we aim to explore the world of laser engraving onto keychain souvenir by developing an automation control system using Arduino microcontroller. The project involves utilizing the Arduino platform to control double head laser engraving modules simultaneously, offering enhanced capabilities and flexibility for creative applications (Durna et al., 2020).

2. LITERATURE REVIEW

In the realm of precision crafting and digital fabrication, the combination of dual lasers with the Arduino Uno, powered by GRBL (G-code Realtime Bootloader) (Prashant et al., 2020), represents a cutting-edge approach to laser engraving. This innovative system seamlessly combines the precision control of two lasers with the flexibility of the Arduino Uno microcontroller, and the accuracy of the GRBL firmware (Raikar et al., 2021). As a result, this dual-head laser engraving setup offers a sophisticated and customizable solution for artists,

makers, and enthusiasts seeking to push the boundaries of their creative and technical endeavours. Moreover, the innovation contributes to more economic and environmental advantages of using double laser engraving machines in souvenir industry.

3. PROBLEM STATEMENT

Using a single laser in wood laser engraving does come with certain disadvantages, particularly in terms of time, productivity, and other factors. Engraving with a single laser can be time-consuming, especially when dealing with high volume order, the overall productivity might be lower because of the limited speed and efficiency of a single laser, and if there is an increase in demand or larger-scale production requirements, a single laser may not scale up well to meet the production needs. These could lead to bottlenecks in the workflow (Koprda et al., 2020).

4. OBJECTIVES

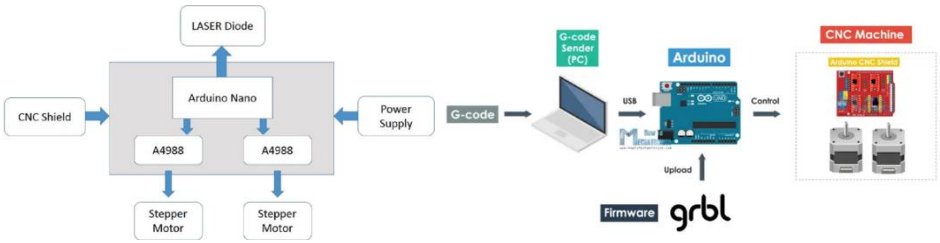
The objective of this innovation is to:

i) Become the first laser engraving machine exist in the wood keychain souvenir industry running in dual head mode.
ii) Increase productivity in the wood keychain souvenir industry by twice the production in half the time by running dual head laser engraving simultaneously.

5. METHODOLOGY

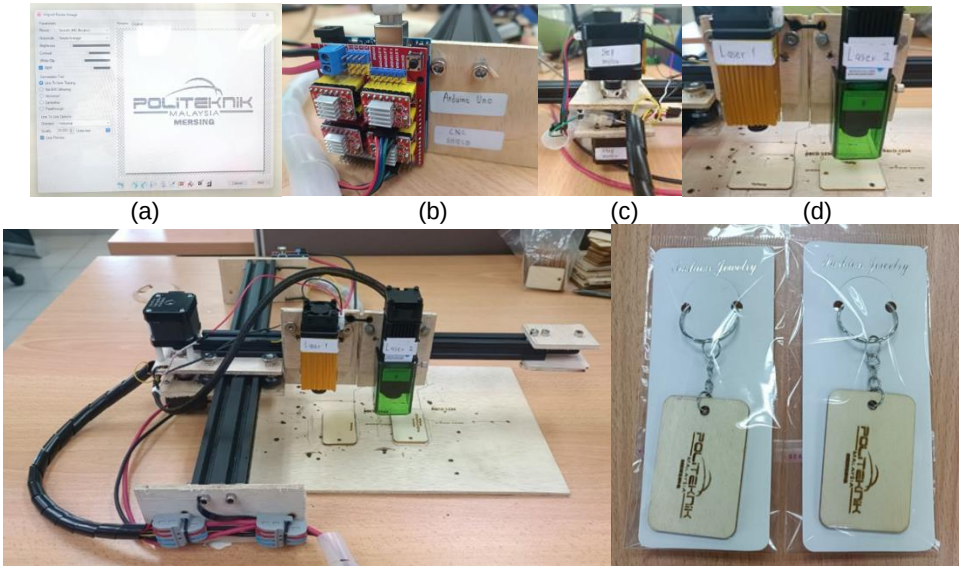
The project involves the design and development of a dual-head laser engraving machine using Arduino and a CNC shield. This system aims to achieve simultaneous and precise engraving on various materials through the coordinated operation of two laser heads. The project will include the selection of appropriate hardware components, such as laser modules, stepper motors, and the Arduino Uno microcontroller with CNC shield, to ensure compatibility and optimal performance (Koprda et al., 2020). The software development phase will focus on creating Arduino-based firmware and control algorithms to manage the synchronized operation of the two laser heads, as shown in block and mapping diagram Figure 1 (a) and (b).

Figure 2 (a), (b), (c), (d) shows the software during image optimization process, the Arduino Uno and CNC shield board, stepper motor, and the dual head laser installed at the machine, respectively. Figure 3 (e) shows the installed components of the DoHLEM machine, and finally figure (f) shows the product of the keychain souvenir in complete packaging.



(a) (b)

Figure 1: (a) Block diagram of DoHLEM, (b) Mapping diagram of DoHLEM



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

(e) (f)

Figure 2: (a) Image optimization process, (b) Arduino Uno and CNC shield board, (c) Stepper motor, (d) Dual head laser, (e) DoHLEM machine, and (f) Product of the keychain souvenir.

6. RESULTS AND DISCUSSION

Before the innovation in dual-head laser engraving machines for souvenir wood keychains, the engraving process was relatively time-consuming and limited in number of the production. Single-head machines lacked the capability to simultaneously engrave both sides of the keychain, resulting in longer production times.

After the innovation, the landscape has transformed significantly. The introduction of simultaneous dual engraving heads revolutionizes efficiency, enabling users to engrave intricate designs on two keychains concurrently or accelerate the process for increased productivity. The innovation has elevated the overall user experience and opened new possibilities in the realm of personalized wood keychain engraving.

This dual laser wood laser keychain souvenir engraves machine comes with reasonable price for two lasers instead of one laser as anyone can get in the market. All the materials used in development of this innovation are mostly handmade and Do-It-Yourself (DIY) customized. But not only the machine, but the wood keychain itself can be a commercialize product to be considered (Friatinia et al., 2023).

7. CONCLUSION

In conclusion, the integration of dual lasers into a wood laser keychain souvenir engraving machine represents a significant advancement in engraving technology, offering a range of benefits and opportunities. The dual-laser system enhances production efficiency, enabling faster engraving times and increased throughput. The affordability of machines with two lasers makes this technology accessible to a wider market, fostering entrepreneurship and innovation.

The versatility of dual lasers allows for intricate designs and diverse material options, expanding the creative possibilities for customized keychain souvenirs. Furthermore, the

commercialization potential extends beyond the engraving machine itself to include the keychain products, creating a comprehensive solution for businesses in the souvenir industry. Overall, the incorporation of dual lasers not only improves the efficiency of the engraving process but also opens new opportunity for businesses to thrive in a competitive market by offering unique, customized, and high-quality souvenirs.

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Chapter 2
DPL Interactive Hub

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ABSTRACT

The DPL INTERACTIVE HUB is an innovative online platform developed collaboratively within Seberang Perai Polytechnic's Diploma in Logistics and Supply Chain Management (DLS) program to address the scarcity of comprehensive educational resources encountered by students and lecturers. The lack of diverse and current study materials in logistics and supply chain management was previously a significant impediment to effective teaching and learning practices, impacting educational experiences. The primary objectives of the DPL INTERACTIVE HUB include establishing an accessible repository tailored explicitly for the Diploma in Logistics and Supply Chain Management program. It comprises eight modules integrated with eight different interactive learning applications, aimed at ensuring easy access to study materials via smartphones and the internet, thereby reducing reliance on heavy textbooks. This initiative intends to facilitate efficient revision, comprehension checks, and enhanced learning experiences within the institution and similar educational environments. Unique in its adaptability to modern trends, the DPL INTERACTIVE HUB allows seamless access to a variety of learning materials through smartphone-based technology. Its development emerged as a concerted effort to bridge resource gaps in logistics education, enhancing engagement by facilitating interactions with diverse learning materials. This feature fosters an active classroom environment, promoting enriched learning experiences and overall comprehension, aligning with its objectives in resource accessibility and educational enhancement. For students and educators, the platform simplifies access to diverse study materials, aiding revision, and enabling comprehensive comprehension assessments. Its potential extends beyond the institution, offering a solution to resource scarcity in other educational settings, thereby elevating educational standards in logistics and supply chain management. Moreover, the platform's adaptability holds promising commercial prospects, catering to institutions offering similar programs. Its potential widespread use could position it as a widely recognized resource in the educational landscape. Further empirical research validating its effectiveness in enhancing learning outcomes and addressing resource scarcity would bolster its value and potential adoption in various educational settings.

Keywords: DPL INTERACTIVE HUB, Teaching and Learning, Learning Materials, Active Classroom Environment.

1. INTRODUCTION

The emergence of the DPL INTERACTIVE HUB addresses the educational needs of Logistics Students at Seberang Perai Polytechnic, providing a digital platform for a more efficient and comprehensive learning experience in logistics studies. This innovation project aims to

modernize learning by facilitating easy access to coursework materials, integrating online learning tools into the educational system, and enhancing supplementary learning tools for better comprehension and engagement. Challenges persist in adopting interactive learning methods within educational institutions like Seberang Perai Polytechnic, resulting in limited availability of comprehensive online learning resources. Students face difficulties in engaging actively with coursework materials, hindering their overall learning experience.

The primary objectives include establishing a central repository exclusively for the Diploma in Logistics and Supply Chain Management program, integrating interactive learning applications within eight modules, and enhancing the overall learning experiences for enrolled students.

2. LITERATURE REVIEW

The literature review underscores the urgency for educators to adopt innovative pedagogical practices and embrace technology in the modern educational context. Jasni & Zainal (2020) advocate for creative teaching approaches that actively engage students, fostering effective communication and encouraging innovative problem-solving. Nazruddin & Hisam (2022) emphasize the crucial role of interactive multimedia tools in promoting dynamic and effective learning with active involvement in critical thinking. Mahlan & Hamat (2020) highlight the expedited adoption of online education, particularly through platforms like WhatsApp, Google Meet, and Zoom, in response to the COVID-19 crisis. Kamlin & Keong (2020) stress the benefits of incorporating video content in education for improved student outcomes, despite associated challenges. Kuppusamy & Norman (2021) underscore a substantial shift towards online learning in higher education prompted by the pandemic. Saifudin & Hamzah (2021) emphasize the necessity of a digital approach enriched with multimedia elements to align with the Fourth Industrial Revolution. In summary, the literature collectively urges educators to embrace innovation and technology for enhanced learning experiences.

3. METHODOLOGY

DPL INTERACTIVE HUB is an innovative and interactive website designed to simplify the teaching and learning process for logistics and supply chain management courses. It addresses the common issues faced by both students and instructors, such as the lack of learning resources and exercises, resulting in students having difficulty understanding the coursework. This platform effectively resolves the scarcity of learning materials while facilitating instructors and engaging students in their learning experience.

3.1. Project Description

DPL INTERACTIVE HUB (https://dplhub.weebly.com/) requires several tools and software for its implementation, such as the Weebly website platform, laptops, the Pinterest app, and smartphones. Weebly, an American web hosting and development company under Block, Inc., serves as the website creation tool. Additionally, Pinterest functions as a social media platform enabling users to collect, save, and share visual images and videos.

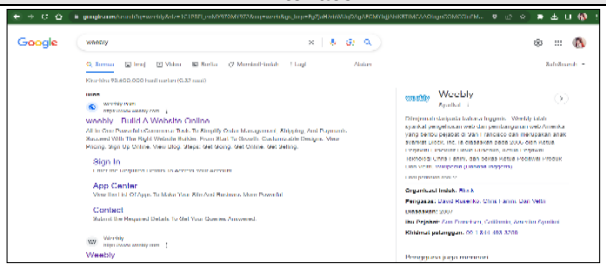
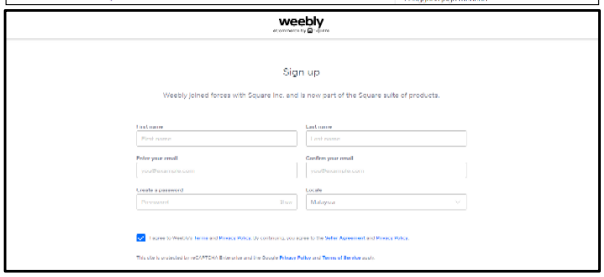
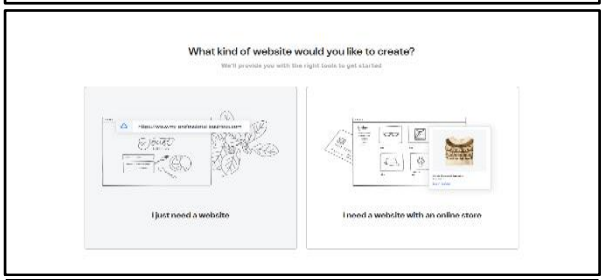
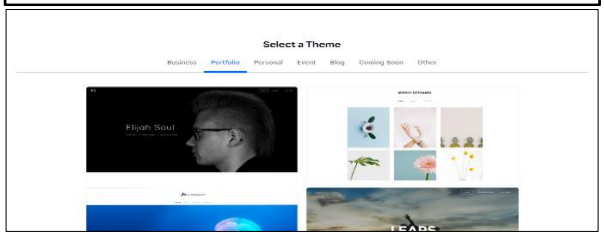
Step	Description	Interface
Step 1	Information collection process on Google regarding the creation of the DPL INTERACTIVE HUB website.	
Step 2	Registering within the Weebly software. It's necessary to complete all the information before moving on to the next steps.	
Step 3	Selecting the type of website to be built within Weebly. This display will present two options.	
Step 4	Selecting a theme suitable for the DPL INTERACTIVE HUB.	
Step 5	Showcases the outcome after completing all the processes. https://dplhub.weebly.com/	

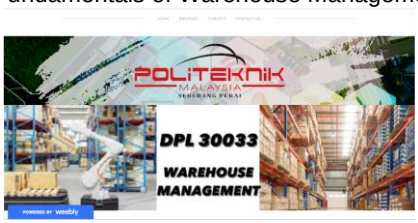
Figure 1: Steps in developing the DPL INTERACTIVE HUB

3.2 Interface of DPL INTERACTIVE HUB activities

A total of eight courses are involved in the development of this innovative project.

Procurement in Logistics and Supply Chain

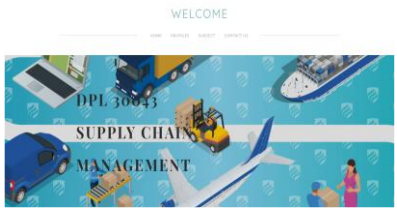
Fundamentals of Warehouse Management



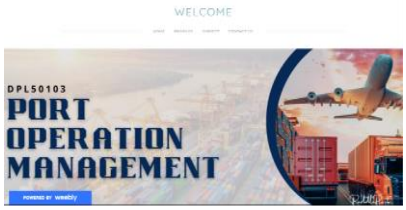
Export, Import Documentation and Procedures

Principles and Practices of Transportation

Supply Chain Management



Port Operation Management



Fundamentals of Logistics

Business Project

Figure 2: Course Interface of DPL INTERACTIVE HUB activities

4. RESULTS AND DISCUSSION

The DPL INTERACTIVE HUB stands out for its alignment with modern educational trends, smartphone accessibility, diverse learning materials, and addressing resource gaps in logistics education. It enhances access to study materials, improves the learning experience, and holds long-term promise for advancing logistics education. With adaptability to various institutions and potential commercialization, the platform contributes positively to education and society. Table 1 illustrates its effectiveness.

Table 1 The effectiveness of the DPL INTERACTIVE HUB

IMPACTS	Before Interactive Hub	After Interactive Hub
Lack of Teaching Materials.	There is a shortage of teaching resources in logistics and supply chain at Seberang Perai Polytechnic.	There's a dedicated repository for Diploma in Logistics and Supply Chain (DLS) with quality teaching materials.
Dependency on Textbooks.	Students heavily rely on textbooks as the primary learning source.	Reduced dependence on textbooks with better access to diverse and interactive learning materials.
Limitation in Access to Learning Materials and Technology.	Limitations in accessing learning materials and technology.	Enhanced access through smartphones, enabling more open and convenient learning.
Limited Learning Quality.	Learning quality in logistics is hindered by limited active interaction in the learning process.	Increased active participation in logistics learning enhances overall learning quality.
Educational Market Potential.	No clear opportunities to expand the platform's benefits in the educational market.	The platform has the potential to cover a broader educational market and provide more extensive benefits.

5. CONCLUSIONS AND RECOMMENDATIONS

DPL INTERACTIVE HUB excels in providing an engaging and dynamic learning experience for logistics students. However, its reliance on internet access may limit accessibility for students with connectivity issues or less familiarity with online technology. Despite these challenges, there are opportunities for expansion beyond Seberang Perai Polytechnic, offering intuitive learning tools to other institutions. Yet, potential threats include students' preference for traditional materials and scepticism about online learning's effectiveness, along with the challenge of internet dependency. Nevertheless, the DPL INTERACTIVE HUB represents a significant advancement in reshaping logistics education, and future refinements can ensure its continual growth and widespread adoption, ultimately enhancing logistics education.

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Chapter 3
Weather-Based Smart Plant Watering System with Soil Moisture Monitoring

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ABSTRACT
The aim of this project is to develop an innovative solution for plant owners, allowing them to efficiently manage their plant's watering needs based on real-time weather conditions and soil moisture levels. The system uses a combination of sensors, microcontrollers, and a user-friendly interface to continuously monitor important parameters, including soil moisture levels, temperature, and local weather data. The primary goal of this system is to provide automated and data-driven plant care. By integrating soil moisture sensors, the system can assess the moisture content of the soil. At the same time, it also collects weather data such as temperature, humidity, and precipitation forecasts. Real-time data is analyzed to determine the optimal watering schedule for each plant, ensuring that they receive the right amount of water at the right time. This project also includes a user-friendly mobile application that allows plant owners to monitor the status of their plants remotely. Users can receive real-time data, switch watering mode status, and access historical data to gain insights into their plant's growth and health. The system can automatically water in response to soil moisture thresholds and weather conditions. The project significantly improves both the operational efficiency and quality of plant care in watering systems, therefore creating a promising solution for plant irrigation.

Keywords: Plant care, smart watering, weather based, irrigation, soil moisture.

1. INTRODUCTION

According to Malaysian Meteorological Department (2023, January 31), temperatures in 2022 is fluctuated between 19.0°C and 36.9°C, with extreme rainfall ranges from 1942.9mm to 6173.1mm, distributed across the different months of the year at various locations. This temperature change affects the changes in humidity levels, where higher temperatures lead to an increase in the humidity capacity of the air. These extreme climate patterns highlight the challenges inherent in traditional methods of plant care, and human observation is often incapable of adapting to changing weather patterns.

Although Malaysia is rich in water resources, there are certain dry months from May to August, also known as "agricultural drought" (Malaysian Meteorological Department, 2023, January 31). During this period, water levels drop, potentially disrupting agricultural activities. For example, rising temperatures are posing major challenges to Malaysian farmers as pest infestations are damaging up to 30% of crops (Nair, T., 2023, June 1). A rise of 1°C can result

in a 9% to 10% drop in yield potential, especially during critical stages such as flowering and grain filling (*Dry spell looms in the north*, 2023, February 23). To ensure uninterrupted water supply and solve this problem, it is important to implement an efficient irrigation system.

In response to these challenges, this project aims to modernize traditional plant care methods through the integration of advanced technology. The project involves the development of an automated system to monitor soil moisture, weather conditions, and automatically irrigate based on watering requirements. Various sensors such as soil moisture sensors, temperature sensors, and humidity sensors are being incorporated with mobile technology to optimize plant growth and minimize water consumption. The main goal of this project is to increase efficiency and contribute to sustainable plant care practices. This helps improve plant care efficiency and supports sustainable farming in Malaysia's changing climate.

2. LITERATURE REVIEW

Gardening is hugely popular in Malaysia, especially among residents in rural areas. However, gardening is not a casual activity that can be taken lightly. Irrigation systems, often considered a part of home automation, are becoming increasingly important due to the growing scarcity of water resources, especially in the agriculture sector. The motivations behind gardening cover a variety of purposes, including self-sufficiency in food production, income generation, landscaping, and personal satisfaction. However, there is also a growing interest in gardening in urban areas, thanks to concepts such as edible gardens, urban farming, and community gardening. Water is a fundamental resource for agriculture and plays a key role in ensuring food security, maintaining ecosystems, and supporting human activities. Effective water management in agriculture is crucial as agriculture accounts for a large portion of global water consumption. Smart irrigation systems play a critical role in optimizing water usage by monitoring various site conditions, such as soil moisture, rain, and wind, and using this information to apply the appropriate amount of water. Traditional irrigation systems often involve manual labour, rely heavily on timers, and usually ignore weather changes and humidity changes which will lead to inefficient use of water.

Study conducted by Chawla, H. and Kumar, P., (2019) and Hamid, S. A., et al. (2020), Devika, S. V., et al. (2014), and Goud, L. J., et al. (2019) proposed Arduino-based systems utilizing soil moisture sensors for efficient plant watering in home gardens. These systems offer real-time soil moisture monitoring, activating water pumps when needed. The integration of Arduino technology optimizes water use, reducing manual effort and enhancing crop productivity. Laxmikant Jayprakash Goud introduces an automatic irrigation system that uses soil moisture sensors and an Android app for remote control. This system combines sensors, a controller, and a GSM Kit to monitor soil moisture levels and automate the watering process. It meets the need for user-friendly remote irrigation management, ensuring timely water supply while conserving resources.

The study by Mehta et al. (2018), Nath et al. (2018), and Islam et al. (2020), explored IoT-based smart irrigation systems. These systems leverage Arduino, ESP8266, and other sensors to collect and transmit real-time data on soil moisture, temperature, and humidity. The integration of cloud servers and web databases enables remote access and control, contributing to informed decision-making in agriculture.

3. METHODOLOGY

There will be hardware and software development, including an ESP8266 as the microcontroller; capacitive soil moisture sensor, DHT22 sensor (temperature and humidity

sensor), and weather data as inputs; OLED display, relay, and water pump as outputs. There is also a Blynk mobile app that connects to the ESP8266 via Wi-Fi. The overall functionality of the project is shown in the descriptive system functionality chart in Figure 1.

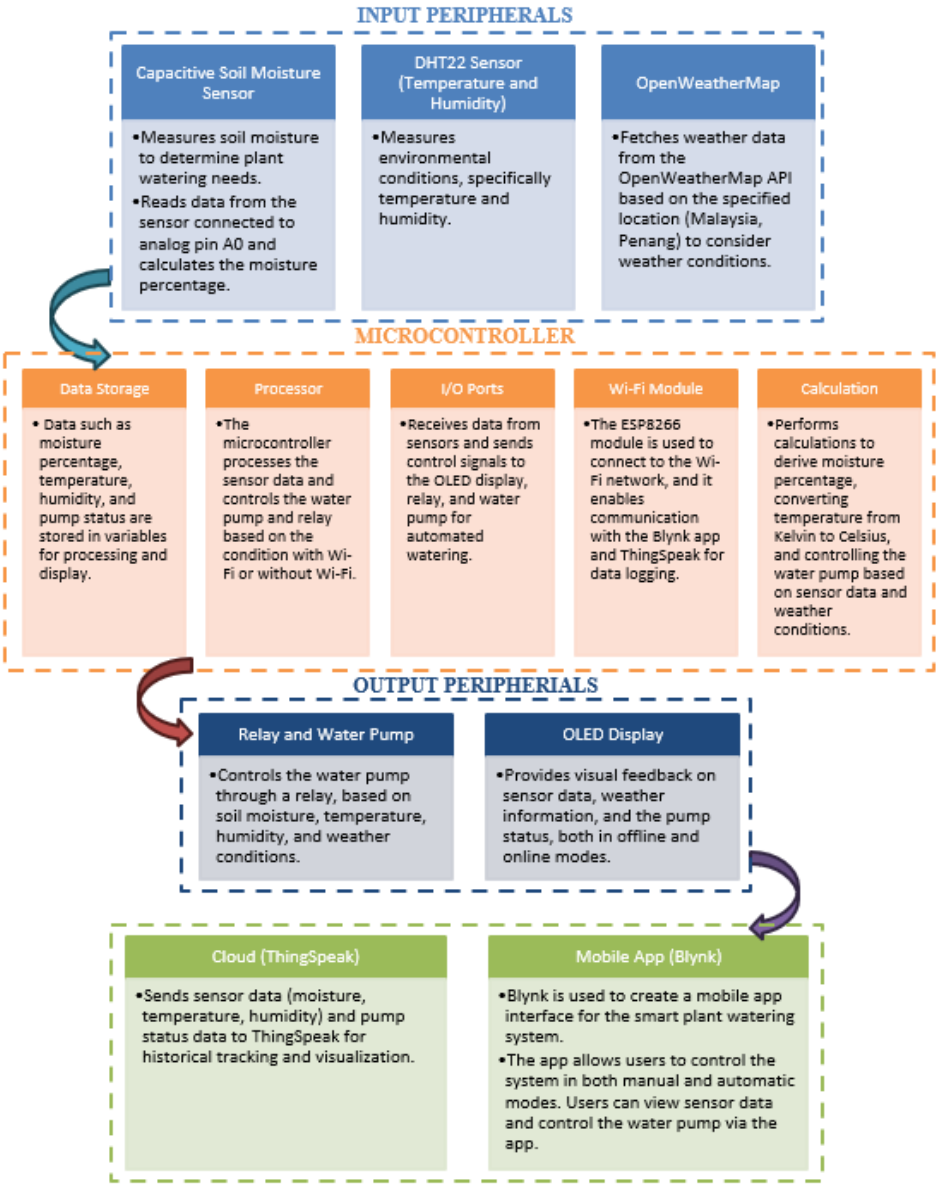

Figure 2: System Functionality Chart

The hardware design involves the selection and connection of various components, including the ESP8266 NodeMCU development board, capacitive soil moisture sensor, DHT22 sensor, SSD1306 OLED screen display, DC Mini Submersible Water Pump, and 1 Channel 3V Relay Module. While the software design includes the use of Blynk, Arduino IDE, and ThingSpeak. Blynk is used to create a mobile app for remote monitoring and control of

the plant watering system. Arduino IDE is used to program the ESP8266 microcontroller, and ThingSpeak is used for data storage and visualization. The code is written to read sensor data, control the water pump, and communicate with Blynk and ThingSpeak.

4. RESULTS & DISCUSSION

Day 1: The system was tested between 1:55 pm and 6:02 pm on November 19, 2023. To be noted that the plant was watered manually in the morning and the soil condition was still moist during the testing period.
Environmental Conditions:

- Temperature: Ranged from 31.3°C to 34.3°C
- Humidity: Ranged from 56.3% to 68.3%
- Weather: few clouds, no rain

Figure 2 shows the data plotting of the weather-based smart plant watering system on ThingSpeak for day 1. The graph captures data points from 17:46:29 to 18:02:16, recording data at 10-second intervals. Note that the ThingSpeak platform only allows up to 60 data points to be plotted in each graph, resulting in the observed time range.

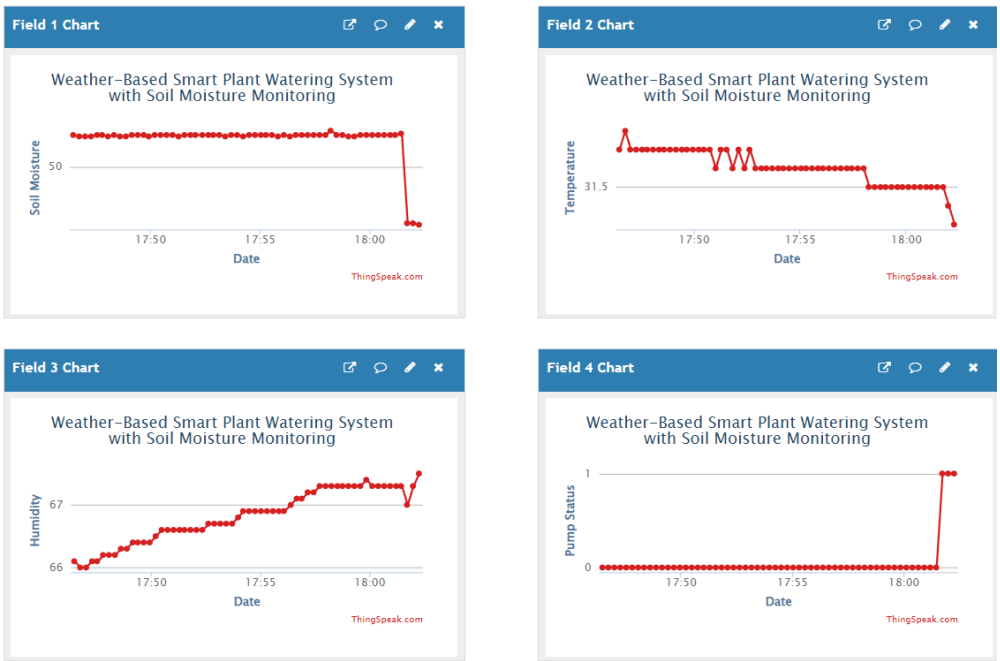

Figure 2: Graph for Outdoor Plant Condition in ThingSpeak (Day 1)

On day 1, the soil moisture percentages ranged from 67% to 75%, indicating that the water pump remained inactive during the test, possibly due to the manual watering conducted before the testing period. When the soil moisture sensor was removed from the soil and exposed to air, the soil moisture readings dropped to 9% and 10%. This simulated dry condition is an intentional act to test the system's ability to respond to low soil moisture percentages. As expected, this triggered the system to activate the water pump, demonstrating the system's ability to respond to artificially induced dry conditions. The test

results demonstrated the system's ability to maintain optimal soil moisture levels in the absence of rainfall. It also shows that the system can effectively respond to changes in soil moisture, ensuring plants get water when they need it.

Day 2: The system was tested between 1:43 pm and 5.24 pm on November 21, 2023. To be noted that the plant was exposed to the sun for a day without watering and the soil condition was dry during the testing period. Figure 4 shows the data plotting of the weather-based smart plant watering system on ThingSpeak for day 2. The graph captures data points from 13:43:10 to 17:24:09, recording data at 10-second intervals. Note that the ThingSpeak platform only allows up to 60 data points to be plotted in each graph, resulting in the observed time range.

Environmental Conditions:

- Temperature: Ranged from 29.1°C to 30.6°C
- Humidity: Ranged from 78.6% to 81.7%
- Weather: light rain
- To be noted that the plant is not placed under the rain.

Figure 3 shows the data plotting of the weather-based smart plant watering system on ThingSpeak for day 2. The graph captures data points from 13:43:10 to 17:24:09, recording data at 10-second intervals. Note that the ThingSpeak platform only allows up to 60 data points to be plotted in each graph, resulting in the observed time range.

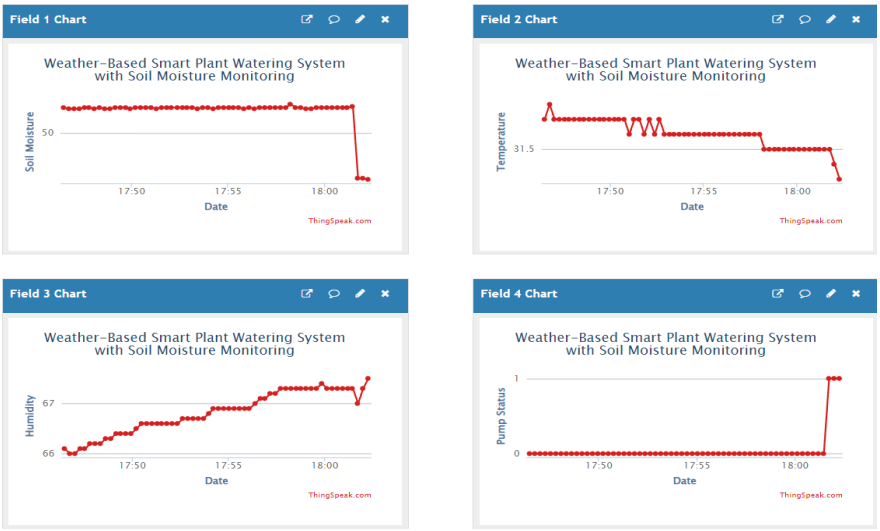

Figure 3: Graph for Outdoor Plant Condition in ThingSpeak (Day 2)

On day 2, the observed results show a lower temperature range and a higher humidity range compared to day 1, reflecting rainy weather conditions. The soil moisture percentage ranged from 28% to 49%, falling within the optimal range of 25% to 60%. Within this soil moisture range, temperature and weather conditions are considered to decide whether the water pump should be activated or remain inactive. Normally, the water pump is turned on when the ambient temperature exceeds 29°C and there is no rain. However, observed that there is light rain in Penang during the testing period, so the water pumps will not be activated. agriculture.

5. CONCLUSION

The Weather-Based Smart Plant Watering System with Soil Moisture Monitoring has been successfully developed and tested, demonstrating its ability to address the complexities posed by Malaysia's changing climate and contributing to global initiatives aimed at optimizing water use for plant care. The system integrates IoT technology and the ESP8266 microcontroller to provide real-time monitoring and control via a user-friendly mobile app. Weather-based smart plant watering systems offer several advantages over traditional plant care methods and existing smart irrigation systems. The system's adaptability to Malaysia's unpredictable climate, responsiveness to real-time data, and ability to integrate historical data tracking through ThingSpeak set it apart. The combination of soil moisture, temperature, humidity, and weather data ensures a complete understanding of the plant environment, allowing precise irrigation decisions to be made.

In conclusion, the Weather-Based Smart Plant Watering System with Soil Moisture provides the foundation for advanced and sustainable plant care practices. By addressing the challenges of climate change and water conservation, the system not only supports healthier plant growth but also aligns with wider environmental conservation goals. Future developments could further refine and expand the functionality of this system, making it a valuable tool for plant enthusiasts, farmers, and environmentalists.

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Chapter 4
Power Supply Trainer Learning Kit

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ABSTRACT
The integration of Teaching and Learning Aids (ABBM) in the educational process is vital for ensuring the effective and systematic delivery of course-related information. This significance is particularly pronounced in technical courses, where challenges like scarce and outdated equipment may impede student engagement and hinder the comprehension of theoretical concepts. The Power Supply Trainer serves as an innovative tool designed to function as a compelling learning medium, capturing students' interest and aiding their understanding of both theoretical and practical aspects associated with the Linear DC Power Supply topic in the DEE30043 Electronics Circuits course. The creation of the Power Supply Trainer aimed to replace the conventional breadboard connection method, seeking to minimize student errors in circuit connections and optimize teaching and learning time in the laboratory. This aligns with the practical learning schedule outlined in the curriculum. The structure of the Power Supply Trainer corresponds to the power supply block diagram sequence, enabling students to analyze circuits effortlessly. They can observe the actual components used and the corresponding circuit connections. To assess the impact of the Power Supply Trainer, a set of questionnaires and practical result forms were distributed to third-semester students enrolled in the DEE30043 Electronics Circuits course. The collected data aimed to capture student perceptions and evaluate the effectiveness of using the Power Supply Trainer. The findings suggest an enhancement in understanding and enthusiasm for practical work, as the tool allows students to witness theoretical concepts in action. Moreover, the Power Supply Trainer encourages the proper and safe usage of equipment, contributing to a more efficient learning environment. Time savings are evident, as practical work can be completed within the allocated time. The working environment is described as more comfortable, clean, and organized, owing to the simplified and organized practical work steps facilitated by the Power Supply Trainer. The study proposes further development of the Power Supply Trainer for use in other polytechnics, aligning with the objectives of the Polytechnic Education Department to produce graduates proficient in Outcome-Based Education (OBE).

Keywords: Teaching and learning aids; power supply trainer; linear power supply

1. INTRODUCTION

The Power Supply Trainer Learning Kit serves as a device utilized by instructors in the DEE30043 course to facilitate practical work during the second workshop of the curriculum. This instructional tool comprises five key components: converter, rectifier, filter, voltage regulator, and voltage divider, aligning with the theoretical concepts taught in class. By

incorporating this teaching aid, instructors can deliver course materials in a more interactive and engaging manner, enhancing student participation in the learning process.

Moreover, the teaching aid features testing points for each block's output, enabling students to easily compare practical output waveforms with the theoretical knowledge acquired in class. The utilization of this teaching aid allows instructors to create a dynamic and stimulating learning environment, fostering a deeper understanding of the subject matter among students.

The successful completion of practical work using the teaching aid provides students with valuable hands-on experience, solidifying their comprehension of the theoretical concepts covered in class. In summary, the Power Supply Teaching Aid has proven to be an effective tool in enriching the learning experience and knowledge acquisition for students in the DEE30043 course. It undoubtedly contributes to their overall learning outcomes, preparing them for future challenges in both their academic and professional journeys.

Md Nor, Selamat, Johari, and Omar (2005) agree that the user-friendly design of the trainer kit helps enhance student motivation in conducting laboratory experiments, thus facilitating the teaching and learning process. The study by Md Zaid SN, and Abd Hamid ND (2017) focuses on the effectiveness of the trainer kit as a teaching aid. The research results indicate that the testing period conducted using the trainer kit is faster and easier compared to conventional connection methods.

According to Azman, Ali, Mustapha, Balamuralithara, and Mohd Isa (2014), the use of teaching aids (ABM) can further enhance the effectiveness of students' understanding of a concept and theory implemented in practical sessions compared to oral explanations. The use of learning kits is also considered one of the Teaching Materials and Aids (ABBM) in the teaching and learning process to help students better understand the lesson content (Noor Suhaiza, 2017).

2. MATERIAL AND METHODS

The creation of The Power Supply Trainer Learning Kit is grounded in learning theories, including Edgar Dale's Theory (1969), the Theory of Behaviorism (1913), and Cognitive Theory, which emphasizes that human memory retention is significantly higher at 90% when individuals engage in self-directed study. Additionally, the Theory of Behaviorism posits that learning behavior changes in response to stimulation. The implementation of this Learning Kit follows a structured process involving five development phases, as depicted in Figure 2.1 below.

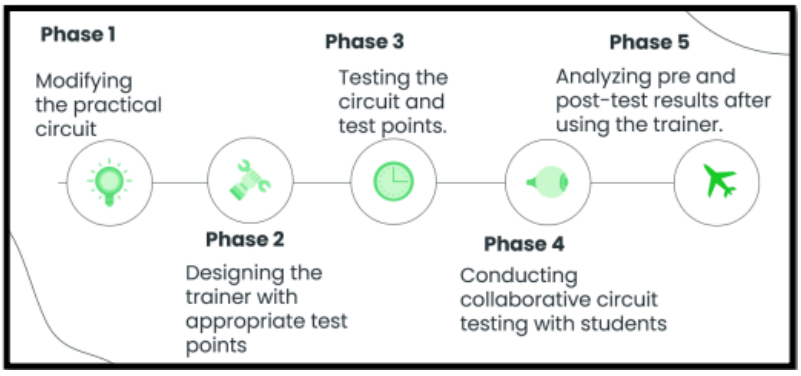

Figure 2.1 Development phase of Power Supply Trainer Learning Kit

The implementation process commences with the enhancement of the practical circuit and progresses to the subsequent phase, involving the design of appropriate test points within the developed trainer. These test points are strategically aligned with the theoretical concepts conveyed in the classroom. Notably, the constructed circuit has undergone improvements from its previous version by incorporating two types or two different values for each power supply block.

For example, in the rectifier circuit, both half-wave and full-wave rectification have been integrated. In the filter circuit, the inclusion of two different capacitor values allows for the observation of how these values impact the ripple voltage in the power supply circuit. Two distinct types of voltage regulators, namely the 7805 and 7812, are employed in the voltage regulator section. This implementation empowers students to apply their theoretical knowledge and assess the output waveforms of both voltage regulators through the designated test points.

The designed circuit and test points are meticulously organized to ensure clarity and ease of understanding for students, mirroring the arrangement of blocks in a classroom setting. This approach facilitates a seamless connection between theoretical concepts and practical application, enhancing the learning experience for students in the DEE30043 course.

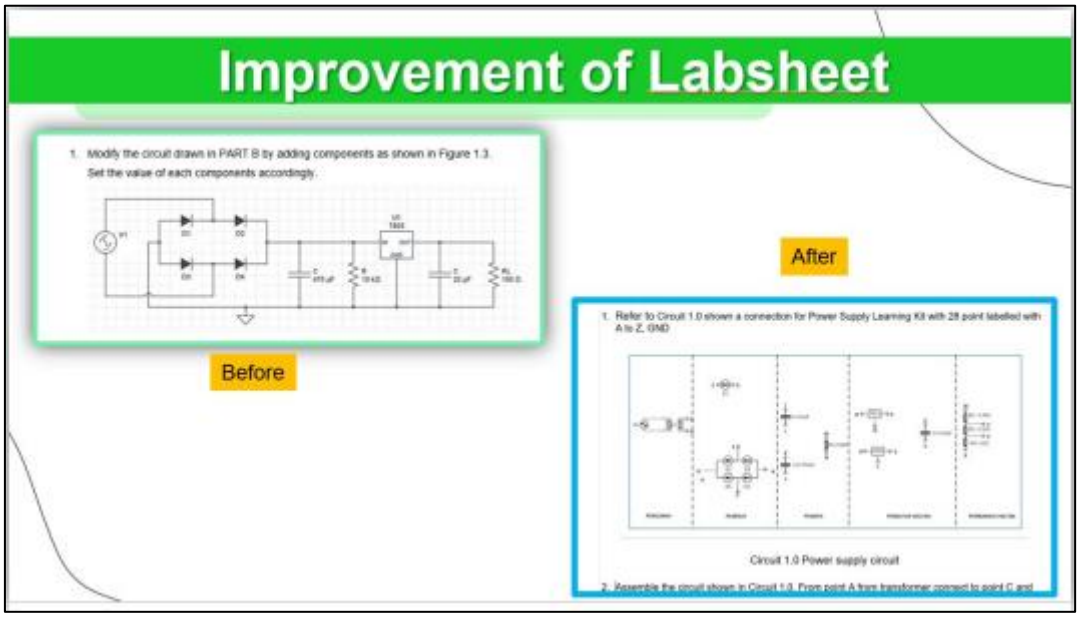

Figure 2.2 Improvement of circuit in Labsheet

In the third phase of the implementation process, the circuit undergoes testing, and examination of test points is conducted to observe the produced output waveforms. This step aims to verify whether the observed outputs align with the expected results as taught in the theoretical class. Moving on to the fourth phase, practical work is carried out with students utilizing the developed trainer kit. During this phase, students exhibit high interest and motivation while engaging in the practical tasks associated with the course.

In the final phase, the process involves analyzing survey questions administered both before and after the use of this trainer. The analysis results reveal several advantages observed after the students have utilized the trainer.

3. RESULT AND DISCUSSION

The development of this trainer has yielded several positive outcomes. Firstly, there is a notable reduction in the time required to conduct practical exercises in the course when compared to the previous method. This efficiency is beneficial in optimizing the use of instructional time. Moreover, students are now better equipped to avoid errors in making circuit connections that could potentially damage components, leading to a reduction in material costs.

One noteworthy enhancement is the labeling of output waveforms for each power supply block. This labeling facilitates ease of measurement for students, allowing them to comprehend the trainer more effectively. The arrangement of the trainer aligns with the theoretical class setup, creating a seamless transition between theoretical knowledge and practical application. Overall, these results underscore the positive impact of the trainer in improving both efficiency and understanding in the course.

The transformer utilized in this trainer is of the center-tapped type, yielding an output of 12V-0-12V. This configuration enables students to conduct measurements and make comparisons between the output waveforms of the trainer and the theoretical knowledge they have acquired. It's noteworthy that the transformer's output is maintained in the form of alternating voltage. To visually represent the waveform display from this trainer, Fig. 3.1 below provides a graphical illustration. This figure serves as a valuable visual aid for students to further comprehend and analyze the characteristics of the alternating voltage output from the trainer.

Figure 3.1 Output waveform for center-tap transformer

Refer to Fig. 3.2 showing the output waveform of the rectifier circuit block, observed from the output test point on the trainer. This feature allows students to differentiate the output waveform produced by the trainer from the theoretical waveform they have studied in the course. By comparing and analyzing these waveforms, students can gain practical insights into the real-world behavior of the circuit buffer block, enhancing their understanding of theoretical concepts through hands-on experience.

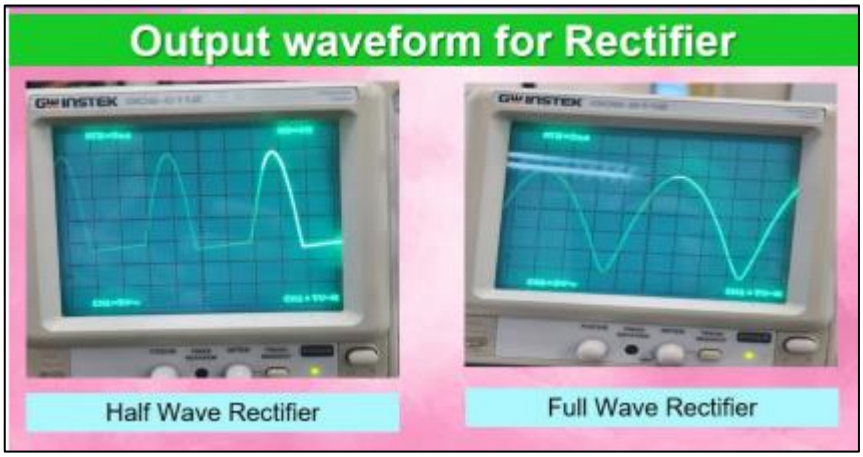

Figure 3.2 Output waveform for rectifier

Referring to Fig. 3.3, it shows that when a 22uF capacitor is utilized, the filter block within the power supply circuit produces a significant ripple voltage. Consequently, the output direct current demonstrates a noticeable and substantial fluctuation. As per the theoretical knowledge acquired, it is understood that the ripple voltage generated in this filter can be mitigated by adjusting the capacitor value employed in the filter circuit. Specifically, increasing the capacitor value will lead to a reduction in the ripple effect in the output of the direct current voltage. This observation aligns with theoretical expectations and provides a practical illustration of the impact of capacitor values on the performance of the filter block.

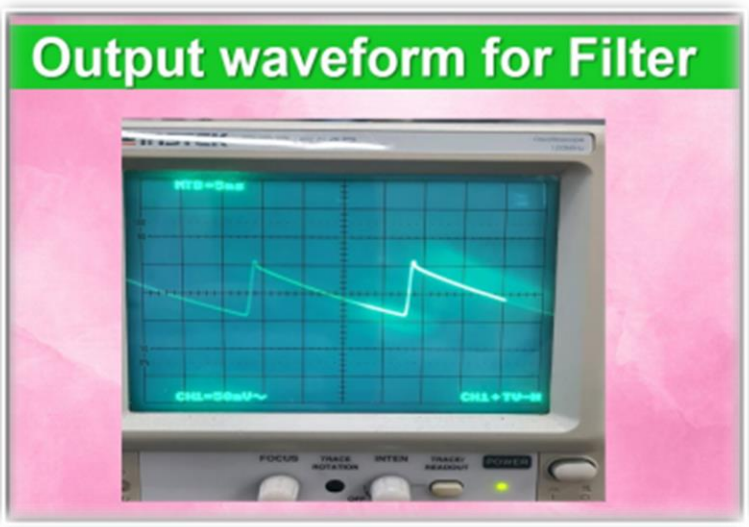

Figure 3.3 Output waveform for filter

The voltage divider block in the circuit consists of two types of voltage regulators, namely 5V and 12V, which utilize IC 7805 and IC 7812, respectively. The practical results indicate that the output voltage from these regulators is a pure direct current, free from any ripple voltage or pulsating direct current from the input as shown in Fig. 3.4 below.

Figure 3.4 Output waveform for regulator

4. CONCLUSION

The findings from the study on the effectiveness of using the Power Supply Trainer learning kit indicate a very high level of effectiveness. This suggests that the use of the Power Supply Trainer learning kit has a positive impact on students' understanding of concepts and indirectly increases their interest in the DEE30043 Electronics Circuits course. The pre-post tests conducted also revealed an improvement in students' understanding after using the Power Supply Trainer learning kit. This indicates that the kit is highly suitable as a teaching aid for explaining concepts and theories more effectively.

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Chapter 5
Barretta the Portable Bar

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ABSTRACT
During this generation many projects and inventions are invented to reduce the manpower, time, and difficulties of the work. But still some small types of works are only based on the manpower because of the cost price of invention and difficult of handling of inventions. Counter service is a form of service in restaurant, pub and bar where food or drinks are being ordered at the counter. Counter service is sometime referred as a "bar service", such as used for "juice bar" or in the case of pubs and bars where the counter is also called the bar. A portable bar is all about a bar on wheels that can be moved easily to any place. With their ability to acquire less space, this bar becomes more desirable. Portable bars are the best replacements for permanent bars. This bar is also movable because it can be moved easily to any place, even to distant places. Generally, the customers pay before consuming the food or drink. In some situations, the food service trend is not only being held indoor, but it is also covering outdoor activities such as catering services for wedding event, family gathering, exhibition or carnival. Therefore, when it comes to the preparation and setting up service area, large scale of equipment and utensils are involved as the completion of entire the operation. The idea came when we focused on equipment that can be handy and efficient to operate the counter service while having it in an outdoor scene. Then the portable bar is created to bring out the bar service anywhere it can go. It is also much more convenient to fulfill this kind of service purpose as a drink counter elsewhere and yet it can achieve the main objective as the bar service provider without neglecting the originality of its function.

Keywords: Barretta, Portable Bar, Counter service - Bar service.

1. INTRODUCTION

1.1 Background of The Project

Counter service is a form of service in restaurant, pub, and bar where food or drinks are being ordered at the counter. It is sometime referred as a ‘Bar Service’, such as used for ‘Juice Bar’ or in the case of pubs and bars where the counter is also called the bar. Generally, the customers pay before consuming the food or drink.

Therefore, the project aim is to select service equipment which is a bar counter that can be portable and handy to use during the service operation. It is also can be effective as a useful tool especially on the restaurant service operation entirely without deserting the originality of the service procedure itself.

According to Dennis Lilicrap and John Cousins (2006), the creation of atmosphere, by the right choice of décor, furnishing and equipment, is therefore a major factor that contributes to the success of the foodservice operation. A careful selection of items in terms of shape, design and color enhance the overall décor or theme and contributes towards a feeling and total harmony.

Throughout the project, we will be able to see the benefits that can gain from the usage of this equipment that might help the service operation to run smoothly either in the institution of study or commercial foodservice restaurant.

1.2 Purpose of Project

The primary purpose of this project is to provide an information toll about the portable bar that is invented to enhance the service operation entirely. The study is also planned to focus on its function that can bring an outrages outcome in handling such foodservice operation in future in terms of its convenience and accessibility.

2.0 PROJECT OBJECTIVES

a) The importance of a portable bar to improve service performance.
b) Simplified equipment to use and handy to operate anywhere.

3.0 PROBLEM STATEMENT

In foodservice operation, the preparation of excellent food and beverages, best customer service, well presented service person for the guest is not only the important rules to gain customer's satisfaction. Nevertheless, fast service by acquiring the usage of specific equipment in operating the restaurant sales and management, is also crucial to derive the guess impression and devotion continuously for a long terms business investment.

Mostly, the changes in modern technology and innovation in equipment have affected the customers' eating out trend especially in the restaurant. Their expectation to gain the best food and services has led the restaurateur to become more update with such technology and innovation for a better result.

A simplify method of equipment function is needed though and the creation of portable bar as one of the operating tools in dining area which is not only handy and simple but effective that will however; contribute the benefits for the restaurant to run more efficiently.

4.0 SIGNIFICANCE OF THE PROJECT

The importance and significance of this project are meant for the food service operation to enhance the deliverance of efficient bar service by utilizing the portable bar as the service tools not only limited for indoor usage but also accessible elsewhere. It is also hassle free and easy to operate by one service person only.

5.0 INNOVATION IMPLEMENTATION METHODS

Produce of ***'Barretta the Portable Bar'*** product.
This innovative product has taken 17 weeks to be produced based on the timeline in *(Figure 1)*. The timeline has been drawn up so that this innovation product can be set according to the desired period.

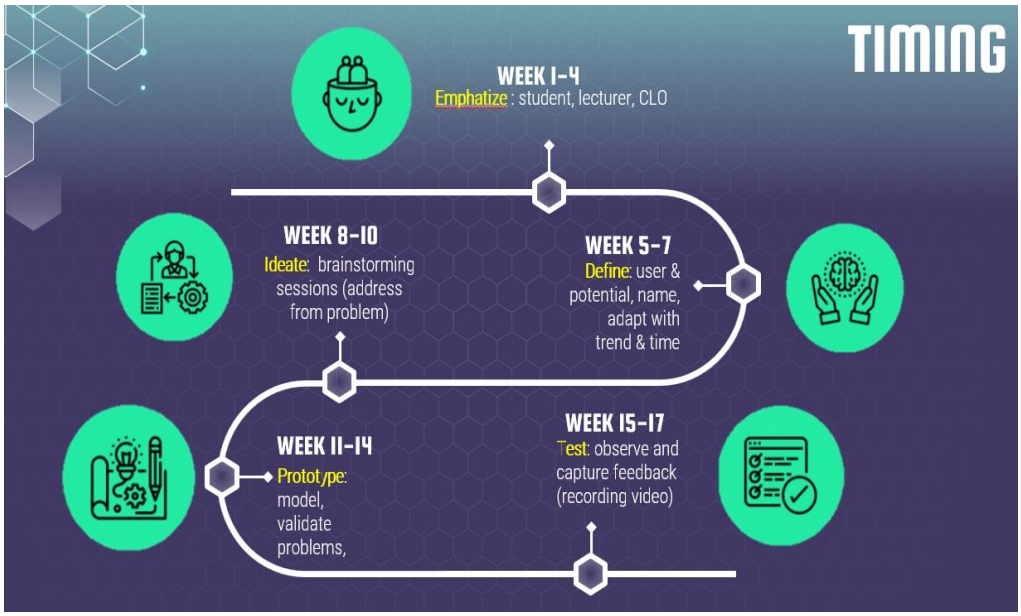


Figure 1: 'Barretta the Portable Bar' timeline.

Therefore, four (04) steps have been taken for the preparation of the product in order to reach the time target. The innovation design process is through several types of processes. The product has been produced for the sharing knowledge in the topic of Food Service - Table Etiquette at Kolej Komuniti Ledang, Johor.

5.1 The Process of Innovation Product

STEP 1 (Type of Portable Bar)	A literature review was conducted to identify portable bars available in Malaysia.
STEP 2 (Improvement)	The effectiveness of the Lifelong Program (PSH) and Pastry Certificate students during teaching and learning.
STEP 3 (Design)	Selection of small-scale design, easy to carry and use and attractive storage space.
STEP 4 (Assessment)	This innovation is use in learning and teaching sessions and observations are made for improvement.

5.2 Product Details

The product produced is in the 11th to 14th week according to Step 4 which has been listed in the design process. The product is in the form of a portable bar and has 12 component parts with the use of wood and soft aluminum as shown in *(Figure 2)*. Meanwhile, these component parts have a mechanism that can be folded to facilitate the process of lifting and preparing the food and beverage counter during the preparation process as shown in *(Figure 3)*.

Figure 2: How the product of 'Baretta the Portable bar' been operate.

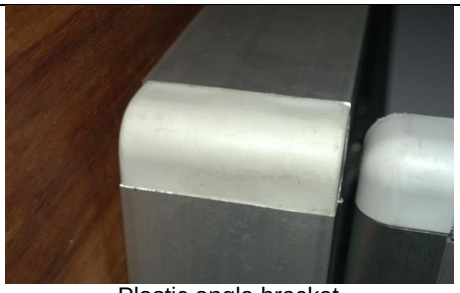
Figure 3: The mechanism of its transformation of the portable bar view.

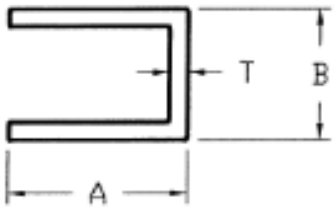
6.0 PROJECT OPERATION

6.1 Materials

Material selection *(Table 1)* is made based on the suitability to ensure the stability and effectiveness for the operation. Aluminum was selected compared to steel and wood because it is light, and the final product looks neat and clean. The tables below show the items use during the progress in creating the portable bar:

Table 1: Material uses for Portable Bar.

Material	Picture
 Screw	 Rivet
 Plywood	 White Formica sheet
 Plastic angle bracket 3'x 1' & 1'x 1'	 Plastic angle bracket



Aluminum U channel/bracket

Stainless steel hinge

Plastic knob

Plastic wheel

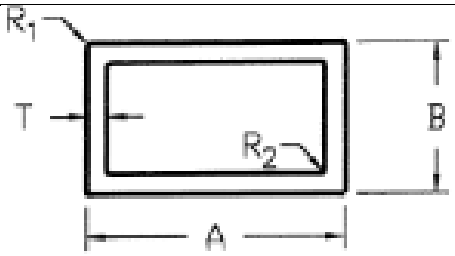
Plastic stopper

Cupboard aluminum lock

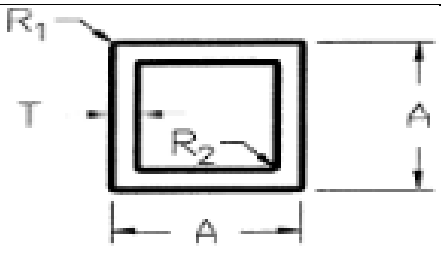
4' x 12' H/Size Plastic container

4' ¼

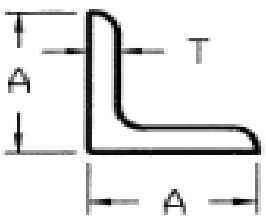
H/Size Plastic container



Aluminum rectangular tube 1'x3'



Aluminum square tube 1'x1'



Structural equal leg 1cm x 1cm


Stainless steel lock


Plastic Ice Scoop

6.2 The Final Product

The working desk *(Figure 4)* is equipped with plastic container in the middle which can be used to place ice cubes and condiments such as lemon and mint leaves. The middle shelf is designed as a compartment to put the goblet. The top surface is used for beverages service purposes. The front view of the portable bar is clean *(Figure 5)*. It is built from the same materials as middle shelf, top surface, and left and right surface which is plywood laminated with white Formica sheet. The portable bar is very practical because it is light and can be carried anywhere as wheels equipped.


Figure 4: The inner view of ‘Barretta the Portable bar’.


Figure 5: Portable bar front view.

7.0 FINDINGS

The results of the study were carried out effectively based on observations and measurements of respondents' perceptions using survey forms. Based on observation it shows high interest after using 'Barretta the Portable Bar'. Based on the survey form which contain 7 question items that refer to the technical mastery of the respondents in order to use the innovations produced.

(Table 2) shows the percentage of respondents' perception results before and after using 'Barretta the Portable Bar'.

Table 2: Total percentage of respondents' perceptions before and after usage.

No	Description	Before				After			
		Very Weak (%)	Weak (%)	Good (%)	Excellent (%)	Very Weak (%)	Weak (%)	Good (%)	Excellent (%)
1.	Classifying 'preparation of excellent F&B'	40	40	10	10	0	0	50	50
2.	Management of 'best customer services'.	40	40	10	10	0	0	40	60
3.	Skills in the 'well-presented service person'.	50	40	10	0	0	0	20	80
4.	Knowing the steps in the use of 'Barretta the Portable Bar'.	30	50	10	10	0	0	30	70
5.	Application of 'Barretta the Portable Bar' more effectively.	40	50	10	10	0	0	40	60
6.	Reducing the use of labor in the F&B preparation process by using 'Barretta the Portable Bar'	40	50	10	0	0	0	30	70
7.	The process of sharing Food Service - Table Etiquette knowledge is more fun.	30	60	0	10	0	0	20	80

8.0 CONCLUSION

A portable bar is an innovative product in order to enhance the service process especially for beverages preparation either indoor or for outdoor usage wherever providing drink for guests is needed. It is also an equipment that contribute to smoothen the restaurant operation in terms of time consuming, manpower, space and layout, storage and fit to any theme bring out by the service provider without neglecting the originality of the bar service itself. It is the pure solution to improve service quality and efficiency.

The design is unique because the top and middle shelf and lateral surfaces can be folded easily. On top of that, it is flexible as a container of condiment and ice can be placed in the middle shelf. The surfaces are laminated with Formica sheet which is stress-free to clean and can be long last for the maintenance purposes. It is also equipped with wheels and makes it easier to be placed anywhere.

Chapter 6
HT T-Hunter for Supporting Blended-Cooperative Learning Environment in Heat Transfer Course

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ABSTRACT

Traditional classes frequently focus on lectures and note-taking, which can result in passive learning. Students may become passive consumers of information rather than actively engaged with the material. It also has limitations in accessing modern technology and educational resources, hindering the integration of interactive content and multimedia. Not only that, but teachers are also typically prioritized in traditional educational settings as a pedagogical technique, with the instructor serving as the major source of knowledge. In the modern era, students need a fun and attractive educational approach to improve their understanding. The Heat Transfer educational game (HT T-Hunter) is an innovative learning tool that helps to support a Blended-Cooperative Learning Environment (BCLE) in a Heat Transfer course classroom. This innovative learning tool is able to improve student's Course Learning Outcome (CLO) achievements. HT T-Hunter additionally employs Microsoft Excel as the game platform that offers easy access to users. This learning tool is divided into 3 main divisions which are knowledge recall division, game content and student performance analysis. In addition, students also be able to refresh their Heat Transfer knowledge, discuss and solve the game among their friends, and at the same time analyse their CLO achievement performance when using this innovation tool. In conclusion, HT T-Hunter game will benefit the students by providing an alternative educational approach and supporting the Blended-Cooperative Learning Environment in Heat Transfer course.

Keywords: Blended Cooperative Learning Environment (BCLE), technical education, HT T-Hunter, heat transfer.

1. INTRODUCTION

Traditional classroom methods often lack student engagement and collaborative learning opportunities. This conventional educational approach also often prioritizes the teacher as the primary knowledge source. Furthermore, a fully online learning environment will cause in lack of social engagement and exacerbate educational inequalities due to technology access and limitations in internet coverage.

Heat transfer is one of the courses in Diploma in Process Engineering (Petrochemical). This 3 credits course aims for three primary Course Learning Outcomes (CLO) as targets. CLO1 is to apply the engineering principles and basic mechanism of heat transfer in steady-state conditions. CLO2 is to solve engineering calculations for problems involving heat

transfer and thermal exchange systems. CLO3 is to justify using knowledge of heat transfer through its application.

The Heat Transfer educational game (HT T-Hunter) is an innovative learning tool that benefits users by maximizing student engagement, encourage active participation, and develop a sense of community among learners by incorporating both online and in-person components. This learning tool is an educational game that using Microsoft Excel as a gaming platform. HT T-Hunter provides gaming experiences to users but in an educational environment.

2. LITERATURE REVIEW

Cooperative learning is a pedagogical approach that provides the opportunity for a group of students to work together to achieve a common goal or to complete a group task (Gillies, 2016). The students are responsible to work together and help each other by sharing their knowledge and skills. This cooperative learning approach has been widely recognized that promoting socialization and learning among students from pre-school to tertiary level education (Gillies, 2016).

Blended learning is a type of learning that combines online learning and physical classroom learning (Martinez et al., 2011). It has been designed to meet the needs of other different types of learners to achieve specific learning outcomes (Martinez et al., 2011). The teacher provides online resources for the learning process such as videos, slide notes, or quizzes that the students could complete outside of class. Then, during the physical class session, the teacher might then use interactive activities to reinforce the understanding of the online materials. This blended learning has been shown to be effective to improve student achievement in higher education (Martinez et al., 2011).

A blended Cooperative Learning Environment (BCLE) is an educational strategy that combines face-to-face classrooms with online learning activities. It is a setting for learning where students attempt to complete the tasks given to them in groups with the use of computer-aided or web-based tools (Kamaruddin, 2022). Teacher, social and content are the 3 main types of interaction in BCLE (El-Deghaidy & Nouby, 2008). Teachers provide face-to-face interaction and an active learning environment for students (El-Deghaidy & Nouby, 2008). In addition, the teachers must focus on engaging students in activities requiring problem-solving, critical thinking, and active participation. Instead of simply listening to lectures or reading textbooks, they are actively involved in constructing understanding of knowledge. By connecting content and pedagogy, fundamental ideas and student involvement are essential components of pedagogical content knowledge, which supports high-quality learning in higher education (Zepke, 2013). Content in education can be different according to the grade level, subject area, and educational standard. To help teachers prepare lessons and gauge students' understanding, educational content can be divided into distinct subjects, units, or learning outcomes. The last type of interaction in BCLE is social interaction. The ability of students to see themselves as part of a community that supports constructive interdependence is referred to as social interaction (El-Deghaidy & Nouby,2008). When students do cooperative tasks and share the sources, this type of engagement occurs in the learning process. Some common social interactions in BCLE include group discussion, peer review, and feedback, collaborative projects, and online collaboration and discussion tools.

Hence, HT T-Hunter as a learning tool represents a promising and innovative approach to education that combines digital learning methods and traditional classrooms. The blended learning model provides a more effective educational experience rather than a

traditional classroom (Deperlioglu et al., 2013). A combination of both learning approaches will help to improve student understanding in education.

3. METHODOLOGY

HT T-Hunter uses Microsoft Excel as a game platform and consist of 3 main division. The first part is known as the knowledge recall division. All the players or students will be recommended to read the online e-note on their own that is attached to the game. Figure 1 shows the e-note that is attached inside the HT T-Hunter.

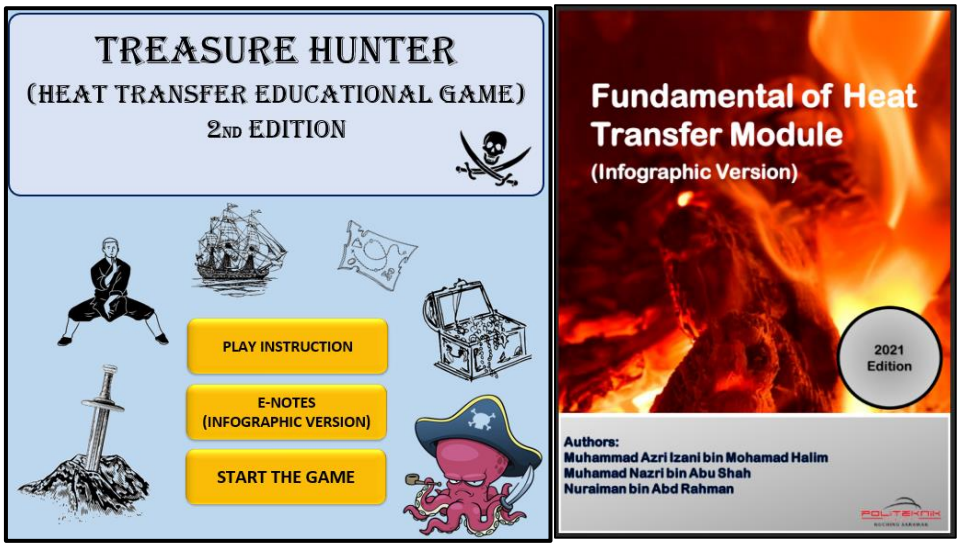


Figure 1: Attachment (E-Note) inside the HT T-Hunter.

The second division is the game content. Students will form a group of 3 or 4 people and try to solve the game. At the beginning of the game, players need to pick their best character to solve the game puzzle. Players need to answer correctly the questions in order to help them win the game. All the questions in the game are related to the Heat Transfer course syllabus. Figure 2 shows examples of the HT T-Hunter game.

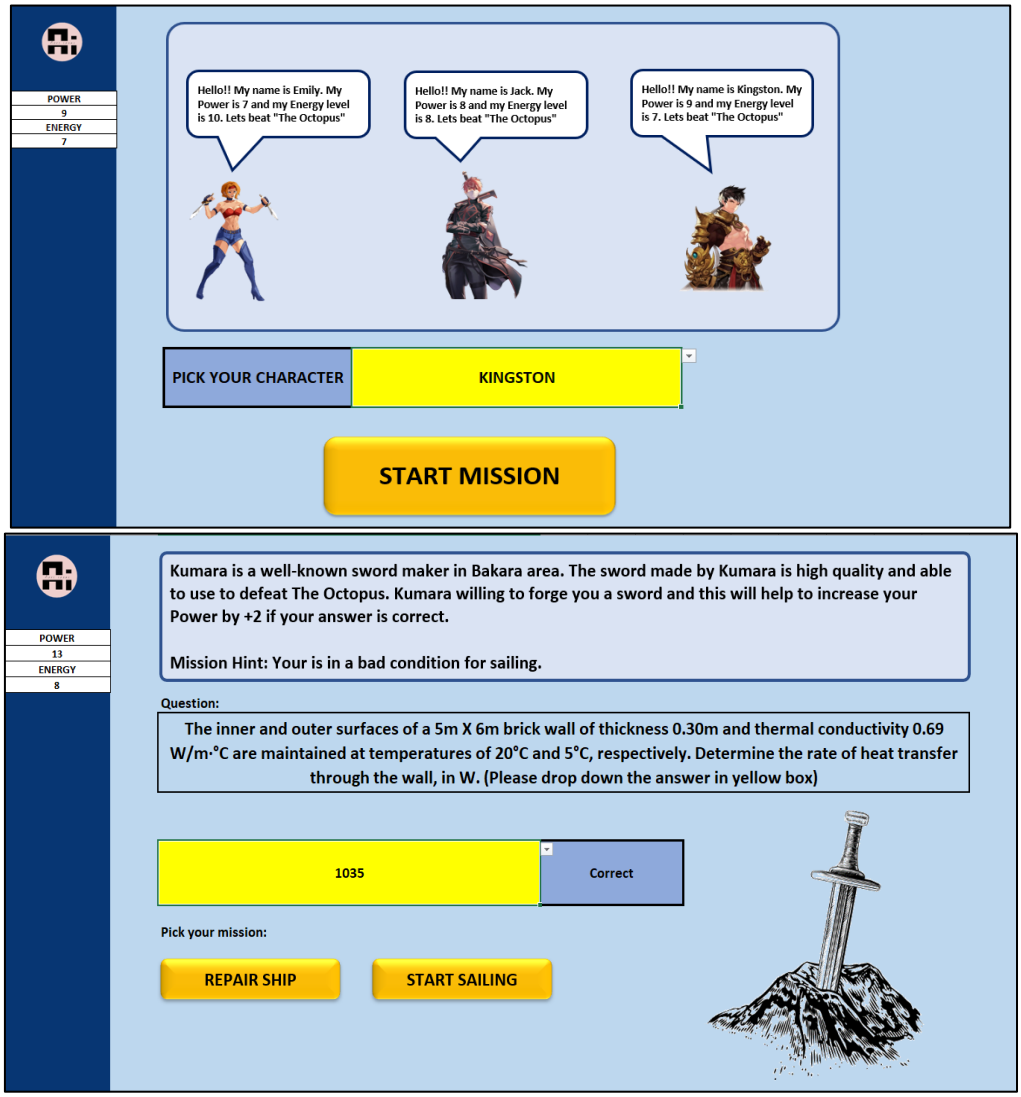
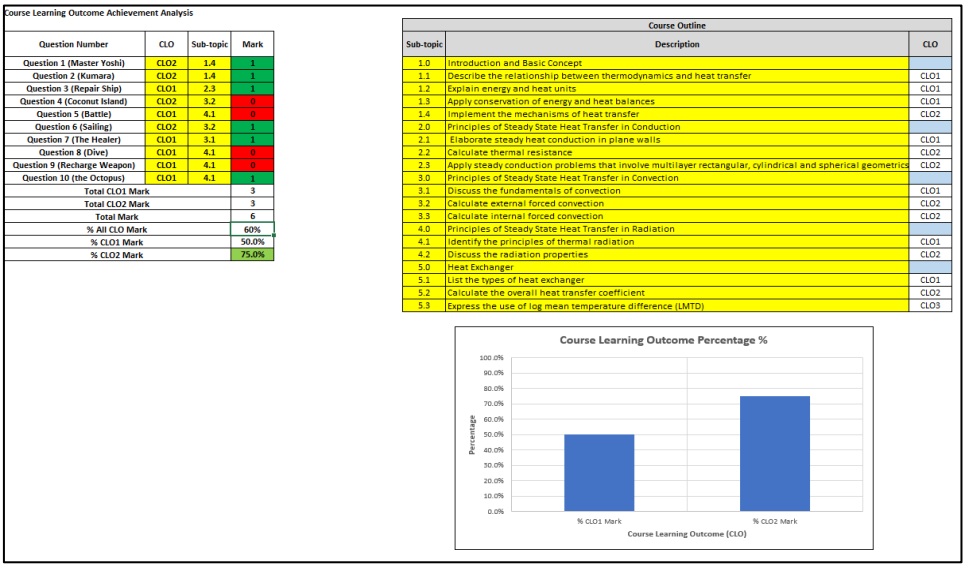


Figure 2: HT T-Hunter game interface.

The third division is the student performance analysis. At the last section of the game, the coordinator and player will be able to analyse their game performance that reflects to the CLO. This section will help to indicate the percentage performance of CLO1 and CLO2 for future improvement. Figure 3 shows the division of student performance analysis.



Course Learning Outcome Achievement Analysis

Question Number	CLO	Sub-topic	Mark
Question 1 (Master Yoshi)	CLO2	1.4	1
Question 2 (Kumara)	CLO2	1.4	1
Question 3 (Repair Ship)	CLO1	2.3	1
Question 4 (Coconut Island)	CLO2	3.2	0
Question 5 (Battle)	CLO1	4.1	0
Question 6 (Sailing)	CLO2	3.2	1
Question 7 (The Healer)	CLO1	3.1	1
Question 8 (Dive)	CLO1	4.1	0
Question 9 (Recharge Weapon)	CLO1	4.1	0
Question 10 (the Octopus)	CLO1	4.1	1
Total CLO1 Mark			3
Total CLO2 Mark			3
Total Mark			6
% All CLO Mark			60%
% CLO1 Mark			50.0%
% CLO2 Mark			75.0%

Course Outline

Sub-topic	Description	CLO
1.0	Introduction and Basic Concept	
1.1	Describe the relationship between thermodynamics and heat transfer	CLO1
1.2	Explain energy and heat units	CLO1
1.3	Apply conservation of energy and heat balances	CLO1
1.4	Implement the mechanisms of heat transfer	CLO2
2.0	Principles of Steady State Heat Transfer in Conduction	
2.1	Elaborate steady heat conduction in plane walls	CLO1
2.2	Calculate thermal resistance	CLO2
2.3	Apply steady conduction problems that involve multilayer rectangular, cylindrical and spherical geometries	CLO2
3.0	Principles of Steady State Heat Transfer in Convection	
3.1	Discuss the fundamentals of convection	CLO1
3.2	Calculate external forced convection	CLO2
3.3	Calculate internal forced convection	CLO2
4.0	Principles of Steady State Heat Transfer in Radiation	
4.1	Identify the principles of thermal radiation	CLO1
4.2	Discuss the radiation properties	CLO2
5.0	Heat Exchanger	
5.1	List the types of heat exchanger	CLO1
5.2	Calculate the overall heat transfer coefficient	CLO2
5.3	Express the use of log mean temperature difference (LMTD)	CLO3

Figure 3: Student performance analysis.

4. RESULTS AND DISCUSSION

The results for this innovation were evaluated when all the students or players have finished the game, they are required to scan the QR Code for Program Effectiveness Evaluation Form and answer the survey. There are 15 required survey questions that help to improve the educational game effectiveness in the future. Table 1 shows the survey questions to determine innovation effectiveness and the percentage of students that score 4-5:

Table1: Summary of HT T-Hunter effectiveness

No.	Question	Percentage (%)
1.	Projek inovasi PDP ini mudah untuk digunakan?	92
2.	Microsoft Excel menjadi platform yang sesuai untuk projek inovasi ini.	90
3.	Inovasi PDP ini membantu untuk proses pembelajaran anda.	94
4.	Inovasi PDP ini memudahkan pelajar untuk lebih memahami konsep pembelajaran.	94
5.	Inovasi PDP ini menarik minat pelajar untuk menggunakannya.	94
6.	Inovasi PDP ini memudahkan pelajar untuk mengulang kaji pelajaran.	94
7.	Inovasi PDP ini sesuai untuk digunakan sebagai alat bantu mengajar pensyarah dalam kelas.	94
8.	Bahasa yang digunakan mudah difahami.	92
9.	Reka bentuk tulisan oleh buku ini sesuai.	94
10.	Saya ingin belajar dengan menggunakan inovasi PDP ini apabila pensyarah tidak dapat masuk ke kelas.	94
11.	Inovasi PDP ini lebih efektif jika digunakan sebagai aktiviti berkumpulan.	94
12.	Saya dapat memahami konsep apply the engineering principles and basic mechanism of heat transfer in steady state condition (CLO1).	94
13.	Saya dapat memahami konsep solve engineering calculations for problems involving heat transfer and thermal exchanges system (CLO2).	94
14.	Saya berpendapat bahawa inovasi PDP sebegini dapat diperbanyakkan.	94
15.	Masa yang diperuntukkan untuk menggunakan inovasi ini tidak terlalu lama dan efektif.	94

HT T-Hunter received positive feedback from the survey across various aspects, with high percentages indicating satisfaction. The game was deemed user-friendly by the students, who also thought it was beneficial to the learning process and that Microsoft Excel was an

appropriate tool for the innovation. The innovation was considered effective in aiding understanding, engaging students, facilitating review, and assisting instructors. The content was judged appropriate overall, and the language employed was thought to be easily understood. This game was useful for group activities, and students indicated that this can be used when lecturers are not present. Additionally, the project was thought to be relevance to problem-solving and engineering concepts. The majority of students recommended expanding the use of such innovative teaching methods. The time allocated for using the innovation was perceived as neither too long nor ineffective. Overall, the feedback suggests a strong endorsement of the innovation project in education.

5. CONCLUSION AND RECOMMENDATION

In general, this HT T-Hunter educational game is significant to provide an effective educational approach that combines cooperative face-to-face interaction, the flexibility of online learning and an interactive learning approach. The students work together in a group to complete the HT T-Hunter game while interchanging engineering knowledge provides a cooperative learning environment experience. Online references (e-note) attached to the HT T-Hunter allow students to individually refresh heat transfer knowledge before solving the game providing a blended learning experience to students. Not only that, the interactive gaming interface and creative storyline of the HT T-Hunter game would attract student interest in the interactive learning environment. Last but not least, it proves the effectiveness of the HT T-Hunter as a learning tool for supporting the Blended-Cooperative Learning Environment in the Heat Transfer Course. This educational game should be extended to other courses as well.

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Chapter 7
Gamification in the Virtual Laboratory: Cultivating Student Engagement and Elevating Learning Outcomes

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ABSTRACT
The flipped classroom is an instructional approach where classroom and homework activities are inverted. This approach has gained attention and adoption in practical laboratory classes. In the implementation of the flipped approach, the laboratory module is separated into a homework-based pre-lab activity and a classroom-based practical lab session. One potential problem is the lack of student engagement in the pre-lab activity. This issue is addressed by incorporating interactive gaming elements and creating an engaging virtual laboratory experience. Thus, a gamified pre-lab activity was implemented in a second-year undergraduate engineering course, Structural Mechanics, at a higher education institution. The activity includes an escape room gamification and a virtual laboratory simulator. Students will work through the game and subsequently complete a series of virtual experiments before attending the actual practical session following a flipped approach. The survey results showed that the pre-lab activity enhanced students' engagement. The flipped approach could be a promising way to motivate students in familiarizing themselves with key concepts before participating in the hands-on laboratory session. Additionally, this project could provide new insights for educators in designing interactive pre-lab activities applicable to other disciplinary subjects.

Keywords: Virtual lab, gamification, flipped-classroom.

1. INTRODUCTION

Hands-on laboratory experience plays a vital role in the engineering curriculum. It not only provides mastery of practical skills to operate equipment and tools but also enables learners to apply theoretical knowledge in a real-world scenario. Moreover, it enhances learners' confidence in problem-solving abilities when laboratory tasks are embedded with relevant requirements. If laboratory learning is conducted as a team, students' collaborative skills will also be developed.

A virtual laboratory is a simulation of a physical experiment performed online or on a computer-based platform. Typically, a virtual lab is enhanced with attractive graphics and interactive content to engage learners. Virtual laboratories have gained popularity with the advancement of computer systems and software. Furthermore, the rise of distance learning

and the concept of online or blended learning has further led to the widespread utilization of virtual laboratories.

In fact, the implementation of virtual laboratories in the curriculum provides much flexibility in designing the instructional approach. The virtual lab can be implemented as a standalone teaching and learning module. Alternatively, it can be coupled with the real laboratory class, especially in higher education, where engineering programs often require real laboratory classes due to the irreplaceable practical elements.

2. LITERATURE REVIEW

Virtual laboratories offer numerous advantages compared to traditional physical laboratories. They typically provide enhanced interactivity with users through the use of eye-catching animations and graphics. Not only can the content be customized for better engagement, but it also offers improved accessibility by providing online access, eliminating the need for a physical laboratory space. Virtual labs create a completely safe environment for learners to conduct experiments involving hazardous elements. Additionally, virtual labs allow for high repeatability, enabling learners to conduct experiments virtually as many times as needed. In summary, a virtual lab generally offers better cost-effectiveness compared to its traditional physical laboratory counterpart (Potkonjak et al., 2016).

Virtual labs have been successfully utilized in various domains in higher education. For instance, a virtual lab was employed in medical education, significantly enhancing the effectiveness of teaching and learning (Kadri et al., 2024; Lewis et al., 2023). Specifically, it was found to overcome limitations of traditional laboratory anatomy classes due to more interactive content and better visualization (Kadri et al., 2024).

The use of virtual lab technology in teaching and learning is also gaining traction in engineering and science education, thanks to its versatility in overcoming barriers related to accessibility, visualization, and student engagement (Domínguez et al., 2018; Guzmán et al., 2020; Sun et al., 2023). Its versatility is demonstrated by its flexibility to be implemented as a standalone educational resource (Guzmán et al., 2020) or coupled with a physical laboratory, either as a pre-laboratory (Sun et al., 2023) or a post-laboratory activity (Domínguez et al., 2018).

3. METHODOLOGY

The virtual laboratory is implemented as a complement to the physical experiment in a common 2nd-year course, namely, Structural Mechanics, within the engineering programs of Civil, Mechanical, Robotics, and Mechatronics streams. Both virtual and physical labs involve students applying an external load to a beam and observing the deformation behaviour of the beam. Students are allowed to conduct experiments (both virtual and physical) with varying loading conditions, beam dimensions, and the type of beam material. A written report is expected to complete the laboratory exercise.

The entire laboratory teaching and learning are separated into two phases. In Phase 1, students simulate the experiments using a virtual lab. The virtual lab is provided with the same variables as the upcoming physical experiment in Phase 2. However, certain discrepancies between the simulated and physical experimental results (Phase 2) are intentionally introduced into the virtual lab. This design ensures that the virtual lab serves as a learning resource complementing the actual lab rather than replacing it entirely. Additionally, students are required to revise the relevant scientific theories of the subject and complete a gamified quiz. Students earn points, unlock achievements, and collaborate on quests in the gamified environment.

After completing the virtual lab in Phase 1, students are required to conduct the physical experiments in Phase 2. The actual experiments are conducted based on the knowledge gained from the simulated experiments in Phase 1.

The overall methodology is depicted in Figure 1. A survey was conducted to obtain data on students' perception of this implemented instructional approach.

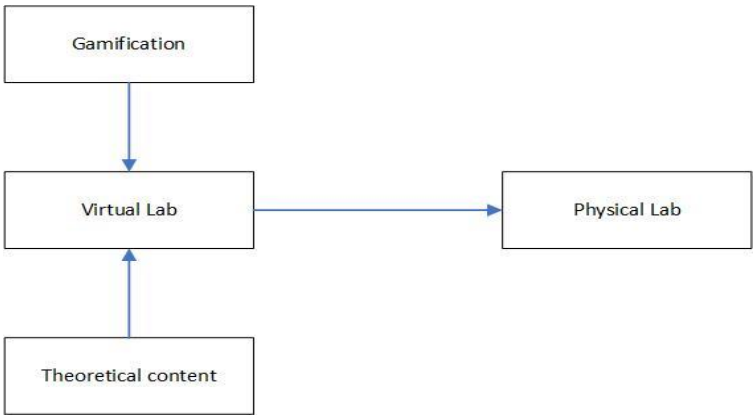

Figure 1: The overall process of implementing a gamified virtual lab followed by subsequent actual experiments.

4. RESULTS & DISCUSSION

Table 1 shows the survey results. Overall, 24% and 44% of the participants expressed satisfaction and strong satisfaction with the teaching approach. Furthermore, the majority of the participants indicated satisfaction in terms of the connection between theory and practical application, understanding of the specific task given, accessibility to the virtual lab (preparedness), and problem-solving skills. The survey showed 76%, 83%, 80%, and 76% agreement from the participants on the respective survey items presented in Table 1. It can be inferred that the inclusion of a virtual lab and gamified elements made the learning process more engaging. As a result, it enhanced understanding of the given experimental tasks and improved students' focus and knowledge retention during the actual lab.

Table 2 Survey results of the instructional approach with virtual laboratory technology

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Connection between theory and practice	0%	4%	20%	40%	36%
Understand the lab task	0%	4%	13%	33%	50%
Preparedness	4%	0%	16%	40%	40%
Problem-solving	0%	4%	20%	40%	36%
Overall satisfaction	0%	0%	24%	44%	32%

5. CONCLUSION & RECOMMENDATION

The instructional approach of combining virtual and actual laboratory support with gamification was effective in bridging the gap between theory and practice, ensuring that learners obtained the prerequisite knowledge before entering the actual laboratory. Due to the high versatility of virtual lab technology and considering the positive effects of gamification, this approach can

be customized to meet the needs of various subjects and implemented in various educational disciplines in the future.

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Chapter 8
Digital Logistics Technology (DLT): A Seamless Automated Delivery

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ABSTRACT
The Digital Logistics Technology (DLT) at Kolej Profesional MARA Bandar Penawar represents an innovative leap in the realm of logistics and digital technology. This advanced system streamlines the delivery process by automating online ordering, selling e-goods achieving remarkable operational efficiency. DLT, accessible via www.y5kpmp.com, skilfully merges various logistics technologies, enabling the completion of the entire order-to-delivery cycle, from seller to consumer in under five minutes. Originally developed to overcome the limitations of manual ticket distribution at Koperasi Kolej Professional MARA Bandar Penawar Kota Tinggi Bhd, DLT has transformed the sales process by reducing response times and ensuring prompt delivery, with a notable 98% success rate in deliveries, hence spiking the sales performance of product offered. Targeted towards customers using unique product codes or e-goods, DLT has reached a Technological Readiness Level of SEVEN (7), signifying its full operational capacity and readiness for wider market implementation. Future enhancements include the potential integration with Unmanned Aerial Systems (UAS) and Automated Guided Vehicles (AGV) to deliver physical products seamlessly. This expansion positions DLT at the forefront of digital logistics innovation, especially in Malaysia. The advancement of DLT not only underscores Kolej Profesional MARA's commitment to technological prowess but also makes a significant contribution to the global landscape of technology-driven logistics and delivery services. This system shows a versatile, world-class solution in digital logistics, adaptable for use anywhere globally.

Keywords: digital logistics, logistics, seamless delivery

1. INTRODUCTION

Transitioning from conventional practices to the digital age, advancements in online procurement systems have significantly elevated customer satisfaction through enhanced precision. This is substantiated by the pioneering efforts of The Maverick, an innovation group at Kolej Profesional MARA Bandar Penawar. Their groundbreaking creation, Digital Logistics Technology (DLT), revolutionizes the supply chain by automating processes from order reception to goods delivery, eliminating manual intervention and ensuring seamless efficiency.

The recent innovation initiatives are specifically targeted towards enhancing e-goods products, with the primary objective of addressing operational challenges encountered by Kolej Profesional MARA Bandar Penawar's Cooperative Shop in the distribution of Wi-Fi

codes to the students. Persistent issues such as delayed response times upon receiving customer orders, misplacement of unsold Wi-Fi codes in agent inventories, escalating customer debt rates, and sluggish delivery of Wi-Fi cards necessitate a departure from the conventional agent-based distribution model. A forward-looking approach to innovation is essential to overcome these challenges and optimize the efficiency of the Wi-Fi code distribution process. The implementation of the Digital Logistics Technology (DTL) system represents a pioneering advancement in the delivery of e-goods, offering customers an unparalleled level of convenience and efficiency. By eliminating temporal constraints, this innovative system streamlines the purchasing process, providing customers with the flexibility to access services from any location without the need for intermediary agent communication. Moreover, the automated design of the system ensures prompt delivery, with e-goods reaching customers in a mere five minutes or less, revolutionizing the efficiency and immediacy of product fulfilment.

2. LITERATURE REVIEW

Business logistics encompasses activities such as planning, executing and controlling the flow of products, information and resources, from the supplier to the final customer (Maria Erilúcia, José Evandro, 2023). The companies that offer excellent and seamless logistics performances, will achieve a competitive advantage (Wilhelm Hauser Wilhelm Hauser, 2022). Price, terms, and conditions are no longer the leading criteria to ensure the success of the company. How the company manages its logistics will particularly result in the company being present in the list of chosen providers among the customers.

Ning Luo (2023) stated that technological advances improve how an entrepreneur can produce a good, including increases in knowledge about how to combine factors more efficiently and developing capital goods that are more productive than those used before.

The use of modern information technologies and intelligent transport management systems is a key area for improving the delivery of goods either physical or virtual. Digitalization makes the transportation of goods and information much simpler, provides flexibility in working with customers and thus allows one to pay in any currency through various payment systems (Liana Kanchaveli Liana Kanchaveli,2021). In the era of the “Industry 4.0” concept and 5PL logistics, the development of the digitalization of logistics and modern information and the introduction of computer technologies have become extremely relevant. (Irina Zaychenko1, Anna Smirnova, 2020).

Liudmyla Verbivska et al (2023) found that the use of information technologies in logistics makes it possible to effectively solve current problems and eliminate possible problems in the future, improve the quality of logistics services, maximally load the capacity of logistics flows, rationalize material flows, increase the safety of transportation, optimize costs for the supply of resources and products, eliminate intermediate links by ensuring the transformation of information into forms that are convenient for consumers, increase the efficiency of information exchange and increase its security, implement new services and innovative customer support tools.

3.0 METHODOLOGY

3.1 Data Collection

Data were collected from the historical data from the back-end website domain https://www.y5kpmbp.com and manual sales recorded from the manager to measure the e-goods delivered time from the ordering time to delivery time comparing the manual and

automatic method using DLT. It consists of 3 years data for manual collected and 1 year for full implementation of the innovation Digital Logistics Technology in Koperasi Kolej Profesional MARA Bandar Penawar.

4.0 FINDINGS

The DLT has had an impact or effect on time savings, user satisfaction and an increase in sales. DLT got a 98% of delivery success rate based on quantity for 980 over 1000 tickets sold. Significant impact, the annual sales have increased from 2021 (RM46,216) to 2022 (RM64,361) or 37% for comparison as shown in Figure 4.1 and Figure 4.2 below:

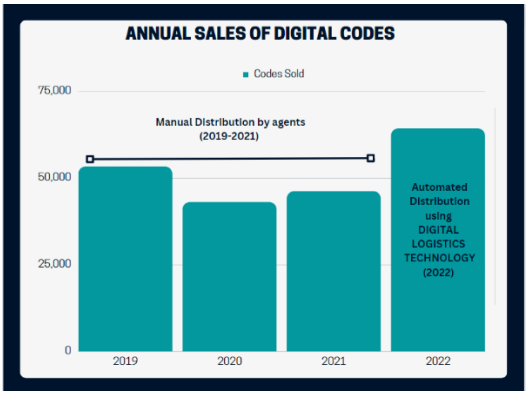

Figure 4.1 Sales improvement comparison from Year 2019 to Year 2022 (Source: Author)

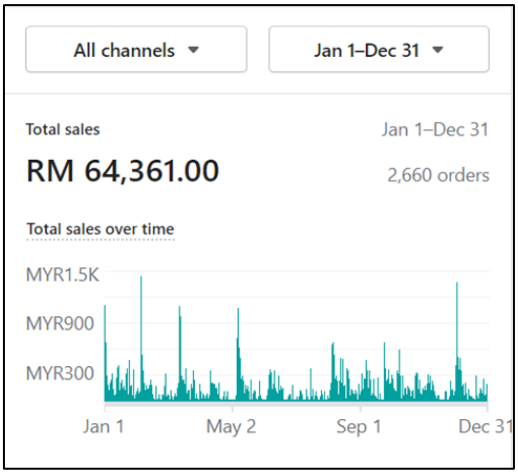

Figure 4.2: Record Of Sales 2022 (Source: Author)

5.0 DISCUSSION

This system has been proven to help customers to get digital products at the best time and effortlessly. As for now, the target clients and partners are businesses or premises that use a unique code as one of their products. It may include of access cards, top-up cards, or dedicated e-books, homestay, online tickets, and event management bookings.

Digital Logistics Technology (seamless delivery anytime, anywhere) has been proven to help customers to get digital products in rapid responses. This is because the system is already fully operational and has already received feedback and resulting sales that exceed the cost of development. This approach of digitising logistics process technologies makes it simple and quick to address the risk of lost, unrecognised, or untraceable commodities and to gain customers satisfaction.

Furthermore, this system was developed and combined with several other systems to create a comprehensive system with a network of facilities in the logistics management process, starting with the producer and continuing through the supply chain and transportation to the client with seamless delivery process. The innovation digital logistics system that has had an impact on time savings, user satisfaction and an increase in sales. This means, the successful process of system automation occurs at a rate of 98% throughout the time the system is implemented.

6.0 CONCLUSION & RECOMMENDATION

The entire order and delivery process to customer's accordance with the logistics procedure that satisfies users' demands. This system has been connected with the Payment Gateway to assist streamline the procedure and provide consumers the comfort of choice by allowing them to select from a range of payment options, including FPX, e-Wallet, or Credit Card. The procedure accelerates delivery rates, ensuring that the consumer receives the product on time and is able to utilise it straight away. The order process has been enhanced and is now accessible from anywhere, anytime and always available to support user sales and purchases. This enhances the usefulness of this innovation idea to meet customer's satisfaction.

As for now, the target customers are businesses or premises that use a unique code as one of the sales products known as e-goods. It may consist of access cards, top-up cards, or dedicated e-books that use the unique code. Marketing methods using exhibitions, demonstration techniques and system presentations to potential customers make it easier for customers to understand whether to buy or rent this system.

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Chapter 9
From Textbooks to Tracks: The Educational Benefits of Train Eco Camp

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ABSTRACT

"The Train Eco Camp (TEC) is an innovative project fundamentally developed from the MAKAR application. It is designed to facilitate Teaching and Learning sessions for courses that involve theory, facts, and memorization, such as Microeconomics, for students taking a Diploma in Accounting and a Diploma in Integrated Logistics Management at Kolej Profesional MARA Bandar Penawar, Johor. Utilizing TEC as a teaching aid has alleviated students' challenges in understanding textbook material. This innovation enhances students' knowledge of the subject matter and significantly improves their understanding of course concepts, particularly in elucidating theories more effectively. TEC was developed in response to observations that students often lost concentration quickly and struggled with content comprehension due to limited English proficiency. This led to a reliance on lecturers for assistance. To measure the effectiveness of TEC, pre and post-tests were administered to students before and after its implementation. The findings of this study indicate that TEC not only improves student performance but also their English proficiency. Additionally, students' perception of TEC during the T&L process has been overwhelmingly positive. Consequently, educators are encouraged to adopt this method as an alternative approach to assist students, particularly those who struggle with comprehending theories effectively."

Keywords: Teaching Aids, Applying and Improving Understanding and Alternatives.

1. INTRODUCTION

Artificial intelligence (AI), mobility, interactivity, and technology learning tools like games and augmented reality (AR) are significantly revolutionising the educational scene. The mobile-interactive paradigm that these components produce maximises convenience while acknowledging the needs of learners. Intelligent tutoring technologies are essential to democratising access to tutoring by providing tailored and flexible assistance (Alam & Mohanty, 2023).

The Train Eco Camp (TEC) is an innovative project fundamentally developed from the MAKAR application. It is designed to facilitate Teaching and Learning sessions for courses that involve theory, facts, and memorization, such as microeconomics, for students taking a

Diploma in Accounting and a Diploma in Integrated Logistics Management at Kolej Profesional MARA Bandar Penawar, Johor. Utilizing TEC as a teaching aid has alleviated students' challenges in understanding textbook material. This innovation enhances students' knowledge of the subject matter and significantly improves their understanding of course concepts, particularly in elucidating theories more effectively.

A preliminary survey with lecturers teaching microeconomics indicated that students struggle to remember theories and facts in the subject. This difficulty is attributed to their lack of effective memorization techniques. Additionally, there is a noticeable lack of communication between students and lecturers in class, mainly due to the students' limited proficiency in English, affecting their classroom interaction. Early findings found that students quickly lost concentration, did not have the means to remember facts or theories well, struggled to understand the lesson's contents, were quick to give up and always expected help from lecturers. This information is obtained using several assessment methods such as questioning in class, discussion, training, tests, and exams. Therefore, the lecturer has planned to think of a suitable method and try to find a solution to this problem using the TEC.

The objectives of “From Textbook to Tracks: The Educational Benefits of Train Eco Camp” are to:

a) Enhance students' knowledge.
b) Understand course concepts such as theories more effectively.
c) Active participation during lesson sessions.
d) Cultivating interest in learning.

The novelty of TEC's innovative approach is focused on aiding students in grasping and understanding terms and economic theories more effectively, thereby resolving the challenges associated with abstract factual concepts. It also plays a significant role in enhancing English language proficiency among students. Moreover, TEC is instrumental in boosting students' academic achievements already performing well in the course.

2. LITERATURE REVIEW

Games incorporate personalised learning experiences into the curriculum, and by utilising adaptive learning technology, they can adapt to individual students' specific needs and abilities. This ensures that each student is engaged appropriately and can advance at their speed. Educators can adjust their teaching approaches to better cater to each student's distinct requirements through instant, real-time feedback on a player's performance from digital learning games. This leads to a more focused utilisation of in-class instruction time and enhances overall learning outcomes (Inemeh-Etete, 2023).

In situated learning, digital educational games are a learning space for building new knowledge, allowing learners to acquire and apply skills through interactions within the game and with fellow players. This learning environment, rooted in games, can be seen as a virtual community of practice, offering learners a context for learning, guidelines for exploration, and collaborative opportunities (Klopfer & Thompson, 2020). Additionally, digital educational games incorporate various learning mechanisms or elements, such as pedagogical agents, self-explanation strategies, and adaptation, acting as cognitive apprenticeships to assist learners in progressing from beginners to experts (Gui, Cai, & Yang, 2023).

Research indicates that incorporating games into teaching can enhance student engagement, promote social and emotional learning, and inspire students to take educational risks. For instance, a study on the widely used multiple-choice quiz game Kahoot revealed that it positively influenced students' attitudes toward learning and positively impacted their academic performance (Nguyen, 2021). However, it is crucial to recognise that games should

not replace other forms of knowledge. Like any educational tool, careful planning and integration are necessary, ensuring that games are used only when they align with the learning objectives.

3. METHODOLOGY

3.1 Study Methods

This study is carried out using one of the main methods, which is through the tests carried out, which are pre-tests and post-tests. Pre-tests are given at the initial stage of the study and before the TEC method is introduced to the students, and the post-test is provided after the student is described about the TEC method. This post-test is given to identify the students' increased mastery of economic concepts.

3.2 Data Collection and Analysis

This study focuses on 23 students who took the Microeconomics course at KPM Bandar Penawar. All students are briefed about the TEC method. The methods used in the data collection for this study are derived from the test scores conducted in pre-test and post-tests. The lecturer provides two sets of questions, a set for a pre-test where the question covers topics one and two. Currently, students have not yet been introduced to the TEC method. The second set is a set of post-tests where students have been introduced to the TEC method, and the topics taught are still the same topic to measure the student's ability to answer the questions given and thus identify the effectiveness of this method in assisting the students' performance.

4. RESULT AND DISCUSSION

4.1 Pre-Test Results and Post-Tests

The maximum score on the test was 15%, and the score was categorised into levels of student achievement: very weak, weak, moderate, good, and excellent, as shown in Table 1.

Table 1: Guide to Score and Student Achievement Level

SCORE (%)	MILESTONES
12. 1 – 15.0	Excellent
9.1 – 12.0	Good
6.1 – 9.0	Moderate
3.1 – 6.0	Weak
0 – 3.0	Very weak

Based on the results of the Pre-Test and the Post-Test, it is clearly illustrated that there has been a significant improvement in successful students. Table 2 shows the score and the number of students exposed to this method.

Table 2: Pre-Test Results and Postal Tests

SCORE (%)	MILESTONES	Pre-Test	Post-Test
12. 1 – 15.0	Excellent	4	5
9.1 – 12.0	Good	1	11
6.1 – 9.0	Moderate	9	6
3.1 – 6.0	Weak	9	1
0 – 3.0	Very Weak	-	-

Table 2 clearly illustrates significant differences regarding overall student achievement between the Pre-Test and the Post-Test. Overall, there were no students categorised as very weak students. At the initial stage, the number of students at the weak level was nine, and after this method was implemented, the number of students at the weak level was successfully reduced from nine to one. Meanwhile, students at the moderate level were nine initially and decreased to six after this method was applied.

In addition, before implementing the TEC method, the number of students was at a good level of one. Nevertheless, after introducing this method, the number increased by ten people to 11, which was an outstanding improvement. For students whose excellent category of achievement is only four and has risen to five, a good increase in which excellent students can be improved. Using this method can help students who are weak in understanding concepts and, in turn, be able to draw curves well. Therefore, the TEC method has helped students better understand the course taken, which is microeconomics.

A survey was conducted to determine the students' perceptions or satisfaction with using TEC. Questionnaires were given to students after they used this TEC. Each data obtained is analysed using SPSS. Table 4 shows the findings.

Table 3: Student Satisfaction Levels Against the Use of TEC

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Tahap Persepi Pelajar	Pernah	6	4.8571	.28571	.11664	4.5573	5.1570	4.29	5.00
	Tidak Pernah	17	4.5042	.46871	.11368	4.2632	4.7452	3.57	5.00
	Total	23	4.5963	.45104	.09405	4.4012	4.7913	3.57	5.00
Tahap Kesesuaian Penggunaan	Pernah	6	4.5833	.69722	.28464	3.8516	5.3150	3.33	5.00
	Tidak Pernah	17	4.6765	.44281	.10740	4.4488	4.9041	3.67	5.00
	Total	23	4.6522	.50481	.10526	4.4339	4.8705	3.33	5.00

Table 3 shows that students who have previously studied economics have a higher mean score of 4.8571 with a standard deviation of 0.28571, indicating a relatively consistent perception. The 95% confidence interval ranges narrowly from 4.5573 to 5.1570, suggesting strong confidence in the mean estimate. Meanwhile, students who have not studied economics have a slightly lower mean score of 4.5042 with a standard deviation of 0.46871, which indicates more variability in their perceptions. The confidence interval for this group ranges from 4.2632 to 4.7452. The total mean score for all students is 4.5963, with a standard deviation of 0.45104, showing a generally positive perception of the TEC across both groups.

Then, for the suitability of use, students who have studied economics show a lower mean score of 4.5833 with a standard deviation of 0.69722, suggesting that they find the TEC slightly less suitable than their perception score. The confidence interval ranges from 3.8516 to 5.3150, which is more comprehensive, reflecting more significant uncertainty in the mean score. Students who have not studied economics have a higher mean score of 4.6765 with a standard deviation of 0.44281, implying they find the TEC more suitable. Their confidence interval ranges from 4.4488 to 4.9041.

The overall mean score for suitability of use is 4.6522, with the standard deviation being 0.50481, which is relatively like the total mean score for perception, indicating a generally positive suitability of TEC for all students. In summary, students with prior economics education rate the TEC highly regarding their perception but slightly lower in suitability for use. In contrast, students without an economics background find the TEC more suitable for their needs. Overall, both groups show a positive attitude towards the TEC, with all mean scores above 4.5, and the tool seems to be well-received for enhancing academic performance.

5. RECOMMENDATIONS

Based on the findings of this action study, several suggestions to improve the quality of teaching and learning for Microeconomics courses, such as the impact study, applied this method to all courses related to economics, such as Business Economics and Macroeconomics, to help students improve their understanding and mastery of the course. In addition, the study's findings can be extended and developed for subsequent studies addressing the problem of weak students in all economics-related courses. Therefore, as lecturers, we need to be attentive to our students so that they can successfully master everything they learn. In addition, we hope that the findings of this study will stimulate further research to prove that the use of the TEC method can help to improve students' understanding of economic concepts and thus help them improve their excellence.

The findings of this study can also catalyse the researchers' efforts to continue looking for alternative methods to help improve the quality of teaching and learning and the organisation they participate in. Indirectly, it is in line with the objective of the Malaysian Education Development Programme, which is launched, which is that teachers play an essential role in producing high-potential students and quality and adequate human capital.

6. CONCLUSION

This TEC is beneficial and can help students remember a term or economic theory easily and overcome the problem of abstract factual confusion. In addition, using TEC can increase students' interest in studying this course. At the same time, it can assist students in improving their English proficiency, thus overcoming the problem of term and language confusion. TEC can be extended to various factual or abstract courses.

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Chapter 10
Tungsten Electrode Sharpener Using Hand Grinder Jig

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ABSTRACT

There are several jigs whose designs were customized by the welder according to their working experience and condition towards the machine design and work. Therefore, it is dependable for welders to create and fabricate jigs using an angle grinder according to the specifications of the grinding machine. Thus, a study on the jig was made by reviewing the examples of jig designs and the information on how the jig should be made and from what it should be manufactured. Jigs are made from a variety of materials. By using a jig as a holder, it will make a uniform and clean cut for the tungsten. The hand grinders are suitable for light jobs such as removing excess sharp cutting edges and finishing processes. GTAW (Gas Tungsten Arc Welding) is an arc welding process that uses non-consumable tungsten electrodes to produce work. The weld area is protected from atmospheric contamination by an inert shielding gas (argon or helium), and a filler metal is normally used with a tungsten electrode. The tungsten electrode used in GTAW is made from a tungsten alloy because tungsten has the highest melting temperature among pure metals, at 3,422 °C (6,192 °F). Tungsten electrodes are not consumable and are different from SMAW electrodes. During the welding process, some erosion (called burn-off) can occur. Clean-finish electrodes mean the electrode has been chemically cleaned, while ground-finish electrodes have been grinded to a uniform size and have a polished surface, which makes them optimal for heat conduction. Tungsten electrodes are important for the welding process and must be ground and cut cleanly with proper angles. Any improperly prepared electrode leads to an arc defect, splitting, shedding, inconsistencies, and increasing production costs [2].

Keywords: - Jigs, Hand Grinder, Tungsten Electrode, GTAW

1. INTRODUCTION

One of the types of welding that is often used nowadays is GTAW. GTAW is more practical than other welding methods, for example, SMAW or OAW. The combination of two types of welding makes the GTAW more reliable compared to others added with shielding gas and filler rod. The electric current that flows from the welding machine through the torch will produce a quite high heat zone, around 3200°C, with the addition of argon gas or helium, which acts as a shielding gas that protects the melting crater or welding pool from the atmosphere. Due to this, GTAW results are more clean, neat, and strong, with fewer arc defects. GTAW is widely used nowadays because of its ability to weld on various types of iron materials, such as aluminium and stainless steel, with different thicknesses. Furthermore, GTAW welding is widely used in the manufacturing industry, the automotive industry, and the

aeronautical industry. GTAW may well be a method that melts and joins metals by heating them with an arc established between a non-consumable element and the base metals. [4] Tungsten electrodes are not consumable and are different from SMAW electrodes. The diameter of the electrode can vary between 0.5 and 6.4 millimetres (0.02 and 0.25 in), and its length can range from 75 to 610 millimetres (3.0 to 24.0 in).

As shown in Figure 1.1, the tungsten is usually used in a water-cooled copper tube, referred to as the contact tube, that connected the fastening cable from the terminal. This process creates arc current from the ability to enter the fastening cup and thus the tungsten to be cooled to avoid heating [4].

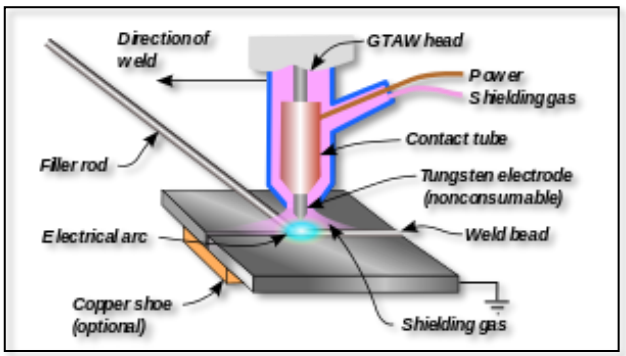

Figure 1:1 G.T.A.W welding process

2. LITERATURE REVIEW

2.1 Jig design as holder to angle hand grinder

In term to design jig holder some important consideration must include such as dust extraction that will safely contain all grinding dust. Jig design feature also need fixture that will make it possible to lead the work and improper position, but will not interfere with loading and unloading the work piece." Jig is a device used to clamp workpiece in a specific location so that the mechanical process is properly guided. Jigs are independent devices which fastened to the machine table [1] To avoid any damage to fragile and soft work piece and also to the finished surfaces of the work piece while clamping. Design of the jig and fixture should be a simple one.

2.2 Hand Grinder

There are several types and sizes with different tasks that angle grinders are suitable for. By making sure the correct grinder it can grind the electrodes tungsten in short time.

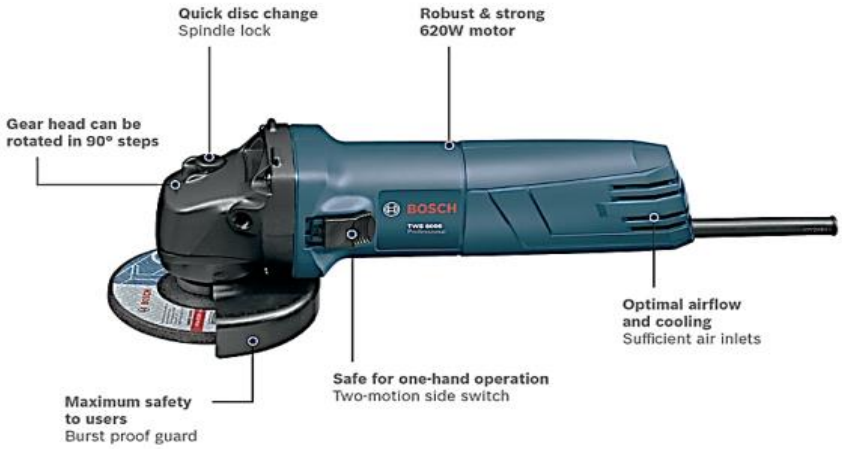

Figure 2:1 Angle hand grinder from Bosch Engineering Company

2.3 Tungsten Electrode

GTAW machines has use tungsten electrode to supplies or connected the current to the base metal with compatible GTAW torch. An arc off the weld pool from tungsten were created along with the welding parameter. In term to use the electrode it must depend on the type, thickness and material of the work piece. By added the function of electrode tungsten on GTAW it will make the welding clean and strong joint especially for thin materials.

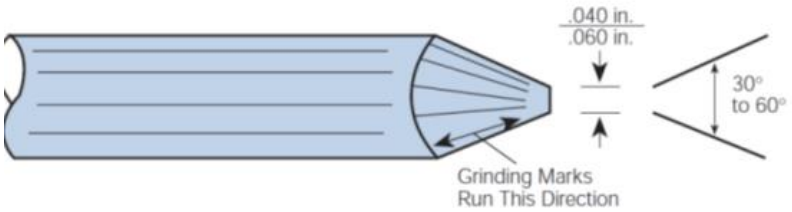

Figure 2:2 Perfect angle to grind tungsten electrode between 30° to 60° angle of cutting.

3.0 METHODOLOGY

3.1 Research Flowchart

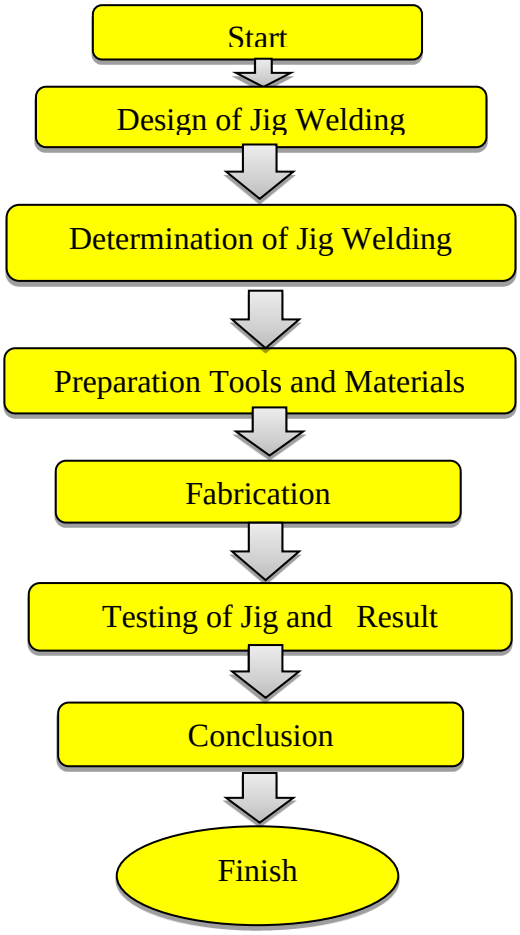

Figure 3.1 Research Flowchart

3.2 Project Design

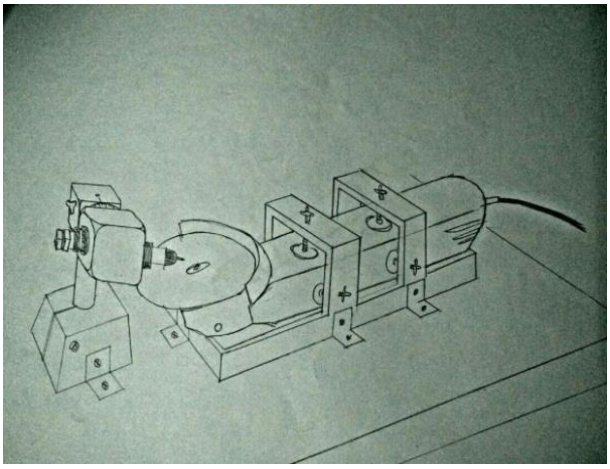

Figure 3: 2 Conceptual design

Figure 3:3 Tungsten Sharpener using hand grinder jig

4.0 RESULTS AND DISCUSSION

4.1 Finding Results

Finding results for this hand grinder Jig has achieved the objective, which is change the method operation grinding to become more practical, easy to handle and safe for used. The design for this hand grinder Jig is simple and does not involve many components to build. This jigs also can avoids injury amongst welder or user when it uses because off hard plastic to cover from accident or hazard.

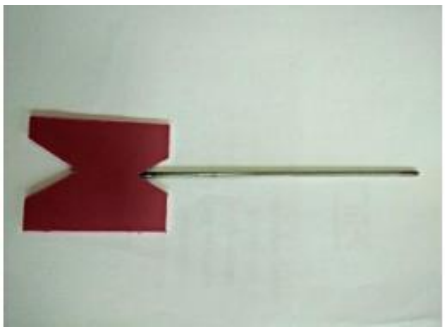

Figure 4: 1 Tungsten electrodes visual inspection in measuring 30°and 60° angle.

4.2 Advantages of Jig Design for Sharpen Tungsten Electrode

The advantage of this project is the jig can help welders from having a hard time to sharpen the tungsten electrode to the 30 °and 60° degree of angle. Besides that, this jig also has safety features to avoid welder from excessive sparks and spatter from the grinding process, it is also light and portable (weight include grinder is 4.27 kg) to move and carry to anywhere in the flat surface area.

4.3 Disadvantages of Jig Design for Sharpen Tungsten Electrode

While there are benefits with the projects, there are also some disadvantages, the jigs only able to sharpen the tungsten electrode with angle of 30° and 60°degree only. Besides the problems to find a multiple angle holder for the jig to rotate for more cutting angle, the problems is to maintain suitable angle for the tungsten, because the hand grinder also regularly need to be open for the another job such as cutting and finishing process.

5.0 CONCLUSION AND RECOMMENDATION

The conclusion that can be drawn from this jig fabrication is that this project can provide benefits for the welders and optimize the usability of hand grinders by developing stable and uniform welding jigs for grinding the tungsten electrode fixedly. The advantages also include increasing safety precautions among welders. Thus, this can eliminate time and effort, especially for the unskilled welder, in terms of finding the right angle of cutting for the electrode. This allows welders to get the best grinding angle for tungsten electrode functionality in GTAW. A good welding result can produce a strong and solid connection and thus save manufacturing costs. Thus, it can also increase the marketability of welders to the highest level in general.

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Chapter 11
Learning through Immersive and Interactive Mathematics Discovery Platform

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ABSTRACT
In general, learners nowadays encounter various challenges in comprehending mathematical concepts. These challenges include a lack of understanding of the interconnections between mathematical ideas, struggles in applying these concepts to the real-world scenarios and inability to grasp complex mathematical concepts. In addition, some learners also perceive mathematics as a boring and abstract subject which leads to disengagement and decreased of learning motivation. This project aims to improve learners' engagement and motivation in mathematics education by immersion of historical context of mathematicians and their contributions through an immersive, interactive and gamified mathematics learning platform. The platform comprised of various exploration activities which offers students a diverse range of learning experiences to explore mathematical concepts from different perspectives, while helping students to apply the concepts and skills within real-world context. Learners revealed positive perceptions towards the mathematics learning platform as indicated by the questionnaire. For instance, they agreed that the platform offers an immersive learning experience about mathematicians, enhances engagement and is both fun and interesting. Moreover, it facilitates learning through multiple representations and strengthens the application of mathematical concepts in real-life scenarios. This project has a potential to offer new insights to educators in designing interactive learning platform and integrating diverse learning strategies to meet the demands of the students within a technology-rich learning environment.

Keywords: mathematics, engagement, motivation, immersive.

1. INTRODUCTION

Nowadays, mathematics is frequently viewed as the most challenging and abstract subject, despite its interconnections with various disciplines. This perception arises from the abstract nature of mathematical concepts and often causing students to struggle in recognizing their relevance in real-life applications. As a result, this challenge leads to a decline in their motivation to actively participate and engage with the subject.

The educational paradigm has undergone a substantial shift, particularly with the emergence of Education 4.0 and the tech-savvy nature of today's learners. Consequently, the role of mathematics educators has experienced significant evolution. The traditional approach

of "chalk and talk" is no longer sufficient to engage and educate the current generation. In the past, the teaching of mathematics focused primarily on theoretical concepts but the present approach requires a shift towards a more interactive and personalized learning experience. Hence, there is a need for educators to embrace new teaching approach and proficiently incorporate emerging technologies to enhance students' learning experience.

One creative methodology in teaching mathematics would be to include the history of mathematics and explore the stories of the pioneers and their discoveries. Students not only could understand the origin of mathematics and the contributions of mathematicians but also could spark a sense of curiosity and appreciation for the subject through this strategy.

Furthermore, utilizing advanced technologies such as Artificial Intelligence (AI) to enable mathematicians to explain their theories can further enhance the learning experience. This interactive approach not only clarifies mathematical concepts but offers students a personalized insight while creating a bridge between abstract concepts and real-world applications. In addition, utilizing various representations and diverse technological mediums could significantly enhance learners' understanding of the concepts. For example, a visual learner may find simulations, diagrams, graphs and videos particularly effective in improving retention.

In essence, the modern math educator must go beyond traditional teaching methods such as leveraging technology, historical context and interactive approaches to make mathematics a more personalized and interesting subject for today's learners.

Following from that, the interactive mathematics learning platform aims to revolutionize mathematics learning by creating an engaging and dynamic environment where learners can connect, contextualize and visualize mathematical concepts. In addition, the platform seeks to bridge the historical narrative of mathematicians and their contributions with the essential mathematics learning concepts. Furthermore, it aims to establish connections between mathematical principles and real-life applications to foster a deeper understanding of mathematics. Finally, the platform aims to increase students' motivation and appreciation for mathematics while catering to students' diverse learning styles by incorporating multiple representations in the platform.

2. LITERATURE REVIEW

Students grasp mathematics concepts better when they work on problems they find interesting rather than doing exercises and drills that make them anxious. Mathematical anxiety among engineering students could be revealed in various ways such as perceiving mathematics as a challenging subject, encountering persistent difficulties or failures in mathematics and experiencing demotivation in overall interest in the subject (Vitasari et al., 2010).

A study revealed that students' motivation has a direct correlation with their academic success in the subject of mathematics (Yarin et al., 2022). Hence, the study proposes that universities and educators implement measures to enhance student motivation. For instance, educators are encouraged to employ strategies to engage students in learning with the aim to improve motivation and subsequently enhance their performance in mathematics. This approach not only could reduce the fear often associated with traditional drills but also transforms mathematics into a dynamic and engaging experience while enhancing overall understanding and retention.

Following from that, the key is to foster an environment where mathematical challenges align with students' intrinsic interests. This enables them to approach problem-solving with enthusiasm and curiosity. Educators can increase students' motivation by tailoring

mathematics activities which customized to their preferences to make the learning process enjoyable and more conducive to understanding complex concepts.

There are several advantages by incorporating historical perspectives in the teaching of mathematics. It allows students to witness the evolution of math and appreciate the diverse contributions made by various individuals and cultures to its development. In addition, students can grasp the concepts more comprehensively and understand their interconnectedness with other subjects through the stories and methods behind mathematical discoveries. Moreover, integrating history into mathematics education has the potential to enhance learners' motivation, cultivate a positive attitude toward learning and contribute to the development of strong mathematical thinking (Liu, 2003).

In addition, illustrating mathematical concepts through real-life applications could enhance students' understanding of the relevance and significance of mathematics. Visual representation which presented through various technological mediums could offer an effective way to aid comprehension of the concepts. For instance, the Pythagorean theorem can be explained using diagrams and practical objects like a ladder leaning against a wall. In fact, establishing connections between new information and students' existing knowledge, insights from other disciplines and real-world context has been proven as a more effective approach compared to learning concepts in isolation (Kovalik & Olsen, 1994).

3. METHODOLOGY

A sample of 25 first year undergraduate students studying Engineering Mathematics voluntarily participated in a pilot project exploring the interactive mathematics discovery platform. The students were invited to share their opinions through a questionnaire after their participation in the project. The questionnaire administered to the students comprised questions employing a 5-point Likert scale, spanning from 'Strongly Disagree' to 'Strongly Agree.' These questionnaire statements were used to examine students' perceptions regarding their satisfaction and learning experiences towards the platform.

4. RESULTS & DISCUSSION

The findings from the questionnaire responses in the pilot study were presented in Figure 1 through bar charts in percentages. Overall, the results indicated that students hold highly positive views about the interactive learning platform.

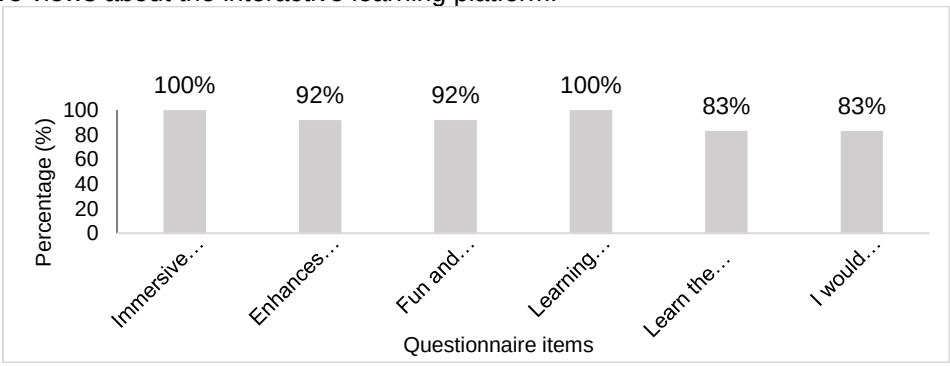

Figure 3: Students' perceptions of Immersive and Interactive Mathematics Discovery Platform

From Figure 1, all participants expressed fully agreement (100%) that they gained an immersive understanding of mathematicians and experienced multifaceted learning through multiple representations. This can be attributed to the platform's incorporation of videos

featuring mathematicians explaining complex concepts to provide a personalized learning experience. Prior to this, students had limited exposure to the historical background of mathematicians. The platform expanded their insights by providing a broader understanding of mathematicians' backgrounds and the specific mathematical concepts they pioneered. Furthermore, all participants revealed that the platform offers a diverse range of interactive elements through multiple representations (100%) as shown in Figure 1, such as graph modelling, quizzes, Augmented Reality, and 360-degree panorama views to ensure a variety of learning experiences. Consequently, the platform accommodates various learning styles among students.

Moreover, Figure 1 indicated a significant majority of participants revealed that the platform not only enhance their engagement with the content (92%) but also made the learning experience fun and interesting (92%). This outcome can be attributed to the platform's unique approach which requiring students to interact with content before undertaking mathematical quests. This method fosters motivation, a sense of connection with the material and an overall perception of the learning process as both enjoyable and interesting which is different from conventional approaches to learning mathematics.

In addition, approximately 83% of the students affirmed that the platform effectively demonstrated the application of mathematics concepts in real-life context as shown in Figure 1. This positive affirmation revealed that students could understand how mathematical concepts connect to their daily life scenarios. Consequently, they could see the importance and usefulness of what they were learning.

Students also expressed a willingness to recommend the platform to their peers (83%) as indicated in Figure 1. The platform's ability to bridge the historical context of mathematical developments with modern technological advancements creates a unique learning dimension for students, making it a noteworthy recommendation for other learners.

5. CONCLUSION & RECOMMENDATION

This study revealed the potential of an interactive mathematics learning discovery platform as an alternative approach to increase motivation in learning mathematics. For instance, this platform delivers an engaging and immersive learning experience which combines the history of mathematicians with fundamental mathematical concepts.

Moreover, educators could gain valuable insights from this study to strategically incorporate technology into the development of interactive learning platforms. In fact, integration of digital technology strategically with transformative pedagogy is essential to meet the different learning needs of today’s tech-savvy learners.

The preliminary pilot results indicated that students displayed high motivation and a sense of enjoyment when learning through interactive platforms. A more in-depth investigation is needed to explore whether this increased motivation correlates with improvement of learning outcomes. Future research in this direction may offer a deeper insight of the impact of interactive learning platform on academic achievement to pave the way for more informed educational practices in the digital age.

In summary, educator’s vision is to pioneer a transformative learning experience in the emerging revolution of education. The ultimate goal is to cultivate a new generation of learners who go beyond conventional memorization and empower them to seamlessly integrate learning concepts with emerging technologies. This is to ensure the learners to acquire essential skills for future graduate attributes in future.

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Chapter 12
The Execution of the Construction Property is Fun (CProFun) Game

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ABSTRACT
The Construction Property is Fun (CProFun) Game was developed in January 2023 with the aim to promote students' engagement through active and interactive learning as well as to facilitate the lecturer in assessing the student's understanding of the construction property topic. It was developed using Quizizz software team to enhance the level of the students understanding through an interactive learning style by conducting an online tutorial for the third year of the Quantity Surveying Diploma Programme in UiTM Perak. However, the efficiency of the Game has yet to be ascertained and concluded as to whether it is capable to improve students' understanding of the construction property topic. Therefore, this initiative was conducted to determine the effectiveness of the CProFun Game in increasing the level of students' understanding of the construction property topic. The execution process started by distributing the pre-quizizz questionnaire survey and then proceeded with conducting a tutorial named CProFun Game via Quizizz software to the students. Subsequently followed by a post-quizizz questionnaire survey to obtain their perception of the online interactive tutorial. The data was analysed using descriptive analysis. The result of the study has proven that the CProFun Game was effective in helping them to understand more on the construction property topic. The majority of the students loved and enjoyed the experience of taking tutorial via the CProFun Game session and they reflected that using Quizizz were more interactive and enjoyable compared to sitting for a tutorial using google form and the U-future platform. In the meantime, 93% of students agreed that the CProFun Game is capable to attract their interest to explore and gain more knowledge. Meanwhile, 98% of students would like the other quantity surveying subjects to use Quizizz as one of the tools used in teaching and learning. Since online learning has become a norm at every level of education nowadays, this study has shown its effectiveness and supports the shift toward the future implementation of more online teaching and learning processes in quantity surveying courses.

Keywords: e learning, interactive, effectiveness, execution

1. INTRODUCTION

The relevancy of the conventional teaching and learning approach is arguable. This method often includes whole-class lectures, teacher-led instruction, pre-planned units, plenty of structure and objective modes of assessment. Research has been replete with arguments on the effectiveness of the conventional approach where it discourages critical thinking, problem-solving and decision-making skills of the students (Henderson, 2005). Besides, the lack of schedule flexibility as well as the lack of interactivity brought by this method has led to dull and boring learning activities. With the continued technological advances, students nowadays learn in a dynamic world where information changes and expands as fast as technological innovation. Modern-day teaching involves using various new and innovative ideas is preferred rather than making students recite the syllabus to clear the examination (AlSubaie et al., 2018). In addition, it could create a fun learning environment and nurture the passion of the students towards the learning activities. Hence, an initiative was taken by the Construction Economics teaching team to enhance the level of the students understanding through an interactive learning style by developing the CProFun Game for the third year of the Quantity Surveying Diploma Programme in UiTM Perak. The teaching team envisaged that the interactive online tutorial via gamification method is one of the possible instruments for assessing the student's progress in mastering the construction property topic. It is also intended to avoid the stress and loss of interest from students in learning the construction economics syllabus. Besides increasing the students' understanding of the topic taught, the interactive CProFun game conducted also could be able to encourage an enjoyable learning session amongst the students and lecturers.

2. METHODOLOGY

2.1 The product development

The product development process commenced by composing questions covering all subtopics of construction property. Next, the questions were vet through by the teaching team and then were transferred into the e-learning gamification platform. The tutorial, CProFun Game was conducted via Quizizz platform (Figure 1). This platform offers multiple tools to make a classroom fun, interactive and engaging. This product had been registered with Intellectual Property Corporation of Malaysia (MyIPO) with the registration number of DY 2022 W1884.

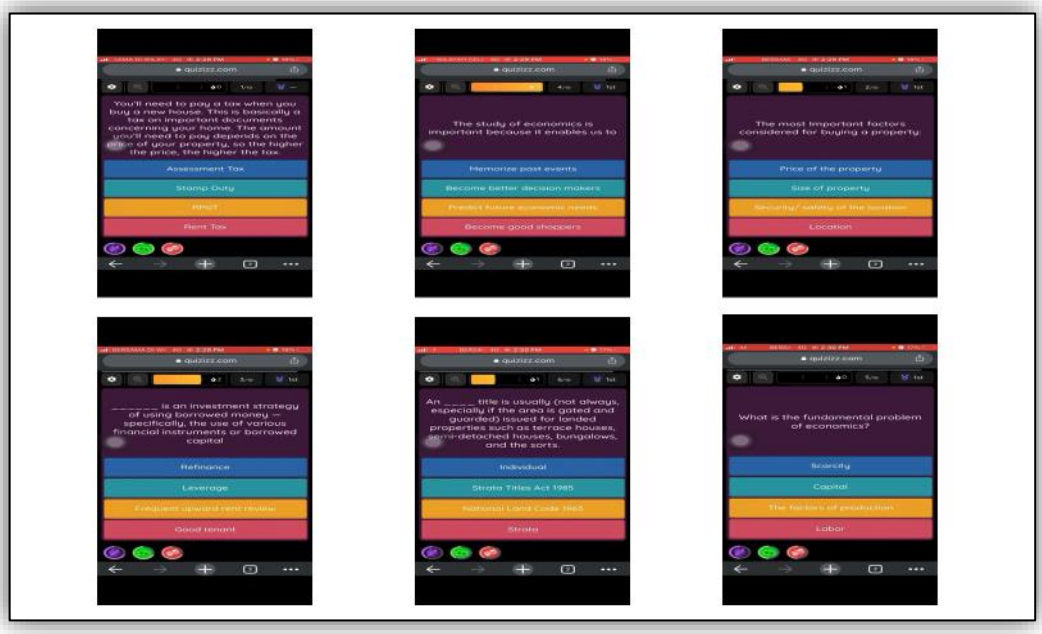

Figure 1: The example of tutorial questions set in the CProFun Game

2.2 Target population

The final year students of quantity surveying programme UiTM Perak were the target population of this study. The sample selection used was the purposive sampling method, namely the students who were taking Construction Economics III course.

2.3 The execution of CProFun Game

During the execution of the CProFun game, the tutorial link or code was given to the 76 students for them to enjoy the interactive tutorial. The students also have been allowed to participate this tutorial via their handphone at any places.Prior to taking the CProFun Game, the students were asked using questionnaire survey for their preference in taking the tutorial either on an interactive online platform or by the traditional method (pre-CProFun game questionnaire). Subsequently, after completing the CProFun Game, the students were then asked a few questions regarding their satisfaction and experience of taking tutorial via online using a second set of questionnaire survey (post-CProFun game questionnaire) (Figure 2). This is important to obtain their feedback pertaining to the game conducted. The data collected from this survey were then analyzed by using descriptive analysis. This data analysis part was elaborated further in the following section.

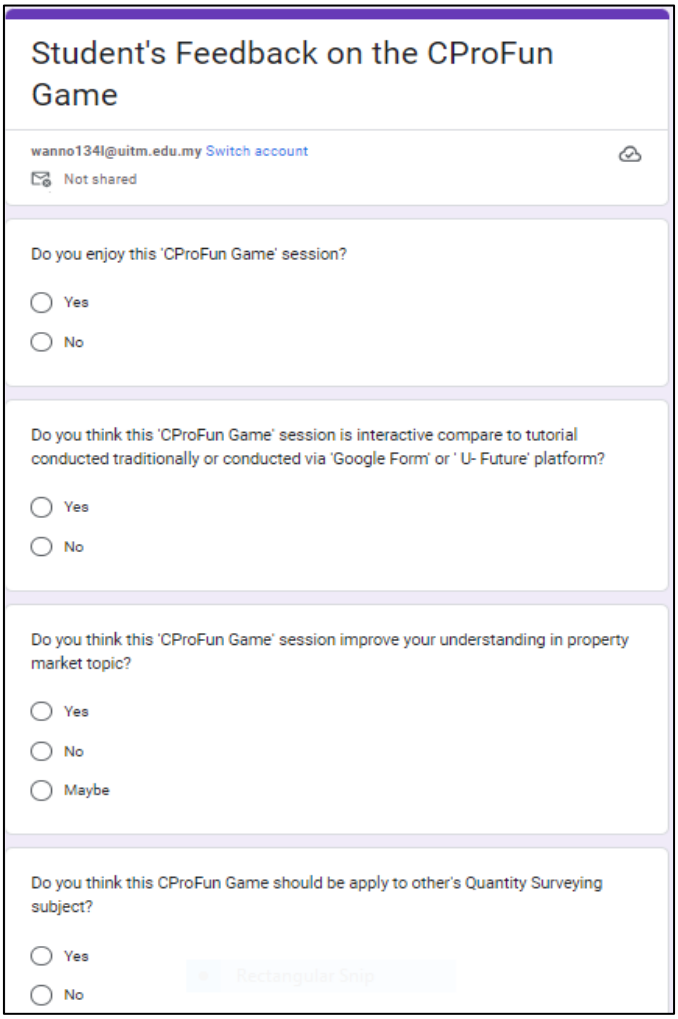

Figure 2: Samples of question for student`s feedback on the CProFun game

2.4 Novelty

The CProFun Game could significantly increase the students' performance in construction economics courses through a fun approach. Unlike conventional tutorial approach where the students feel uninterested, this CProFun Game offers a more interesting way to complete the tutorial as it is an interactive e-learning through gamification platform. Besides, it can be used by anyone, anywhere and anytime because the Quizizz is a free access platform.

3. RESULT AND DISCUSSION

3.1. Preference on the medium of taking tutorial

In the pre-CProFun Game questionnaire survey, the respondents were asked for their preference in taking the tutorial either on an interactive online platform or by the traditional method in classroom. With a 80% response rate, 84% of students reflected their high

preference for online assessments such as Kahoot, Quizizz, and Quizalize. Meanwhile, the remaining 16% prefer to take the tutorial face to face in the classroom conventionally. They highlighted that the issue of internet connection problems can be avoided if it is conducted in a conventional way. They further added that, being in the classroom environment sitting for the tutorial makes them feel the vibes and could perform better.

Table 1. Students' preference on the medium of taking tutorial.

Students' perception	Yes		No	
	N	%	N	%
Do you prefer tutorial conducted in class either in interactive platform (Kahoot, Quizizz, Quizalize, etc) or by traditional method	51	84%	10	16%

3.2. Perception on the CProFun Game

Subsequently, after enjoying and completing the CProFun Game, the students were asked a few questions in the post- questionnaire survey regarding their satisfaction and experience of taking the CProFun Game. The questions and the result are shown in Table 2.

Table 2. Students' perception on the interactive CProFun Game session

Students' perception	Agree		Not Agree	
	N	%	N	%
Do you enjoy this 'CProFun game' session?	60	98%	1	2%
Do you think this 'CProFun game' session is interactive compared to tutorial conducted traditionally or conducted via 'Google Form' or ' U-Future' platform?	54	86%	7	14%
Do you think this 'CProFun game' session improve your understanding in property market topic?	57	93%	4	7%
Do you think this 'CProFun game' should be apply to other's Quantity Surveying subject?	59	98%	2	2%

According to the result shown in Table 2, 98% students agreed that they were enjoy experiencing the CProFun Game session and most of them reflected CProFun Game were more interactive and enjoyable compared to sitting for a tutorial using google form and the U-future platform. To better comprehend the construction property topic, 93% of students agreed that the CProFun Game is capable to attract their interest to explore and gain more knowledge. Unlike the conventional approach, this kind of interactive method could increase the students' involvement and motivation, have chance to get a better score and reduce the stress. Meanwhile, 98% of students would like the other quantity surveying subjects to use the method like the CProFun as one of the tools to be used in teaching and learning as well as in assessing the student progress.

5. CONCLUSION

Based on the perception of the respondents on the execution of the CProFun game, this study found that the use of appropriate online interactive media could motivate and increase the

student engagement in teaching and learning, especially for a hard and boring subject like construction economic courses. Besides, this CProFun Game was capable to increase the student interest and eagerness in accomplishing the tutorial as it incorporates the facts and figures with gamification techniques. Hence, the conventional classroom boredom can be eliminated. Since online learning now has become a norm, especially in universities, this study supports the shift towards the future implementation of more online teaching and learning process in quantity surveying courses.

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Chapter 13
Interactive Digital Map of MSekin Wonderland

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ABSTRACT
The tourism industry is transitioning from offline to online information, benefiting both companies and visitors. This project aims to create an Interactive Digital Map of MSekin Wonderland for tourists and provide an interactive experience. The map uses AR and VR applications to enhance information, allowing visitors to explore attractions like water theme parks, restaurants, and hotels. The map includes multimedia elements like photos, videos, and audio guides. The study's finding with a tourist focus group, the digital map enhances their experience and solidifies the area's status as a vacation destination.

Keywords: Interactive Digital Map, Tourist Attraction, 3Dvista application, Thing Link applications

1. INTRODUCTION

In the vibrant world of the tourism industry, attractions serve as a lure for tourists from far and wide to explore new destinations. These attractions are captivating points of interest, offering visitors unique experiences, cultural insights, and recreational pleasures (Bhavna Bura, 2023). From natural wonders such as waterfalls to historical landmarks and amusement parks, these places captivate visitors, delivering diverse and exciting experiences that make Malaysia a top tourist destination. These attractions stimulate curiosity by offering avenues for learning, relaxation and entertainment. All these elements of tourism are integrated into the itinerary offered (UNWTO, 2017). These experiences will shape the narrative that tourists take home.

Selangor, a Malaysian state known for its diverse cultural heritage and natural beauty, is a burgeoning tourism destination. Located on the west coast of Peninsular Malaysia, Selangor offers a rich tapestry of experiences ((Tourism.Selangor, 2023). The state's capital, Shah Alam, boasts modern landmarks, while Kuala Selangor exudes historical charm. Visitors can explore Batu Caves, a renowned Hindu pilgrimage site, or indulge in retail therapy at bustling shopping districts like Petaling Jaya. Nature enthusiasts can venture to Kuala Selangor Nature Park or Kuala Lumpur Bird Park. Selangor's vibrant culinary scene, highlighted by its famous seafood and street food, further enriches the tourism experience, making it a captivating destination for tourists.

MSekin Wonderland is the first water theme park in Sabak Bernam designed with a family concept in mind. This water park is located near Redang Beach and includes Sekin Hotel & Resort, Ikan Bakar Sekin and Mkopi Laut (MSekin, 2023). Many activities can be done here including swimming and dining. Special facilities are also provided such as hotels, swimming pools, grilled fish restaurants and can rent an electric motorcycle, bike or ATV.

The advent of interactive digital maps has revolutionized exploration by providing real-time guidance, multimedia features and customized itineraries accessible via smartphones and tablets. This digital companion is redefining the travel landscape, empowering tourists to optimize their global expeditions with ease (Team, 2023).

1.1 Problem Statement

MSekin Wonderland, a newly built theme park in Sekinchan district, faces significant challenges because there are no physical or digital maps developed for visitor information. This lack of physical and digital maps causes the accessibility of information about the facilities and activities offered to be limited, making it difficult for visitors to plan their activities before and during their stay at the theme park and miss the main attractions (MSekin, 2023). The absence of physical and digital maps can result in poor indoor navigation, leading to losses, increased losses, and an unsatisfactory tourist experience. Traditional solutions include flyers and social media posts, but these methods do not significantly increase the number of visitors. The absence of digital maps is even more disadvantageous, as it contributes to the increase of information assets for visitors in line with today's technology-savvy world. Based on this problem, the objectives of this project are (a) To increase the user experience and number of visitors to MSekin Wonderland, (b) To produce an interactive digital map with visual characteristics for MSekin Wonderland and (c) To analyze the effectiveness of the interactive digital map about MSekin Wonderland

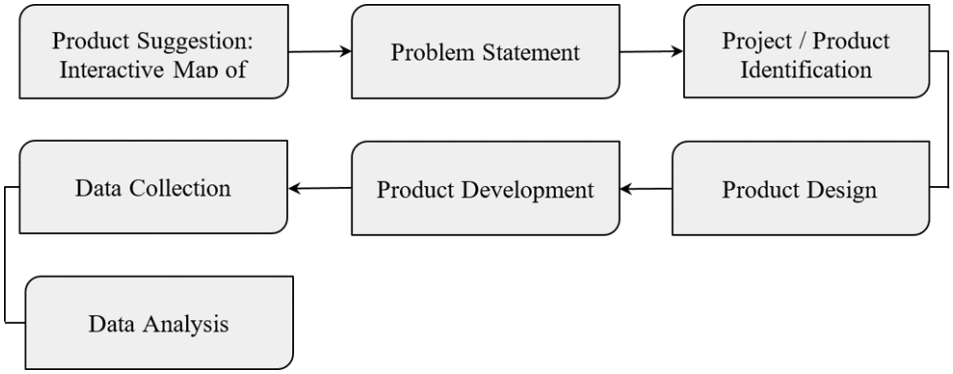
2. LITERATURE REVIEW

Interactive digital map MSekin Wonderland is developed using technologies such as virtual reality (VR) and augmented reality (AR) to create an immersive travel experience. The map is designed using the concept of an intuitive and responsive interface to multiple devices. It allows visitors to explore exclusive information about MSekin Wonderland such as water activities, accommodation, food and beverage, ticket costs, opening hours and more. The map also combines aerial photographic imagery, 360-degree video, and GIS data for an up-to-date and comprehensive digital map for route and travel planning. AR overlays digital information on the real world, allowing users to zoom in and out of maps, pan across different areas and search for specific locations. In addition to this, visitors can also improve their understanding by answering quizzes and exploring the information provided. This interactive map was designed using 3D Vista, thing link, quizzes, Canva and the Insta360 X3 camera, and is accessible to users with disabilities. The map can be navigated by visitors through existing websites and social media platforms. Usability testing has been conducted to ensure the accuracy, user friendliness and effectiveness of this product to tourists and the market.

3. PROJECT METHODOLOGY

3.1 The project frameworks

A tool that provides guidance and structure for the execution of a project. Our project framework is as below:



3.2 Product Development

To complete the development of this project. It goes through 4 phases:

Phase 1: Report
In this phase, we do research on the background of MSekin Wonderland. Also, we discussed the theme of the interactive digital map of MSekin Wonderland.

Phase 2: Information
We do a short Interview with the person in charge and the tourist at the MSekin Wonderland to Get more information and first impressions. Also search for information about MSekin Wonderland or data from articles, journals, and official websites.

Phase 3: Product Design
We discussed the product, which is the Interactive digital map for MSekin Wonderland. The product anatomy is discussed and negotiated to achieve a result that is satisfactory to both of us and the consumer/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.

3.3 Product Process

The process of creating an interactive pop-up map for MSekin Wonderland includes planning objectives and features, designing a visual layout, creating informative content about the location of parts found in MSekin Wonderland, developing a digital format with interactive features, testing functionality and compatibility, integrating it into the digital map MSekin Wonderland website and social media, and create key informational pop-ups on MSekin Wonderland, and update maps to ensure accuracy and usability.

3.4 Final Product

All the information you need to visit MSekin Wonderland is available on this digital map starting from the main entrance of MSekin or from the vehicle parking area up to the point

where the journey ends at Laut Mkopi, which leads directly to Redang Beach. We use simple and eye-catching design elements in addition to using user-friendly navigation controls and features such as location markers and pop-ups that update with the latest information about MSekin along the map route. To contextualize attractions, we provide historical details with interesting or knowledge about places and AR technology to provide virtual tours of destinations or tourist preview experiences. This can help travellers visualize their trip and increase enjoyment. In addition to using a combination of aerial photographic imagery, 360° panoramic street views and GIS data to provide up-to-date and comprehensive digital maps for route and travel planning.

4. RESULTS & DISCUSSION

This study aims to measure the effectiveness of using Maps from the aspect of interactive digital maps and interactive Maps for interpretive tools. The results discuss the findings, giving light on the project's primary outcomes. The study uses quantitative research methods to gain a complete understanding of the topic under investigation (Marshall & Rossman, 1989). This study utilised a questionnaire as a research tool, which was distributed to respondents via Google Forms. A total of 55 respondents participated. The results of the study are shown as follows:

Table 1: The results of the study

Question	Number Of Respondent	Mean	Std. Deviation
About the interactive digital map			
The map of the MSekin Wonderland is very interactive	55	4.6	0.74
The content of the interactive map is very clear	55	4.6	0.71
The pop-up feature in interactive map is very interesting.	55	4.6	0.74
The interactive map is easy to browse	55	4.6	0.71
The interactive digital map is convenient for tourists who need	55	4.6	0.79
The interactive map is convenient for tourists activity plans	55	4.5	0.74
Interactive Map for Interpretive Tool			
The interactive design is very attractive	55	4.6	0.84
The interactive map is very creative	55	4.6	0.79
The interactive map is very convincing	55	4.6	0.71
This interactive map is user-friendly	55	4.5	0.79

Based on the data analysis, it appears that respondents had a positive experience with the MSekin Wonderland interactive digital map. The average scores for all questions related to the interactive map were 4.5 or higher, meaning that respondents found the map to be interactive, clear, interesting, easy to navigate, and suitable for tourists' needs and activity plans. Respondents also found the interactive design attractive, creative, compelling and user-friendly. The standard deviations for all questions were relatively low, indicating that responses were consistent among respondents. These findings suggest that the use of interactive maps can be an effective tool for enhancing the tourist experience.

5. CONCLUSION

In summary, there is a great deal of potential to improve the entire tourism experience by creating an interactive digital map that incorporates Virtual Reality (VR) and Augmented Reality (AR) features for tourist attractions. We can give tourists an exciting and dynamic

approach to explore locations by skilfully combining various immersive technologies, encouraging a closer relationship with the historical and cultural elements of the area. Visitors can plan their route through MSekin Wonderland in advance by using the interactive features of the map, saving time and preventing tourists from getting lost or presenting themselves there (Junyu Lu Xiao Xiao & Zhou, 2022). By using virtual reality (VR), users can virtually go to other locales and get a sneak peek at what to expect at different tourist attractions. This can help travellers plan their trips more effectively and give them more information to work with when choosing their itinerary. Conversely, augmented reality (AR) elements give the physical world an extra layer of engagement by offering historical context, real-time data, and extra points.

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Chapter 14
Enhancing Language Learning in Rural Settings: The SPASS Game Innovation

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ABSTRACT
The Sentence Puzzle and Skill Structure, or SPASS Game is an innovative educational intervention addressing challenges in rural language learning in the Pensiangan district. Targeting sentence construction proficiency, it tackles resource scarcity, technological constraints, and motivation deficits. The nine-month development involved a dedicated teacher, frugal resource use, and a deck of 135 durable cards. Results show a 40.86% average increase in student performance, supported by visual evidence and a checklist highlighting positive impacts. Dissemination strategies include digital sharing, cross-language applicability, teacher training, and community workshops. Future enhancements focus on a redesigned card deck, patenting, and digitalisation.

Keywords: Teaching, English, classroom, game, rural school

1. INTRODUCTION

The SPASS Game responds to challenges faced by a rural school in Pensiangan, addressing resource scarcity, technological constraints, and motivation deficits in English learning. This section provides an overview, emphasising its focus on enhancing sentence construction proficiency among Year four and five students.

1.1 Background

A rural school in Pensiangan grapples with limited teaching resources, technological constraints, and a motivation deficit in English learning. The SPASS Game project unfolds as a commitment to navigate these challenges, providing an innovative solution tailored to the distinct needs of rural primary schools.

1.2 Issues addressed by the SPASS Game

Strategically designed, the SPASS Game addresses specific issues encountered by the students:

a) **Sentence Construction Proficiency:** Enhancing students' proficiency in constructing sentences, particularly focusing on fundamental language elements.
b) **Resource Dilemma in Teaching:** Overcoming the scarcity of teaching resources, ensuring knowledge quest is not hindered.

c) **Technological Limitations:** Complementing technology's limited reach by harnessing the power of play.
d) **Motivation Deficit:** Transforming English language learning into a joyous exploration, fostering enthusiasm and engagement.

1.3 Objectives of the SPASS Game

a) **Objective 1:** Fostering Student's Sentence Construction Skills in English Language Learning.
b) **Objective 2:** Enhancing Student Engagement and Enjoyment in Language Learning in Rural Schools.

2. LITERATURE REVIEW

The literature on rural education consistently underscores challenges faced by schools in remote settings, encompassing limited access to resources, technological constraints, and a motivational deficit in language learning. Geographical and socioeconomic factors often create a resource dilemma, hindering the delivery of quality education (Nurulpaik et al., 2022). Traditional approaches, though valuable, may fall short in addressing the unique needs of students in such environments, as reported by Solstad and Karlberg-Granlund (2020).

In response to these challenges, scholars and educators increasingly turn to innovative approaches, recognising the need for tailored solutions that leverage existing resources and engage students meaningfully. Game-based learning, particularly, has gained attention for its potential to transform education (Hussein et al., 2019). Incorporating play into the learning process has demonstrated the ability to enhance motivation, collaboration, and skill development (Behnamnia et al., 2020; Hartt et al., 2020).

While several game-based language learning solutions have been developed, adapting these to the unique challenges of rural education remains an ongoing endeavour. This literature gap is addressed by the SPASS Game, presenting a frugally designed solution tailored to the distinct needs of rural primary schools. Drawing from constructivist and experiential learning theories reported by Case (1993), the SPASS Game creates an environment where language learning is an active, participatory process, aligning with contemporary educational philosophies.

3. METHODOLOGY

3.1 Development of the SPASS Game

The systematic and iterative development of SPASS Game involved a needs assessment, conceptualisation, and design focusing on sentence construction proficiency. The game's materials were deliberately chosen for rural settings, and its implementation followed a structured framework represented by a Gantt chart in Table 1.

Table 1: Gantt Chart of the SPASS Game implementation

Project Phase	Months								
	1	2	3	4	5	6	7	8	9
Project Initiation	✓	✓							
Game Design and Development		✓	✓						
Pre-Implementation Testing		✓	✓						
Production and Printing			✓	✓					
Game Implementation				✓	✓	✓	✓	✓	
Data Analysis and Evaluation								✓	✓
Refinement and Future Planning								✓	✓

3.2 Quantitative Data Collection

Quantitative data assessed the impact of the SPASS Game on students' language proficiency through pre- and post-implementation assessments. Ethical considerations were paramount throughout the process, ensuring informed consent and data confidentiality.

4. RESULTS & DISCUSSION

4.1 Student Performance Result

Analysing pre- and post-implementation in classroom-based assessments (*PBD*) provides valuable insights into the SPASS Game's impact on students' language proficiency as can be seen in Table 2. *PBD* assessments covered various levels of understanding, application, and creativity in sentence construction. Notably, there's a significant 40.86% average increase in performance levels (*TP*), demonstrating the game's efficacy.

Table 2: Pre- and Post-Implementation Assessment Results

Students	Year/Class	April *PBD* result	August *PBD* result
A	4	TP 2	TP 3
B	4	TP 2	TP 2
C	5	TP 3	TP 4
D	5	TP 3	TP 4
E	5	TP 2	TP 4
F	5	TP 2	TP 4
G	5	TP 3	TP 4
H	6	TP 3	TP 4
I	6	TP 4	TP 4
J	6	TP 4	TP 5

4.2 Observational Checklist Results

The final observational checklist offers a comprehensive understanding of the SPASS Game's impact on student engagement and enjoyment during gameplay, as presented in Table 3. Covering aspects like participation frequency, enthusiasm level, and cooperative play, the checklist results indicate a positive influence on the learning environment. High frequencies in items such as participation, cooperative play, willingness to take risks, and overall engagement affirm the game's effectiveness in fostering a dynamic and positive classroom environment.

Table 3: Final Observational Checklist Results

No	Observation Item	Low (1)	Moderate (2)	High (3)
1	Frequency of participation	2	4	4
2	Enthusiasm level	3	4	3
3	Interaction with peers	2	5	3
4	Time-on-task	4	4	2
5	Verbal expression of enjoyment	2	5	3
6	Non-verbal expression of enjoyment	1	6	3
7	Cooperative play (e.g., helping others)	2	3	5
8	Creativity in forming sentences	4	4	2
9	Confidence in sentence construction	4	4	2
10	Use of vocabulary and grammar	2	5	3
11	Engagement with game rules	2	5	3
12	Attention to game instructions	2	5	2
13	Willingness to take risks in sentence creation	1	5	4
14	Adaptation to game challenges	2	5	2
15	Overall engagement and enjoyment	2	4	4

4.3 Discussion

The results collectively demonstrate the SPASS Game's efficacy in improving students' sentence construction skills. The significant increase in performance levels aligns with the collaborative and interactive nature of the game. Moreover, the observational checklist results provide additional layers of understanding, emphasising the game's role in enhancing various aspects of student engagement. Collaborative play, creativity in forming sentences, and willingness to take risks indicate that the SPASS Game not only addresses language proficiency but also contributes to a positive and participatory classroom environment. The versatility of the game is evident in its applicability to diverse learning environments.

5. CONCLUSION & RECOMMENDATION

5.1 Conclusion

In conclusion, the SPASS Game has proven to be a transformative and innovative educational tool, addressing challenges in rural language learning in the particular rural school. The analysis of pre- and post-implementation assessments in *PBD* reveals a substantial 40.86% average improvement in students' language writing proficiency, highlighting the positive impact on understanding and application. The observational checklist further affirms the game's success in fostering a dynamic and positive learning environment. The SPASS Game stands as a beacon of transformative possibilities, effectively enhancing students' language learning journey.

5.2 Recommendations

Building on the success of the SPASS Game, recommendations are proposed for its continued dissemination and improvement:

a. **Research and Longitudinal Studies:**
   - Assess the long-term impact of the SPASS Game on language proficiency.
   - Implement studies to track students' progress over extended periods.

b. **Digital Adaptation and Accessibility:**
   - Develop a user-friendly digital version of the SPASS Game.

- Ensure compatibility with various devices for broader accessibility.

c. Community Involvement and Awareness:

- Conduct workshops for parents and community members.
- Create promotional materials to convey the benefits of the game.

d. Collaborative Partnerships:

- Forge collaborations with educational organisations and government agencies.
- Seek feedback from educators and communities for continuous improvement.

e. Patenting and Commercialisation:

- Initiate the patenting process for the SPASS Game.
- Explore strategic partnerships to enhance visibility and accessibility.

f. Continuous Improvement:

- Implement an iterative design process for the SPASS Game.
- Encourage feedback loops for future enhancements.

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Chapter 15
Moveable Charger

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ABSTRACT

Moveable Charger is an innovation project that enables mobile phone charging during a power outage such as a natural disaster. Normally, electricity substations have to be closed for the safety of the public. As a result, the electricity supply is cut off while at the same time impacting the non-functionality of electrical and electronic equipment, especially mobile phones. A cell phone with a dead battery is like a nightmare because it makes it difficult for the victim to communicate and makes the victim emotional. Blocked communication access will make the communication process between victims, rescue teams and families difficult. With this, an innovative Moveable Charger was created using a car alternator and car battery as the main components. The car alternator functions as an electrical energy generator in the vehicle to turn on the car's electrical and electronic components. The car battery is a place to store the electricity produced by the car's alternator. The water wheel that is paired with the car's alternator serves to move the car's alternator shaft. As a result, the resulting value of Rotation per Minute (RPM) is 1300rpm with a reading of 12V Direct Current output (DC). The inverter acts as an electronic device that converts the resulting 12V DC electric current into 220V Alternating Current (AC) which can be used to turn on electronic equipment that requires high voltage such as mobile phones, fans, lights and so on. Four (4) Universal Serial Bus (USB) port slots are also installed to enable four (4) mobile phones to be charged at one time. This charging period takes an average of 1 hour 40 minutes for the phone's battery to be fully charged. Moveable Charger is expected to help when there is no electricity as an emergency electricity generator in providing communication support to disaster victims.

Keywords: Moveable Charger, Mobile Phone, Voltage, Generator

1. INTRODUCTION

Flood disasters are quite synonymous with Malaysia and are the worst threat among all types of disasters in Malaysia. Loss of property, difficulty in communicating, mental and physical fatigue, affected health and loss of life of family members have a traumatic effect on those who experience it.

In addition, due to the lack of electricity supply at the disaster site, it is also a factor in how difficult it is for victims to get help. The victim's dependence on mobile phones is very high, but unfortunately the mobile phones have run out of battery. Usually, when a natural disaster occurs, internet access will be affected, especially in some flood-affected locations, making rescue efforts and communication with flood victims difficult. This difficulty caused victims to be stuck for days waiting for help to arrive. Delays in the arrival of aid can contribute to an increase in the number of injuries and even deaths of victims affected by disasters. With

that, a Moveable Charger project was created that works to supply temporary electricity for the purpose of charging phones to victims of disasters such as floods. This generator is very practical because of its light shape and easy to carry.

1.1 Problem Statement

Being trapped during a disaster like a flood is a horrifying delirium for the victims involved. Generally, if there is a very severe flood, the electricity supply will be cut off for safety reasons. What options do victims have when involved in an unexpected emergency? Of course, the victim is very dependent on the functionality of the mobile phone to get help. The main disadvantage of cell phones is that the cell phone battery is limited and drains quickly. The situation became more difficult with the power bank running out of battery and the electricity supply also being cut off. Difficulty in communicating will cause the victim's emotional effects to fluctuate and become restless, causing other difficulties. This situation clearly shows the importance of every home having its own electricity generator which is used to charge mobile phones when there is no electricity. Based on this factor, an idea was born to design and develop a generator that works to charge phones during flash floods.

1.2 Objectives

Portable alternative generators are designed to charge mobile phones when there is no electricity. This innovation was developed as an electricity generator that allows mobile phones to be charged when there is no electricity source. This generator is also connected to a water mill that uses the water source as a turbine drive. A total of 4 types of mobile phones can be charged at one time. The duration to charge this depends on the capacity and type of phone battery used.

2. LITERATURE REVIEW

Moveable Charger is developed using existing equipment such as car alternators, dry cell batteries and waterwheels. These three main components work to generate electricity and are used to charge smartphones. For the safety of mobile phones and users, the Moveable Charger is also equipped with a circuit breaker that cuts off the current supply if the limit is exceeded. The use of Polyvinyl Chloride also functions as a host and acts as an insulator.

i. **Car alternator**
   An alternator is an electrical generator that converts mechanical energy into electrical energy in the form of alternating current. The alternator functions to generate electricity and supply voltage to turn on the electrical components in the car.

ii. **Dry cell batteries**
   A dry cell is a type of electrochemical cell with a low-viscosity moisture electrolyte. It is a common source of electricity used in electronic devices. The dry cell used in this project serves to store the electrical voltage generated as a result of the rotation of the alternator.

iii. **Waterwheel**
   The main basis of waterwheel construction is to use water power to move a water wheel or turbine. This mechanical process uses fans installed around the turbine.

The continuous cycle results in the conversion of mechanical energy into kinetic energy and electrical energy.

iv. Circuit Breakers

A circuit breaker is a safety device that acts as a protection for electrical lines. Circuit breakers are very important as a safety aspect of electrical equipment. The working concept of a circuit breaker is the same as a fuse. The circuit breaker will cut the flow of current supply to the circuit if the current is a limit and exceeds the set limit. When conditions are normal, this stream will work as usual. Electrical equipment can be saved from damage and fire.

v. Polyvinyl Chloride (PVC)

Polyvinyl Chloride (PVC) is one of the most widely used polymers in the world. Due to its versatile nature, PVC is widely used across a wide range of industrial, technical and everyday applications including extensive use in buildings, transport, packaging, electrical/electronic and healthcare applications. PVC in this project is used as a housing for the components of the project.

vi. Iron rod

Iron is used to make a stand and a place to hold the PVC and the water wheel. The choice of iron is because it is cheap, easy to cut and durable. The process of combining iron is also very easy to do and the iron is not easily perforated during the welding process.

3. METHODOLOGY

The design of this moveable charger is through several types of design. Improvements are made to produce a design that is suitable for disaster situations, easy to carry and easy to move, safety design during the charging process and also a waterwheel design. Figure 3.1 shows a waterwheel rotating through the force of flowing water. This rotation will generate electricity from the attached motor. A mechanical process takes place and energy conversion results through kinetic energy to mechanical energy and produces electrical energy of only 12 Volts.

In addition, this project sketch is also more effective because the battery will not run out due to the water wheel constantly rotating with the support of water from the aquarium pump that produces a fast current of water. The legs of this project are also more stable and balanced to support the weight of the components. The project can be installed and reopened as well as easy to move. Next, this project is drawn using Invertor 3.0 software as shown in Figure 1.

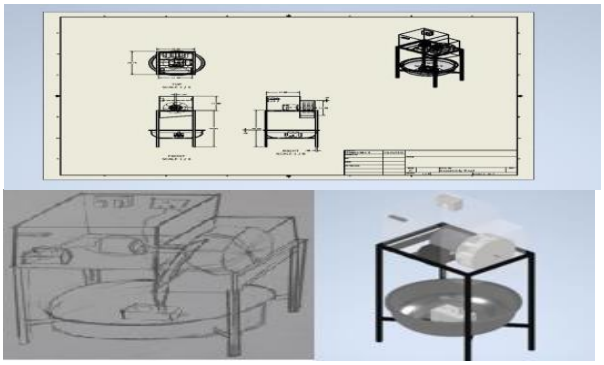

Figure 1: Project Design

Welding work is done in a welding workshop using a Metal Innert Gas Welding (MIG) machine. Next, work on joining Perspex to form the housing as a place for the alternator, battery and water wheel as shown in Figure 2. The final step is the process of wiring the circuit to produce electricity. Safety measures are taken into account to ensure the safety of users and electrical equipment from being damaged. The materials and cost of the project is only RM 342 because this project uses a lot of recycled materials.

Figure 2: Moveable Charger View

4. RESULTS

The total voltage produced is 12 V. The voltage will decrease according to the total number of smartphones charged at the same time. Generally, the more smartphones are charged at the same time, the lower the voltage will be delivered. Table 1 and Table 2 show the time taken to charge the phone according to the cell phone battery capacity.

Table 1 Analysis Table 1

Number of Cell Phones	Battery	Capacity Time Taken
Mobile phone A	4100 mah	1 Hour 40 minutes
Mobile phone B	4100 mah	2 Hours
Mobile phone C	4100 mah	2 Hours 20 minutes
Mobile phone D	4100 mah	2 Hours 40 minutes

Table 2 Analysis Table 2

Number of Cell Phones	Battery	Capacity Time Taken
Mobile phone A	3500 mah	1 Hour 10 minutes
Mobile phone B	3500 mah	1 Hour 40 minutes
Mobile phone C	3500 mah	2 Hours
Mobile phone D	3500 mah	2 Hours 10 minutes

Throughout this analysis, precautions were taken as this project involved the safety of users and the mobile phones used. The use of personal safety protection equipment such as gloves and safety glasses is used. Fire extinguishers are also available throughout the analysis process.

5. DISCUSSION AND CONCLUSION

Hydroelectric power is a form of renewable energy that uses the power of moving water to generate electricity. Water is an excellent conductor of electricity. The higher the water rotation power, the more watts are produced. Malaysia is synonymous with flash floods. The absence of electricity during a flood is very difficult for flood victims because they cannot use mobile phones to get help. With the result of this portable charger can help flood victims charge their phones. At least being able to charge 30% of the phone's battery is enough. A very simple power transfer by simply charging using a dry cell battery with a voltage of 12v will be able to supply electricity to 4 smartphones. The dry cell battery will be recharged by an alternator that produces electricity and is fed to the dry cell battery. The electricity produced is caused by the rotation of the water wheel against the alternator.

In conclusion, the innovative tool produced, which is a portable charger, helps the community in providing emergency electricity supply when there is no electricity supply. By using only natural resources such as running water, this machine can generate electricity that can be used to charge dry cell batteries and then dry cell batteries can be fed to 4 smartphones.

6. RECOMMENDATION

After running this project, we found that our project can benefit consumers because this machine can help the community in providing electricity supply in an emergency during a flood disaster. To overcome the weaknesses of this project, there are several suggestions that have been submitted:

i. Add wind energy to produce more kinetic energy to generate electricity.
ii. Install sensors to detect water level so that the tool does not sink.
iii. Install protection on the front of the project to prevent debris from colliding with the machine untilit breaks down.

7. APPRECIATION

The dedication of this appreciation is directed to Muhammad Zarul Ikhwan Bin Zakaria, Muhammad Zulhilmi Aiman Bin Afizul, Muhammad Syakir Zufayri Bin Hamzah and Mohamad Firdaus Bin Rosi @ Mohd Radzi and all those who helped directly and indirectly in completing this project.

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Chapter 16
Effectiveness of C Notes and Compiler Apps (Sololearn) on Mechanical Engineering Students in Mastering the Programming Course

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ABSTRACT

The C Notes & Compiler Apps (Sololearn) application is an innovation in helping the teaching and learning process (PdP). This PdP method uses QR codes and links to access notes, practicals and online compilers. Students' understanding can also be tested through quizzes. The development of this application uses Appsgeysers, Canva, Power Point and Google Sites software and interestingly all these software are free. The advantage of C Notes & Compiler Apps (Sololearn) is that this application is only downloaded once and remains stored in the smartphone. The advantage of this application is that it can be accessed anywhere while attracting students to study independently. The effectiveness of these apps was tested through a study through the distribution of a set of questionnaires in the form of a google form and was distributed to a total of 33 respondents who were students of the Sultan Mizan Zainal Abidin Polytechnic for the Mechatronics Engineering course Semester 2. The data was analyzed using Excel software. The mean score was measured based on a Likert Scale. The data processed through the respondents' answers show that the average mean score for the acceptance aspect high with result is 4.08.and the feedback aspect is also high with 4.22 score. This innovation proves the level of effectiveness of this application for students. It is very helpful for engineering students in semester 2 to master the programming course. The conclusion from the findings of this study is that C Notes & Compiler Apps (Sololearn) needs to be expanded to other courses because it can help students master difficult courses in addition to making students learn independently. Indirectly, the application of Outcome Based Education (OBE) practices can be applied and practiced at the same time.

Keywords: App, Effectiveness, Mastery, Learning Independently

1. INTRODUCTION

The digital mastery of lecturers is very important in attracting students' interest in addition to helping students improve their understanding of the course being taught. Digital technology is not only interesting but can even help students learn independently for courses that are difficult and require a high level of understanding. Among the courses that are difficult for students to master are calculation courses, programming and theoretical courses. Many studies prove that smartphones can be used as a tool to attract students to master difficult

and less popular courses. Average students, including children as young as 3 months old, have been exposed to this mobile screen culture. Therefore, educators need to make this gadget the main dissemination tool to help student's master difficult courses such as programming courses. Educators do not need to worry about creating applications because many courses now offer courses on building applications without coding. Videos on the YouTube site can also be used as the main reference for educators in building simple and easy applications. The series, C Notes & Compiler Apps (Sololearn) was developed using Power Point Software, Google and Apps Geysers and Canva. This application is in the form of a note and needs to be downloaded via the student's mobile phone. By simply scanning the displayed QR code, and following a few steps, the downloaded note will appear on the screen of each mobile phone. Students can access the notes anytime and anywhere without limitations.

1.1. Problem Statement

University is a place for individuals to learn, understand and master it until they become proficient in the field they are studying. In the context of learning, individuals have uniqueness and differences in skill levels. Some are quick to learn something, some need to go through the repetition process and some may not understand it at all (Azlin Norhaini Mansor, 2021). Therefore, lecturers need to take into account the difference in student mastery, especially in difficult courses such as programming languages. Programming language is a computer language that is difficult for students to master, especially engineering students. This is because students need to understand and learn specific algorithms and command codes in understanding programming languages. Programming language writing also needs to be emphasized.

The series, C Notes & Compiler Apps (Sololearn) was developed in an effort to attract engineering students to learn and master the programming language. The mobile learning assisted teaching method is very helpful for students to master difficult courses such as programming and calculation courses, (Azlin Norhaini Mansor, 2021). The phone has become the closest gadget to students. The hope is that this programming language can attract the interest of the young generation who have computational and technological thinking and produce digital works that are recognized by the world.

1.2 Research Objective

i. Identifying the level of effectiveness of C Notes & Compiler Apps (Sololearn) on engineering students.
ii. Identifying the acceptance level of C Notes & Compiler Apps (Sololearn) towards engineering students.

1.3 Research Scope

This study is only limited to students who take the Mechatronics Diploma specialization in semester 2 only. A total of 32 students of Mechatronics semester 2 for Session II 2022/2023 at Polytechnic Sultan Mizan Zainal Abidin were taken as the population and study sample.

2. LITERATURE REVIEW

Educators need to prepare themselves in all aspects when faced with a changing world in order to be able to adapt to any situation (Drucker, 2017). According to Fullan (2018), the

educator's role in making change can be generated and sustained in the following five (5) actions solving complex environmental problems, practicing effective communication, having flexibility, applying the latest technology and combining old and new concepts.

Mobile Learning or known as m-learning is a learning method that uses mobile devices in teaching and learning. According to a study by Ahmad Sobri (2019) which states that users feel happy and enjoy when using an application that has good usability features. The use of Apps in a course at least helps students to master the course. As a result, students will enjoy mastering the course, including difficult courses.

3. METHODOLOGY

Descriptive research is research that aims to explain an ongoing phenomenon (Mohd Majid Konting, 2000). Questionnaire is a research instrument in this study. The respondents of the study are students of semester 2, Mechatronics Engineering program, Sultan Mizan Zainal Abidin Polytechnic. 33 students were taken as the population and study sample considering that the total study population is small (Krejcie and Morgan, 1970). All respondents answered the research instrument honestly.

Figure 1 shows the display of the C Notes & Compiler application (Sololearn). Students simply download this application by scanning the QR code displayed. Notes, practice, quizzes and compilers are available in the application. The appropriate blend of colors and audio makes this application attractive and harmonious.

Figure 1: View of *C NOTES & COMPILER APPS (SOLOLEARN)*

4. RESULTS

Table 1 shows the Mean Score that has been set by the researcher. The researcher assumed that all respondents have a smartphone and all respondents have been exposed to the use of mobile applications since they were in high school and through this study it is clear that all respondents are very skilled with mobile technology.

Table 1 Effectiveness level mean score *C Notes & Compiler Apps (Sololearn)*

Mean Score	Interpretation
1.00-2.33	Low
2.34 – 3.66	Medium
3.67-5.00	High

Table 2 shows the distribution of mean scores obtained through the distribution of questionnaire sets. The instrument of this study was taken from the writing of previous studies and improved by the author according to the suitability of the researcher's respondents. A pilot study was conducted on 30 respondents with a reading of Cronbach's alpha value of 0.892. The results of acceptance show that all items are at the mean score level of 3.67-5.00 which is at a high level of interpretation. The highest interpretation was recorded on Item 5 which is 4.88. Almost all respondents agreed by saying that the use of C Notes & Compiler Apps (Sololearn) is very easy (user friendly) to use. This proves that learning using mobile devices can motivate them and provide a more effective and enjoyable learning experience.

Table 2 Acceptance *C Notes & Compiler Apps (Sololearn)*

No	Item	Mean	Interpretation
1	The use of C Notes & Compiler Apps (Sololearn) interested me in learning Programming.	4.00	High
2	Using C Notes & Compiler Apps (Sololearn) to understand programming is very easy.	3.88	High
3	The use of C Notes & Compiler Apps (Sololearn) helps students master programming	4.17	High
4	Quiz in C Notes & Compiler Apps (Sololearn) really helped improve my understanding	4.00	High
5	The use of C Notes & Compiler Apps (Sololearn) is very easy (user friendly) to use.	4.88	High
6	Using C Notes & Compiler Apps (Sololearn) is a user-friendly application.	3.74	High
7	Students are easy to download this C Notes & Compiler Apps (Sololearn).	3.89	High
	AVERAGE MIN SCORE	4.08	

Item 6 is the lowest interpretation score with a recorded value of only 3.74. Researchers need to reevaluate the arrangement and display of notes to make it easier for students to use them. Perhaps some respondents are less fond of the use of bright colors. There are also respondents who complain about the small font size making it difficult for respondents to read the font.

Table 3 shows the level of student feedback on C Notes & Compiler Apps (Sololearn). The data results show that all items show a very high score where the highest score is recorded on Item 2. Students are very excited and hope that this innovation can be continued in the future by developing more courses that are developed in the form of applications. The attractive interface of the application motivates students to master it. The lowest item is recorded in Item 5. The researcher thinks that maybe the students do not understand programming language terms and need more in-depth guidance and explanation through the lecturer. This is because there are terms and code of instructions and programming algorithms that are poorly understood by students. A clearer explanation should be explained by the lecturer during class.

Table 3 Feedback of *C Notes & Compiler Apps (Sololearn)*

No	Item	Mean	Interpretation
1	This C Notes & Compiler Apps (Sololearn) is very good.	3.76	High
2	C Notes & Compiler Apps (Sololearn) help me learn C programming in an organized way.	4.87	High
3	C Notes & Compiler Apps (Sololearn) saves my time writing notes.	3.68	High
4	C Notes & Compiler Apps (Sololearn) are easy to apply by all age groups.	4.29	High
5	C Notes & Compiler Apps (Sololearn) has content that is easy to understand.	3.65	High
6	C Notes & Compiler Apps (Sololearn) is simple and compact.	4.55	High
7	C Notes & Compiler Apps (Sololearn) can be shared by all students.	4.38	High
8	These C Programming apps need to be continued in the future.	4.61	High
	AVERAGE MIN SCORE	4.22	

5. DISCUSSION AND CONCLUSION

i. To what extent is the level of acceptance of students using C Notes & Compiler Apps (Sololearn) against engineering students?

At the end of the learning session, students can study individually by accessing notes and watching videos through their respective mobile phones. In addition, for students who are shy to ask questions in class, they can study on their own in the dormitory by referring to notes and videos in apps the said. This is because the level of students' understanding ability is different - the difference when in class (Azlin Norhaini Mansor, 2021). The use of applications in a course at least helps students to master the course followed including for difficult courses.

ii. To what extent is the level of feedback from students using C Programming Apps towards engineering students?

Referring to Table 3, the majority of students gave positive feedback and stated that this innovation helped and facilitated them in improving their mastery of the course. This application does not burden the student in terms of cost and student internet data because the student only downloads it once into the student's mobile phone and this application will remain as long as the student does.

6. RECOMMENDATION

Among the suggested improvements to further improve the functionality of these apps are:

i. Using programming language terms to make it easier for students to understand.
i. Added a user-friendly button function.
iii. Added help button function for each display.

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Chapter 17
Easy Pissy Writing

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ABSTRACT

Language teaching especially English is pivotal for a multiracial country like Malaysia as the country is embarking towards the 4th Industrial Revolution. Remarkably, the toughest skills to be taught is any language is the writing skill. Indisputably, writing is the most essential and intricate skills dreaded by most students and even educators. However, this skill is often overlooked and lacks due attention. Thus, this EASY PISSY WRITING method allows students to be articulate. On the other hand, educators will be able to render guidance towards students continuously and progressively as students write. This innovation also enables students to learn in a more interactive but in a less intimidating manner. Students will be coached throughout the process until the end product emerges. Educators can employ simultaneous evaluation and continuous assessment. It also caters room for discussion and enhancement whereby the students and educators benefit greatly through this method. Assisting a large group of students is the uniqueness of this innovation. All age groups of students can ease the writing process as well. Educators can monitor the progress and motivate the students to complete the task within the stipulated time frame. Besides, the most important element, notably the human touch is present in this innovation. Research had been carried out using EASY PISSY WRITING innovation of teaching and learning writing skills to Year 4 Bachelors of Education (TESL) teacher trainees in an Institute of Teacher Education in the northern region of Malaysia. The participants comprise of 23 females and 4 males respectively. The data was collected through qualitative approach. Series of interviews and observations were done throughout the semester which lasted for 4 months consecutively. The findings revealed that this method was effective as the lecturers were able to monitor the participants progress and also mentor them effectively. However, there is still room for exploration. Further navigation is increasingly crucial for commercialisation potential. Awards and recognition towards this innovation are on the verge of attainment as more elements need to be heightened for better output in the long run for the advantage of students throughout the learning process.

Keywords: writing, evaluation, assessment, collaborative.

1. INTRODUCTION

English is an international language, regarded as lingua franca. This language is given due status for the purpose of communication, education, business and technology. As of in the Malaysian education system, English is emphasised as it is the second most important language after Bahasa Melayu which is the national language. The four main skills which are reading, writing, listening and speaking are accentuated in the teaching and learning process. However, writing skill is the most dreaded component in learning English.

According to Maslihatul (2022), the challenges in teaching writing skills need to be addressed accordingly, as this skill is inevitably pertinent for students to develop and master the art of writing. Formal instructional situations must be created in order to develop writing skills, opined Alemu (2020). Rashid (2022) further added that multiplex activities should be designed to encourage students to participate in writing activities, as this method aids students to be creative and produce good writing as early as primary schools.

Mastering the art of writing indirectly unlocks more openings for students at the tertiary level after their completion of studies. The world of business is looking forward to graduates who are competent in both writing and conversing in English fluently. Hence, it is vital for tertiary- level students to master their writing skills eloquently. Equipping oneself with good language skills helps to foster placement in the job market within a short time span (Maslihatul, 2022).

Undoubtedly, students face various challenges when writing tasks are handed to them. The challenges that students have been facing were identified, which includes difficulty in getting started on writing assignments, easily being distracted during the writing assignment, mental fatigue and tiredness while engaged in writing assignments, inconsistency in legibility, uneven writing tempo, poor planning, and careless errors (Rashid, 2022). Hence, in order to accommodate the students encounters, the EASY PISSY WRITING method has been developed. This innovation gives students the comfort to express their thoughts, ideas and experiences through writing with fewer challenges as the teacher or lecturer is supervising, mentoring, prompting, and coaching them simultaneously and collaboratively, taking into account the learners need and prior knowledge.

2. LITERATURE REVIEW

Writing is a method to deliver ideas, thoughts, perceptions, experiences, and feelings. It is done consciously, with lots of effort put in. Thus, writing needs to be inspired and taught systematically, as it is a pivotal skill that will benefit the student for the rest of his or her life. Presenting and practicing various interesting writing activities will help boost students' confidence and instil love for writing. Personal story writing and journal writing help students discover themselves and work on themselves (Rashid, 2022).

However, many students face difficulties with their writing skills. The difficulties faced by students differ from one another and may prevent them from progressing to produce a good piece of writing. Tertiary students may have issues related to their readiness to learn to write. The issues pertaining to readiness in writing can be divided into physical readiness and mental preparedness (Maslihatul, 2022). It is very important for them to be ready before the process of writing, as this will motivate students to pay attention to what and how to write.

The second most dreaded difficulty students face in writing is a lack of exposure to reading materials (Alemu, 2020). Students find it very tough to obtain and retrieve significant sources of information pertaining to their subject matter (Bulgiyah et.al 2021). Undeniably, lack of extensive reading will surely hinder the process of writing, as the student will surely be deficient in ideas and vocabulary.

Last but not least, the lack of motivation is another challenge that students face (Suprapto et.al (2022). Motivation is the key to success. Thus, students who are demotivated may not be interested in the learning process, which will eventually discourage them to complete any given tasks. Positive and constructive feedback from teachers will surely motivate the students to excel in their studies. Personal touch, coaching, mentoring, support, collaboration and guidance from teachers will do wonders for students who are lacking in motivation.

These main challenges faced by students in learning writing skills must be addressed adequately. This is to ensure students are able to stay focused and learn the required skill diligently, as writing skills will definitely benefit students and help them achieve greater heights in their lives.

3. METHODOLOGY

This study was carried out using a qualitative approach. Qualitative research is employed in most educational research in order to investigate the problem in depth with the aim of creating a solution for the arising issues (Maslihatul, 2022). Thus, the researchers interviewed 27 students who were in the Year 4 Bachelor of Education (TESL) program attached to the Institute of Teacher Education Campus Tuanku Bainun. They were 23 females and 4 male students. The advantage of adopting a qualitative study is its potential of exploring the complexities of the issue. The data was collected in a natural setting whereby information is gathered by directly interacting with the participants and seeing them behave and respond within their environment. Additionally, data were also collected through observations and documents. The data were transcribed, coded, analysed, and presented.

4. RESULTS & DISCUSSION

The study aims to identify the challenges the participants faced in the process of writing their assignments and explore the effectiveness of the Easy Pissy Writing innovation. The following are the findings obtained through the interview regarding the challenges faced in writing.

70% of the participants admitted that they had difficulties choosing a topic and organizing the essays. The issue arises because they are not familiar with the area of study and are unable to obtain adequate information about the chosen topic. Loss of ideas, organizing ideas, reviewing the content, and reviewing the structure are some of the challenges the participants encountered during the writing process.

> *"I am not well versed with the topic…very limited knowledge, so I don't know what to write."* (P 3, male)
> *"Tried a few days looking for information…I googled, lots of information…but don't know what to choose and how to begin"* (P 10, female)
> *"I know what the topic or title of my write up. But when I start I am stuck. Then, feel like giving up on writing."* (P 12, female)
> *"When I am writing suddenly not sure how to continue. My ideas get mixed up."* (P 15, female)
> *"Sometimes I am not sure which point is important and how to describe my points. To develop idea is stressful."* (P 18, male)
> *"Got information but not sure how to organize into writing properly. Try to get help from friends…friends also not sure how to go about it. Half way stop writing. To continue and complete the writing task is a great problem."* (P 22, female)

The above extracts clearly portray that the participants had challenges in pre-writing activities, which is in line with Suprapto et.al (2022) and Bulqiyah et.al (2021). In order to aid students in generating ideas, activities like brainstorming, clustering, free writing, and questioning help students develop ideas to write (Alemu, 2020). The use of the Easy Pissy Writing method has given the participants an avenue to learn the process of writing and garner confidence in completing the written task. The following are some of the excerpts obtained from the interview after this approach was employed.

"*I enjoyed the writing process using this method…I was not struggling alone."* (P 1, male)
"*My lecturer helped me throughout the process of writing. When I was confused, she helped to prompt me and I was able to continue my writing."* (P 17, female)
"*I like this method…as I am assured that I am on the right track."* (P 19, female)
"*The lecturer guided me constantly. I felt motivated to complete the task."* (P 18, male)
"*I was able to discuss with my fellow course mates on the task. I did not feel all alone doing it."* (P 4, female).
"*I kind of sailed through the process of writing. Did not have so much trouble to complete the assignment. Glad it aced. I love this."* (P 6, female)
"*My friend and I did the writing together. I could collaborate and get help while doing the write up. Chill."* (P 8, female)
"*The method allowed me to learn to write properly. Discussing with my friends. Lecturer was there to guide and give constructive feedback immediately."* (P11, female)

The above quotes are substantially clear evidence that providing students with supervision and coaching are elements that are looked forward to by students. Intensive guidance from a teacher is considered the greatest priority yearned by students during the process of writing, as collaborative writing enhances the ability to express themselves creatively. A teacher plays a vital role in monitoring students' progress in each and every step and eventually motivates the students indirectly to complete the written task effectively (Maslihatul, 2022).

5. CONCLUSION & RECOMMENDATION

This study reveals that challenges faced by students in the process of writing must be addressed from the very beginning. Most students claimed that they have difficulties in choosing a topic and organizing the ideas because they lack the motivation to read extensively. These difficulties tend to revolve around the mechanics of writing, coherence, and essay organization which will fall into place when done repeatedly and progressively with proper guidance and coaching. Constructive feedback indirectly tends to stimulate the students writing abilities. Hence, the Easy Pissy Writing Approach is able to ease the writing process as the lecturer is together with the students when the writing process is in progress. The collaborative writing process eases the students minds as they are able to obtain constructive feedback from peers and lecturer simultaneously.

To conclude, the findings in this study stand as a platform for improving the writing process among students at all levels, either in groups or individually. It is important to note that writing skills can be developed when the process is done constantly. Producing a good piece of writing requires continuous and unceasing practice as well as rigorous guidance from educators. Writing skills can be mastered by any individual as long as the challenges and difficulties faced are identified and addressed from the very beginning. Thus, enjoy the process of writing through learning, relearning, and unlearning the skill.

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Chapter 18
Wheel of Forecast

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ABSTRACT
Forecasting and Aggregate Planning is one of the topics in the Operations Management DPB50133 syllabus at polytechnics. The topic of forecasting is a topic that requires the use of many formulas and has its own laws or rules. Various teaching and learning methods as well as reference materials are used to ensure that the Course Learning Outcome (CLO) is achieved. Quality reference approaches and materials can enhance the level of understanding and assist in the achievement of the impressive Course Learning Outcome (CLO) that empowers the students. Knowing the need for and importance of reference materials to ensure the quality of the graduates produced, this paper discusses the innovation of a teaching aid (Wheel of Forecast) in ensuring the memorization of quantitative forecasting formulas can be used and memorized easily.

Keywords: teaching aids: quantitative forecasting: operations management

1. INTRODUCTION

Innovation Wheel of Forecast is a Teaching Aid Tool (ABM) for students in using the concept and memorization of formula in the regulation of quantitative forecasting topics. For topic 4 Forecasting and Aggregate Planning in this DPB50133 Operations Management course, there is a calculation formula to keep in mind to make it easier for students to answer the entire topic of 4 quantitative forecasting. This means that students need to know the basics and memorize formulas in advance. This Wheel of Forecast card can be used as a formula which can be used in many places in an easy-to-carry and use manner without the student bringing the Operations Management reference book. The Wheel of Forecast card uses lightweight materials and attractive graphics to enable students to easily and enjoy using it. The Wheel of Forecast card is adopted by students who take the DPB50133 Operations Management course in topic 4 to memorize and use formulas in completing calculations for demand forecasting.

2. LITERATURE REVIEW

The purpose of this Wheel of Forecast card is to help students learn the subject of calculations in a more efficient and enjoyable way. It is one of the ABM examples given in Chapter 4 of the DPB50133 Operations Management course, which makes predictions using simple formulas. The Teaching and Learning (T&L), which method can be implemented more effectively and methodically with the help of this Wheel of Forecast card.

The delivery of teaching by lecturers can be enhanced in its effectiveness through the utilization of Teaching Aids (ABM) such as print methods, graphics, models, and e-Learning (Mohmed, 2021). The effective use of ABM is evident when students can depict real-life situations such as properties, structures, and movements. Students also gain new experiences using these ABM materials. The impact and effects of using ABM cannot be denied; however, the appropriateness of ABM needs to be emphasized to ensure that the impact on students is elevated to the optimal level (Mohmed, 2021).

Therefore, an initiative needs to be undertaken to provide a better understanding to the students involved in this course in general, and specifically, on topic 4, which is Forecasting and Aggregate Planning. As part of these efforts, researchers have created a Teaching Aid (ABM) known as the "Wheel of Forecast," which utilizes the concept of tactile materials, namely wheel cards. By utilizing this ABM material, it is hoped that students can better grasp the concepts of forecasting calculations in this topic.

3. METHODOLOGY

The first process includes the preparation of equipment to form the cards that the researcher wants to produce. Among the equipment are art card paper 260 gsm in thickness and Eyelet. The use of lightweight art card makes the wheel lighter, stronger and non-perishable and the use of Eyelet to turn the front art card (top).

With interesting graphics and colour images. The wheel is used so that the student can rotate the formula with the match of the given question; the round movement of the wheel makes it easier for the student to find the formula or formula to be used. Refer to the Appendix for the entire Wheel of Forecast movement simulation.

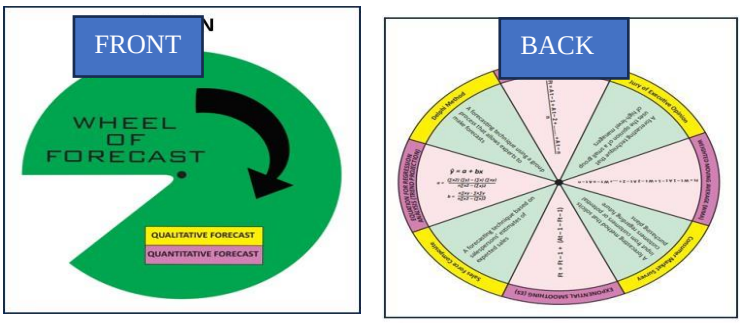

Figure 1 Front and back of the card

4. RESULTS & DISCUSSION

Students were attracted to this project because it demonstrated how formulas are used in the DPB50133 Operations Management course specifically as well as the business world.

Real-world examples of the teaching and learning process can be used to help students understand and apply the concept of approximation in management. Students more easily memorize the basic formulas necessary in the process of calculating formulas. Can identify questions and use formulas quickly and easily and easily store Wheel of Forecast cards. It's a mobile card that you can carry with you wherever you go.

A Study on the Effectiveness of the Use of Teaching Aid (ABM) Wheel of Forecast in the Learning of Operations Management Course at Politeknik Kota Bharu needs to be conducted to assess its effectiveness in the educational process of delivering information.

Lecturers should be more proficient in utilizing the provided teaching materials to enhance students' understanding and interest in learning within the classroom.

5. CONCLUSION & RECOMMENDATION

It is undeniable that with the presence of the Teaching Aid (ABM) Wheel of Forecast, it is hoped to serve as one of the effective teaching aids for lecturers in facilitating the teaching process. The researchers hope that the use of this tool can improve the academic performance of polytechnic students and indirectly attract their interest in the calculation topic of the course more effectively.

Wheel of Forecast aims to address the challenge of memorizing formulas and enhance students' proficiency, thereby fostering skill improvement. Increase students' interest in the realm of calculations, specifically in the context of the operations management course. Simplifies the revision of forecasting topics, offering students convenient and flexible access from any location and at any time.

As a recommendation by using thick and lightweight materials during the production process will improve the Wheel of Forecast card's material type and enable longer storage and use. This Wheel of Forecast card needs a function added to it, like a sample question. Involve many students to spark their curiosity about producing innovation by innovative technology along with TVET education.

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Chapter 19
Fact Finding Booklet V.II: I Am Malaysian

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ABSTRACT
Malaysia's Constitution protects basic human rights. These include liberty of person, freedom of religion, limitation of government's power and others. These rights are incorporated in the Federal Constitution are intended to protect and promote the well-being of all people in the country. Due to their importance, understanding these rights in the Constitution is critical because without it, the people will not recognise the rationality of its existence. Unfortunately, the student's understanding of the Constitution remains restricted. The reason is that teaching and studying about the Constitution is frequently boring. Compelling explanations of complex legal concepts may result in some engaged, nodding heads from students. Therefore, the primary objective of this product is to convert Malaysia's Constitution into a gaming booklet that provides engaging methods to learn about the Constitution. Inspired on the popular children's game Humpty Dumpty, the game is divided into 3 level, which challenge the ability and understanding of players pertaining to rights as citizens as provided by the supreme law of the land. This product intends to elevate the consciousness of not only students, but all Malaysian citizens, and to improve their understanding of general knowledge through innovation. In terms of marketing potential, the product can be used not only in academic settings but also to benefit the community.

Keywords: Constitution, basic human rights, understanding law, gaming booklet

1. INTRODUCTION

Several Constitutional issues have swept over Malaysians in the previous years. Since the Covid-19 pandemic, along with political turmoil, has put Malaysia's Constitutional democracy in jeopardy. Issues such as judicial independence, freedom of speech and assembly, citizenship and discrimination, power balance between federal and state government and the prime minister's emergency power during a national crisis have emerged as prominent and contentious issues debated by various groups in the nation setting. Without a question, the Malaysian Constitution, as the supreme law of the land. Hence the basic structure of our federal Constitution must be viewed from our local circumstances where this contextualized approach ensures that the Constitution remains relevant and responsive to the unique

challenges and opportunities facing Malaysia (Husain, 2021). The federal Constitution is the primary resource for legal experts on the issues discussed above. As a result, the “Fact Finding Booklet V.II: I Am Malaysian” is as a tool for legal education. As Federal Constitution of Malaysia is the supreme law of the land. It establishes the presumption that no legitimate power may be used to deny citizens of their fundamental rights unless done so in accordance with the Constitution. The law enshrines the fundamental rights which need to be uphold by the Malaysians. Due to their importance, understanding these Constitutional rights is crucial. In regard to the community college students the Pengajian Malaysia subject is a compulsory subject for them. They will learn about the federal Constitution as a part of the Pengajian Malaysia’s subject during the first semester of their study. The main goal of this project is to transform Malaysia's Constitution into a game booklet that offers engaging methods to learn about it.

2. LITERATURE REVIEW

Many scholars have discussed the role of Federal Constitution of Malaysia in maintaining harmony between multi-racial societies and its supremacy, such as Mohd el al., (2024), Faruqi el al., (2023), Mohamad et al., (2021), Ibrahim et al., (2020) and Hasan et al., (2015). The initial interaction among the multiracial societies representing each race has been the fundamental commencement of Malaysia’s Federal Constitution. Federal Constitution is the highest form of law for a sovereign nation like Malaysia. The existence of a Constitution is a guide to organize and coordinate the administration of a country. Genuinely, the Constitution also acts as a guide for the formation of laws, whether by the administration or for the individuals. According to Muslim, (2017), there is no institution that can surpass the supremacy of the Federal Constitution in Malaysia. The main goal of this project is to transform Malaysia’s Constitution into a game booklet with interesting ways to learn about them. We introduce classic game of Humpty Dumpty as a part of the learning process in every level. This expectantly will make the learning process of the Constitution more stimulating and attractive. Booklet and Humpty Dumpty game aim to raise awareness of Malaysia's Constitution. Sulaiman et al., (2018), Harahap et el., (2020), Panjaitan et al., (2021) concluded that booklet has very valid criteria and suitable and effective for use as a learning supplement.

3. METHODOLOGY

This study used a qualitative design with a content analysis approach. Six students from Kolej Komuniti Bukit Mertajam were selected using a purposive sampling method involving students which has taken Pengajian Malaysia’s subject previously. A semi-structured one-on-one interview method was used for data collections from Mac 2023 to May 2023 by the second author. The interviews were done using Malay language and started with open-ended questions. The participants were asked to explain their experiences learning Pengajian Malaysia’s subject before. Probing questions such as ‘explain more about your experience’ were used based on the participant’s answer for more clarification and examples. The interview session has taken place in a private setting. The session started with more general questions and gradually to more specific towards the aims of the research. Questions such as follows were raised; Do you still remember some topics learned in the subject of *Pengajian Malaysia.* What is your opinion on the traditional ways of learning *Pengajian Malaysia.* Please explained some of your experience learning *Pengajian Malaysia*. Each interview lasted 30 to 50 minutes. All of the interviews were audio recorded and transcribed verbatim. Collected data was analysed manually using an inductive method in which the researcher carries out precise and continuous examinations of the data to extract categories and themes from the

raw data. Furthermore, specified meaning units were coded based on participant's descriptions. Reduction and compression processes were later used to classify and extract similarly. Finally, categories and subcategories were formed. The codes extracted from each transcribed text were then analysed using a constant comparison technique before the codes were classified and integrated. Codes extracted from the data were "boring", "confusing sentences and complex", "hard to remember" and "more interesting". We used the Guba and Lincoln and Creswell criteria for measuring the accuracy and reliability of the study.

4. RESULT & DISCUSSION

All participants were guided to describe their experience learning the Pengajian Malaysia's subject. All the six respondents mentioned about the learning process was "boring" one of the respondents described:

> *"I often tried my best not to doze off during the lecture. I believe most of friends felt the same ways too, but we did try our best to listen as we will need to answer quiz or use what have learned to do the assignment. As the time goes by, it was harder to concentrate on the lesson. Sometimes we will be given a few minutes to rest to freshen up, but it does not help so much."*

The second code is "confusing sentences". Four of the respondents felt like the lecture notes and they gave lesson using a confusing sentence. The example description for this code is:

> *"Sentences used both in the lecture notes and explanations from the lecturer were confusing. I believe this is due to the usage of law language, which is often intertwined and complex. Some of my friend will often request the lecturer to repeat the explanations for our better understanding*."

The following code is "hard to remember" one respondent narrates that:

> *"I find it really hard to remember important points even after I revisit the lecture notes. Sometimes I will use more creative ways to remember such as turning the important point to songs."*
>
> The final code is "more interesting" as five out of six respondents mention that it will help if the methods of learning Pengajian Malaysia are more interesting. The example description for this code is:
>
> *"I wish there are other ways to learn the subjects. Perhaps usage of easier and more examples and pictures will help to make learning Pengajian Malaysia more interesting."*

4.1 Product Description

The product is intended to act as a forum for raising awareness of and a deeper comprehension of the fundamental rights as Malaysian citizens. This product, which draws inspiration from the well-known kid's game Humpty Dumpty, intends to use innovation to increase Malaysians' awareness of and understanding of their Constitutional rights. The first step in the game is to complete the booklet's questions with the correct answers based on your level. The player's goal in the Humpty Dumpty game is to remove a brick without letting it fall if their response is incorrect. Additional bricks will need to be removed if there are additional incorrect responses or if the questions in the booklet are not answered. Whoever causes the Humpty Dumpty to come unfastened will forfeit the game.

We divide this invention into three stages, namely:

1. Novice
2. Intermediary
3. Advance

For the **novice level**, this booklet presented Malaysia's framework and the Federal Constitution of Malaysia, which guarantees citizens' fundamental liberties. The Malaysian constitution is the supreme law of the land that establishes the structure of the government, defines the powers of different branches, and outlines the rights of citizens. Therefore, the participant must possess a basic understanding of Malaysia as a country, government's agencies and structure of government to proceed beyond the novice level.

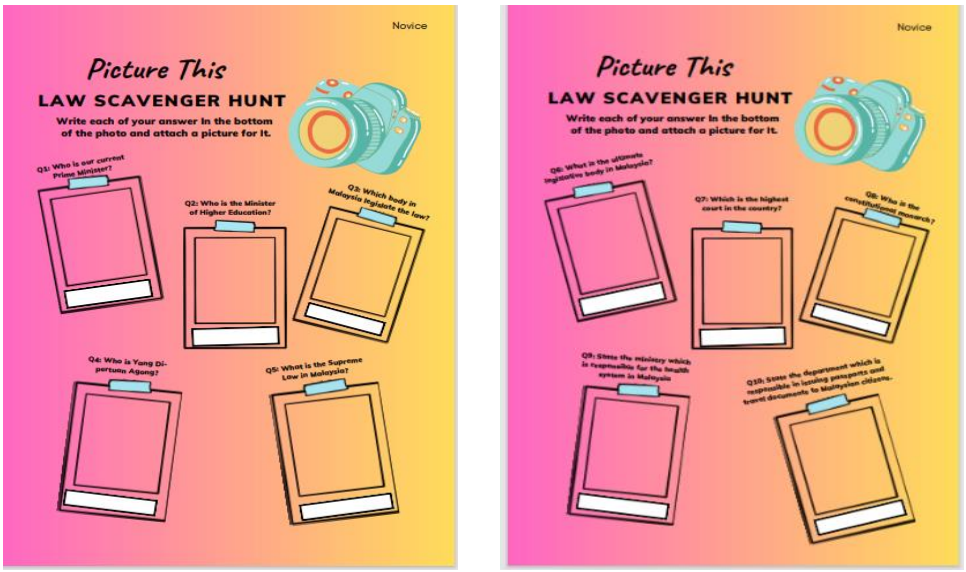

Figure 1: Novice Level

For the **intermediary level**, the participant is introduced with the federation of Malaysia with the federal Constitution as the supreme law of the land. at this level, the player is examined on their level of knowledge about Malaysia as a nation, the establishment and function of the government, and a variety of other areas.

Figure 2: Intermediate Level

An **advanced level** includes rights related to interactions with police officers and the right to legal representation in the case of an arrest and trial. Police reports are considered sacrosanct in Malaysia and are usually the best course of action. These rights are therefore described using infographics based on hypothetical situations, since infographics are visual representations of information, facts, or knowledge that attempt to convey information quickly and clearly (Naparin et al., 2017).

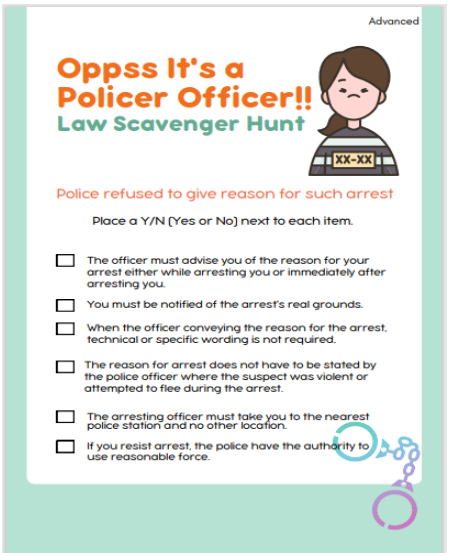

Figure 3: Advance Level: Right when dealing with a police officer

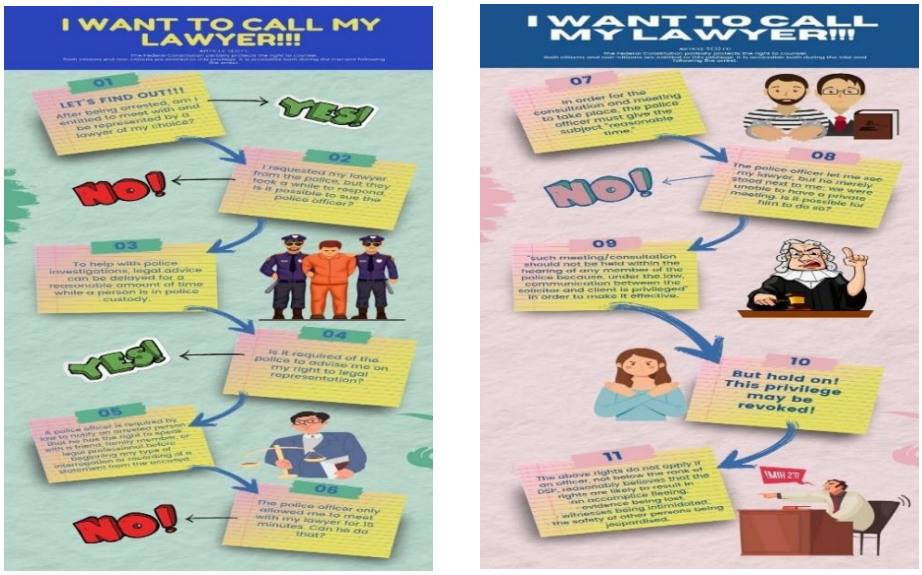

Figure 4: Advance Level: Right to legal representation

The right to legal representation for Malaysian citizens during their detention and trial is likewise protected under the Constitution. The legal journey of "I want to call my lawyer" begins with the right to contact a lawyer following an arrest, the right to an unhindered consultation with the lawyer, and the right to be informed of legal counsel by the police. In terms of commercialization, the aim is to promote and increase the product's visibility through a cooperation programme with local governments and public institutions. The product can be used not only in academic settings, but also to assist the larger community.

5. NOVELTY & UNIQUENESS

This product's distinguishing characteristic is how easily users can understand their rights and the laws that protect them by simplifying the Federal Constitution through board games inspired by classic Humpty-Dumpty games. Infographics can enhance knowledge retention by adding visual components. Thus, in a more interesting and appealing manner, this product serves as an educational tool to help Malaysians better grasp their legal rights as citizens of Malaysia.

6. BENEFIT TO USERS & SOCIETY

Legal information is frequently intricate and challenging to understand. These intricacies can be simplified into more approachable, understandable graphics with the use of an infographic, which can be especially helpful for people who are not familiar with legal language. The product "Fact Finding Legal Booklet V.II: I Am Malaysian" gives users the chance to learn about proper communication techniques with authorities in addition to improving their insight and understanding of their Constitutional rights. The smooth operation of society may be aided if users and the public are provided with succinct and understandable explanations of complicated legal topics. This product's main objective is to turn the Malaysian Constitution into a gaming booklet that provides engaging methods to learn about various Constitutional topics. By ensuring that everyone is informed of their legal rights and assisting them in

avoiding dispute over finding a workable solution, it also has the benefit of maintaining social order.

7. CONCLUSION

Infographics are more engaging compared to text-heavy documents. Spreading them via social media and other channels can easily expands the information's audience. This is especially beneficial for engaging younger audiences or individuals who are unlikely to seek legal information on their own. The " Fact Finding Legal Booklet V.II: I Am Malaysian "can serve as a learning tool to enhance understanding of the government's obligations as well as the rights and fundamental liberties of Malaysian citizens. Improved comprehension of the Federal Constitution can foster more amicable relationships between Malaysia's diverse multiracial civilizations. Undoubtedly, people's social transformation has been accelerated by their comprehension of Constitutional law, which also provides a foundation for acceptable activity in society. The product has the potential to be used in both academic settings and for the benefit of the community, presenting a significant commercial opportunity. Such an infographic can offer residents of Malaysia or citizens of that country a convenient reference guide to the most important legal information they require.

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Chapter 20

Innovation in The Use of Yagi Antennas with The Speed Test Application by Ookla and Huawei Manager to Improve Students' Understanding in The Topic of Telemetry and Data Acquisition for The DJM30062 Industrial Electronics Course

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ABSTRACT

The innovation of using the Yagi Antenna is an antenna system built with the Speed Test by Ookla application and Huawei Manager for the use of students enrolled in the DJM30062 Industrial Electronics course. The hardware set involved in this innovation is the Huawei Modem Router B310As-852, Coaxial Cable LMR240, Yagi Antenna and SIM card. This innovation is implemented to help students understand how antennas work for telemetry systems. Questionnaires (Pre-Test) are distributed to students before the innovation is carried out. A total of 32 students were involved. The results show that 30 out of 32 students scored 5/10 and below. The findings of the Pre-Test show that students do not understand the topic of Telemetry and Data Acquisition. 21st century learning and teaching skills refer to several core skills, namely collaborative, digital literacy, critical and creative thinking skills in a hands-on and minds-on manner and problem solving. In order to meet the needs of learning and teaching skills of the 21st century, the initiative to introduce the innovation of the use of antenna systems for Telemetry functions has been implemented. This innovation was developed to improve students' understanding of the Telemetry topic. This innovation applies Practical/Practical Based Learning. The implementation of this innovation is a collaborative concept between students and lecturers. Collaborative features are skills that need to be applied in 21st century learning. Questionnaires (Post Test) are distributed to students after the innovation is carried out. The results show that all students got high marks which are 9/10 and 10 only. The results of the Post-Test show that students understand the topic of Telemetry after the innovation is carried out. As a result, the innovation of using the Yagi Antenna has been proven to be effective when it has been successful in helping students improve their understanding of the topic of Telemetry and Data Acquisition.

Keywords: Yagi Antenna, telemetry systems, teaching skills

1. INTRODUCTION

The DJM30062 Industrial Electronics course includes theoretical and practical parts. From the observations and interviews made in the class, it was found that students did not understand the topic of Telemetry and Data Acquisition. One of the main topics of conversation is that mechatronics major students consider telemetry and telecommunications to be irrelevant in the field of Mechatronics Engineering. A survey was made to see students' understanding of the topic of Telemetry and Data Acquisition. From the findings of the questionnaire, it was found that students do not understand the topic of Telemetry and Data Acquisition.

The innovation of using a Yagi antenna was developed to improve students' understanding of the topic of Telemetry and Data Acquisition. Innovation in the use of Yagi antennas is an antenna system built with the Speed Test application by Ookla and Huawei Manager for the use of students enrolled in the DJM30062 Industrial Electronics course. The set of hardware involved in this innovation is Huawei Modem Router: Huawei B310As-852, Coaxial Cable: LMR240, Yagi Antenna and SIM card. This innovation is implemented to help students understand how antennas work for telemetry systems.

2. LITERATURE REVIEW

The learning and teaching skills (PdP) of the 21st century refer to several core skills, namely collaborative, digital literacy, critical and creative thinking skills in a hands-on and mind-on manner as well as problem solving. 21st century learning as a form of learning that requires students to master content and produce, analyze and synthesize (unification/combination) and evaluate information from a wide variety of sources by understanding and respecting different cultures (Berry, 2011). Students are expected to be able to communicate, collaborate, create and be digitally literate in addition to having the characteristics of humanity and social responsibility. Students need to be prepared with the skills to deal with the challenges of the educational world that is exposed to various interpretations that challenge thinking.

In order to meet the needs of learning and teaching skills (PdP) of the 21st century, an initiative to introduce the use of an antenna system for the Telemetry function has been implemented. The innovation of using a Yagi antenna was developed to improve students' understanding of the topic of Telemetry and Data Acquisition. This innovation in the use of Yagi antennas applies Practical Learning (Learning by Doing-LBD). According to Zol Azlan (2000), the practical approach can be defined as one, a pair or a small group of students being provided with materials and resources to carry out learning. The most practical and effective method to use and can help students directly in the teaching and learning process. The lecturer will make an explanation about a lesson using materials and resources while students will do practical referring to materials and resources.

3. METHODOLOGY

The implementation of this innovation is a collaborative concept between students and lecturers. The collaborative feature is a skill that needs to be applied in the learning of the 21st century. The construction of this Yagi Antenna Innovation uses a combination of hardware and applications. The applications involved are CellMapper, Speed Test by Ookla and the Huawei Manager application. The hardware used is Modem Huawei Router: Huawei B310As-852, Coaxial Cable: LMR240, Yagi Antenna and SIM card.

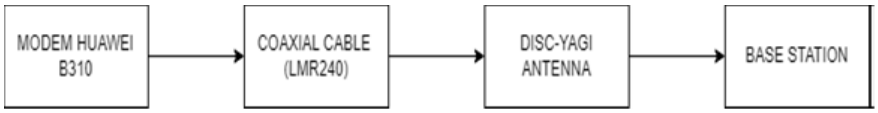

Figure 1: Block diagram of Yagi Antenna Utilization Innovation.

A. Antenna Installation on Router

i) Insert SIM card into SIM card slot in the router. The SIM card size should be mini instead of micro or nano.

ii) Connect external antenna to coaxial cable LMR240 before connecting to the SMA connector on the router. Keep in mind that the port used should be the same when updating antenna setting in Huawei router's IP address.

iii)

Figure 2: Antenna Connection on Huawei Modem Router to an external antenna (Yagi Antenna).

B. Antenna Settings in Huawei Router's IP Address

i) Configure router's settings in router's web interface by typing 192.168.8.1 into web browser.

ii) Set the antenna setting as Built-in as in Figure 4. Record measurements from speed test and Huawei Manager to get the initial measurement of internet strength before using any external antenna.

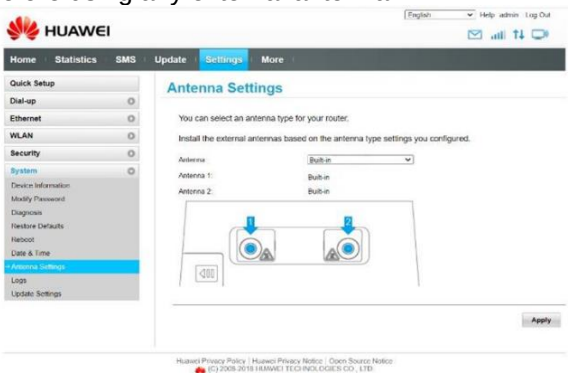

Figure 3: Antenna setting without using an external antenna.

iii) Set the antenna setting as External antenna as in Figure 4. Make sure external antenna is connected to the port as in the illustration labels.

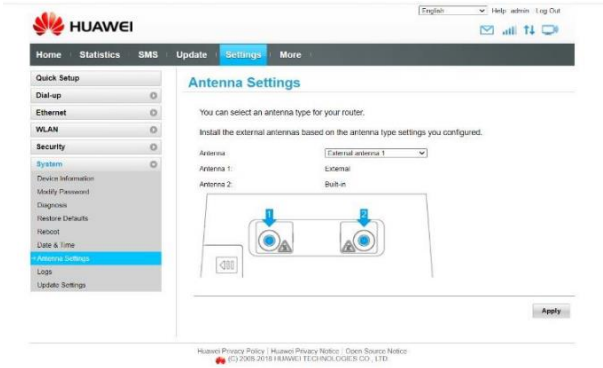

Figure 4: Antenna settings in the Router's IP address to connect to external antenna (Yagi antenna).

iv) Position the antenna until the reading from Huawei Manager are better than initial measurement.

iv) Record the best measurement from Huawei Manager, conduct the speed test, and record the results of the speed test.

C. Base Tower Was Located Using Cellmapper

i) Determine the location of the nearby Base Tower by using the CellMapper application https://www.cellmapper.net/map.

ii) From Figure 5, the green network logo is an available base tower while the red one is a non-working base. From the logo itself will indicate the basic tower band service. Therefore, the nearest base tower covering the test location with band 7 was selected.

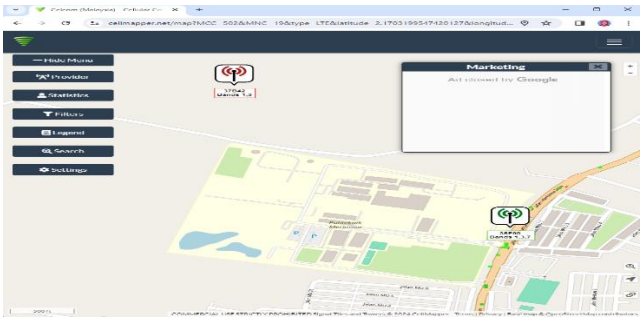

Figure 5: Base station in CellMapper

iii) From the base station location information in CellMapper, a more accurate estimate of the base tower location can be made using Google Maps https://maps.google.com/. Therefore, the position direction of the base tower can be more accurate.

D. Field Test Before and After with Signal Strength

i) Knowing the base tower location, the antenna was adjusted according to the finding and the field test parameters were tested. There are two applications used for field testing which are the Speed Test and Huawei Manager app as in Figure 6. In Speed Test, the parameter tested were the speed download and

upload. Next, the parameter tested in the Huawei Manager app are RSSI, RF-MARGIN, 4G-RSRP, 4G-RSRQ and 4G-SINR.

Figure 6: *Speed Test by Ookla* and Huawei Manager application

ii) Speed test using speedtest by Ookla (https://www.speedtest.net/)

Figure 7: Speed Test reading before installing the Yagi Antenna

Figure 8: Speed Test reading after installing the Yagi Antenna

iii) Signal strength parameters using Huawei Manager (https://www.mediafire.com/file/678myzi44jg0gtc/Huawei_Manager_7_English.apk/file)

Figure 9: Analyze Huawei Manager before installing the Yagi Antenna

Figure 10: Analyze Huawei Manager after installing the Yagi Antenna

iv) The results of the Speed Test by Ookla and Huawei Manager applications in Table 1 as below.

Table 1: Signal strength parameters result before and after installing antenna

Parameter	Without antenna	With antenna
RSSI	-83dBm (Good, 57%)	-83dBm (Good, 57%)
RF-Margin	-29dBm (Bad, 17%)	-25dBm (Very Good, 84%)
4G-RSRP	-112dBm (Bad, 17%)	-108dBm (Weak, 22%)
4G-RSRQ	-10dB (Good, 67%)	-5dBm (Very Good, 84%)
4G-SINR	7dB (Weak, 49%)	7dB (Weak, 49%)
Download speed	16.2 Mbps	19.6 Mbps
Upload speed	0.78 Mbps	0.97 Mbps

From Table 1, the results of RF-Margin, 4G-RSRP and 4G-RSRQ records increase the parameter values with antenna installation. Although RSSI and 4G-SINR did not show any improvement. The difference in Download Speed and Upload Speed was recorded to be faster at 3.4Mbps and 0.19Mbps respectively than without the antenna.

4. RESULTS & DISCUSSION

i) Before innovation

A questionnaire (PreTest) is distributed to students before the innovation is carried out. A total of 32 students were involved. The results as shown in Figure A show that 30 out of 32 students scored 5/10 and below. This shows that students are not interested and do not understand the topic of Telemetry and Data Acquisition before the innovation is carried out.

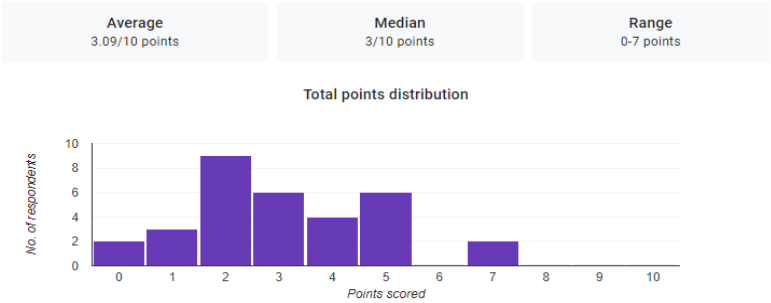

Figure A: Student scores before the innovation (PreTest)

ii) After innovation

Questionnaires (PostTest) are distributed to students after the innovation is carried out. The results as shown in Figure B show that all students got high marks which are 9/10 and 10 only. This shows that students are more interested and understand the topic of Telemetry and Data Acquisition after the innovation is carried out.

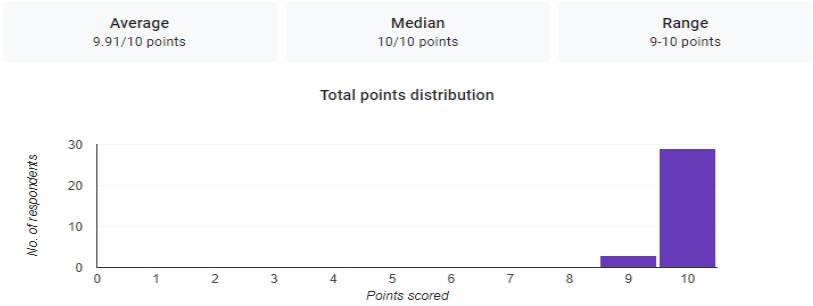

Figure B: Student scores after the innovation (PostTest)

5. CONCLUSION & RECOMMENDATION

As a result, this Innovation of Yagi Antenna Use has been proven to be effective when it has been successful in helping students improve their understanding of the topic of Telemetry and Data Acquisition. From the findings of the PreTest and PostTest conducted as shown in diagram A and Diagram B, it was found that students' understanding of the topic of Telemetry and Data Acquisition has increased after using the Yagi Antenna system as a learning innovation.

It can be concluded that this Innovation of Yagi Antenna Use has been proven to be effective ie students show interest and understand how the antenna works for the telemetry system. Students have also learned and used the Speed Test By Ookla and Huawei Manager applications to improve student understanding in the Telemetry And Data Acquisition topic for the DJM30062 Industrial Electronics course.

Expanding the Innovation of the Use of Yagi Antennas to other institution for the use of Industrial Electronics Courses in particular and other courses related to the topic of Telemetry.

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Chapter 21
Laundry Liberator

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ABSTRACT

This novelty project introduces the Laundry Liberator, a cutting-edge and automated clothesline retraction system designed for outdoor laundry drying. This innovative system integrates an Arduino Nano microcontroller, MAX7219 Dot Matrix display, servo motor, and a rain sensor to elevate user convenience, protect clothes from adverse weather conditions, and promote energy efficiency. At the heart of the Laundry Liberator is the Arduino Nano, a compact yet powerful microcontroller that orchestrates the functions of the MAX7219 Dot Matrix display, servo motor, and rain sensor. The MAX7219 Dot Matrix display serves as an intuitive user interface, providing real-time information about the system's status, weather conditions, and customizable settings. The servo motor, acting as the mechanical workhorse, ensures the automatic retraction and extension of the clothesline with precision and reliability. The MAX7219 Dot Matrix display enhances user interaction by visually conveying the system's responses and settings, making it a user-friendly and informative addition to the Laundry Liberator. The rain sensor remains a crucial element in the Laundry Liberator's intelligence by detecting precipitation. When rain is detected, the Arduino Nano receives the signal from the rain sensor and triggers the servo motor to retract the clothesline. Simultaneously, the MAX7219 Dot Matrix display communicates this action to the user, providing real-time feedback on the protective measures being taken. The Arduino Nano's programmability empowers users to customize the Laundry Liberator based on their preferences, with the MAX7219 Dot Matrix display facilitating a seamless and engaging user experience. Adjustable sensitivity settings for the rain sensor and programmable retraction intervals offer users control over the system's behaviour, optimizing performance in diverse environmental settings. Laundry Liberator, with its incorporate ion of the MAX7219 Dot Matrix display, is not only practical and environmentally conscious but also technologically advanced. By retracting the clothesline during rain, the system minimizes water usage and reduces the need for re drying, contributing to energy conservation. The integration of affordable and readily available components ensures accessibility, promoting sustainability in household practices. In conclusion, the Arduino Nano-based Laundry Liberator, featuring the MAX7219 Dot Matrix display, servo motor, and rain sensor, provides a sophisticated and efficient solution for automated clothesline management. This system represents a significant leap toward smart and eco-friendly household technologies, ensuring the longevity and quality of outdoor-dried laundry in varying weather conditions.

Keywords: Laundry Liberator, clothesline retraction system, retraction system, laundry

1. INTRODUCTION

Introducing the Laundry Liberator – a pioneering solution revolutionizing outdoor laundry drying. This state-of-the-art system seamlessly incorporates an Arduino Nano, MAX7219 Dot Matrix display, servo motor, and rain sensor to enhance user convenience and safeguard clothes from unpredictable weather conditions. The Arduino Nano, acting as the system's core, coordinates with the MAX7219 display, providing real-time updates and customizable settings. The servo

motor ensures precise and reliable clothesline retraction, while the rain sensor adds intelligence by triggering automatic retraction during rain. This technology not only prioritizes user control with adjustable sensitivity settings but also contributes to energy conservation by minimizing water usage. The Laundry Liberator, with its blend of affordability and accessibility, signifies a significant stride towards eco-friendly household practices. In conclusion, this Arduino Nano-based system guarantees an advanced and efficient solution for automated clothesline management, ensuring the durability and quality of outdoor-dried laundry in diverse weather conditions.

2. LITERATURE REVIEW

Numerous projects have explored innovative approaches to clothes drying systems, such as the Smart Clothes Drying System (sCDs), which utilizes warm air from residential air conditioners during nighttime. Although sCDs demonstrated improved drying duration, it lacked internet-based observability and control. Similar projects by Mahlia et al. (2010) and Widodo et al. (2021) utilized AC waste heat for drying, while Cutinha et al. (2016) created a web-based drying system controllable via the Internet using GSM networks.

Hegade (2016) incorporated a cabinet and an industrial blower for clothes protection, and Sachin et al. (2019) introduced an electromechanical drying system responsive to weather conditions. Kumar et al. (2016) developed an automated system using smart sensors, photo voltaic sensors, and a drive system, whereas Nugraha (2020) integrated a fan, heater, and Wi-Fi connectivity for temperature control and remote monitoring.

Various mechanisms, such as pulleys and reels (Kumas et al., 2017), cloth dryer and dehydrator combinations (Kalyankar et al., 2018), and IoT-based roof control systems (Yunus and Sulistiyowati, 2021), were explored. Chaihang and Puengsungwan (2021) designed a spiral moving type clothes drying rack, and Ishak et al. (2020) introduced an automatic retractable cloth drying system.

Building upon these projects, we propose the Laundry Liberator, a hybrid system combining sunrays-based drying by Cutinha et al. (2016) and servo motor control by Hegade et al. (2016) and Romero et al. (2021). Laundry Liberator retrieves the clothesline for sun-based drying on sunny days and adjusts to rainy days by retracting the clothesline into the shed. A rain sensor was used as a detection guide during the retrieval process. Laundry Liberator also features monitoring capabilities, allowing users to track system activity through a smart display.

3. METHODOLOGY

The operational excellence of the laundry liberator is driven by a meticulously designed method that seamlessly integrates advanced technologies to redefine outdoor laundry drying. At the core of this innovative system lies a strategic amalgamation of components – an arduino nano microcontroller, max7219 dot matrix display, servo motor, and a rain sensor.

Arduino Nano's Role

The Arduino Nano serves as the system's central controller, managing the functions of other components.

MAX7219 Dot Matrix Display

The display provides real-time information on the weather conditions enhancing user interaction.

Servo Motor's Function

The servo motor automates the retraction and extension of the clothesline with precision and reliability, controlled by the Arduino Nano.

Rain Sensor Integration
The rain sensor detects precipitation, sending a signal to the Arduino Nano when rain is detected.

Protective Measures During Rain
Upon rain detection, the Arduino Nano triggers the servo motor to retract the clothesline automatically. Simultaneously, the MAX7219 Dot Matrix display communicates this action to the user in real-time.

User Customization through Arduino Nano
The Arduino Nano's programmability allows users to customize sensitivity settings for the rain sensor and program retraction intervals.

4. RESULTS AND DISCUSSION

The experiment yielded insightful results:

i. The rain sensor, tested with 20 users, exhibited efficient response times during simulated rainfall.
ii. The servo motor demonstrated precision and reliability in retracting the clothesline.
iii. The MAX7219 Dot Matrix display effectively communicated real-time information to users.
iv. Users praised the customization features facilitated by the Arduino Nano's programmability.
v. Energy consumption during system operation was minimal, contributing to energy conservation.
vi. Significant reductions in water usage were observed, indicating the system's efficiency in preventing unnecessary redrying.

Table 1: Survey from 20 users

Criteria	Reviews (Out of 20 people used)
Ease of Use	17
Effectiveness	18
Customization Praise	16
Reliability	17
Clothes Protection	19
Energy Efficient	14

Figure 1: Based on the data collected from 20 users

Ease of Use
17 out of 20 users found the Laundry Liberator easy to use, indicating a high level of user-friendliness.

Effectiveness
18 users acknowledged the system's effectiveness, suggesting its capability to meet user expectations.

Customization Praise
16 participants praised the system's customization features, emphasizing the value of tailoring the experience.

Reliability
17 participants expressed satisfaction with the system's reliability, indicating consistent performance.

Clothes Protection
An impressive 19 participants recognized the Laundry Liberator for its efficacy in protecting clothes during outdoor drying.

Energy Efficiency
14 participants commended the system's energy efficiency, showcasing positive feedback in this aspect. The overall positive response from users established the Laundry Liberator as a promising and user-centric solution for automated clothesline management. The collected data served as a foundation for refining and improving the system based on user feedback.

5. CONCLUSION

The Laundry Liberator, with its incorporation of the MAX7219 Dot Matrix display, emerged as a practical, environmentally conscious, and technologically advanced solution for automated clothesline management. By intelligently retracting the clothesline during rain, the system minimized water usage and reduced the need for redrying, aligning with principles of energy

conservation. The integration of affordable components ensured accessibility, promoting sustainability in household practices. In conclusion, the Laundry Liberator represented a significant leap toward smart and eco-friendly household technologies, guaranteeing the longevity and quality of outdoor-dried laundry in diverse weather conditions.

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Chapter 22
Digitalization of the Selangor State Inspectorate Management System Through Dashboard SP@SEl

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ABSTRACT

SP@SEL is a digital management system in the Selangor School Inspectors Department, serving as a one-stop center for employee management, leave monitoring, inspected and uninspected school statistics, officers inspection data, assets, references, documentation, and related information. Its usage over the past one year has resulted in a more systematic approach compared to traditional methods, enhancing accessibility and efficiency. The system allows officials to easily and quickly obtain information, contributing to smoother management in Selangor School Inspectors Department. Additionally, the system promotes a paperless environment, contributing to environmental sustainability initiatives. The advantage of SP@SEL lies in its accessibility for all department employees, irrespective of their location, through internet connectivity. In addition to its comprehensive features, SP@SEL facilitates real-time communication among department staff, fostering collaboration and quick decision-making. The system's user-friendly interface ensures that even non-technical users can navigate it with ease, promoting widespread adoption. Moreover, SP@SEL contributes to data accuracy and integrity, reducing the risk of errors associated with manual record-keeping. The platform's flexibility allows for customization based on evolving department needs, ensuring it remains aligned with the dynamic nature of educational management. SP@SEL further enhances accountability through its audit trail feature, providing a transparent record of all activities within the system. The platform also incorporates security measures to safeguard sensitive information, ensuring compliance with data protection regulations. Overall, SP@SEL stands as a testament to the successful integration of digital solutions in optimizing the efficiency and effectiveness of administration in Selangor School Inspectors Department, Ministry of Education in Malaysia.

Keywords: digitalization, accessibility, efficiency, widespread, accountability

1. INTRODUCTION

Digital transformation is a concept that has gained wide attention from different disciplines given its multi-faceted and appealing nature. At its core, digital transformation implies change on two levels: first, at the core of the organization, its processes and routines; and second, in its environment, business models, products, and services, and in the interaction between users and the organization itself (Hanelt et al. Citation2021; Mergel, Edelmann, and Haug Citation2019).

The main trigger of these changes is the introduction of digital technologies, which changed the expectations that citizens and users have for the delivery of public services (e.g. seamless service delivery, increased usability) and introduce new modes of service delivery.

The term "Digital Management System" can refer to a system that uses digital technologies to manage and streamline various processes within an organization. It encompasses a wide range of functionalities and tools designed to enhance efficiency, collaboration, and decision-making. SP@SEL is a comprehensive digital management system implemented by the Selangor School Inspectors Department in Malaysia. This system serves as a centralized platform to manage various aspects of departmental operations, providing a one-stop solution for several functions.

2. LITERATURE REVIEW

Providing a comprehensive definition of digital transformation is complex because it is a multi-faceted (Broekhuizen et al., 2021; Hanelt et al., 2020; Vial, 2019) and multi-dimensional phenomenon (Hess et al., 2016; Zangiacomi et al., 2020), affecting organizations at different levels and in different forms. According to Mergel (Mergel et al., 2019), government organizations are rethinking about the entire processes and services rather than just digitizing individual official documents to computerize their processes. Some public administrations are making more progress along this scale than others, while others are falling woefully behind on the execution front. This may be because of insufficient government support for digital initiatives, a lack of coordination between different governmental agencies, budget constraints, or ill-advised attempts to change public administration (Dunleavy et al., 2006). The development of a network civilization is based on the advancement of digital technologies. Public management is one of the area which was impacted by the rise of digital technology, making it possible to use cutting-edge public management instruments and emerging possibilities. The use of the invention in public management is made possible by digital technology. (Kondratenko et al., 2020; Tkachenko et al., 2019). The automatic workflow, speed, and adaptability of digital technologies have made them a sensation (Il'Ashenko, 2004; Tkachenko et al., 2019).

As the world is moving towards the Industrial Revolution 4.0, Malaysia is expected to see the whole new world where everything will be based on digital information. The way we do and deliver things will have to change. The delivery of public services to the people will be changed. When we are moving forward in digitalising our public sectors, one of the important aspects that need to be addressed are on how we gathered, managed, stored and accessed the data. As such, governments across the world are moving towards enacting legislations and changes in policy (Kofi Koranteng Adu et al. 2016) as we are becoming digital government. According to Andresen C. (2017) ~~found that,~~ the digitization of government will accelerate growth and development of the country as it enables to expand new markets in the region, improves services delivery to the citizens, and strengthens the institutions. For example, the applications of digital government in Vietnam shows a great significance toward their economy by having a high total factor productivity growth because the government able to solve the complaints and problems which arise from the citizens quickly and created transparency in e-government system. Thus, it definitely can attract more foreign direct investment and enhance efficiency and effectiveness of the government services.

3. METHODOLOGY

The discussion of this conceptual paper was developed by using the systematically review of the literature through the secondary data collection method. This type of data collection technique is also known as the library research method. It refers to theoretical proof obtained from previous studies by other researchers. Based on this theoretical research, a conceptual

framework or hypothesis that represents the overall writings of the research can be structured. It also refers to explanations that exist in the form of documents and records, even though this category is only used occasionally (Yvonna & Guba, 1985). By using this method, the researcher would obtain important data from books, journals, documents, manuscripts, papers, proceedings and internet sources on information related to the researcher's study and analysed by using content analysis.

4. RESULTS & DISCUSSION

4.1 Evolution of Digital government in Malaysia

In the 21st century, most governments are turning to opportunities of new operating paradigms through technologies to cater the demands from citizenry for more efficient, transparent and timely service. Nowadays Malaysia is moving forward to form a Digital Government. The initiatives that are already underway by MAMPU are include the Government Online Services Gateway (GOS), Government Data Exchange Hub (MyGDX), the Government Data Optimization (data.gov.my), and the Public Sector Data Centre (PDSA).

4.2 Better service to the organization

A digital government will help make public institutions more inclusive, effective, accountable, and transparent. Most of the staffs increasingly expect organization to provide the fast and seamless service by using a mobile device, at home on their computer, in person or through a combination of channels. Therefore, the Selangor State Inspectorate Management which invest in and also deliver digital services can tremendously improve the welfare of their organization. By making Malaysia as a digital government, many benefits can be given to the organization. For example:

a. Employee Management: SP@SEL likely includes features for managing employee information, such as personal details, work history, and contact information.
b. Leave Monitoring: The system helps in tracking and managing employee leave and streamlining the process which ensures accurate records.
c. References and Documentation: The system serves as a repository for references and documentation related to the department's activities, ensuring easy access to essential information.
d. Efficiency and Accessibility: The use of SP@SEL over the past year has resulted in a more systematic approach compared to traditional methods, indicating improved efficiency. The system enhances accessibility, allowing authorized users to access relevant information from anywhere, at any time.

4.3 Better collaboration among organization staff

The Selangor State Inspectorate Management System allows a better collaboration among organization staff. It can be seen through cross data sharing. In SP@SEL perspective, the dashboard has developed a hub for sharing and managing data. For example,

a. School Statistics: SP@SEL provides insights into both inspected and uninspected school statistics, allowing the department to analyze and make a good and an informatic decisions.
b. Officers Inspection Data:The system likely includes the data related to inspections conducted by officers, enabling efficient tracking and reporting.

c. Assets Management: SP@SEL helps in managing departmental assets, which may include tracking, maintenance, and inventory control.

4.4 Efficiencies and cost savings

As government services increase in complexity and the staffs come to expect government interactions to be as smooth as consumer transactions, many agencies find themselves turning to digital transformation efforts. These initiatives promise to reduce the amount of human intervention required in completing government transactions, bringing the dual benefits of reducing labour costs and increasing constituent satisfaction. The SP@SEL is a publishing platform which brought a one-stop centre for employee management and reduced central government spending on websites. The ability to produce official papers electronically, contributes to the reduction on spending for printing.

5. CONCLUSION & RECOMMENDATION

As an overall conclusion, Malaysian Government is in the progress of making a new government by uplifting Malaysia into another level of playing arena ~~for~~ which is a digital government. The construction of the SP@Sel Dashboard is one of the efforts of the Selangor State Nazir Congregation in smoothing the administrative management of the organization. Implementing a digital management system like SP@SEL brings several advantages, including streamlined processes, reduced paperwork, improved data accuracy, and increased overall efficiency. It facilitates a more organized and systematic approach to managing departmental activities, contributing to better decision-making and resource optimization. It's great to see organizations adopting digital solutions to modernize their operations and enhance overall effectiveness. Malaysia Government keen not only in focusing on people's mobility but also by upgrading the evolution growth of ICT towards the citizen. The prospect of digital government is widen in the hope to provide better services for the citizen, increase civic participation in decision making, better collaboration with others organization and lastly efficiency and cost saving.
The evolution, growth and adoption of ICT in ASEAN will continue as in line with Malaysia Government aspiration in order to ensure sustainable, robust and resilient growth and always synchronize with ASEAN's journey towards comprehensive digitalization in 2025. However, there are also several recommendations it will need to include for the upcoming milestones especially the need to improve the business case for investing in internet and broadband infrastructure, including skills and knowledge. Moreover, it is important to engage and communicate among each member of ASEAN so that the digitalization initiatives fit into the ASEAN ICT and Connectivity Master plans 2025.

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Chapter 23
Universal Solar Charging System

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ABSTRACT
In off-grid settings, there is a need for a dependable power supply, which is addressed by the Solar Power Universal Mobile Charging Box. This project includes solar charge controllers, power inverters, DC and AC input/output sockets, voltage and current display meters, battery, and LED lights in addition to solar panels that can capture direct sunlight (DC) or grid power (AC). With a pull-up lever and a DC 5V 3A output, the PVC-made box offers a variety of power options. The gadget includes an AC and DC power supply, a temperature gauge with a solar charging indicator, and safety features like overload and overheating protection, low battery voltage disconnecting, and high voltage disconnecting. The Solar Power Universal Mobile Charging Box is perfect for outdoor activities, building, camping, and remote living because of its lightweight design. It functions as an emergency power source in the event of a grid outage in addition to providing instantaneous power for electronic devices. Carrying about a variety of gadgets, such as TVs, radios, CD/DVD players, desktop and laptop computers, fans, and lights, is made easy with this box. The solar-powered universal charging box's efficacy has been confirmed by successful testing and construction. The LED lights offer dependable illumination, the DC and AC power supply function flawlessly, and the indication meter shows precise voltage and current readings. This creative approach provides a sustainable and portable way to acquire power for various applications, empowering users in places where energy is scarce.

Keywords: Solar Power, LED light, Power Inverter, temperature gauge, PVC Box, Battery

1. INTRODUCTION

The increasing global demand, particularly in developed and developing nations, has led to the need for more sustainable energy solutions to replace traditional electricity generation resources such fossil fuels [1]. Energy sources derived from fossil fuels are contributing to harmful environmental problems like climate change and global warming [2]. The last few decades have seen an exponential increase in the amount of greenhouse gases released into the environment by the production of electricity [3]. Therefore, in order to tackle the current environmental issue, Renewable Energy (RE) technologies have been created to generate power, including solar, wind, hydro, biomass, geothermal, and hydrogen energies. Renewable energy (RE) is gaining significant attention due to its ecologically beneficial qualities and ability to generate power with zero or nearly nil production of air pollutants.

The Solar Power Universal Portable Charging Box serves as a dependable power source in locations beyond the reach of conventional grid power. Whether you're camping, participating in outdoor activities, involved in construction work, or residing in remote areas, this

portable charging box provides instant power for your electronic devices or appliances. The objectives of this project are to design a universal portable solar battery charger. In addition, it senses temperature and has a solar charging indication in addition to providing AC and DC power.

It can also provide emergency power supply when the grid power temporary fails. it is easy and convenient to carry. Solar Power Universal Portable Charging Box can be used for most common appliances like TV, radio, CD/DVD player, desktop computers, laptops, fans, lights, etc.

2. LITERATURE REVIEW

Electronic devices such as mobile phones have become a necessity. However, a drawback is the reduced mobility resulting from the occasional need to charge these devices. Charging sessions are often limited to electric wall supplies, posing a challenge for travellers who may find it difficult to charge their electronic devices during their journeys. Additionally, the battery capacity of mobile phones diminishes rapidly in areas with low network connectivity. This is due to increased energy consumption in the search for network connections, especially noticeable when users travel to remote locations such as jungles. Consequently, electronic devices run out of battery faster, and users face the predicament of being unable to recharge due to the absence of a power supply.

3. METHODOLOGY

The methodology section outlines the approach and procedures employed in the development and implementation of the portable solar charger system This section provides a comprehensive overview of the steps undertaken to achieve the project objectives effectively and efficiently. The methodology encompasses various stages, including design, development, and testing, each of which plays a crucial role in ensuring the successful execution of the project. The chosen methodology integrates practical experimentation, data analysis, and iterative design processes to refine and optimize the universal solar charger system.

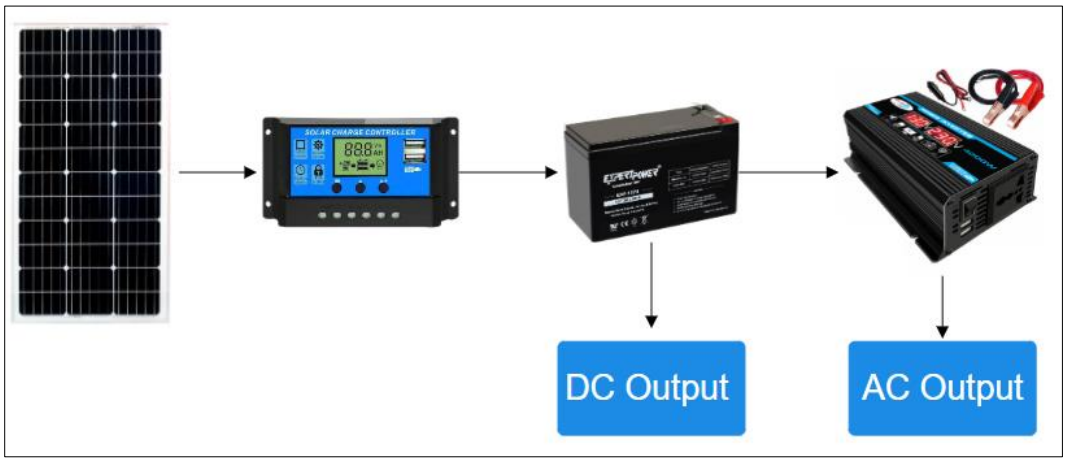

Figure 1: Block Diagram the Universal Solar Charging System

System component

1. Solar Panel Technology
2. Charge Controller
3. Battery
4. Inverter

4. RESULTS

Figure 2: Front view

Figure 3: Rear view

This universal solar charging system has been tested for charging time. Here is the information that has been obtained:

Table 1: Solar Panel Charge Time

Solar Panel Charge Time	Solar Calculator	Actual Reading
12V Batteries	4.48 Hours	5.5 Hours

In order to reduce the charging times, it is recommended to use more than 1 solar panel. A 5kW solar system, for example, will charge a 100Ah 12V battery in a little over an hour.
Scope of future work:

The future proposal is to add a solar tracker to get the maximum solar energy so that more solar energy can be converted into electricity. The battery capacity can also be increased for the use of more electrical tools. Last but not least, the addition of a data logger to the universal solar charging system so that all information can be analyzed for its use.

5. DISCUSSION AND CONCLUSION

The universal solar charging system is a tool that facilitates users in off grid areas. It actually depends on the level and type of electrical equipment used by the user, if the user uses a lot of electrical equipment, then the solar panel needs to be added and the battery capacity is also directly proportional to it.

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Chapter 24
SOCO Simplex Legal Pocket V.2: Staying Safe During Holidays

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ABSTRACT
Premises liability is a legal concept that defines a property owner's or occupier's legal liability for any damage produced by a dangerous condition that they established through negligence. A premises liability lawsuit holds a property occupier accountable for any damages or suffering caused by an injury sustained on their property. Tort law compels the occupier to make a reasonable effort to keep their property safe for visitors. Failure to keep the property safe in accordance with the standard of care results in a negligence lawsuit. Nonetheless, due to a lack of corresponding legislation, Malaysia's occupier liability law is based on common law principles. The occupier's obligation, however, is established by the relationship between the injured individual and the owner or tenant of the property where the injury occurred. Unfortunately, legal concepts can be rather complex to comprehend. Therefore, the primary objective of SOCO SIMPLEX V.2 is to educate respective parties on their legal duties and responsibilities when running a tourism business, as well as to raise knowledge of visitors' legal rights in the event of negligence. This study employed a doctrinal approach, a legal technique, in conducting legal research. SOCO SIMPLEX V.2 provides three comprehensive and unified legal frameworks, which incorporate not only the duty of care and standard of care for each visitor in accordance with tort law but also elements to be established for negligence action. For readers' convenience, this legal pocket also includes infographics that explain the various sorts of visitors and their legal rights, which must be recognised by the tourism industry when managing their business. Furthermore, a checklist is supplied to allow the parties to systematically analyse and assess their compliance with applicable rules and regulations, as well as the legal action that visitors may take in the event of negligence. In addition, this legal pocket includes a chatbot that enhances reader interactions by providing real-time answers to their questions with minimal human engagement. Tourism industry's players may use this product as a reference to effectively manage operations and prevent future disputes. This legal pocket is easily marketable, with an e-booklet offering updated legal information on relevant themes.

Keywords: staying safe, occupier, legal liability, duty and standard of care, negligence.

1. INTRODUCTION

In corporate world, problems and challenges are unavoidable. Every business will face obstacles; it is only a matter of what, when, and how they will manifest. There is a high risk of an accident occurring at the hotel during a vacation or stay. Incidents of a physical, mental, or emotional nature frequently occur while attending to hotel guests, possibly harming both visitors and the hotel's reputation. Hence, it is critical for industry players to follow the standards and regulations governing the duty and obligation to provide care to tourists and visitors.

A tort is a legal term for a circumstance in which someone is held accountable for inflicting harm or injury to another person because they failed to meet their legal duty to act reasonably and prevent such harm. Therefore, those in the hospitality industry need to comprehend both legal and operational aspects of their organization. In the hospitality business, personal injury claims can stem from incidents within the hotel and during recreational activities. Hence, having legal knowledge guarantees tourists and industry operators a fair and just environment. Furthermore, understanding it is crucial for industry operators to avoid legal implication or penalties.

2. OBJECTIVE

a. SOCO SIMPLEX V.2 aims to educate relevant parties on their legal duty and responsibilities when conducting a tourist business.
b. SOCO SIMPLEX V.2 aims to enhance visitors' awareness on their legal rights in cases of negligence.

3. COMMERCIALIZATION

This legal pocket is highly marketable, featuring an e-booklet that provides up-to-date legal information on pertinent topics. It serves as a convenient legal resource for both hospitality professionals and visitors or tourists, making it easily marketable. Additionally, it functions as an educational tool, fostering a deeper understanding of the legal protections afforded to the injured party. Plus, it's a quick and easy legal reference for young people involved in media, helping them understand legal risks like defamation through straightforward infographics.

4. BENEFITS TO SOCIETY

For the users: This product is beneficial for users seeking comprehension of the legal rights and responsibilities stipulated by laws when managing a tourism business. It aids users in mitigating the risk of legal claims and ensures compliance with current legal requirements, fostering trust and confidence among tourists and visitors.

For the society: Presented in an easily understandable infographic format the information serves as a valuable resource for the public to grasp concepts like the tort of duty of care and negligence effortlessly. In addition, chatbot platform which mimics a human communication with user can facilitate user’s information discovery and eliminate the need for human interaction and inexpensive to use. It functions as an educational tool, contributing to the dissemination of legal awareness and promoting understanding within the community.

5. NOVELTY AND UNIQUENESS

The novelty of this product is the use of a user-friendly interface to assist people in navigating through the claim procedure. The use of chatbot technology enhances accessibility. Hence, this product may be considered time-efficient in comparison to traditional approaches, since it

enables users to promptly choose the appropriate course of action without the need to seek guidance from a legal company.

This product's uniqueness resides in its ability to address specific themes and provide an immediate response. In addition, reduction of complex legal terminologies and jargon makes the process more understandable for the public.

6. METHODOLOGY

This paper used a legal methodology called the doctrinal method. This paper employs library-based research method, which the primary sources and online databases as secondary sources used statutes, regulations and decided cases (Pradeep, 2019). This method is used because it involves reading and interpreting the laws, statutes, and decisions of courts. This study reviews the cases taken from Current Law Journal. Table 1, show the selected cases to review to construct and build the products.

Table 1 List Selected Cases to Review

No.	Case	Year	Source
1	Donoghue v Stevenson [1932] AC 562	1932	Current Law Journal
2	Blyth v. Birmingham Waterworks Co (1856) 11 Exch 781		Current Law Journal
3	Barnett V. Chelsea & Kensington Hospital Management Committee (1968) 2 WLR 422		Current Law Journal

7. RESULT AND DISCUSSION (PRODUCT INSIGHT)

There are four products been created for this topic. First, a Legal Framework namely Framework: Elements for An Action of Negligence. Second, the Infographics about Negligence. Third, the Checklists of Negligence and the last one is the Chatbot (Artificial Intelligent Application). Framework: Elements for An Action of Negligence.

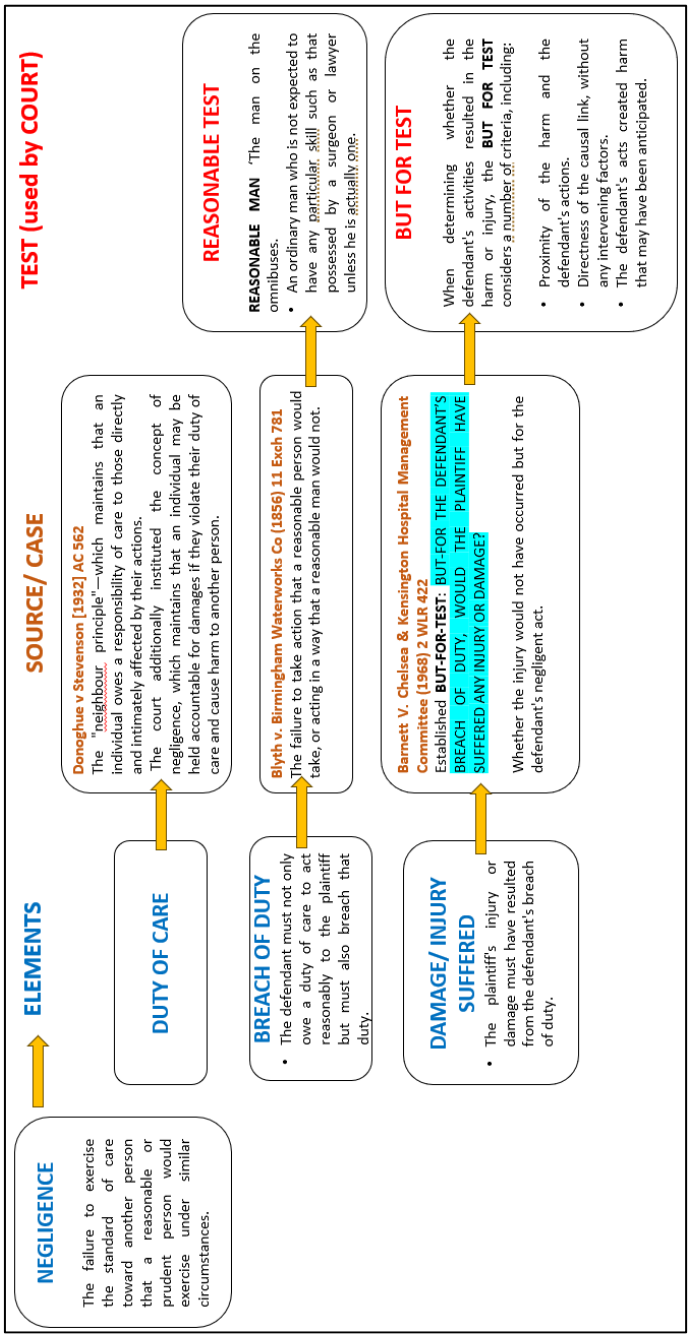

Figure 1: Framework: Elements for An Action of Negligence

This legal framework highlights the essential ingredients that must be established before a negligence action can be brought against the defendant. These elements are based on landmark cases for each legal principle.

7.1. Infographics about Negligence

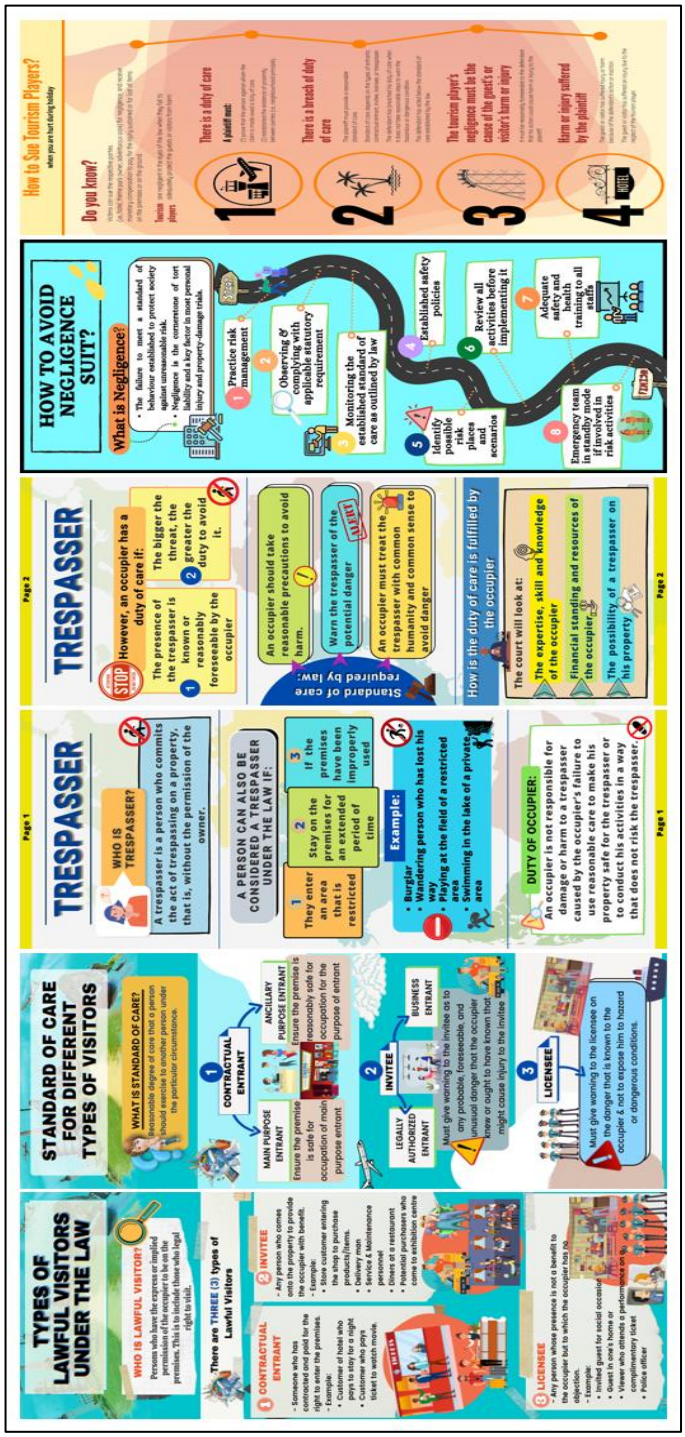

Figure 2: Infographics about Negligence

These infographics illustrate various information on negligence. Each infographic would serve as a useful guide to educate users on standard of care to be observed for each visitor and legal implications in failing to observe the standard of care as established under tort law.

7.2 Checklist of Negligence

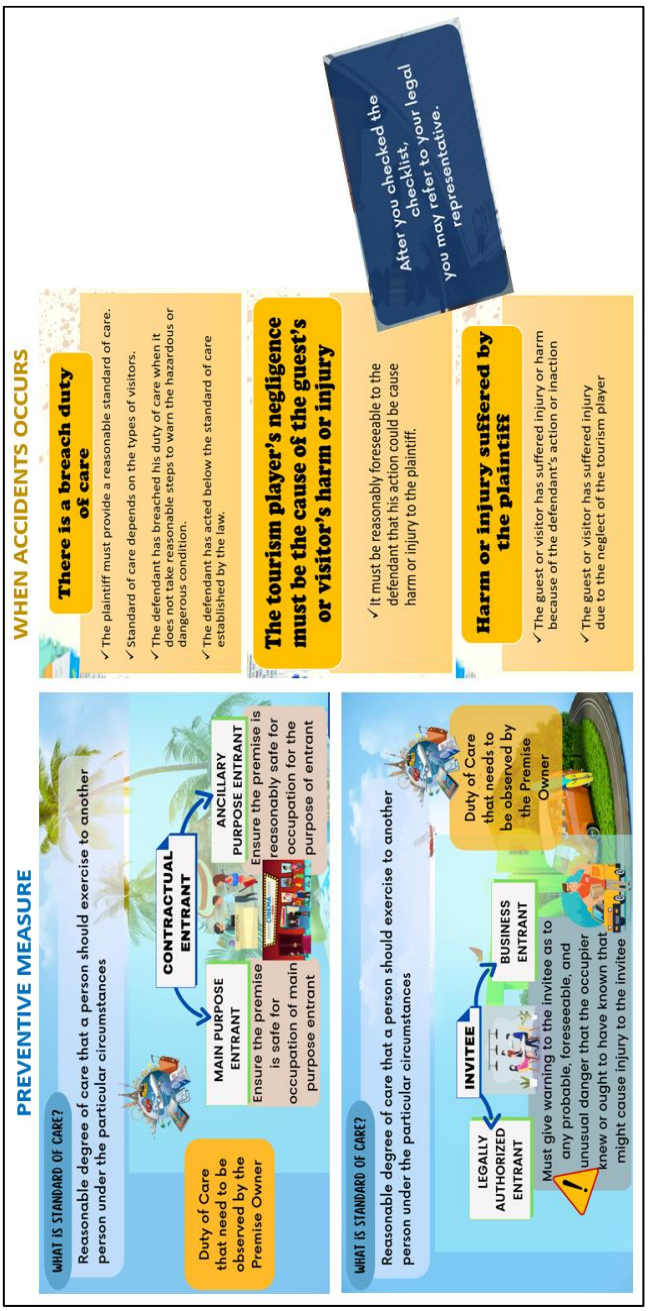

Figure 3: Checklist of Negligence

The checklist highlights the preventive measures that need to be taken by the premise owner and what plaintiff should do should the accident occur. Checklists serve as a means of keeping track of what must be done and serve as a brief list of tasks that the person in charge must accomplish to perform his job. This ensures that the work-completion quality matches the criteria. As a result, it improves clarity, accountability, and transparency. As checklist's function to short list of tasks that the person in charge must complete in delivering his job, it guarantees that the work-completion quality meets the standards and acts as a means of keeping track of what needs to be done. Thus, it increases accountability, transparency, and clarity.

7.3. Chatbot

Legal pocket that incorporates a chatbot, offering an innovative way to engage with readers. This chatbot gives users advice on what needs to be established by visitors before any legal action is initiated for negligence. It provides instant responses to reader inquiries without requiring significant human involvement. This real-time interaction can create a more dynamic and engaging experience for users. Therefore, the legal pocket with an integrated chatbot is a tool designed to make legal information easily accessible, enhance reader engagement, and support hotels in efficient operations and dispute prevention. The chatbot may be accessed using this link.: https://rb.gy/mn6abf.

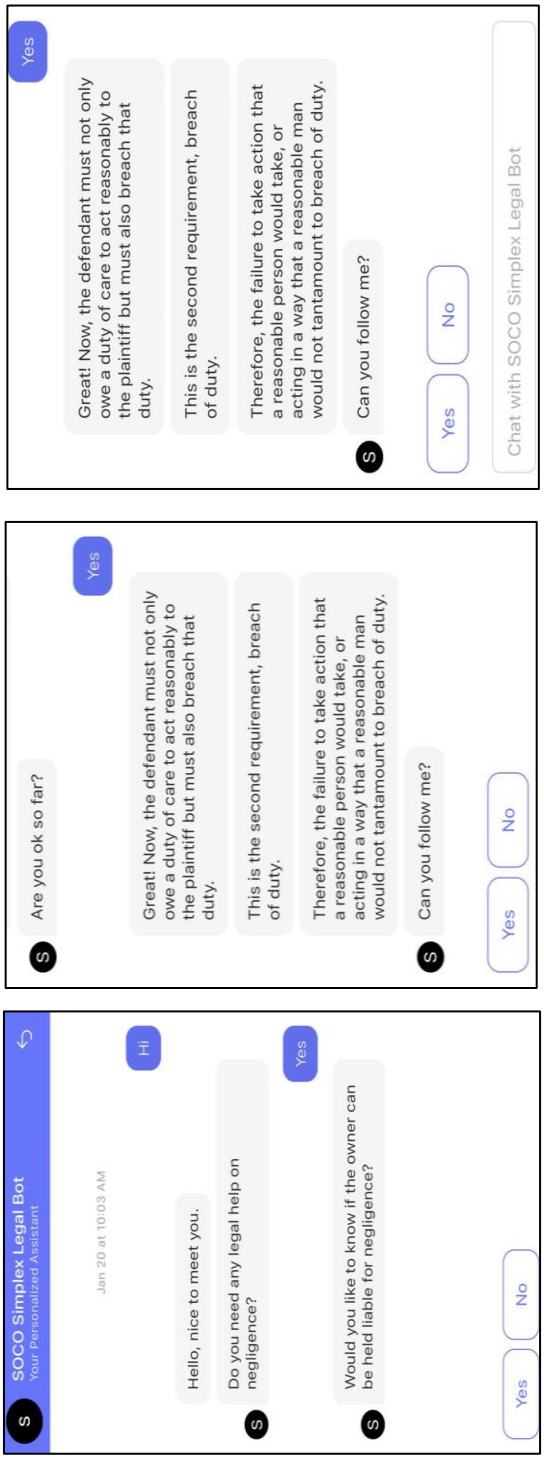

Figure 4: Chatbot

8. CONCLUSION AND RECCOMENDATIONS

In conclusion, the legal pocket—which includes a chatbot and e-booklet—emerges as a flexible and easy-to-use instrument with various advantages. Designed with the hospitality industry, travellers, and younger media consumers in mind, it provides a handy means of getting up-to-date legal information. By assisting users manage operations and lowering risk, it increases user confidence. The product undoubtedly helps raise legal awareness in society because of its easy-to-understand infographic format, which simplifies legal concepts and serves as a helpful teaching and learning aid. This innovative legal resource not only answers user inquiries in a timely manner but also makes a substantial contribution to the improvement of legal knowledge, compliance, and the averting of future disputes in a variety of industries.

The impact of SOCO SIMPLEX LEGAL POCKET V.2 on Sustainable Development Goal is multi dimensions. It supports economic growth (SDG 8) by reducing the economic burden associated with prolonged legal processes, fosters innovation (SDG 9) within the legal industry, improves the overall well-being of communities (SDG 11) by addressing legal matters efficiently, and contributes to the development of a fair and accessible legal system (SDG 16).

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Chapter 25
Enhancing Learning Engagement in Introduction to Computer Systems (ICS) through Innovative Integration of Flashcards and Mobile Applications

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ABSTRACT
This study outlines the results of Continuous Quality Improvement (CQI) discussions with course instructors and coordinators for the Introduction to Computer System (ICS) course; suggests the use of tools as an additional support medium to enhance students' mastery of understanding. The discussion outcomes revealed favourable results, proposing the innovative combination of flashcards and mobile applications as a more engaging and consistent method for learning support. The flashcards, crafted from recycled materials (3R), offer unique advantages with their small size, portability, and versatility for use anywhere. Designed to reinforce understanding and facilitate information memorization, each flashcard contains crucial information. Meanwhile, the mobile application functions as a digital support providing an interactive platform for engagement with flashcards. This innovation reflects a commitment to continuous improvement in learning quality and contributes to the advancement of education in this digital era.

Keywords: flashcards, mobile applications, tools, learning experience.

1. INTRODUCTION

As we navigate the digital age, the demand for innovative pedagogical approaches to enhance learning engagement and mastery becomes increasingly apparent. In response to this imperative, this study emerges from collaborative Continuous Quality Improvement (CQI) discussions with ICS course instructors and coordinators. The ICS course, with its emphasis on understanding the core elements of computer systems, plays a pivotal role in shaping the knowledge base of an aspiring computer technician. However, conventional teaching methods may fall short in capturing the dynamic nature of technological advancements and the diverse learning preferences of contemporary students. Recognizing this gap, the study proposes an integration of flashcards and mobile applications, strategically designed to align with the specific nuances of the ICS curriculum otherwise it can apply to engineering (Kob, Kannapiran and Shah,2018), mathematics (Borba et.al, 2016), accounting (Kutluk & Gulmez, 2014).

The flashcards crafted from recycled materials (3R) present a unique opportunity offer an eco-friendly approach and a portable medium. As students' progress from understanding the

basics of computer systems to more intricate concepts, the physical interaction with these flashcards becomes an invaluable supplement to their learning experience.

The integration with mobile apps; introduces a digital dimension through a mobile application tailored to the nuances of the ICS course. This application serves as an interactive platform, seamlessly complementing the flashcards and extending the learning environment to students' mobile devices. By integrating these tools in teaching approach (Radu & Mateescu, 2018), the study aims to create an engaging and dynamic learning experience, fostering improved mastery and utilization of the curriculum.

2. LITERATURE REVIEW

Educational institutions aim to foster and develop students' abilities with the goal of enhancing positive learning outcomes, including academic and non-academic achievements such as skills, competencies, self-esteem, satisfaction, and improved grades. Bloom's Taxonomy (1956), is a widely recognized framework for assessing the quality of learning outcomes, distinguishing between lower-order skills such as knowledge, comprehension, and application, and higher-order skills like analysis, synthesis, and evaluation.

Lee and Mao (2016), characterize students as preferring a "learn by doing" approach. Malacapay(2019), suggests that learning styles are not necessarily influenced by demographics or academic achievement. It is essential for educators to recognize the variability in learning acquisition. Therefore, learning materials, instructions, and activities should cater to visual, auditory, and kinesthetics learners, allowing them to engage with lesson content through diverse methods and tasks. These instructional materials should focus not only on the content but also on the process and output of the lessons. The implications of these considerations can help instructors plan and implement suitable instructional interventions, one example being the use of flashcards.

Flashcard learning, a widely recognized strategy, is known for its effectiveness and efficiency in learning and memorization (Davis, 2013). This approach makes subjects easier to understand and enhances long-term memorability said Nakata (2019). Developed as an effective memory-aid tool, the use of flashcards contributes to the improvement of the teaching and learning process across all age groups (Hui *et.al*,2021).

3. METHODOLOGY

3.1 Mobile Integration

The integration of mobile applications and flashcards into the Introduction to Computer Systems (ICS) course followed a systematic and iterative process guided by the ADDIE Model (Analysis, Design, Development, Implementation, and Evaluation) adopted by Morrison 2010. The iterative nature of ADDIE allowed for continuous refinement, aligning the integrated tools with evolving educational needs, and optimizing the learning experience in the ICS course.

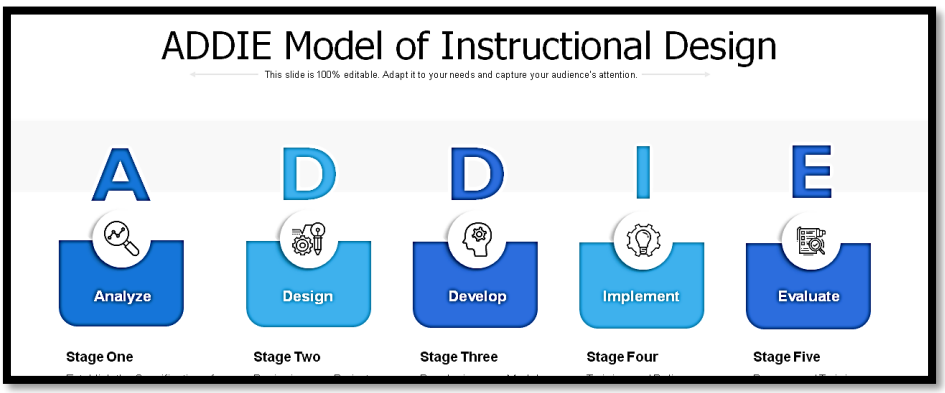

Figure 1: ADDIE Methodology Model

3.2 Flashcards

Eco-friendly flashcards for the ICS course using recycled materials have been created. These cards integrate with a mobile app via QR codes, offering an interactive learning experience. The initiative combines sustainability with technology, providing students with engaging physical flashcards while seamlessly accessing digital content to enhance their understanding of computer science concepts.

4. RESULTS & DISCUSSION

According to a preliminary survey of 97 respondents, 51.5% are female, while 48.5% are male. These respondents represent semester 1 students currently enrolled in the ICS course. The survey shows strong positive sentiments towards the application, as 70.1% find it very user-friendly, 67% acknowledge its effectiveness in information retrieval, and 58.8% express high satisfaction. Additionally, 41.2% use the app frequently (4-5 times/month), and 53.6% are satisfied with the user interface. Notably, 99% would recommend the application, with 91.8% learning about it through friends. Figure 2, show the percentage of user survey based on application.

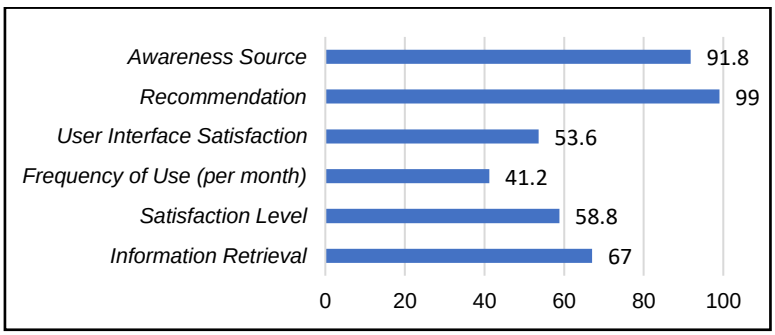

Figure 2: Percentage - User survey based on application

The student perception to ICS flashcard in learning show in table 1 below. It shows that the ICS FLASH CARD application is well-received among the respondents, proving effective in supporting their learning activities, particularly in understanding topics and retrieving information.

Table 1: Perception on ICS Flashcards in Learning

Respondents Perception on ICS FLASH CARD in Learning:	
Understanding Topics:	64.9% found the application very helpful in understanding topics.
Information Retrieval for Learning:	64.9% used the application for obtaining information on learning topics.
Assignment Assistance:	6.9% disagreed with using the application for assignment answers.
Preference Over Notes and Books:	92.8% agreed with preferring the application over notes and books for understanding.

5. CONCLUSION & RECOMMENDATION

The integration of 3R recycled flashcards with a mobile app in the ICS course has generated a positive impact on student engagement and interactive learning. The physical and eco-friendly approach has successfully captured attention. This application, serving as a comprehensive platform, enhances learning with interactive features. The use of similar or improved innovative tools is recommended for other courses, and the main challenge is to continue updating digital resources for optimal student support.

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Chapter 26
Revolutionizing Macroeconomics Education in The Era of Industry 4.0: Embracing Disruptive Technologies for Enhanced Learning Outcomes

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ABSTRACT

The integration of technology into our society has had a profound impact on education. With the rise of the internet and the technological advancements of the 21st century, the teaching landscape has undergone significant changes in just a few years. In particular, the development of information and communication technology during the fourth industrial revolution has revolutionized the field of education. However, adapting to these changes has presented challenges for university lecturers, who must continually adapt their teaching methods to meet the needs of the Industrial Age 4.0. Macroeconomics, in particular, has been a challenging subject for students due to its mathematical and statistical components. Traditional teaching methods are no longer sufficient to support effective learning in the 21st century. As a result, blended learning and outcome-based education have emerged as alternatives to traditional teaching methods. To evaluate the effectiveness of these methods, a study was conducted using final examination results from two semesters. The results indicated that the blended learning approach, supported by technology and e-learning, led to better academic performance for macroeconomics students compared to traditional teaching methods. In conclusion, the integration of blended learning and technology into macroeconomics education can improve students' ability to adapt to the demands of the Industrial Age 4.0.

Keywords: Blended learning, outcome-based education, innovation and teaching and learning.

1. INTRODUCTION

The landscape of education is undergoing a rapid transformation, driven by the technological advancements of the 21st century. The integration of technology into our society, coupled with widespread internet access, has fundamentally altered the way teaching and learning occur. The impact of Information and Communication Technology in the era of Industry 4.0 has been profound, not only shaping the development of nations but also revolutionizing the field of education (Taib et al., 2020). Today's educational environment is no longer bound by conventional norms; instead, it embraces a dynamic and technology-centric approach that extends beyond traditional classrooms (Mokalu et al., 2022). Learning is no longer confined to specific times or locations, with self-learning gaining popularity among university students. The introduction of mobile learning (m-learning) has further revolutionized education, providing flexibility and accessibility to the learning process (Ahmad et al., 2018).

Within this evolving educational landscape, certain courses face challenges in engaging students effectively. Macroeconomics, in particular, is often perceived as less popular due to its requirement for grasping complex concepts, theories, and mathematical principles. The course's objectives encompass understanding economic principles, connecting them to daily life, addressing current economic issues, fostering interest, and developing practical skills for responsible societal participation. The difficulty students face in mastering statistical and mathematical skills, including graph interpretation, contributes to their struggles in understanding economic concepts (Yin, 2008). Traditional teaching methods are deemed inadequate in the 21st century, especially for numerical courses, which demand active learning to boost student motivation (Abdul Rahman, 2017). The use of game-based learning tools such as Puzzle, Quizlet, Educaplay, and Quizizz has emerged as an innovative approach to enhancing student understanding by introducing interactive content into the teaching process (Hung et al., 2015). As education continues to evolve, incorporating creative and interactive strategies becomes imperative for sustaining student engagement and success (Mohamed Rosly, 2017).

1.2 Problem Statement

The macroeconomics course stands as a mandatory component for all students pursuing Bachelor's Degree programs within the Faculty of Entrepreneurship and Business (FKP). Catering to various disciplines such as Bachelor of Entrepreneurship, Bachelor of Commerce, Bachelor of Retail, Bachelor of Islamic Banking and Finance, and Bachelor of Logistics and Distribution Business, this course delves into intricate concepts, theories, and necessitates a mastery of mathematical and statistical skills. However, students undertaking this course often encounter challenges in demonstrating a profound understanding of concepts and theories, struggling to apply macroeconomic principles to propose solutions for contemporary economic issues. The perceived difficulty arises from the course's theoretical nature and its demand for mathematical and statistical proficiency.

In the current landscape of the Industrial Revolution 4.0, universities must evolve to incorporate technological advancements for a more conducive and enjoyable learning process. Lecturers play a pivotal role in fostering innovation and integrating technology into education. Scholars such as Wana (2011) and Yusop et al. (2011) emphasize the benefits of technology-enhanced learning, creating an effective environment for diverse learners, stimulating engagement in training, and accommodating varying learning speeds according to individual abilities. Recognizing that conventional classroom-focused learning may not fully foster the development of students' knowledge, it becomes essential for students to engage in self-learning through technology-assisted Teaching and Learning (P&P) processes. Embracing technology in education not only provides diverse learning experiences but also aligns with the needs of contemporary students in this era.

1.3 Project Innovation Objectives

The main issues of this project are to pique learners' interest in learning macroeconomics through blended learning. This online teaching was conducted during the lockdown of Covid-19. Before the pandemic, this course was made face to face. When the lecture was done physically, the lecturer could interact with the students and able to communicate and explain in detail, and even for example may show how to sketch economic curves physically. But with online teaching, a typically recorded video lecture and explaining the content of a chapter for one or two hours will bore the students. Therefore, in this blended learning, a concept of the micro-credential approach was adapted to engage macroeconomics learners with interactive teaching and learning.

2. MATERIALS AND METHODS

In response to the digital era and the growing trend of digital transformation, educators are adapting by incorporating computer technology into both learning and teaching methodologies. The Pedagogical Proposal Model emerges as a comprehensive framework that integrates pedagogy and technology into course design, encompassing pedagogical objectives, activities, and online tools for instructors. This model introduces six fundamental educational goals along with corresponding methods for achieving them.

Figure 1 Bending with purpose

Based on this model, every week students will be provided a series of videos for lectures, According to the model, a blended learning approach is adopted for the macroeconomics course. Each week, students are provided with a series of instructional videos, complemented by online lectures conducted through platforms such as Google Meet, Zoom, Google Classroom, and Microsoft Teams. Following video lectures, students are assigned tasks to reinforce their learning. The UMK Learning Management System, known as UMK e-Campus, serves as the repository for learning materials, leveraging the capabilities of the Moodle platform 3.11. This version facilitates the integration of various plugins, allowing the incorporation of external web applications directly onto the platform in a creative and effective manner. The e-Campus platform also serves as a communication medium for instructors and students through chat boxes and forums, with minimal use of WhatsApp for discussion sessions. Evaluation processes are seamlessly integrated into the e-learning system, with students required to submit assignments through the platform for optimal record-keeping. Additionally, the system automatically captures student attendance each week, tracking their engagement with the learning materials and activities.

The primary goal of this project is to ensure that students enrolled in the macroeconomics course can successfully achieve all course learning outcomes (CLOs) through a blended learning approach utilizing engaging and effective web tools. Careful planning is undertaken to ensure that students' learning time (SLT) is effectively utilized, with a keen focus on selecting appropriate web tools. Synchronous online lectures are conducted through platforms like Google Meet, Zoom, Google Classroom, and Microsoft Teams, while asynchronous delivery involves the use of video recordings, teaching recordings, animated videos, and evaluation tools such as quizzes and tests through applications like UMK e-learning, Google Forms, Quizzes, Kahoot, Puzzle, and Flashcard. The analysis of student achievement for each course learning outcome and course assessments reveals improved student performance and a better understanding of the course content. For data analysis, the final examination results of two semesters were utilized – September 2019/2020 for non-blended cohorts and September 2020/2021 for blended cohorts, involving a total of 899 students across both semesters.

3. RESULTS AND DISCUSSION

The blended learning approach adopted in this project has demonstrated its effectiveness in promoting students' creativity and self-directed learning. This approach involves a combination of online and face-to-face learning activities, including synchronous discussions through Google Meet and forum participation. The assessment of students' learning outcomes indicates that they have developed a range of skills, including the ability to analyse economic problems, propose solutions and policies, deliver effective presentations, demonstrate knowledge of macroeconomic theories and concepts, and report on current issues in the global economy.

Table 1: Student Achievement based on CLO's

	September 2019/2020 (Non-Blended cohort)	September 2020/2021 (Blended cohort)
CLO1	1.17	3.07
CLO2	2.63	3.12
CLO3	3.15	3.41

(Note: CLO1: Discuss issues related to macroeconomic concepts and theories; CLO 2: Apply relevant concepts and tools to address macroeconomic problems; CLO 3: Discuss macroeconomic current issues and challenges in the context of macroeconomic problems)

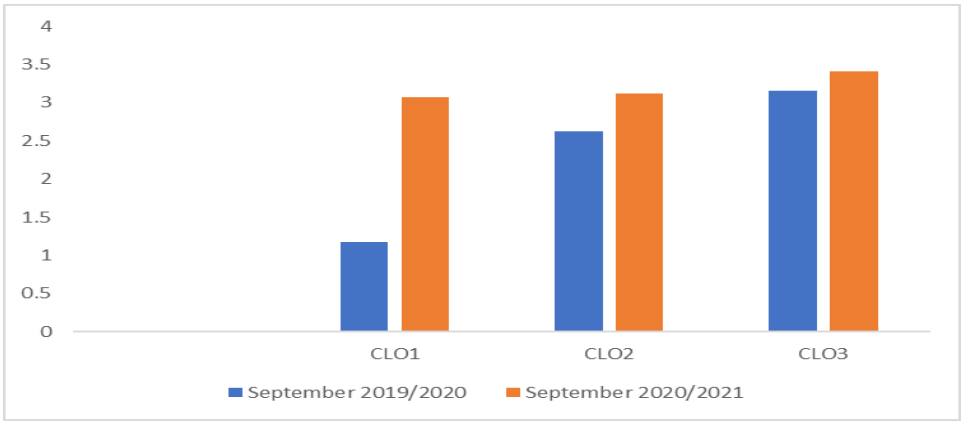

Figure 2: Student Achievement based on CLO's

The findings suggest that the students following the blended structure and technology e-learning support are more active learners as opposed to a student who is following the conventional structure. Besides that, evident by students' self-learning assessment results on their learning experiences showed the average alignment level score of course outcomes are higher than non-blended teaching method.

4. CONCLUSION

In conclusion, the implementation and application of a blended learning approach supported by technology e-learning indicate better grade point average achievement for macroeconomics students in terms of academic performance in comparison to the conventional teaching-learning approach.

4.1 Relevance to government policy

a. Global online learning is a shift in the Malaysian Higher Education Development Plan for the years 2015–2025. One of the accomplishment objectives for this transition is blended learning.
b. The future of learning online for the system Malaysian higher education is centralized to global quality standards, increased access as well as equity which ensures the group who have less chance of getting Take advantage of it. The ministry plans to make online learning and blended learning the cornerstone of the curriculum to provide access to this knowledge.
c. Offer access to SDG 4 in quality education with alternate Blended Study helps meet both present and future educational demands by combining technology used with concurrent conventional learning also SDG8 in decent work opportunities and economic development.
d. Towards Industry Revolution 4.0. Analytics integrated with the platform Learning Management System (LMS) to add value to learning specifically the profile of engagement and progress information-based students.
e. Enhance value-based Students and Educators. In the 21st century students and educators take advantage of technology. The latest ICT in enhancing effectiveness Learning. Students and educators can cross physical boundaries to inter interpret on the global stage.

4.2 Novelty

1. This project adopted the Blending with Pedagogical Purpose Mode by Picciano (2017). This model is relevant to blended learning, where we utilize multiple technology and media, as well as support students socially and emotionally.
2. This project integrated innovation and strategies with web tools 2.0 for teaching and learning macroeconomics.
3. Blended Learning Provides More Interactive Educational Experience for Macroeconomics students.
4. The multimedia application in the teaching process and learning in this project has created more effective and entertaining learning for macroeconomics students.

4.3 Commercialization potential

The content of this blended macroeconomic course can be used as a course that can be offered on a micro-credential basis at the faculty. Preparation of structured content by lecturers, where each chapter contains content such as videos, activities, and even assessments. This is in line with the procedure for preparing the course on a micro-credential basis. Therefore, this course has the potential to be offered or commercialized as a micro-credential course. Relevant and support the initiative of APEL-M by the Malaysian Qualification Assurance (2021) where academia can replicate the Micro-credential modules.

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Chapter 27
Smart 3-Wheel Bike: Technical Support for Disabled Entrepreneurs

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ABSTRACT

Technology is a crucial aspect of starting a business, particularly for disabled entrepreneurs who may face additional challenges due to their disabilities. Entrepreneurship has become a preferred field of employment for disabled people, primarily due to a lack of other employment opportunities. However, the current technology available for disabled entrepreneurs is insufficient, and they may not be able to compete effectively in the business world. Compared to non-disabled individuals, disabled people have lower labor market participation rates, which limits their opportunities for employment. Running a business can be challenging for anyone, but disabled people often face additional obstacles that make it harder for them to succeed. Due to their disabilities, they may require specific technology or technical assistance to help them grow their business. The Smart 3-Wheel Bike was developed to provide better facilities to disabled entrepreneurs, making it easier for them to organize and operate their businesses competitively. The process of developing this product is based on three phases: the analysis phase, the design and development phase, and finally the implementation and evaluation phase. In the analysis and evaluation phases, two case studies were conducted on the needs and acceptance of the prototype. The findings from the two case studies indicated that the development of the Smart 3-Wheel Bike for disabled entrepreneurs was able to fulfill the disabled entrepreneurs' needs, and people with disabilities accept this technology in running their businesses.

Keywords: Disabled Entrepreneurs, Technology, Entrepreneurship.

1 INTRODUCTION

Disabled people face numerous challenges when it comes to employment opportunities, and one of the main reasons is a lack of employability skills. According to Grammenos (2011), disabled people experience lower labor market participation rates than non-disabled individuals. In 2019, only 0.31% of disabled individuals were employed out of the total labor participation rate of 68.7%, a figure that has further decreased due to the COVID-19 pandemic. These statistics demonstrate that disabled people are often concentrated in lower-skilled, lower-paid occupations (Meager and Higgins, 2011). However, promoting entrepreneurship can provide a potential solution to the problem of low participation rates. Self-employment or running their own businesses can offer disabled people more control over their employment situation and provide opportunities for financial independence.

In Malaysia, promoting entrepreneurship is a critical component of the national agenda, and the introduction of the "National Entrepreneurship Policy" (DKN) provides a holistic

framework for the development of entrepreneurship in the country. This policy is in line with the OKU Action Plan 2016-2022, where entrepreneurship is a strategic focus to empower the economy of the OKU. The plan aims to increase the participation of disabled individuals in an open, inclusive, and accessible job market, enabling them to live independently and contribute to national development.

Assisting disabled entrepreneurs can make a significant contribution to the Sustainable Development Goals (SDGs) outlined by the United Nations. By promoting entrepreneurship among disabled individuals, this technology contributes to SDG 8: Decent Work and Economic Growth. SDG 8 aims to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. By providing better facilities and technology for disabled entrepreneurs, the Smart 3-Wheel Bike helps to ensure that no one is left behind, which is the central aim of the SDGs. Additionally, promoting entrepreneurship among disabled individuals can also contribute to SDG 10: Reduced Inequalities, as it can help to reduce the gap between disabled and non-disabled individuals in terms of employment opportunities and economic empowerment.

Recent studies have highlighted the challenges faced by disabled individuals in the labor market and the potential benefits of entrepreneurship. According to Stone and Horn (2021), they found that disabled entrepreneurs are more likely to pursue social entrepreneurship, which involves using business ventures to address social or environmental issues. Another study by Corbisiero and Schaper (2020) found that disabled entrepreneurs face unique challenges in accessing capital and resources, but they are also more likely to innovate and take risks in their businesses. In addition to entrepreneurship, some researchers have suggested that remote work and digital platforms can provide more opportunities for disabled individuals to participate in the labor market. Marques and Jesus (2020) found that remote work can be an effective strategy for accommodating disabled workers and promoting inclusivity in the workplace. Overall, these studies demonstrate the importance of creating a more inclusive and accessible labor market for disabled individuals.

1.1 Problem Statement

Disabled individuals often encounter additional barriers when starting or growing a business due to their disabilities, which can limit their access to resources and opportunities compared to non-disabled individuals. Research has shown that technology can be a crucial factor in enabling disabled entrepreneurs to succeed in the business world, by providing them with the necessary tools and assistance to overcome these barriers and compete effectively (Sans-Bobi, M. A. et al. 2012, Rozell et.al. (2010), Norasmah (2002), and Rogoff et al. (2004)). However, despite the potential benefits of technology, the current options available for disabled entrepreneurs are often insufficient. The Smart 3-Wheel Bike was developed specifically to address this gap, with the goal of providing disabled entrepreneurs with a tool that can help them to overcome the unique challenges they face and run their businesses in a more competitive and sustainable manner. By focusing on the specific needs of disabled entrepreneurs and leveraging technology to address these needs, the Smart 3-Wheel Bike has the potential to make a meaningful contribution to the broader goal of promoting inclusive entrepreneurship and sustainable economic development for all.

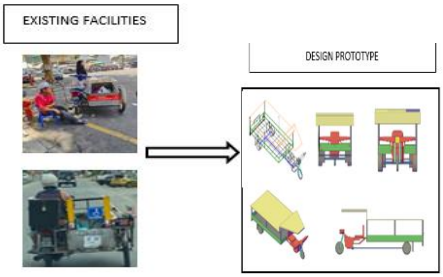
2 PRODUCT INNOVATION

2.1 Product Design

Smart 3-Wheel is designed using a modified motorcycle where it will be equipped with reverse gear transmission facilities, a large basket/place to place the sales items, roofed, and equipped

safety features. As compared to the available supporting facilities for disabled people, Smart 3-Wheel Bike is more user-friendly.

2.2 Prototyping Process



Prototype frame	Installing baskets on motorcycle	Install rear gear
 	 	 

Extend the gear to facilitate OKU	Install Roofed	Safety Feature
 	 	   

2.3 Product development

This product is a collaboration project between UMK and Deen Ironwork that is fully funded by UMK Prototype Research Grant (UMK-Pro). In December 2020, the process of analysis, design, and development has been started and already completed in January 2022 and received a patent from MyIpo.

3.0 METHODS

The process of developing a Smart 3-Wheel Bike is based on three phases, the analysis phase, the design and development phase, and finally implementation and evaluation phase. In the analysis and evaluation phase, two case studies were conducted on the needs and acceptance of the prototype.

4.0 RESULTS AND DISCUSSIONS

The Smart 3-Wheel Bike was developed to provide better facilities to entrepreneurs with disabilities. The study will examine the factors of acceptance of technology in assisting entrepreneurs with disabilities (PWDs) through the development of the "Smart 3-Wheel Bike". Using Smart-PLS analysis and the sample size is 37 people of disability (PWDs) from Kelantan.

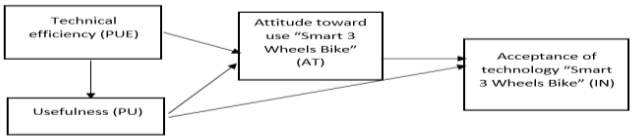


Figure 2: Research framework

Table 1: Discriminant Validity (HTMT)

	AT	IN	PU	PUE
AT	0.896			
IN	0.716	0.852		
PU	0.611	0.587	0.861	
PUE	0.764	0.682	0.808	0.879

Note: AT is attitude; IN is Acceptances of technology; PU is usefulness; PUE is Technical efficiency.

Table 2: Hypothesis result

Hypothesis	Relationship	p-values	f^2	VIF	Results
H1	IN → AT	0.000	1.054	1.000	Supported
H2	IN → PU	0.000	0.525	1.000	Supported
H3	IN → PUE	0.000	0.870	1.000	Supported

The results reveal that all variables such as technical efficiency, usability, and attitude to use technology influence the acceptance of the development of the "Smart 3 Wheels Bike ". Therefore, people with disabilities accept this technical assistant in running their businesses. In

a conclusion, the need for technology in helping entrepreneurs with disability (PWDs) through the development of the "Smart 3-Wheel Bike" is very much needed.

5.0 IMPORTANCE OF PRODUCT

Smart 3-Wheel Bike will be able to facilitate disabled people in doing business and growing their business. In most cases, due to inappropriate technologies, people with disabilities have disadvantages to obtain independent individuality as well as necessary information for their business and overcoming barriers to organizing their business competitively. Thus, to strengthen the entrepreneurship of disabled people, is, therefore, essentially providing technical support to them.

5.1 Advantages

1. Able to facilitate disabled people to operate the vehicle easily because it is equipped with reverse gear transmission.
2. The vehicle had a larger storage space
3. The vehicle is equipped with a roof
4. The design and size are ideal
5. Equipped with safety features

5.2 Marketability

Smart 3-wheel Bike design to fulfil the need of disabled people. Besides, this product is seen to be able to meet demand other than the disabled people, where it can be used in the small-scale agricultural sector (such as palm oil farmers, rubber, vegetables, and others), business (hawkers and petty traders) based on size, function, and as well as user-friendly.

6.0 CONCLUSION

The Smart 3-Wheel Bike is the technical assistance and technology that is very much needed by disabled entrepreneurs to make their business easier and to remain competitive in their business activities.

7.0 ACKNOWLEDGEMENT

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Chapter 28

WorkEase Assessment App: Enhancing Worker Safety and Health in the Workplace through Comprehensive Assessment

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ABSTRACT

The WorkEase Assessment App has been meticulously designed to evaluate the levels of risk associated with occupational environmental stress, emphasizing enhancing workers' comfort in their workplace. Serving as a robust tool, the application facilitates the calculation and evaluation of the Occupational Environmental Stress Assessment (OESA) Index, providing a user-friendly and direct risk assessment method. This app ensures a seamless, cross-platform experience, catering to mobile phones and desktop computers. Recognizing the significance of understanding occupational environmental stress within a workplace, becomes crucial for maintaining optimal levels of safety and well-being for workers. The workplace environment holds substantial sway over worker performance, productivity, overall health, and safety factors. This significance is underscored by the recent amendment to the Occupational Safety and Health Act 1994 (Act 154) by DOSH, Malaysia, stressing the imperative of conducting risk assessments in all workplaces to prevent adverse effects. Following a successful pilot test within the small welding industry, the app is ready for future implementation in small, micro, and medium-sized industries. This enables these sectors to monitor and track their workers' OESA Index effectively, offering essential documentation for future reference in case of workplace incidents. To further enhance the app's reliability and usability across diverse industries, there is a plan to develop a real-time monitoring device that seamlessly integrates with the app as a future project. At present, the app utilizes various devices to collect physical environmental data for calculating the OESA Index. Ultimately, this innovative approach empowers employers to implement targeted strategies for improving the workplace environment and ensuring workers' safety in a forward-looking manner.

Keywords: Workplace Assessment, Environmental Factors, Safety, Health, Worker.

1. INTRODUCTION

Maintaining workplace comfort is crucial for employee safety and well-being, impacting productivity and performance. Previous research in the metal industry highlights the significant influence of environmental factors on job stress, productivity, performance, and psychological well-being (Balasubramaniam, N.R, 2009). Adverse conditions in manufacturing, including noise, poor lighting, extreme temperatures, and dust, contribute to job-related stress (Ismail, A.R. et. al., 2014). Specific elements like job responsibilities, repetitive tasks, high cognitive demands, and unfavourable environmental conditions are associated with stress or depression (Emin, K., 2007). The impact of temperature stress, noise levels, and lighting on productivity, job performance, and environmental comfort is individually recognized (Yang, W. & Moon, H. J., 2019).

The occupational environmental stress exposure affecting workers in the workplace, especially in manufacturing industries, has a profound impact on their safety and health. Therefore, actions must be taken to calculate, evaluate, and ensure the level of safety and health concerning environmental factors in the workplace. The present innovative product fulfils this objective.

2. LITERATURE REVIEW

Highlighting the significance of a comfortable workplace environment is essential for improving health, safety, and overall performance and productivity for workers. Previous studies explored the influence of environmental stress, specifically noise, on workers' heart rates (Said, M.A.M., Wellun, Z., & Khamis, N.K.,2022). In addition to these investigations, several researchers have explored the impact of individual environmental stress factors on worker satisfaction, health, or productivity (Geng, Y., et. al, 2017). However, there is a limited body of research examining the collective effect of all environmental stress variables on the job performance of workers in the workplace (López-Cabarcos, M. Á., Vázquez-Rodríguez, P., & Quiñoá-Piñeiro, L., 2022).

This current study was carried out in a small-medium metal industry which is the welding industry in Southern Peninsular Malaysia to explore the effects of occupational environmental stress variables among welders. The study specifically evaluates occupational environmental stress by analyzing factors such as temperature, relative humidity, noise, and lighting. A predictive equation named OESA Index was developed using multiple regression and an assessment application has been developed to enhance the level of safety and health among workers in the workplace.

3. METHODOLOGY

The research and development (R&D) employed a comprehensive approach, utilizing a questionnaire survey among welders in small to medium-sized industries and a physical environmental assessment. Post data collection, the application development began, involving the creation of a novel index on the Glide Apps platform. This distinctive index forms the basis for the application's assessment features, ensuring it addresses specific needs and challenges in the welding industry, enhancing its effectiveness in promoting worker safety and well-being.

4. RESULTS & DISCUSSION

4.1. The WorkEase Assessment App

The WorkEase Assessment App offers seamless accessibility through mobile phones and desktops, representing a true cross-platform application. Users can easily log in to the

application using their credentials, regardless of the device they are using. Figure 1 shows the login features, visually representing both the phone and desktop views and showcasing the user-friendly interface designed for convenience and versatility across various platforms.

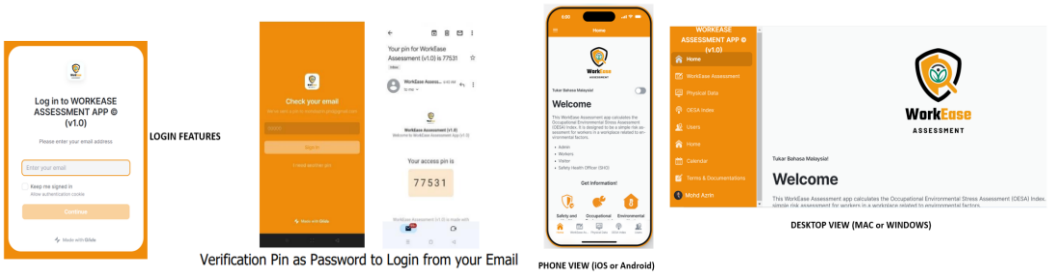

Figure 2: WorkEase Assessment App Preface

Figure 2 illustrates the preface of the Occupational Environmental Stress Assessment (OESA) Index results for workers. After inputting the required data, the app calculates and displays the results. The historical OESA Index values are securely recorded and can be downloaded as a CSV file for future reference or analysis.

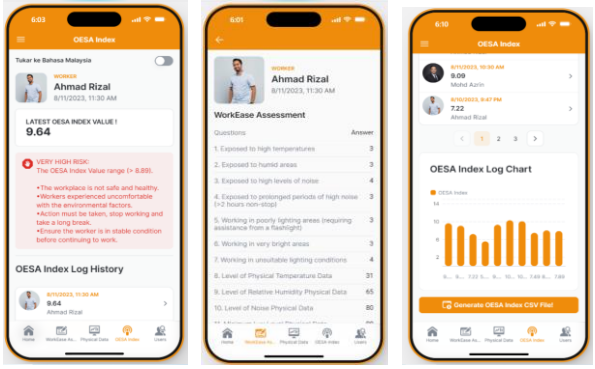

Figure 2: WorkEase Assessment App OESA Index Result

4.2. The Novel OSEA Index Analysis

The Occupational Environmental Stress Assessment (OESA) Index was developed and has been tested to ensure the goodness of fit index model shown in Figure 3 and the level of risk from low risk to very high risk has been established using ROC analysis shown in Figure 4. The index also has been validated with R^2 = 0.7819 shown in Figure 5 and Figure 6 shows user interface and user experience testing results with scores 3.73 up to 4.27.

Chi-Square Test

Frequencies

Comfort

	Observed N	Expected N	Residual
Low RIsk	1	10.5	-9.5
Medium Risk	16	10.5	5.5
High Risk	19	10.5	8.5
Very High Risk	6	10.5	-4.5
Total	42		

Test Statistics

	Comfort
Chi-Square	20.286[a]
df	3
Asymp. Sig.	.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.5.

Figure 3: Goodness-of-Fit Index Model

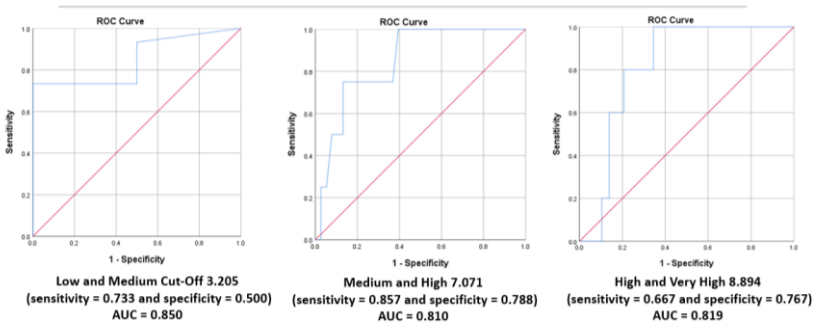

Figure 4: Receiver Operating Characteristic (ROC) Analysis

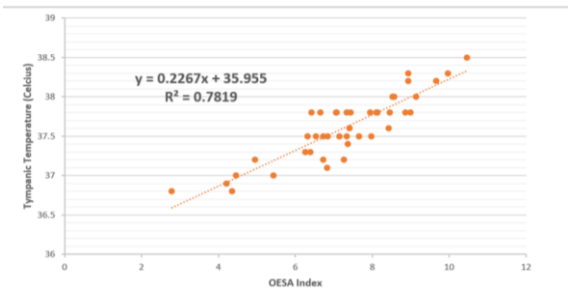

Figure 5: Validity Analysis

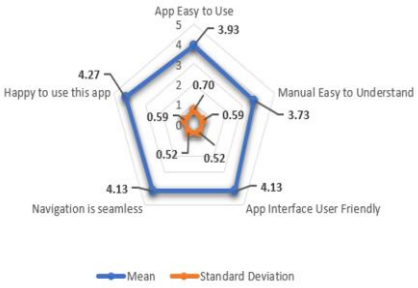

Figure 6: UI/UX Testing

5. CONCLUSION & RECOMMENDATION

The WorkEase Assessment App is a versatile tool designed for a broad range of workplaces, focusing on micro, small, and medium-sized industries. As for now, it has been tested in the welding industry. All features are now implemented, ensuring their effectiveness in assessing and improving workplace safety. Anticipating ongoing development, we plan to add new content and features strategically to address evolving occupational safety needs. Committed to continuous improvement, we proactively refine the app to remain a dynamic and responsive tool. Regular updates aim to fortify its utility, aligning it with changing workplace safety standards for the benefit of workers across diverse industries.

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Chapter 29
Smart System for Detecting and Monitoring Alcohol Content to Workers in The Commercial Transportation Sector

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ABSTRACT

The smart system for detecting and monitoring alcohol content for commercial transport sector workers is a tool created to detect the level of alcohol content in the driver's body and then a short message service (SMS) will be sent to the vehicle owner to give an early warning. The main target users are commercial vehicle company owners such as buses and lorries as well as private vehicle owners. This innovation has been designed using several electronic components such as arduino uno as a microcontroller, MQ-3 gas sensor as an alcohol sensor, and Iot GA6-b as a GSM module to send a short message service (SMS) to give early warning to vehicle owners. This innovation has worked at 100% efficiency.

Keywords: Detecting, Monitoring, Alcohol, Operator, Commercial, Vehicle.

1. INTRODUCTION

Most of peoples know alcohol refer to the hallucinatory and intoxicating drink that actually alcohol is a chemical substance known as ethanol. Ethanol is the first organic compound successfully synthesized by humans because the production of alcohol has been known for at least 4000 years (Hanson, 2013). But in chemistry, alcohol has a broad meaning. Alcohol is an organic compound consisting of carbon, C, hydrogen, H, and oxygen, O, which has the general formula CnH^2n+1OH for aliphatic alcohol and for aromatic alcohol or known as phenol, C^6H^5OH. The functional group of alcohol is known as hydroxyl which is -OH which is attached to the carbon chain (Koivisto et al., 2015).

As a result, alcohol also has its own pros and cons for the drinker. It can be used for something beneficial and also not beneficial. This is at once proven when consuming alcohol from a positive angle can cause someone's life to be successfully saved and the food and beverage industry can process more quantities of products with the presence of alcohol. However, this positive angle cannot cover up the clear and glaring disadvantages of alcohol consumption. Excessive consumption of alcohol can cause harm to the individual involved, such as loss of sanity to think, long-term health problems such as mouth cancer, tuberculosis

and cause cyanosis of the liver. Next, drinking too much alcohol while driving will cause blurred vision, slower reaction time and less focus on the situation on the road. This is one of the factors that cause road accidents in Malaysia (Kareem, 2003).

According to statistics released by the Royal Malaysian Police (PDRM), the number of accidents involving drivers who are under the influence of alcohol is increasing every year. In 2017, there were 212 cases of accidents caused by drivers who were under the influence of alcohol. Based on these statistics, this has caused concern among other road users regarding safety when on the road. Therefore, the authorities have been forced to tighten the law for drivers who are under the influence of alcohol. Therefore, the amendment of the drunk driving act was carried out in 2020 by an agreement obtained in the cabinet among which the amendment will see an increase in the rate of imprisonment from 15 years to 20 years while the maximum fine from RM6,000 to RM150,000. Although the law has been amended, this is a short-term approach that the government can take to curb the 'trend' of drunk drivers. For a long-term approach, it requires a long period of time to educate Malaysians about the harmful effects of alcohol consumption (Arshad et al., 2015).

The increase in the rate of accidents involving commercial vehicles such as trucks caused by drivers who drive under the influence of alcohol shows an increase every year. These statistics are very worrying and require an urgent solution. Therefore, the production of innovative tools such as I-DAD, which is Intelligent - Driver Alcohol Detector, is urgently needed to overcome the problem of the increasing trend of accidents involving drunk drivers among drivers of commercial transport companies such as lorries and buses. With that, researchers hope that with this project they can reduce the rate of road accidents caused by drunk drivers. The researchers named this innovation as ' The smart system for detecting and monitoring alcohol content for commercial transport sector workers (I-DAD)'. This innovation is applied from observations based on how the 'LPG Gas Detector' system works, which is that the gas sensor will detect the presence of gas and then give an early warning through the LCD display and the LED will light up if there is a gas leak in the room. This I-DAD is an early warning system applied to commercial vehicles such as trucks and buses. The way it works is when the driver of the vehicle is detected to have a high alcohol content, this tool will display "High Alcohol Detected" on the LCD screen and then a message will be sent to the employer or trusted person to inform them that the driver is under the influence of alcohol. This makes it easier for employers and other users to know that their employees or friends are driving under the influence of alcohol. This tool will be installed in the cockpit of the vehicle and it is also suitable for use by all users.

2. LITERATURE REVIEW

Alcohol has been used in human life for thousands of years as mentioned by McGovern (2009). There are two theories that discuss the origin of the word alcohol. The first theory states that the word alcohol comes from Arabic which is al-kuhul which means a fine powder of antimony sulfide, Sb2S3 which is used as an antiseptic and eyeliner obtained from the distillation process. This theory was popularized by European writers in the 15th century, along with the term 'distillation' whose technology was pioneered by Islamic scientists. However, the origin of the word alcohol is doubtful because the word al-khwl has a different meaning to the word al-kuhul. The second theory states that the word alcohol comes from the word al-ghawl which means spirit or the essence of wine (Noor et al. 2018).

However, the use of alcohol is not only in the manufacture of alcohol, but it is increasingly widely used in fuel industries, cosmetics manufacturing, medicines, perfumes, food and beverages and so on. This has caused confusion among the community in Malaysia because alcohol is known as alcohol at the same time it will give the impression that something is illegal to use. In general, ethanol or ethyl alcohol as a solvent for the extraction of dyes and

flavors as well as soft drink stabilizers in the food and beverage industry. In addition, alcohol is also used in the medical industry for example as an antiseptic, disinfectant and cure. Alcohol is used on the skin to disinfect the skin before venipuncture and before surgery (Jain et al. 2022). Safety is an issue that is taken very seriously in any field, especially when it involves a person's life. Road accidents are not a new thing in our country, in fact for a long-time road accident in our country are among the highest in the world. Almost every day news about horrific accidents that cause serious injuries, fatal accidents and property losses are broadcast through the mass media. This situation shows that road accidents are a serious problem that often happens in our country. There are many factors that cause road accidents and one of the causes and causes is drivers who are under the influence of alcohol/ drugs. With that, the main reason researchers do this innovation project is to help employers and the public by warning them through a short message system that will be sent by phone if this device detects the presence of alcohol in the cockpit of the vehicle, especially the driver's side. Therefore, a tool or system known as I-DAD will be developed to overcome the problems faced by a few drivers of heavy vehicles such as buses or lorries. There are two types of alcohol detection methods via:

a. Detection through breath - Breath tester or breath analyzer (breathalyser or breathalyzer) is a tool to measure blood alcohol content (BAC).
b. Detection by chemical reaction

It also uses breath, but air from the driver's lungs enters a test bottle containing a reddish- orange mixture consisting of liquid potassium dichromate, sulfuric acid, and silver nitrate (a catalyst). This mixture, together with ethanol from a person's breath will form a redox reaction. If the driver's breath contains a certain amount of alcohol, then this liquid will change color as a result of this chemical reaction.

The results of this study which can be concluded from the literature review define the alcohol sensor and the level of alcohol content in the body. Next, alcohol detection methods have also been identified which have two ways to detect alcohol. In addition, it also compares between existing products in the market that have limited availability in different regions of different brands and features and evaluates one that has better specifications and availability and another that offers at a lower price but is only limited to one region. Through comprehensive literature review found this innovation is novel and has own uniqueness.

3. METHODOLOGY

This innovation was conducted to find out the influencing factors and the best way to prevent people from driving under the influence of alcohol. In completing this innovation project, several work scopes have been set so that this innovation project can be completed and not violate any of the guidelines that have been set, such as:

a. This tool will be installed on the cockpit of vehicles such as private vehicles and also commercial company vehicles such as lorries and buses.
b. This device can detect alcohol in the body with a minimum alcohol content of 0.08 mg/l.
c. This tool is able to send messages to employers and vehicle owners using the short message service.
d. This tool targets commercial company owners and vehicle owners.
e. This tool uses C++ coding language and electronic system.
f. The size of this tool is 160mm X 80mm X 76mm.

Next, the development of the I-DAD system is to use an arduino uno as a microcontroller and an MQ-3 gas sensor as a sensor together with an Iot GA6-b that functions

as a GSM module to send messages. An Arduino code that measures blood alcohol content (BAC) using an alcohol sensor and sends an SMS alert to a specified number when the BAC exceeds a certain level. BAC is displayed on the I2C LCD. To ensure an accurate BAC reading, the Arduino code performs a simple averaging method by reading the ADC value 10 times and calculating the average value. When the BAC exceeds 1.60mg/L (the legal limit for driving in many countries), the code sends an SMS alert to a pre-set number. It also lights up a red LED and displays a warning message on the LCD. The setup() function initiates serial communication with the computer, sets up the LCD display and configures the IoT module to send SMS alerts. The loop() function measures the BAC using the alcohol sensor, converts the ADC value to the BAC value and checks if the BAC exceeds the threshold. If it happens, the code sends an SMS alert and activates the LED and displays a warning message on the LCD. The send SMS() function sends SMS alerts using the IoT module. It sets the text mode for the module, sends the recipient's phone number and sends an alert message.

4. RESULT AND DISCUSSION

The main purpose of this project is to detect the presence of alcohol by using the MQ-3 gas sensor. So, when this product detects the presence of excessive alcohol in the vehicle the LED will light up and a message will be sent as a warning to the vehicle owner. Therefore, tests should be performed to evaluate or determine that the alcohol sensor used is capable of detecting the presence of alcohol according to the program's instructions. Therefore, a set of tests has been done to determine the alcohol limit that has been set in the program. The Table 1 shows the results of the tests that have been carried out. Here is a test based on the amount of alcohol consumed.

Table 1 Alcohol setting and sms

Alkohol (mg/L)	LED	SMS
<1.60	OFF	NO SMS
>1.60	ON	SMS SEND (Driver Was Drunk

This test is made by using 2 different types of alcohol content. The first alcohol used is Hand Sanitizer which has an alcohol content of less than 1.60 mg/L while the second alcohol is a type of alcohol available in the market. Table 1 above shows the effectiveness of alcohol detection that has been produced. Analysis of the effectiveness of alcohol detection has been successfully recorded. This tool is able to work well when detecting the presence of alcohol that exceeds 1.60 mg/L and is able to send a short message service (SMS). The recorded results show that all of them are very satisfied and need this device while driving a truck to help them detect the presence of alcohol in the body. With these results, the testing of the I-DAD device can achieve what it wants to find on objective and scope of the study. In conclusion, this product can help employers to detect drivers who are under the influence of alcohol. Therefore, it is hoped that this product will receive a positive response because it can reduce the average number of road accidents caused by drunk drivers. Figure 1 shows the final of I-DAD system.

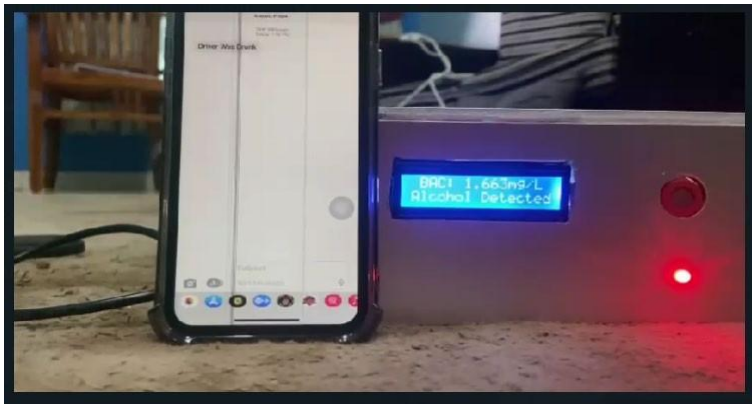

Figure 1: The I-DAD

5. CONCLUSION

In conclusion, the I-DAD project has been successfully created and is able to send a short message service (SMS) as a warning to vehicle owners. This has been proved when the results of the study from the respondents found that all users are very satisfied with this tool. I-DAD helping truck and bus drivers and vehicle owners in monitoring their employees, this tool is able to function very well and efficiently. The result of the material cost count is RM 132.70 and the commercial value is RM 177.70. The effectiveness of this tool to detect the level of alcohol content in the body well and efficiently.

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Chapter 30
The Revolution of Smart Game App: MFRS 137 Provisions, Contingent Liabilities and Contingent Assets

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ABSTRACT

In order to satisfy the requirements in a variety of educational contexts, gamification and game-based learning (GBL) may be used as efficient modes of instruction. Smart Game App: MFRS 137 is a game-based accounting learning tool that offers a novel approach to comprehend financial accounting reporting requirements in a single day, with efficiency and speed. Provisions, contingent liabilities, and contingent assets were given special attention in the Malaysian Financial Reporting Standards (MFRS 137). Since it helps students with their self-learning exercises to help them remember accounting words, concepts, or treatment, the Smart Game App: MFRS 137 is an extremely useful study aid for learning. Nowadays, in order to enhance their learning process, students use educational games as a tool to gain knowledge. Consequently, educational institutions are confronted with the task of encountering the demand for quality learning tools. Prior studies underlined playing instructional games improves processing speed and memory recall. As a result, a brief survey asking students what alternative tools they would rather have to aid in their learning has been done. The findings demonstrated that students desire GBL in order to comprehend the material better. By utilizing GBL to connect with a wide audience, educational institutions can increase their level of autonomy. Therefore, GBL is regarded to be more effective, faster and easy to utilize as compared to lengthy accounting standards or printed handouts. Additionally, students can utilize this GBL at their convenience to help with their curriculum and skill development. Accounting students will find the Smart Game App: MFRS 137 to be one of the most popular learning tools due to its numerous benefits, which include the possibility of providing immersive MFRS 137 experiences.

Keywords: MFRS 137, gamification, game-based learning, accounting education

1. INTRODUCTION

One of the innovative learning strategies that has received a lot of attention recently in a number of academic fields, including accounting, is gamification (Roodt & Ryklief, 2019). The term gamification describes the application of methods or aspects of game design to encourage desired actions (Luo, 2021). Gamification has completely changed the way that education is taught by giving students more interesting and inspiring learning opportunities

than they would have with conventional techniques (Westera, 2019). In a study governing the benefits and drawbacks of gamification applications in learning, Saleem, Noori, and Ozdamli (2022) found that gamification can enhance critical skills like decision-making, collaboration, and communication and can be a useful tool for knowledge acquisition.

Designing learning activities with real games as instructional aids is known as game-based learning (GBL) or educational gamification, and it is currently widely used in both offline and online environments. According to Chen et al. (2019), GBL is a novel approach that encourages student enthusiasm, active engagement, and thorough knowledge acquisition. It includes components that boost motivation, creativity, and self-esteem, like rules, objectives, competition, interactivity, challenges for problem-solving, and enjoyment. As in real-life initiatives, GBL can be utilized to inspire students and equip them to handle uncertainty (Jääskä et al., 2022). A study by Asniza et al. (2021) found that GBL implementation increases student engagement and encourages active learning. Moreover, the competitive nature of GBL encourages students to invest more time in their assignments, creating a sense of flow that eventually leads to better learning outcomes (Chen & Chang, 2020). Camacho-Sánchez et al. (2023) highlighted that the effects of gamification and GBL on student motivation, academic achievement, and commitment make them noteworthy learning strategies.

2. LITERATURE REVIEW

López Gavira, and Omoteso (2013) perceived that GBL serves an important role in the educational environment, increasing student engagement and improving both the quality of the learning and its results. GBL actively explores knowledge, triggering players to experience conflicting feelings of pride, frustration, joy, sadness, disappointment, and curiosity (Lee & Hammer, 2011), which are the main components of the learning process. Consequently, students will be able to develop their cognitive, emotional, and social skills, which are significantly relevant for their future performance as professionals of any given field of knowledge (Liu et al., 2015).

It is imperative that students comprehend the concepts of provisions, contingent liabilities, and contingent assets in the accounting education. Complicated accounting rules, however, might be difficult for students to understand. We have created a GBL called the Smart Game App: MFRS 137 to solve this problem. Through the use of this application, accounting students can learn more about MFRS 137 since it is presented in an interactive manner. This MFRS 137 gamification app's main objectives are to assist students in strengthening their comprehension of the subject, enhance the learning process, and present a fresh method of instruction. Students can efficiently and properly learn how to recognize provisions, contingent liabilities, and contingent assets while receiving quick feedback on their progress by using games like the Smart Game App: MFRS 137. Phillips and Graeff (2014) further claimed that GBL is thought to be a useful teaching tool that builds students' self-esteem, encourages a positive outlook on accounting, and advances a deeper comprehension of accounting principles.

According to the July 2022 final exam result, most accounting students, especially those at UiTM had trouble earning points on accounting treatment questions related to topic MFRS 137. This is an effect of their inability to memorise all the pertinent accounting rules and concepts that they will need to answer later in the questions. In essence, the majority of students (72%) only manage to receive grades below 8 out of a possible 16, indicating a lack of comprehension of the ideas and principles covered in MFRS 137. Students felt that having the Smart Game App: MFRS 137 learning materials is relevant for them to have in order to increase their comprehension level.

With the development of the innovative Smart Game App: MFRS 137, students can now learn about provisions, contingent liabilities, and contingent assets at any time and from any location without having to carry along heavy reference books or financial reporting standards. Students can participate in this new kind of learning with simply a digital device such as a laptop, tablet, or smartphone and internet connectivity. The Smart Game App: MFRS 137 is more efficient, effective, and user-friendly than traditional hardcopy notes and the long explanations found in accounting standards. These interactive Smart Game App: MFRS 137 help students better understand the material covered in MFRS 137, which in turn encourages them to do well on tests and get ready for final exams. Additionally, a study by Silva, Rodrigues, and Leal (2021) bolsters the idea that students' motivation, study habits, and perceptions of accounting learning are all positively impacted by the usage of educational games.

3. METHODOLOGY

We had previously created a timeline for the Smart Game App: MFRS 137 before we even started working on the game prototype. Throughout the game development process, the timeline helps us to monitor our progress and establish clear goals. A brief poll was used to find out what other better learning aids students thought would be most helpful. 252 diploma students from Universiti Teknologi MARA, Perak Branch, who are enrolled in the accounting course, made up the total number of respondents. We developed a series of interactive games with questions on several MFRS 137 subcategories in order to construct the prototype of the Smart Game App: MFRS 137. To improve comprehension, explanations will be given for each right response. When a level is finished, the students who scored the highest can redeem exclusive gifts from their trainer.

4. RESULTS AND DISCUSSION

Figure 1 shows that the majority of accounting students (92.5%) favoured using digital learning tools like laptops followed by smart phones. Since the Smart Game App: MFRS 137 is compatible with both laptops and smartphones, it has been determined to be the ideal tool for matching students' learning preferences in courses.

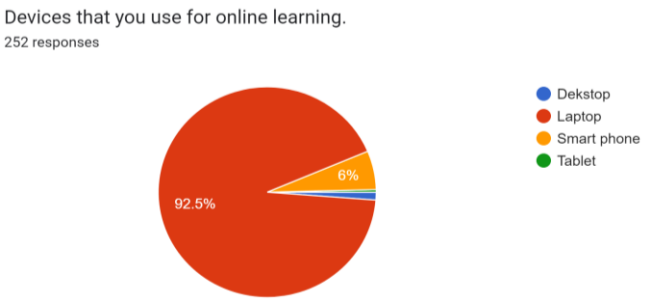

Figure 1: Preferred Education Gadgets

According to Figure 2, 29.4% of accounting students utilize digital devices and the internet for gamification. This type of usage is most likely a result of the interactive, extremely engaging, and thought-provoking nature of gamification arrangements, which incorporate text, moving visuals, and music. As a result, it was found that the Smart Game App: MFRS

137 was the best tool for fulfilling the learning preferences of the students. As long as there is internet connectivity, students can learn at any time and from any location.

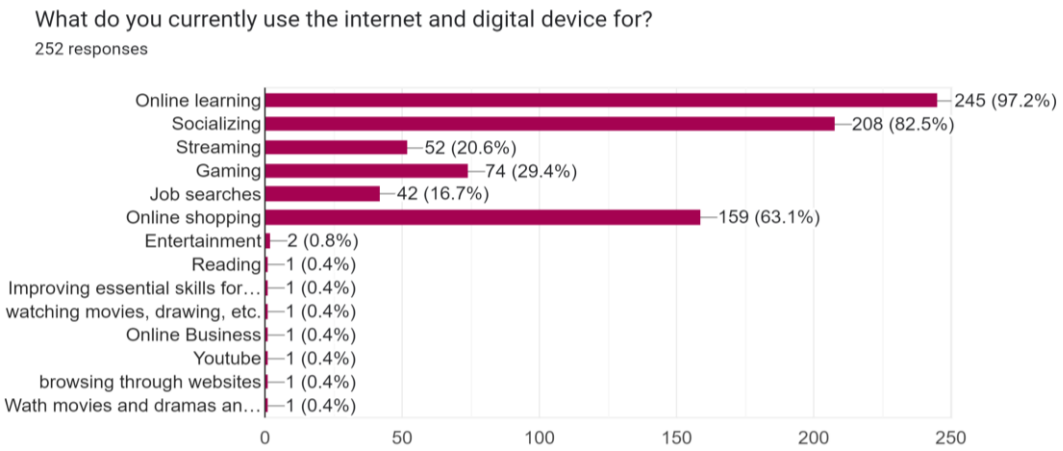

Figure 2: Differential Use of Digital Devices and the Internet

Digital wealthy means that students have attributes such as they own suitable device, they have an internet access at home, the internet coverage is consistent and reliably good, they are digitally literate of using their digital device, and they don't have a language barrier in using the digital device. Figure 3 shows that the majority of accounting students (75.4%) have the ability to manage, evaluate, and communicate information using digital media platforms such as Smart Game App: MFRS 137 as part of their learning process.

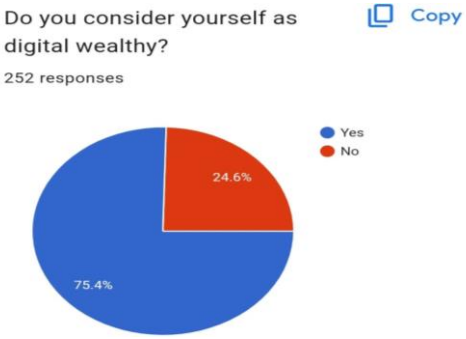

Figure 3: Digital Wealthy

Table 1 shows that the majority of accounting students (39%) preferred playing educational games for learning followed by watching videos. The reason why students seem to prefer these kinds of learning resources is most likely that the interactive aspects make it simpler for them to understand and commit to memorise all of the accounting learning objectives, including categorization, recognition, measurement, presentation, and disclosure. It was felt that this GBL was easier to use, faster, and more effective than lengthy accounting standards or printed handouts. Because of the game's development, it is appropriate for students to use the Smart Game App: MFRS 137 as one of their learning resources because it includes aspects that boost motivation, like competition, enjoyment, and problem-solving difficulties.

Table 1: Evaluation of Preferred Learning Resources

Favoured learning tools	Frequency	Percentage
Game-based learning	356	39%
Videos	296	32%
Digital Flashcards	268	29%

Students can choose multiple preferred learning resources.

5. CONCLUSION AND RECOMMENDATION

One suggested interactive tool for teaching and understanding accounting concepts is the Smart Game App: MFRS 137. This application meets the needs of students by offering realistic activities that make it simple to understand the technical intricacies of subjects like learning provisions, contingent liabilities, and contingent assets. The Smart Game App: MFRS 137 has several advantages that will probably make it a favourite learning tool for accounting students and advantageous for aspiring business owners. Future studies should evaluate accounting students' perceptions of learning provisions, contingent liabilities, and contingent assets utilizing educational games (for instance Smart Game App: MFRS 137) with a bigger sample size that includes students from different institutions.

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Chapter 31
Programming Logic Control Learning Kit

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ABSTRACT

The use of teaching tools and materials *ABBM* contributes a lot in improving student understanding and the quality of teaching and learning among students and educators. However, students have problems in understanding the basic concepts of a lesson being taught. It is also common for educators to only explain the theory without showing the real thing to students. Based on this statement, a study was made to examine the problem of students weakness to understand the basic concepts of magnetic control and Programmable Logic Controller (PLC) programming. A PLC Basics Teaching Kit has been developed as a tool and teaching material to enhance students in-depth understanding of electric motor control and PLC. The main purpose of the PLC Basics Learning Kit is to improve students understanding of the basic concepts of PLC control and programming, which is a weakness of students that can be recognized through the needs assessment that has been carried out.

Keywords: Magnetic control, Programmable Logic Controller, weakness

1. INTRODUCTION

Today the industrial field has entered into an era of automation where the entire manufacturing process has been carried out automatically by machines controlled by a sophisticated central computer control system such as a Programmable Logic Controller (PLC). Full command in the use of PLC is a completeness or proficiency that needs to be present in every student majoring in electrical technology especially to explore the world of automation in the industrial field in the future. With that, most of the local universities and Malaysian Polytechnics have provided automation labs equipped with PLC to provide sufficient training to their students so that the students produced are fulfill the needs of the industry. Hence, the issues faced during PLC learning in the automation lab need to be recognized and given full attention. This is to ensure that students can master both theoretical knowledge and practical skills. This is especially crucial when this practical learning in PLC programming is a different way of learning from the traditional way, it involves expensive and limited equipment, safety issues that need attention as well as the need for a lot of continuous training and proficiency.

PLC Basics Learning Kit is an innovation to be a training model for recognizing PLC system programs more easily. In addition, this project can also help learning problems in the Electrical Technology workshop among which students are unable to apply theoretical learning to practice due to the absence of a real learning kit. The purpose of the project that we have innovated is to help to ease the learning session. In addition, this project also aims

to be able to help make additional references more easily. When compared to previous learning, it is very difficult to understand. Therefore this project can help students understand more easily because they can find out how this program works.

This project consists of several components such as LED lights, Plasma 3 Tier Signal Tower Lamp 24 VDC and alarm bells. The LED lights are to detect the vacancy of the car park. For example, the two lights will turn on if there is a vehicle at the car park and turn off if there is no vehicle. Next, the Plasma 3 Tier Signal Tower Lamp 24 VDC, serves for automatic gates. For example, a green light will turn on to indicate the gate is closed, and an orange light will turn on to indicate the gate is open. The red light turns on along with the alarm bell will sound when the Emergency Button is pressed.

2. LITERATURE REVIEW

The reconstruction concept used must be based on existing or similar products. Hosking (1981) explains product design is a process that uses engineering elements, mathematics, and scientific principles in an effort to produce designs that may bring solutions and contribute to technical needs.

PLC (Programmable Logic Controller) was first introduced in 1969 by Richard E. Morley who is the director of Medicon Corporation. According to the National Electrical Manufacturing Association (NEMA) PLC is defined as a digital electronic component with programmable memory to store programs that perform specific functions such as timing and calculation to control an industrial machine or industrial process as desired. PLC is able to function to carry out a continuous process according to the input device and provide results according to the wishes of the program so that the output value is controlled. PLCs are specialized for applications in industry, monitoring processes, and replacing "hard wiring control" and have their own programming language. However, PLC is not the same as a personal computer because PLC is designed for installation and maintenance by engineers and electricians in the industry who do not need to have high electronic skills and provide control flexibility based on the implementation of PLC instructions.

The way of learning is basically a way or learning strategy that students apply, this is in accordance with the opinion of The Liang Gie (1984: 48) which states that the way of learning is a series of activities carried out in their learning efforts. Hamalik (2001) more clearly states that learning methods are activities carried out in accordance with the learning situation, for example activities in following lessons and facing tests / exams.

Nowadays the industrial field has entered into an era of automation where the entire manufacturing process has been carried out automatically by machines controlled by a sophisticated central computer control system such as PLC. Full mastery in the use of PLC is a completeness or skill that needs to be present in every student majoring in electrical technology, especially to explore the world of organization in the industrial field in the future. With that, local universities, polytechnics and colleges Malaysia have provided programming workshops equipped with PLC to give sufficient training to its students so that the students produced are meeting the needs of the industry.

Thus, the problems faced by the local universities, polytechnics and colleges Malaysia have provided programming workshops equipped with PLC to give the best training to its students so that the students produced are meet the needs of the industry. This is to ensure that students can master theoretical knowledge as well as practical skills. This is especially important when this practical learning in PLC programming is a different way of learning from the traditional way, it involves expensive and limited equipment, safety issues that need attention as well as the need for a lot of and continuous training and skills.

3. METHODOLOGY

A project design should be carried out to give a clear picture of the model of the teaching kit being developed. This process will be repeat till a suitable design is found that can fulfill the needs of the teaching and learning process. After getting a suitable design, the process of building the learning kit is carried out. During the process, the reviewer will ensure that each function of the kit is functioning properly and efficiently. Once the kit has been built and tested for functionality, the next step is to develop training procedures for students so that they can use the kit easily and properly.

3.1. Implementation of Basic Learning Kit (PLC)

The implementation or function of this basic learning kit (PLC) starts with the teaching and learning process of electric motor and lamp control. The instructor will educate the students about the basic components of the PLC usability, namely the output motor is used to drive the gate and the lamp becomes a model of where to place the car. Therefore, the instructor will show how the plc is used and can facilitate the learning process while being able to understand the concept of using these components easily. The next teaching and learning will move on to the introduction to PLC as well as PLC programming. The instructor will use the PLC section for this purpose. The instructor will relate the use of PLC to control electric motors. Through this process, the instructor can expose students to the use of PLC in real industry.

Furthermore, it is the process of putting into practice the knowledge that students gain during the teaching and learning process. This practical involves installing a three-phase motor control circuit, building a ladder diagram and setting up a PLC to run the electric motor. This process allows students to learn PLC programming and use PLC themselves to control electric motors. Through practice, students have the opportunity to think widely and creatively to solve the given problems. They need to build PLC programming to control the motor according to the will of the given question. Therefore, various skills of using PLC and problem-solving skills.

Through the practical process, the lecturer can test the learner's understanding of magnetic base components and PLC programming. Therefore, the lecturer will make sure the learner understands what has been learned. If there are students having problems and lack of understanding, the lecturer will identify which part the student is having trouble with easily. If the student is having problems with the basic components of the PLC lecturer will teach using the manual part. If the problem is programming, the lecturer will use the PLC part while if the problem is in controlling the electric motor, lecturer will guide in the practical part. All the teaching and learning process as well as practical can be done by using such gate and lighting-PLC teaching kit.

3.2. Testing of component

The purpose of this test is to ensure the safety of the installation has been carried out according to the established rules so that the project functions properly and is safe to use. The tests carried out were the continuity test and the guessing test. Among the testing tools used are multimeter and insulation resistance tester. The purpose of the continuity test carried out is to ensure each component has continuity along the circuit. The tool used for this purpose is multimete (Ω). While the resistance test is to ensure there is no leakage current before being connected to the supply. This test uses a resistance tester meter (MΩ).

4. RESULTS & DISCUSSION

A comparative study has been made on the common PLC Learning Kit and the "PLC Training Kit" that has been developed. The study found that ordinary PLC Learning Kits have many problems compared to "PLC Training Kits" which have fewer problems because they are equipped with various systems. Table 1, Table 2 and Table 3 below shows the comparison:

Table 1: Comparative Study

No	PLC (Programmable Logic Controller)	PLC Training Kit
1	Does not have additional components such as sensors, motors, contactors and time relays	Has a variety of input and output components
2	Having a variety of input and output components PLC is limited to toggle switches and LED lights to show the operation of the entered program	PLC are able t be connected to components to expand student understanding

Table 2: A Comparative Study of Practice Time

No	Time	PLC Training Kit	Time
1	4 hours	Practical 1	2 hours
2	3 hours	Practical 2	1.5 hour

Table 3: Comparative Study Using PLC

No	PLC (Programmable Logic Controller)	PLC Training Kit
1	Students find it difficult to understand how to use PLCs, students find it difficult to understand existing PLC functions	Make it easier for students to understand about PLC through operational simulations that have been made
2	Students take quite a long time to understand the use of the existing PLC in the electrical workshop.	Students understand PLC learning faster and efficiently using PLC

5. CONCLUSION

Each project carried out has its own importance and objective. The same is the case with this "PLC Training Kit" project. Although many weaknesses were identified but the objectives for this project were successfully achieved.

Based on the results of the project analysis in creating and completing this project, it was found that this designed project can benefit students where it can help reduce problems especially difficult to understand the content of lessons delivered by lecturers teaching about PLC.

Finally, it is hoped that this project can be fully utilized, accepted, used and in accordance with the development of technology in this day and age and the results obtained from this project can meet the needs of all users.

6. RECOMMENDATION

To overcome the weaknesses of this project some suggestions have been made:-

a. Adding more safety aspects for example can be stored in a special container.
b. Designing a circuit that is more competitive, neat and orderly in terms of organization.
a. Adding various inputs and outputs

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Chapter 32
3KAT (Click, Cost, Cash Flow Calculator)

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ABSTRACT

Effective financial management is crucial for running a corporation. Microentrepreneurs often neglect this due to the excessively technical nature of the procedure. Research indicates that over half of the enterprises in Malaysia terminate their operations within 5 years of establishment due to inadequate financial management. This issue is primarily concerned with the precision of pricing, the accuracy of cost estimation, lack of documentation for cash transactions due to time constraints resulting from excessive focus on business operations, and the complexity of the existing accounting software, which may lead to the misconception that the business is profitable when it is actually incurring losses. The 3KAT application was created using an AppSheet app that follows the ADDIE model. The purpose is to assist entrepreneurs in efficiently calculating costs, setting sales prices, and accurately recording cash flow. This can be done easily and conveniently using a smartphone, without requiring any extensive accounting knowledge. Additionally, the application is capable in generating reports. The 3KAT application exhibits a notable degree of usability (Min = 3.7626) and impact (Min = 3.8088). The success of 3KAT is attributed to its ability to optimise time, reduce expenses, streamline human resources, boost revenue, enhance customer satisfaction, improve brand image, and increase productivity. This initiative significantly influences the enhancement of living standards, economic standards, educational standards, organisational image, and security levels. 3KAT has obtained copyright (No.: LY2023W01145) from MyIPO and has been replicated by several young entrepreneurs and lecturers of the Entrepreneurship and Business Plan Course. The replication has been done by others company and collaborators such as Baketubite Sdn. Bhd., Hanna Global Solutions, Felda Keratong 6 (Chanis), Muadzam Shah Vocational College, PMS Incubator Development Centre (IDC), and PUSPANITA. 3KAT has expanded its reach globally by participating in the Virtual Innovation Competition (VIC 2023) and presenting and publishing five research papers. Additionally, 3KAT was recognised as one of the 15 Best Practices Level National BiGS 2023 and received the Gold Award in the Kumpulan Kreatif & Inovatif Horizon Baru 2023 at the national level.

Keywords: 3KAT, “Click, Cost, Cash Flow Calculator”, young entrepreneur, micro-entrepreneurs.

1. INTRODUCTION

Precise financial data is crucial for businesses, particularly young entrepreneurs, when making significant decisions with financial consequences. These include establishing the discount rate, raising employee wages, expanding the number of branches, acquiring new machinery and equipment, securing bank financing, and various other factors. Problems

develop when the needed data cannot be easily issued and generated, particularly in sophisticated financial and accounting systems. Many entrepreneurs remain unaware of the distinction between their business's income and profit. Income is generated from the revenue obtained via product sales, whereas profit is the surplus obtained from deducting the cost of product purchases and other business operation expenses from the revenue. Micro, small, and medium entrepreneurs are inclined to document their sales on a daily basis and are regarded as the most straightforward to input into accounting software. This leads people to derive satisfaction from observing the daily generated revenue and mistakenly perceive it as their daily profit. Furthermore, there is a misconception regarding the expenses associated with the sale of goods. It is commonly believed that only the cost of items sold is considered an expense. However, it should be noted that expenses encompass not only the cost of goods sold but also the fixed costs incurred on a daily, weekly, and monthly basis. Fixed costs encompass various expenses such as rent for buildings, salary for employees, utility bills, company licences, and other similar expenditures, which may vary depending on the nature of the firm.

2. LITERATURE REVIEW

Smartphones are important devices that are extensively used in modern times. Given the high usage rate and attention-grabbing nature of mobile applications, educators should initiate a new effort to optimise their utilisation in the student learning environment. Smartphone and mobile applications have the ability to assist in learning transfer, regardless of the physical location of the learning.

In order to optimise the teaching and learning experience, it is imperative that the educational framework of Education 4.0 be in sync with technological advancements and cater to the needs of the present-day student population (Adnan et al., 2019). Communities often utilise mobile applications, regardless of their location, as these applications consistently generate interest. Khalid and Samad (2021) assert that mobile application development is viable and can be employed in the realm of education for instructional purposes. In order to ascertain its effectiveness, it is important to carry out research on its usability and the impacts of its utilisation.

Financial management is crucial for young entrepreneurs as it helps them make informed decisions by providing insights into the financial health of their organisation. This enables entrepreneurs to assess their present position and make strategic changes appropriately. Furthermore, it also supports the process of budgeting and forecasting, allowing entrepreneurs to allocate resources and strategize for future expansion. In addition, by offering insights into cash flow management, providing reporting and analysis, and implementing financial management practices, entrepreneurs can strengthen their decision-making capabilities (Owen, 2023).

Moreover, entrepreneurship involves the transformation of a concept into a functioning enterprise. Entrepreneurship aids young people, particularly Malaysian students, in navigating the challenging job market. Students are encouraged to establish businesses as an alternative to employment (Rajaendram and Menon, 2022). To increase the employment opportunities available to graduates, entrepreneurial skills should be encouraged. It is mandatory for the majority of Malaysian universities to offer an entrepreneurship course in order to foster the development of aspiring entrepreneurs. As opposed to seeking employment, the Malaysia Education Blueprint 2015–2025 (Higher Education) advises graduates to be innovative and entrepreneurial (Rajaendram and Menon, 2022).

Despite receiving government subsidies, financing, training, and consulting services, numerous entrepreneurs fail. The likelihood of survival for the enterprises of young

entrepreneurs is low, as stated by the OECD (2020). Considering that nearly 90% t of young entrepreneurs' report that their businesses have experienced a decline, with 25% being forced to close, it is necessary to identify the factors that motivate them.

Entrepreneurs require financial expertise. Budgeting, financial statement analysis, cash flow management, pricing and profitability determination, financial forecasting, and taxation can all be facilitated by financial knowledge. To ensure cost coverage and profitability, entrepreneurs must possess a comprehensive understanding of pricing and profitability (Rai et al., 2019). It is imperative to comprehend the impact of pricing decisions on profitability, in addition to taking competition and market demand into account.

3. METHODOLOGY

Reiser and Dempsey (2007) define the design model as a methodical procedure encompassing learning and achievement analysis, application design, development, implementation, and evaluation in the creation of technological resources. In its design, the 3KAT application utilises the ADDIE model. Because it is one of the instructional design models that functions as the foundation for other instructional design models (Jamaluddin & Zaidatun, 2003), the researcher selected the ADDIE model.

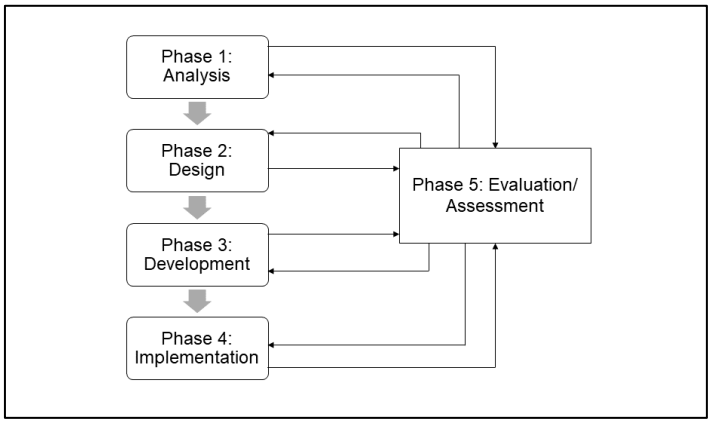

Figure 1: The Development Process is based on the ADDIE model (Gagne, Wager, Golad, & Kaller, 2005)

4. RESULTS AND DISCUSSION

4.1 Usability Assessment of 3KAT

The calculated average mean value for usability evaluation aspects of the user-friendly 3KAT application is 3.7626, which is a significantly high value. This indicates that, with a mean score of 3.7647, respondents agreed that 3KAT is user-friendly and capable of displaying information instantly. Additionally, users have the ability to repeatedly compute costs and prices (3.8529), and the process of controlling is relatively quick (3.7059).

Table 1: Evaluation of Usability

	Item	Mean	SD	Result
1.	3KAT is easy to use	3.7647	0.42734	High
2.	3KAT can be used without help from others	3.7059	0.49047	High
3.	3KAT displays information immediately	3.7647	0.42734	High
4.	3KAT takes a short time to control	3.7059	0.45903	High
5.	Users can use any menu at any time	3.7794	0.41773	High
6.	Users can calculate costs and prices repeatedly	3.8529	0.39643	High
7.	Users are free to leave the application at any time	3.7647	0.42734	High
	Average	3.7626	0.29681	High

4.2 Impact of Implementing 3KAT

Furthermore, when evaluating the impact of implementing 3KAT, the results (Table 2) indicate a higher average mean of 3.8088. The participants acknowledged that 3KAT significantly reduces the time required for usage (3.8676) and facilitates users in determining the expenses associated with their business and product (3.8088). In addition, the use of 3KAT facilitates the generation of cash flow, particularly for their day-to-day transactions (3.8235).

Table 2: Assessment of the impact

	Item	Mean	SD	Result
1.	3KAT saves usage time	3.8676	0.34139	High
2.	3KAT saves expenses	3.7794	0.41773	High
3.	The use of 3KAT helps users identify the costs involved	3.8088	0.39615	High
4.	The use of 3KAT helps users set the selling price	3.7647	0.42734	High
5.	The use of 3KAT helps users provide cash flow	3.8235	0.38405	High
	Average	3.8088	0.31182	High

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Chapter 33
MFRS 140 Investment Property Learning through Gamification – "Challenge of MFRS140: PropertyQuest Game"

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ABSTRACT

Gamification and game-based learning (GBL) are effective teaching and learning strategies that can meet the needs of various learning contexts.This study aims to investigate the effects of gamification on students' understanding of MFRS 140 Investment Property. The innovative new Challenge of MFRS 140: PropertyQuest Game App can help you quickly and easily learn specific financial accounting reporting standards in a single day. The recognition, measurement, disposal, and financial statement presentation of the MFRS 140 Investment Property are all included in this game. This study also provides insights into how learning theory may be applied to understand gamification-based training systems. Surveys have been used to discover students' opinions about gamified learning. This study came to the conclusion that "meaningfulness" was essential for maintaining students' interest and achieving superior learning outcomes based on the survey data. Therefore, it is believed that game-based learning is more effective, quicker, and easier to use than long accounting rules or written handouts. Students are encouraged to study wherever they are because there is no time limit on using the games, which are constantly available. It is highly likely that students seeking accounting help will find the Challenge of MFRS 140: PropertyQuest Game App to be a compelling choice.

Keywords: gamification, investment property, point, badges, redemption of points.

1. INTRODUCTION

According to MFRS 140, investment property is defined as land, buildings, or portions of buildings that are held (by the owner or the lessee under a finance lease) for the purpose of capital appreciation or rental income rather than (a) use in the production or supply of goods or services, administrative needs, or sales made in the regular course of business. This chapter was incorporated into Financial Reporting 4, a standard that is extensively applied globally. The standard covers the following topics: definition, recognition, measurement both at and after recognition, transfer, disclosure, and asset disposal.

One of the most difficult topics in Financial Reporting Four was MFRS 140 Investment Property, which was a fundamental subject. This course served as a prerequisite for Financial Reporting 5, and failure in it could prevent a student from graduating on time or force them to carry the course over to a later semester. A solution to address the typical difficulties students encounter when learning about investment property is the "Challenge of MFRS 140: PropertyQuest Game App". Conventional teaching methods frequently fall short of offering students relevant and hands-on experiences that help them understand the difficult subject. The examination results for the two prior semesters in a row are analyzed in Table 1 below.

Table 1: Result Test of Financial Reporting Four

Semester	Number of students	Percentage of fail (%)
February – August 2023	82	51%
October 2022 – January 2023	48	31%

Based on the result above, it can highlighted that this subject were one of the tough core subject which 51% of the students fail their test for the current semester and 31% of the students were fail in the previous semester. Gamification learning is one the innovation in teaching and learning that hopes to improve the student performance in the future semester.

Many studies have recognized that gamification research is largely concentrated in the domains of education and learning (Seaborn and Fels, 2015; Kasurinen and Knutas, 2018; Koivisto and Hamari, 2019). Indeed, as recently noted by Bayuk and Altobello (2019, p. 953), "academic research has only begun to explore what characteristics of the new technologies, including game features or incentives, are most effective in motivating the students to embark a new methodology of learning. This game will facilitate the learning process of students in higher learning institution through the adoption of gamified learning using MFRS 140 Investment Property. The participants of this gamification study were the students in the age group 19-20 years among accounting undergraduate students of UiTM Perak Branch. Indeed, Bayuk and Altobello (2019, p. 953), "academic research has only begun to explore what characteristics of the new technologies, including game features or incentives.

2. LITERATURE REVEIW

Previous generations preferred learning through lectures, faculty contact, relating learning to personal experiences and considered assignments as being essential to acquire the degree (Johnson and Romanello, 2005). Since millennials prefer learning in collaborative environments, enjoy the use of technology (Alexander and Sysko, 2013) and like class activities to be experiential as well as entertaining, the traditional pedagogies do not find favour with millennials (Gupta and Goyal, 2018). New pedagogies like gamification have been used in several environments such as commerce, health/sports, data gathering, sustainable consumption, innovation, work and education/learning (Koivisto and Hamari, 2019). Thus, for achieving learning outcomes, the educators' pedagogies should resonate with millennials' learning styles.

Gamification applies motivational design to persuade individuals to behave in certain ways. The Technology Acceptance Model (Davis, 1989) proposed that individuals' attitudes toward specific technologies are predicted by two key variables: perceived usefulness and ease of use. Perceived usefulness relates to the user's belief that a system will boost his or her performance, while perceived ease of use refers to the user's belief that using a system will not require extra effort (Davis, 1989). Previous research has shown that perceptions of ease of use and usefulness are influenced by users' motivations to use systems (e.g. Sun and Zhang, 2006). When users enjoy operating technology and find it entertaining and

motivating, they tend to perceive it as easy to use and to find it useful (Laumer et al., 2012).

Educators have integrated game-like in the form of simulations and gamification in their pedagogies and virtual learning environments (Rigby and Ryan, 2011). Gamification and learning outcomes. Studies that investigate the impact of gamification on learning reveal contradictory results (Dicheva et al., 2015). Some find a positive effect of gamification on learners' performance (Groening and Binnewies, 2019; Koivisto and Hamari, 2019). Gupta & Goyal (2021) study suggest that the group that underwent the course with the game based pedagogy had better learning outcomes. In the game design, this study found that the addition of "meaningfulness" to the game elements improved the engagement with the gamification process for the learners. Consequently, this study found that "meaningfulness" played an important role in engaging the students, thereby, leading to improved learning outcomes.

In gamification, numerous game elements have been applied in the context of games. Point, badges, leader boards and redemption of point are the important element integrate into gamification. Points are quantifiable rewards that can be collected by doing certain activities. They have been implemented in gamified settings to reward achievements (Zichermann and Cunningham, 2011), to quantify a player's advancement and for comparison with competition and to get feedback on participant performance (Sailer et al., 2017). Badges are different from points as they are not quantifiable but are more of a status symbol. Players can earn badges on demonstrating some degree of task proficiency (Koivisto and Hamari, 2019) leading to increased self-worth. Leaderboards are a visual representation of the relative position of the students vis-a-vis their classmates. Leaderboards motivate as they provide social competition, give a chance to lead, garner attention and achieve status (Zichermann and Cunningham, 2011). Redemption of points observed that certain people do not value points or badges highly over time and that they eventually expect to redeem them for some tangible benefits. Studies, although mostly in the non-education context, have found redeemable points to be a highly engaging gamification mechanic. In an education context, instructors could integrate redemption of points into the game design by making them redeemable for course material, items, toys and game software as this may enhance course participation (Chang and Wei, 2016).

3. HYPOTHESIS OF GAMIFICATION OF MFRS 140 INVESTMENT PROPERTY

Gamification will only have the desired benefits if learning activities and game components are mapped to specific psychological demands while building the course. The integration of all points, badges, leather boards, and point redemption is present in this MFRS 40 Investment Property game. It is assumed that since players receive badges and points for finishing specific tasks, they have become proficient in the subject matter covered in those tasks. Leader boards and badges link this gaming aspect to the subject's competence by displaying the player's degree of proficiency in the group as a whole. Engaging in activities together might generate enjoyable memories and experiences that enhance the sense of relatedness (Sailer et al., 2017). Millennials prefer to have control over when, how, and what they learn (autonomy/relatedness), as well as competency. We hypothesize that:

H1. The use of gamification addressing psychological needs leads to better learning outcomes.

4. RESULTS

To find out if students could switch to a different type of learning, an online survey was done. Figure 1 shows that the majority of accounting students (92.5%) favored using digital learning tools like computers and cell phones. The Challenge of MFRS 140: PropertyQuest Game App

were discovered to be the ideal instrument for aligning with students' learning styles in classes because this GBL may be efficiently supported by laptops and cell phones.

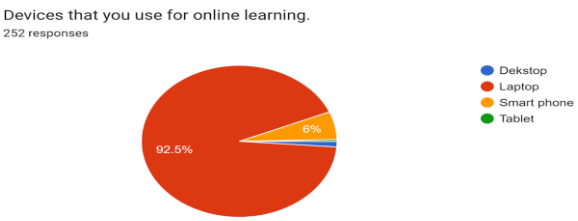

Figure 1: Devices choice for online learning

Table 2 shows that the majority of accounting students (39%) preferred learning through educational games and also through videos. The reason why students seem to prefer these kinds of learning resources is most likely that the interactive aspects make it simpler for them to understand and commit to memory all of the accounting learning objectives, including categorization, recognition, measurement, presentation, and disclosure.

Table 2. Analysis of Preferred Learning Tools

Preferred learning tools	Frequency	Percentage
Game-based learning	356	39%
Videos	296	32%
Digital Flashcards	268	29%

5. CONCLUSION

Introducing a dynamic tool that has the potential to completely transform accounting education: the “Challenge of MFRS 140: PropertyQuest Game App”. Students can learn the complicated principles of MFRS 140 with a practical and visual approach by using this interactive program, which focuses on the identification and measurement of investment property. The app improves students' comprehension of accounting principles by immersing them in visual scenarios. It offers an interesting and engaging alternative to conventional teaching techniques. The “Challenge of MFRS 140: PropertyQuest Game App” is expected to become an essential tool for students seeking to understand the fundamentals of MFRS 140 Investment Property because of its interactive nature, which will provide a fun and enlightening experience.

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Chapter 34
Mastering Problem-Solving in Programming Using PS Mono Games

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ABSTRACT

This innovation is created to assist students in enhancing their problem-solving programming skills for the first three sub-topics of the second-semester Computer Science course in the Matriculation Program. These sub-topics are fundamental for students to master in order to write program code for the subsequent sub-topics. The game is introduced because students find it challenging to identify input, process, and output based on the given problems. Additionally, traditional learning methods make students feel bored. This topic is also new for a significant number of students. The primary goal of PS Mono Games is to establish interactive and cheerful learning, encouraging self-directed learning among students. Furthermore, the game indirectly helps students master the three main topics of this course. By mastering these topics, students can more easily understand and command subsequent topics. The game is developed based on a modified version of the Monopoly game. It can be played in groups or individually (up to four players). There are 30 stations on the game board, where each student station requires answering questions related to the focused topics of this innovation. All players need to roll the dice and move according to the numbered sequence on the game board. Questions are randomly arranged according to four different colours. On the game board, there is also a QR Code linking to interactive concise notes as a reference for students. If a student cannot answer a question correctly, the player must reroll the dice and move backward according to the obtained number. This game is also suitable for use in other courses by simply changing questions and notes based on the course topics. Therefore, PS Mono Games is suitable for commercialization in all educational institutions. Using this game, students can answer questions while playing repeatedly, making learning enjoyable and aligned with the concept of self-directed learning.

Keywords: Programming, Interactive Learning, Problem Solving, Game-Based Learning.

1. INTRODUCTION

PS Mono Games is an innovative approach designed to boost problem-solving programming skills for Matriculation students in the second-semester Computer Science course. It

effectively engages students by addressing challenges in understanding input, process, and output elements in programming problems, particularly in the crucial initial topics.

PS Mono games aims to make learning more exciting and interactive by focusing on key programming topics. The overall goal is to create a lively educational environment that encourages students to take charge of their own learning.

Inspired by the classic Monopoly game, PS Mono Games accommodates both group play and individual exploration for up to four players. The game unfolds on a board with 30 stations, each posing questions related to core curriculum topics. Random question arrangements, distinguished by colours, add an element of unpredictability. QR codes on the game board link to interactive, concise notes for student reference.

The game strategically introduces setbacks for wrong answers, requiring a reroll and a move backward. Not just for Computer Science, PS Mono Games can easily be used in different educational programs. Customizing questions and notes makes it suitable for widespread use across institutions, promising a broad impact.

PS Mono Games allows students to learn programming with joy by blending gameplay with educational content. This innovative approach, rooted in programming, interactive learning, problem-solving, and game-based education, highlights unique features and versatile applications.

2. LITERATURE REVIEW

PS Mono Games is adaptable for use in problem-solving programming. This review explores its unique features and potential applications in programming, interactive learning, problem-solving, and game-based education.

PS Mono Games revolutionizes Computer Science education by enhancing problem-solving skills, drawing inspiration from game-based learning literature. Aligning with Huizenga et al.'s (2017) findings on mobile game-based learning, PS Mono Games introduces engagement, motivation, and improved learning outcomes. Additionally, it echoes Hwang et al.'s (2018) insights into interactive learning environments, emphasizing dynamic and collaborative spaces. The use of QR codes and technology integration in PS Mono Games aligns with Tondeur et al.'s (2020) focus on educational technology acceptance. Fostering self-directed learning, the game resonates with Tsai and Tsai's (2020) exploration of web-based self-directed learning. Ertmer and Ottenbreit-Leftwich's (2013) discussion on technology-enabled learning obstacles supports the innovative use of QR codes. Liu et al.'s (2020) emphasis on motivation and engagement in game-based learning literature aligns with PS Mono Games' goal. While Lye and Koh's (2014) review on teaching computational thinking doesn't directly relate, it contributes to the broader pedagogical strategies in programming education literature, providing insights into effective approaches.

PS Mono Games innovatively integrates these principles, providing a dynamic solution for enhancing problem-solving programming skills. Through its engagement strategies, use of QR codes, and adaptability, PS Mono Games addresses key aspects identified in the literature. It bridges gaps in traditional teaching methods, offering a promising avenue for fostering an interactive, lively, and self-directed learning environment in computer science education. The game not only aligns with current educational trends but also opens new possibilities for widespread commercialization and impact across diverse educational programs.

3. METHODOLOGY

The methodology employed in the development of PS Mono Games embraced the principles of Kurt Lewin's three-step change model within the framework of action research. In the unfreezing phase, a thorough examination of the Matriculation Program's second-semester Computer Science curriculum identified areas where improvements were needed, setting the stage for transformative action. The changing phase involved the iterative design and development of PS Mono Games, drawing on action research principles to implement modifications in response to ongoing feedback and reflection. This process facilitated continuous improvement, ensuring the game's alignment with identified learning objectives. Pilot testing in educational settings served as a crucial action research step, allowing for real-time observation and feedback collection from students and educators. This data was then systematically analyzed to inform further refinements in the game's design. The refreezing phase encompassed the consolidation of positive outcomes and the finalization of the game's structure based on the insights gained from the action research process. This methodology, rooted in the synergy of Kurt Lewin's change model and action research, provided a structured and responsive approach to the development of PS Mono Games, ensuring its effectiveness as an innovative educational tool.

4. RESULTS & DISCUSSION

The results of the study demonstrated a notable improvement in students' performance following the implementation of PS Mono Games. Quantitative data indicated a statistically significant increase in problem-solving programming skills among participants.

After participating in the PS Mono Games, 22 students took a pop quiz during a tutorial class, revealing significant improvement in their programming skills. Impressively, 14 students achieved a perfect score of 35 out of 35, showcasing a comprehensive understanding of the material. Another 7 students performed well, scoring between 30 and 34. While the majority excelled, one student obtained a score of 24 out of 35, indicating a range of proficiency levels. Overall, the results demonstrate the positive impact of the PS Mono Games experience on students' performance, with a significant number mastering the material and showcasing enhanced problem-solving abilities during the quiz.

The engagement strategies, utilization of QR codes, and the adaptable nature of PS Mono Games were found to be crucial contributors to this improvement. Not only did the game effectively address the challenges outlined in the literature, but it also provided a dynamic and interactive learning environment that resonated well with the students. The discussion further delves into the observed positive correlation between active participation in the game and enhanced comprehension of programming concepts.

5. CONCLUSION & RECOMMENDATION

In conclusion, the development of PS Mono games represents a noteworthy advancement in addressing the challenges associated with teaching problem-solving programming skills in the matriculation program's second-semester computer science course. By infusing elements of game-based learning and interactivity, PS Mono games introduces a dynamic and engaging approach to mastering foundational concepts. The integration of a modified monopoly game structure, randomized question arrangements, and QR codes linking to interactive notes contributes to a multifaceted learning experience. The positive outcomes observed during pilot testing underscore the potential impact of this innovative educational tool in enhancing student engagement and comprehension. As a recommendation, further

research and longitudinal studies could be conducted to assess the long-term effectiveness of PS Mono games in improving students' programming skills and retention of knowledge. Additionally, collaboration with educators and continuous refinement of the game's content based on evolving curriculum requirements would ensure its relevance and applicability across diverse educational settings. The adaptability of PS Mono games for use in various courses underscores its potential for widespread adoption, encouraging its consideration for integration into other institutions seeking effective, interactive, and enjoyable learning solutions. Overall, PS Mono games stands as a promising initiative that bridges the gap between traditional teaching methods and the evolving needs of modern programming education.

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Chapter 35
Assessing User Perceptions on the Directory in the FYP Ecosystem Hub

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ABSTRACT
This study explores user perceptions of the directory feature in the FYP Ecosystem Hub—a centralized platform aimed at enhancing collaboration among students, supervisors, and stakeholders in Final Year Projects (FYPs). Through a WhatsApp poll, responses were gathered from 360 students across various tracks, focusing on the directory's utility in accessing past FYP titles. The unanimous agreement of 155 participants underscores the platform's effectiveness in simplifying access to the historical FYP title directory. The results offer insights into user experiences, highlighting the platform's impact on information retrieval within the FYP ecosystem.

Keywords: Final Year Projects, FYP, website, directory, poll

1. INTRODUCTION

The final year project (FYP) title directory is a platform that serves as a repository for FYP titles completed by students in various academic institutions. The primary purpose of this directory is to provide a centralized location where students can access previous FYP titles for reference and inspiration (Norhiqmah, 2012). One potential benefit of such a directory is the reduction of title redundancy for future students (Banda & Ganda, 2020).

FYP title directories play a crucial role in academia by providing a comprehensive collection of previous FYP titles across different disciplines. These directories serve as valuable resources for students, enabling them to explore a wide range of topics and themes that have been previously researched. By accessing these repositories, students can gain insights into the scope of research conducted in their field of study, which can help them in formulating unique and original research ideas (Malik et. al, 2018).

2. LITERATURE REVIEW

Title redundancy is a common issue faced by students when selecting topics for their FYP (Norhiqmah, 2018). Without access to a centralized database of previous FYP titles, students may inadvertently choose topics that have been extensively researched or are similar to existing projects. This can lead to duplication of effort and limited originality in research endeavors. Furthermore, title redundancy may also impact the diversity and breadth of research topics explored within an academic institution.

The purpose of an FYP title directory is to provide students with a centralized list of available project titles for their Final Year Project (FYP). This directory serves to reduce title redundancy for future students by offering a wide range of project titles for selection, thereby minimizing the likelihood of multiple students choosing the same project. Additionally, the FYP title directory facilitates the title selection process, enabling students to explore, select, and propose unique and well-defined project titles. It also assists supervisors and FYP committees in managing and publishing project titles for students to choose from. Overall, the FYP title directory works as a centralized resource to enhance the efficiency and effectiveness of the FYP title selection process (Yau, 2011).

Apart from that, the availability of an FYP title directory can significantly contribute to reducing title redundancy among students. By providing easy access to a wide array of previously completed FYP titles, students can conduct thorough searches to ensure that their chosen topic is unique and has not been extensively explored before (Kum, 2013). This can foster originality and innovation in research projects, ultimately enhancing the quality and diversity of academic contributions.

For future students, the existence of an FYP title directory can be invaluable. It empowers them to make informed decisions when selecting their research topics, thereby minimizing the likelihood of duplicating previous work. Additionally, it encourages students to delve into unexplored areas and address emerging issues within their respective fields, leading to a more dynamic and progressive academic environment (Bakri et al., 2023).

In a nutshell, the establishment of an FYP title directory holds promise in mitigating title redundancy for future students undertaking research projects. By leveraging such repositories, students can benefit from a wealth of knowledge and experiences, ultimately fostering originality and diversity in academic pursuits.

3. METHODOLOGY

A quantitative research approach was employed to assess the perceived effectiveness of Google Sites as a tool for accessing the Final Year Project (FYP) title directory. The study utilized a cross-sectional design, collecting data at a specific point in time from participants across three academic tracks.

A sample of 360 students from three different academic tracks participated in the study. Participants included both current and past Final Year Project students who had interacted with the FYP title directory through Google Sites.

Data was collected through a structured WhatsApp poll distributed among the participants. The poll posed a single question: "Does Google Sites FYP help me check the directory of previous FYP titles?" Participants responded with either "Agree" or "Disagree." The use of a single-question poll aimed to gather specific feedback on the perceived utility of Google Sites for accessing the historical FYP title directory.

Quantitative data analysis was employed to interpret the poll results. The total number of responses, as well as the distribution of "Agree" and "Disagree" responses, were analyzed. Descriptive statistics, including percentages and frequencies, were used to provide an overview of the participants' consensus regarding the effectiveness of Google Sites for accessing the FYP title directory.

4. RESULTS

The results of the WhatsApp poll, conducted among 360 students from three academic tracks, provide valuable insights into the perceived effectiveness of Google Sites for accessing the Final Year Project (FYP) title directory.

4.1 Participation and Responses

Out of the total participants, 155 responded to the poll. All 155 responses indicated agreement ("Agree"), and none of the participants expressed disagreement ("Disagree") with the statement: "Does Google Sites FYP help me check the directory of previous FYP titles?"

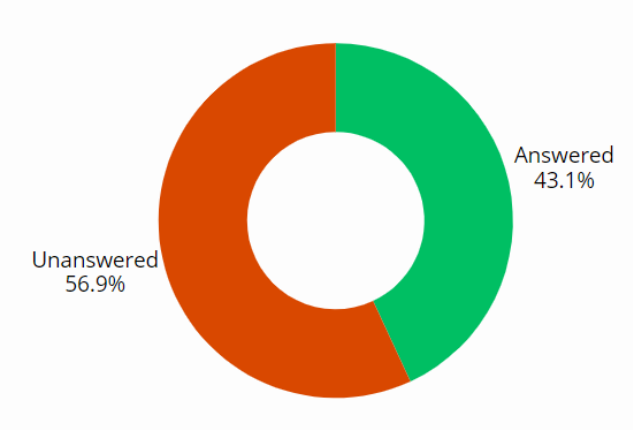

Figure 3: Poll responses percentage

4.2 Consensus View

The unanimous agreement among respondents suggests a consensus view among students who have interacted with Google Sites for accessing the FYP title directory. The absence of any dissenting opinions further reinforces the perception that Google Sites is considered a useful tool for this purpose.

4.3 Quantitative Overview

The quantitative data reflects a 100% agreement rate, indicating a strong positive response to the utility of Google Sites in simplifying access to the historical FYP title directory. While the sample size represents a portion of the student population, the overwhelming agreement provides a clear quantitative perspective on the perceived effectiveness of Google Sites.

Figure 2: Poll results

4.4 Implications

The poll results suggest that Google Sites is well-received by students for accessing the FYP title directory, aligning with the research objective of evaluating its effectiveness. The consensus view indicates a positive impact on user experience and usability, emphasizing the potential of Google Sites as a valuable tool in the context of Final Year Projects.

4.5 Limitations

The study acknowledges that the results are based on a subset of the student population, and further research could explore the experiences of a more diverse group. The exclusive reliance on quantitative data might overlook nuanced aspects that qualitative research could uncover.

The results affirm a unanimous positive perception among students regarding the effectiveness of Google Sites for accessing the FYP title directory. This quantitative evidence lays the groundwork for further exploration and underscores the potential of Google Sites as a valuable resource within the context of Final Year Projects.

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Chapter 36
VOTRaC LexiPlay: Innovating Vocabulary through Card Games

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ABSTRACT

The essence of a language lies in its vocabulary, encompassing not only individual words but also their structure, significance, and application. Little can be conveyed without grammar, but nothing can be conveyed without vocabulary knowledge. People can improve their vocabulary in several ways, including by reading extensively. Exposure to unfamiliar words in books and magazines allows for gradual incorporation into speaking and writing. Teachers, who are constantly looking for useful resources, frequently use educational games to facilitate students in learning new languages and expand their vocabulary. In this project, VOTRaC LexiPlay is used to convey the idea of learning vocabulary through playful card games. "LexiPlay" is a portmanteau of "Lexicon" (which refers to vocabulary or word choices) and "Play" (indicating the element of fun and engagement through games). “Innovating vocabulary" refers to using creative approach to rekindle vocabulary growth and learning. The goal is to bring innovation to the traditional method of vocabulary learning, using card games, making the learning experience engaging, effective, and enjoyable.

Keywords: Card Games, Vocabulary, Vocabulary Learning, VOTRaC LexiPlay

1.0 INTRODUCTION

Vocabulary is the core or heart of a language. It deals more than a single word – it is about its form, meaning and use. Grammar is necessary for communication, but vocabulary knowledge is essential whereby nothing can be conveyed without vocabulary. As cited in Lukas et al. (2020), “Vocabulary is an essential component of language proficiency and acts as foundation for learners to communicate with each other” (Khoii & Sharififar, 2013, p.199). Therefore, teaching vocabulary to the language learners helps them to understand other people and communicate with one and another.

VOTRaC LexiPlay is inspired by popular card games such as UNO and Happy Family. It focuses on vocabulary learning, with each player answering the questions on the card to win the game. The questions are based on numerous selected themes including *People, Flora & Fauna, Transportation, Tools & Kitchen Utensils, Health & Food,* and *Planet & Earth.* The selection of the themes is appropriate for intermediate level school students. The questions are designed according to the lowest level of Bloom’s Taxonomy, Knowledge. Each theme

has different amount of reward (refer Figure 2.0). The items in VOTRaC LexiPlay box and its manual on how to play can be found in Figure 1.0 and 2.0.

The VOTRaC LexiPlay card game offers three key benefits. Firstly, it serves as a valuable tool for building and expanding students' vocabulary knowledge. Since this game focuses on various and authentic themes related to how individuals live their lives, students or players are introduced to new vocabulary that they may not have met before. Secondly, it functions as an effective teaching aid, enhancing student engagement and making lessons more entertaining. Lastly, the product promotes communicative language teaching in the classroom, encouraging real communication through meaningful tasks based on authentic life experiences. The game facilitates language learning by incorporating listening, reading, and communication skills development.

2.0 LITERATURE REVIEW

Teaching young learners poses its own challenges. As educators, it is imperative to employ diverse methods and approaches to ensure that lessons effectively attain their objectives. To create an effective language learning environment, teachers should focus on generating enjoyable activities, fostering a comfortable atmosphere to encourage student participation without fear of mistakes (Raskova Octaberlina & Fitri Anggarini, 2020). In addition, incorporating action, visuals, real-life examples, and gestures is crucial, recognizing that young learners enjoy games, songs, and storytelling.

Games serve as valuable educational tools that teachers can employ for learning and expanding vocabulary knowledge. They are not only enjoyable and engaging but also versatile in teaching a variety of skills and concepts. Games come in diverse formats, including digital (video and mobile) and tabletop (card and board games). Incorporating games into language learning offers numerous benefits, encouraging social interaction, requiring a short playtime, and involving low costs (Abd Karim et al., 2018).

Many previous studies demonstrated that card games can be effective in language learning. Games are useful in vocabulary learning because they "usually involve friendly competition and create cooperative learning environment for the pupils" (Derakhshan and Khatir, 2015 as cited in Ni et al., 2020). Apart from fostering a cooperative learning atmosphere and stimulating active participation among students, card games have also been shown to help students remember the spelling and meanings of vocabulary better (Ni et al., 2020). Communication among learners during game-based activities demonstrates their enthusiasm and active participation in the learning process.

Meanwhile, Wang et al. (2011) claimed that games are more beneficial to children with lower levels of vocabulary acquisition proficiency. One primary reason of incorporating games in the classroom is to assist students learn English within a lowered anxiety environment. They also added that games can enhance children's motivation, facilitate vocabulary acquisition, and alleviate anxiety arising from peer pressure. Thus, these indicate the potential benefits of using card games as a tool for language learning, specifically in the areas of vocabulary acquisition and retention.

3.0 METHODOLOGY

In this research, the researchers used a quantitative method to gain information about the students' perception of the game, VOTRac LexiPlay. A primary data collection method was used in this study to obtain more extensive information about this innovation.

3.1 VOTRaC LexiPlay Materials and Game Procedure

The VOTRaC LexiPlay game box consists of dice with themes, 6 stacks of cards with themes, a set of Pictionary and a manual. Each theme has various levels of difficulty ranging from the easiest to the hardest. The themes start from *People, Flora & Fauna, Transportation, Tools & Kitchen Utensils, Health & Food,* and lastly *Planet & Earth.* Each level is equivalent to a certain value for money: level 1 is RM 1, level 2 is RM 5, level 3 is RM 10, level 4 is RM20, level 5 is RM 50, and level 6 is RM 100. The procedure of the game is as follows.

i) The game is played by four players (A, B, C, D) or more. One player acts as the banker or facilitator while the others are the game players.
ii) Player A starts by throwing the dice to determine the theme.
iii) The banker reads a question based on the theme Player A gets.
iv) If Player A answers the question correctly, the card and the reward of money note at the back can be kept. However, if Player A cannot answer the question, the banker will give the correct answer and the reward is burnt. The game continues with Players B, C and D.
v) The winner of the game is determined by the highest reward one collects.
vi) A set of Pictionary is provided to help players know the meaning and pronunciation of the words.

Figure 1: VOTRaC LexiPlay

Figure 2: List of items and manual

3.2 Data Collection Techniques and Instruments

To identify the effectiveness of the game on students, the game is administered and played by thirty (30) Form Two students from SMK Seri Tapah, Tapah, Perak. Once they have finished playing the card game, they must answer a questionnaire about it. The questionnaire consists of ten (10) Yes or No questions, and one (1) Open-ended question. The questionnaire asked about the structure and design of the gameplay, the effectiveness of the game in learning English and English vocabulary, and the difficulty level of the questions. Lastly, it is followed by a question on suggestions to improve the game.

4.0 RESULT & DISCUSSION

Table 1 Data Collected from Questionnaire (*n* = 30)

Statement	Agreement	
	YES *n* (%)	NO *n* (%)
1. is the game interesting and fun?	30 (100)	0 (0)
2. Are the rules of the game clear?	30 (100)	0 (0)
3. Does the game motivate you to learn English?	30 (100)	0 (0)
4. Does the game motivate you to use English?	25 (83.3)	5 (16.7)
5. Are the questions challenging?	27 (90)	3 (10)
6. Do you like the interaction with the player when playing the game?	30 (100)	0 (0)
7. Does the game encourage teamwork?	30 (100)	0 (0)
8. Is the design/layout of the card game interesting?	30 (100)	0 (0)
9. Does the game help you to have better understanding in vocabulary?	30 (100)	0 (0)
10. Do you want to continue your English learning using this kind of game?	30 (100)	0 (0)

Based on the survey completed by the students, the findings show that the respondents have positive reviews regarding the game. In terms of the gameplay, all 30 respondents agreed that VOTRaC LexiPlay was interesting and fun (100%), the rules of the games were clear (100%), the design and layout of the game were interesting (100%), and the questions asked in this game were challenging for them (90%). The respondents agreed that the game provided them with a better understanding of vocabulary (100%). The respondents also agreed that it motivates them to learn (100%) and use (83.3%) English, they enjoyed the interaction that occurred during the gameplay (100%), and the game encouraged teamwork (100%). The respondents wished to continue learning English using this game (100%).

Recommendations for improvements have been added by the respondents as well in making the game more interesting. Based on the questionnaire, the respondents commented about the value points given and the difficulty level of the questions. 6 (20%) of respondents suggested that the point value needed to be revised according to the level of difficulty, and 5 (16.7%) suggested for the questions to be made easier.

5.0 CONCLUSION & RECOMMENDATION

The use of card games, such as VOTRaC LexiPlay, was found to be effective in enhancing learners' vocabulary skills. The games encouraged students to interact with each other and participate actively in the learning of new vocabularies. The respondents showed positive responses, indicating that they learned and understood the vocabulary better through the

games. Additionally, the games created a cooperative learning environment and motivated the learners to improve their English vocabulary. Overall, the card games were successful in promoting meaningful experiences and enhancing the students' vocabulary skills.

Upon presenting this product at the previous innovation competition and testing it with school children, several suggestions for improvement emerged. It is recommended by the jury that the Pictionary be replaced with a QR code. This modification would allow for the inclusion of not only pictures and meanings but also pronunciation, providing students with comprehensive reference material. Additionally, more questions should be prepared for each theme, and the selection of vocabulary must align with the school textbook and syllabus.

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Chapter 37
Transformative Integration: The E-Ordering System Revolutionizing Education at Kuala Selangor Vocational College

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ABSTRACT

In the realm of education, the infusion of technology is reshaping traditional practices, aiming to enhance efficiency and organization. A notable example of this transformative shift is witnessed in the Bakery and Pastry Program at Kuala Selangor Vocational College; also known as Kolej Vokasional Kuala Selangor (KVKS), where a pioneering approach has been adopted to address the challenges of order management and data accuracy. The e-Ordering System, an innovative solution, was introduced not merely to expedite processes but also as a conscious effort to reduce environmental impact by substituting paper-intensive methods with digital alternatives. This integration goes beyond the mere utilization of technology; it signifies a significant evolution in educational practices. The e-Ordering System, functioning as more than just a tool, symbolizes the harmonious synergy between education and technology. Its role is to simplify complexities, providing an enriched learning experience for all involved in the Bakery and Pastry Program. Thorough testing has been conducted to ensure the system's functionality, assuring its seamless operation. This transformative change isn't just about using computers; it represents a fundamental shift in the educational paradigm. It's not only about convenience but also a thoughtful consideration of its environmental impact. The e-Ordering System serves as a beacon, demonstrating how education and technology can collaborate to streamline tasks and improve the overall learning experience for everyone associated with the Bakery and Pastry Program.

Keywords: Kolej Vokasional Kuala Selangor (KVKS); e-Ordering System, Bakery and Pastry

1. INTRODUCTION

In the heart of the Bakery and Pastry Program at Kolej Vokasional Kuala Selangor; also known as Kuala Selangor Vocational College (KVKS), a pioneering paradigm shift unfolds as technology takes center stage to revolutionize the handling of orders and ensure data accuracy. In an era where traditional methods face the need for efficiency and environmental consciousness, this thesis explores the transformative impact of the newly introduced E-Ordering System. By substituting paper-intensive methods with digital alternatives, this innovative approach not only streamlines processes but also stands as a testament to the harmonious synergy between education and technology. The traditional landscape of order

management within the Bakery and Pastry Program has long grappled with challenges related to manual processes and data inaccuracies. This prompts us to ask if Education 4.0 will require a fundamental transformation in our approach to the design and delivery of teaching and learning, and the provision of smarter learning spaces, services and learning tools? Further, how, in this period of disruption, can Higher Education institutions plan to educate for the future? (Daanen & Facer, 2007, p. 3). Recognizing the need for a streamlined and environmentally sustainable solution, the integration of the E-Ordering System is a timely response to the evolving demands of modern education. This transformative change is not just about adopting a new tool; it symbolizes the harmonious synergy between education and technology. The E-Ordering System is designed to enrich the learning experience for all stakeholders involved in the Bakery and Pastry Program, fostering a collaborative environment that embraces the benefits of technological advancements. At its core, the integration of the E-Ordering System is driven by a commitment to providing an enriched learning experience. Beyond the practicalities of order management, the system is poised to positively impact the educational journey of both students and educators, setting a precedent for the integration of technology in vocational education. In the implementation of changes in TVET systems and policies, the quality of TVET organizational leadership has been at a moderate level. The impact of this moderate quality of TVET leadership has contributed to issues and challenges in the implementation of TVET education changes at College Vocational (Mat Nashir and Mustapha, 2017).

2. LITERATURE REVIEW

Technical and Vocational Education (TVET)

The vocational field provides opportunities for students with good or moderate academic achievements who are interested in vocational learning related to employment. The content of the vocational field has a balanced combination of theoretical and practical components. The objective of this stream is to help produce semi-professionals (technicians/technical assistants) in engineering and non-engineering fields. Upon completion of studies, students can pursue further education in public or private higher education institutions, public and private skills training institutes, or enter the workforce directly (KPM, 2019). The integration of technology in educational institutions has been a subject of extensive research.

Bakery and Pastry Program

This program offers students related to the production and preparation of bread, cakes, pastries, chocolates, desserts, donuts, buns, pizzas, creating and developing new and special recipes, as well as cost management and business in this field.

Ordering System

An ordering system is a structured process or set of procedures designed to facilitate the purchase or acquisition of goods or services. It plays a crucial role in streamlining the transactional aspects of various industries, including retail, e-commerce, hospitality, and more. The development of interactive technologies has led to customers being more active and engaged in different commercial activities, such as gathering information, comparing alternatives, purchasing, and providing reviews (Alalwan, 2020, pp. 28-44).

Waterfall Model

The waterfall model is the classical model of software engineering. It is referred as a linear-sequential life cycle model. In a waterfall model, each phase must be completed before the next phase can begin. The waterfall model serves as a baseline for many other lifecycle

models. The waterfall model phase begins with communication, planning, modelling, construction, and finally deployment phase (Xin & Abd Ishak, 2023, pp. 524–543)

3. METHODOLOGY

This research focuses on developing the ADDIE model using task learning approaches. A purposeful sample of twelve (12) lecturers from the Bakery and Pastry Program at Kuala Selangor Vocational College was selected due to study limitations. Data collection employed three types of validated needs analysis questionnaires to assess system operations and user-friendliness in the program.

4. RESULT AND DISCUSSION

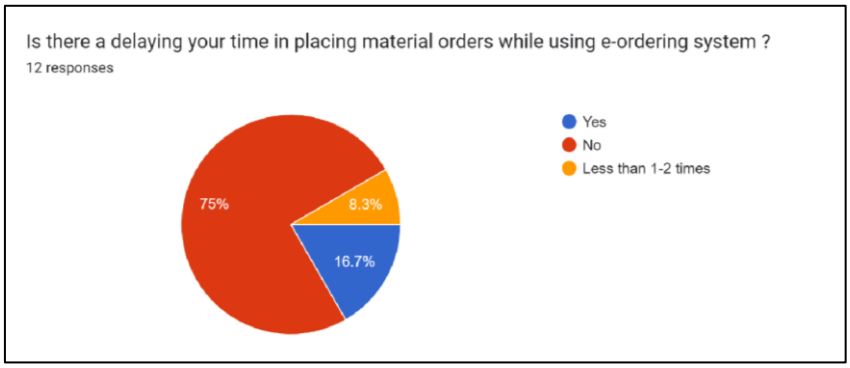

Figure 1: Delaying time placing material order

Based on this Figure 1, 75% of lecturers agree that there is no delay in placing orders within the system, only 16.7% experience such delays, and 8.3% have encountered them 1-2 times.

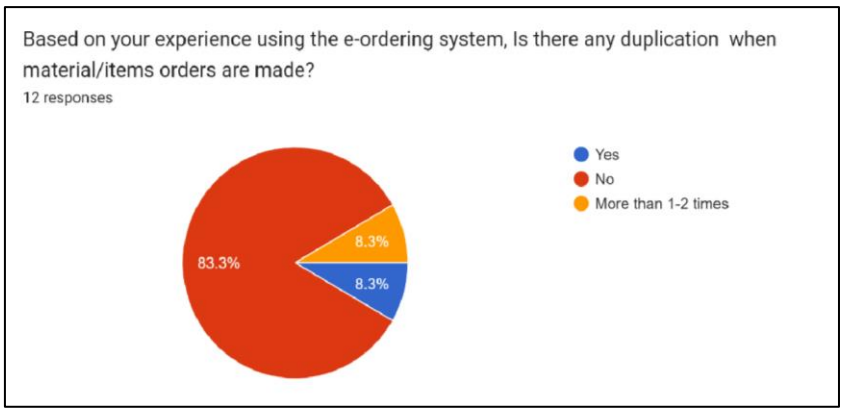

Figure 2: Experience using the e-Ordering System

Based on the feedback on Figure 2, the pie chart indicates that 83.3% of lecturers can place material orders without any overlap. Only 8.3%, corresponding to one lecturer, reported experiencing order overlap, while another 8.3% of lecturers encountered it 1-2 times while using the system.

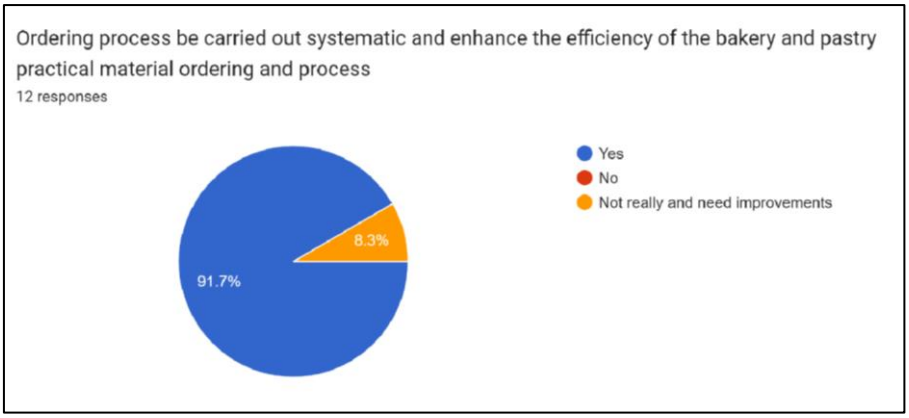

Figure 3: Feedback the efficiency of e-Ordering System

Based on Figure 3, 91.7% of lecturers agree that this system can meet the needs of practical classes and enhance the functionality of the digital system for teaching and learning at Kuala Selangor Vocational College. Only 8.3% hold a contrary opinion.

5. CONCLUSION AND RECOMMENDATION

As a conclusion to the project, the e-Ordering System was successfully developed, providing an efficient solution for ingredient procurement in the Bakery and Pastry program. The main objective of this E-Ordering System was to relieve the burden on lecturers for efficient ingredient procurement. The findings highlighted that most lecturers agree that there is no delay in placing orders within the system. In addition, lecturers can place material orders without any overlap while using the system. 91.7% of lecturers agree that this system can meet the needs of practical classes and enhance the functionality of the digital system for teaching and learning at Kuala Selangor Vocational College. One limitation of the E-Ordering System is that it requires an internet connection to use the application. Finally, Technology transforms processes for efficiency in the Bakery and Pastry Program at Kuala Selangor Vocational College. The E-Ordering System ensures convenient, paperless orders and representing a significant evolution in educational practices.

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Chapter 38
Child Care or Child Scare: A Proposal for A Customised Legal Framework for Small Home-Based Childminders in Malaysia

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ABSTRACT

The development of a well-rounded person depends heavily on early childhood care and education (ECCE). Child care services are becoming more necessary as more mothers are working these days to care for their kids. Thus, receiving high-quality child care is crucial to guaranteeing that the kids are properly attended to in terms of both their physical and mental development. In the endeavour to raise the standard of child care services in Malaysia through legislative means, it is important to draw attention to the problem of unregulated childminding in the country. The purpose of this study is to determine whether creating a regulatory framework to control childminding is feasible. Unwanted events involving unlicensed childminders might be the driving force behind Malaysia's development of a regulatory framework to raise the standard of the services. This study uses a doctrinal approach that includes document analysis and fieldwork through interviews. The creation of a regulatory framework to govern home-based childminders is essential because children's health and safety must be protected by high-quality early childhood care and education. In addition to recommending a legislative framework, this research produces a handbook for parents called "Handbook for Parents; Choosing A Childminder Using RAQHSC Checklist" which is available in English and Malay language version to serve as a selection guide for parents. This guidebook serves as a research-based checklist to help parents select the ideal childminder for their kids.

Keywords: child care, childminder, home-based, legal framework

1. INTRODUCTION

The case of Adam Rayqal, a five-month baby boy who were found dead in his childminder's house shocked the whole country in the year 2018 (Kumar, 2018). More disheartening when the body of the baby was found hidden in freezer when the childminder tried to conceal the death of the boy. Another ordeal involving Nour Rania Asyifaa who was discovered unconscious on 24 February 2022 at a childminder's home after her head entangled in a cloth cradle, also alarmed the society in safeguarding the safety of the children in the hand of these childminders (Malay Mail, 2022).

Legal mechanism shall be fully utilised in curbing such unfortunate events. However, by just being reactive to punish the wrongdoers after the ordeal has happened will not suffice.

Preventive measure by having a strong legal framework in monitoring and controlling all types of services providing service of child care should be materialised.

In order to develop the legal framework for childminders in Malaysia, this research innovation attempts to innovate and propose a regulatory framework which is custom-made to regulate the childminders. One-size-fits-all regulations are not ideal for these childminders and how customised laws can make a difference. The laws and regulations shall not just act as a tool to regulate the childminders but also facilitate them to encourage adherence to the laws and regulations. Eventually, the ultimate purpose of the laws and regulations shall be achieved when the childminders are ready and capable to fulfil the legal requirements which are tailored exclusively for them.

2. LITERATURE REVIEW

The raising cases on child abuse in Malaysia should be well taken care of. According to the statistic from the Social Welfare Department (SWD), from the total number of abuse cases reported from 2012 until 2017, 2.62% involved child care providers or childminders (Ramalingan & Alavi, 2020). As the demand of child care is increasing (Aziz et al., 2021), the laws and regulations governing this industry should be enhanced and improved. Focusing on child care services offered at home, this category should not be given less attention compared to institutional based child care centres. This category of child care either home-based child care centres or childminding offers an alternative for parents which is more flexible and cost-effective (Papatheodorou & Luff, 2023).

Acting reactively, Child Act 2001 (Act 611) specifically Section 31(1)(a), has always been invoked in seeking justice for the abused and negligent cases happened involving childminders together with other relevant provisions in Penal Code. However, preventive approach through legal mechanism should also be developed to avoid more cases from happening again in the future.

The existing laws and regulations on child care services in Malaysia are governed under Child Care Centre Act 1984 (Act 308) and Child Care Centre Regulations 2012. Section 2 defines child care centre as ‘any premises at which four or more children under the age of four years from more than one household are received to be looked after for reward’. Furthermore, Act 308 underlines the categories of child care centre to include home-based child care centres which provide service caring for four to nine children at their own home, and centres taking care more than ten children which may be categorised as work place based, community based and institutional child care centres. However, there is a loophole in these categories when small home-based child care centres or can also be known as childminding is not included in these categories thus not regulated under any law. Therefore, how the safety and welfare of the children placed in their custody may be safeguarded?

There is a short cut way to remedy the situation by broadening the home-based child care centre category under Section 5 of Act 30 to include also childminders looking after one to three children. However, due to the different nature, capabilities, and commercial potentials of these childminders, they are not capable to fulfil the high standard of legal requirements set under the laws especially those underlined by the technical agencies namely the local council, fire department and health department. Therefore, this research proposed for customised legal framework for these childminders. The increasing demand for childminders and the increasing abuse and negligent cases shall be the pushing factor for the improvement of the child care centre legal framework in Malaysia.

3. METHODOLOGY

This research is a qualitative study employing document analysis technique. Laws and regulations on Malaysian child care and other countries are examined in order to identify what are the strengths and weaknesses of the existing legal framework of child care especially childminding. This research did benchmark analysis of Malaysian position with New Zealand child care centre laws and regulations to learn from the lessons and best practices implemented in New Zealand. Besides that, semi-structured interviews with the officer of SWD and President of *Kelab Rekreasi Pengasuh Malaysia* were also conducted to collect first hand data from those involved directly in the industry. Collaboration efforts were also included in developing this innovation when the lead researcher was invited to be the panel for Engagement Session on Child Care Centre Registration with the local councils organised by the Office of Selangor State Secretary. Another collaborative work was the invitation as a panel in Childminders' Rules Refinement Workshop in conjunction with the National Early Childhood Care and Education Convention 2023 organised by Ministry of Women, Family and Community Development and dan the Association of Registered Child Care Providers Malaysia.

4. RESULT AND DISCUSSION

4.1 The Proposal for an Improved Malaysian Child Care Legal Framework

In establishing the new legal framework which incorporate small-scale childminders in the existing child care legal framework, there is a need for the Act to be amended. Meanwhile, Child Care Centre Regulations 2012 which emphasizes on the licensing process and legal requirements such as ratios, group size, qualifications and standards shall segregate the licensing criteria according to the category of child care centres. Licensing criteria for childminding for instance should differ from home-based, community based, work-place based and institutional child care centre due to their different nature, capabilities and commercial potentials. Besides that, apart from the legal mechanism through statutes, the framework should also be supported by non-legal force mechanism.

On top of that, in developing a customised regulations for childminders in Malaysia, it is proposed that the customised licensing criteria for childminders in Malaysia involves legal requirements on ratio, numbers of children, education and training, physical environment, health and safety and education element which are the vital features found in studies in ensuring quality child care. The proposed framework is a novel innovation as before this small-scale child care centre is not included in the child care legal framework thus not being regulated under any law.

4.2 Handbook for Parents

On top of that, knowing the facts that the implementation of policy and laws is time-consuming, this research comes out with a handbook for parents as a guide in choosing childminders called “Handbook for Parents; Choosing A Childminder Using RAQHSC Checklist”. This handbook is a research-based check list assisting the parents to choose the best childminder for their children. The handbook later on is improved by producing the Malay version of handbook and also published in a form of e-book. This shall be a faster solution in resolving the dilemma of parents in choosing better childminders before the laws and regulations are well enacted in the form of statute. The handbooks shall act as a practical tool, a checklist or guide for parents. This resource empowers parents to make informed decisions and guides

childminders in understanding their responsibilities. This innovation has been awarded with gold medal in the Innovation Bank Challenge 2023 organised by Universiti Sains Islam Malaysia under research idea category. The handbooks are then improved by adding additional pages and are available in a Malay language version.

The handbooks may be commercialised to be available for parents especially the young parents. Hospitals and clinics shall be the targeted venues for these handbooks to be commercialised. Besides that, as these handbooks are transformed in the form of e-books, it is more accessible to larger audiences where they are easily available in the e-book vendors' platforms. These handbooks are also in the process of intellectual property application.

Figure 1: Handbook for parents

5. CONCLUSION AND RECOMMENDATION

This research idea innovation provides benefits to the stakeholders namely the children, parents, childminders themselves, and policy makers. For the children, the improved legal framework and the handbooks shall assist in safeguarding the safety and well-being of the children at childminders' home and avoiding them from being cared by irresponsible and harmful childminders. Besides that, the guide shall help parents in choosing the best childminder for their children by referring to the criteria underlined. As for childminder, adding a separate category and customised set of laws assist them to be more recognised in the industry of child care. They will be equipped with basic skills and knowledge in handling children especially on emergency matters. As for policy maker, this innovation shall pave the way to introduce a policy paper and regulation enhancement with regards to child care centres. This would assist the authority in encouraging more operators to register their services and eventually enhance the quality of the services provided.

In conclusion, the welfare and safety of the children should always be the priority, but regulation should also facilitate the operators or childminders to obey and adhere to the requirements. The improved legal framework to assist the policy makers and enhance the professionalism of childminders while the handbook shall act as quick guide for parents. In the end, it is about ensuring a world where our children grow and thrive. Indeed, creating effective regulations for small-scale childminders is a vital step in securing the future of our little ones.

6. ACKNOWLEDGEMENT

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Chapter 39
Early Math Matters: Pabino and Mathematics Outcomes

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ABSTRACT
Pabino, also known as the Number Counting Board, is an innovative educational tool designed to aid teachers in facilitating the understanding and application of numerical concepts among preschool-aged children in alignment with the early childhood curriculum. This particular innovation is associated with the learning standard pertaining to the early Mathematics component under the Science and Technology Pillar of the KSPK framework. This study aims to identify the effectiveness of the Pabino Kit in helping children to master number concepts and basic Mathematics operations in enhancing their numeracy skill. The result derived from children five and six year old consisting of 75 participants were statistically analyzed using Paired Samples T-test. The analysis showed there was a significant different between the mean pre-test and post-test of children in mastering number concepts (p=.00) and basic Mathematics operations (p=.00). This findings proof that Pabino Kit effectively improves number concepts and basic Mathematics operations among children in enhancing their numeracy skills.

Keywords: Pabino, numeracy, early childhood, KSPK

1. INTRODUCTION

Pabino, known as the Number Counting Board (*Papan Bilang Nombor*), is a cutting-edge educational tool developed to assist educators in promoting comprehension and utilization of numerical ideas among children in the preschool age group in accordance with the early childhood curriculum. This tool is linked to the learning standard related to Early Mathematics in the Science and Technology Pillar of the National Preschool Standard Content (*Kandungan Standard Prasekolah Kebangsaan*) framework. Pabino enables self exploration of learning for children in the preschool age group and also provides an instructional approach that integrates learning and play to help educators enhance children's numeracy abilities.

1.1. Problem Statements

Based on this study, there are two problem statements:

i. Children’s mastery in number concepts and basic operations.
ii. Teachers exhibit a lower level of creativity when implementing activities aimed at enhancing children's numeracy skills.

1.2. Objectives

There are three focused objectives:

i. Assist children in resolving common issues with the number concepts and basic operations.
ii. Encourage children to learn early Mathematics by using both physical and digital learning materials.
iii. Develop teaching materials that are suitable and fun for children to learn early Mathematics.

1.3. Research Questions

i. How to guide children in resolving common issues with the number concepts and basic operations?
ii. How to encourage children to learn early Mathematics by using both physical and digital learning materials?
iii. How to develop teaching materials that are suitable and fun for children to learn early Mathematics?

1.4. Hypothesis

i. There is no significant difference between the mean score pre-test and post-test of children in mastering number concepts using Pabino Kit ($p > .05$).
ii. There is no significant difference between the mean score pre-test and post-test of children in mastering basic Mathematics operations using Pabino Kit ($p > .05$).

2. LITERATURE REVIEW

Promoting reading and mathematical skills starting at a young age, as interventions in these subjects are believed to yield the greatest benefits, also children's early Mathematics proficiency is strongly correlated with their later Mathematics ability (Heckman, 2011; Lee & Pant, 2017). Based on this study, the mastery of basic mathematical concepts among children is very important and to attain mathematical proficiency by the time they enter kindergarten, every child ought to be afforded an equitable start to their early educational days.

Vygotsky's Theory

Vygostsky's Model of Constructivism is a change that brings the education system from a teacher-centered learning paradigm to a pupil-centered learning. This model emphasizes the aspect of active learning that sees at the aspects of interaction and the environment that can lead to the formation and development of the existing knowledge of the children. The concept of Zone of Proximal Development (ZPD) highlights the importance of designing a curriculum that incorporates interactive aspects and takes into account the surrounding environment (Ghani et al., 2017). ZPD facilitate children learning through cognitive formation and emphasizing the inseparability of cognitive growth from the social context. Therefore, by engaging in practical and significant activities, children will acquire and excel in fundamental abilities, such as utilizing Pabino items. Teachers will facilitate children's acquisition of fundamental mathematical principles through the utilization of the Pabino Kit and fostering social interaction.

Piaget's Theory

One influential theoretical framework that has significantly contributed to our understanding of cognitive development in children is Jean Piaget's theory of cognitive development. Jean Piaget's theory of cognitive development has played a pivotal role in shaping our understanding of how children learn early Mathematics concepts. Piaget posited that children progress through distinct stages of cognitive development, each marked by specific cognitive abilities and limitations. At the early stages of cognitive development, children are primarily engaged in motor-sensory and pre-operational thinking, which is characterized by limited logical reasoning and a tendency to focus on perceptual aspects of the environment. This stage may influence on how children initially approach basic mathematical concepts. Furthermore, educators must create a learning atmosphere that spurs children's creativity by using concrete material and media to support learning goals (Riana et al., 2023). Media was a tool in the instructional process in the classroom and outside the classroom. In this context, Pabino Kit was used as a teaching medium that can stimulate children's ability to learn early numeracy skill.

Encourage Children in Early Mathematics

Regency (2023) demonstrated that the analysis of enhancing children's numeracy skills through the basketball dribbling game also proves that teachers are required to offer a greater range of methods when implementing learning activities. There are many known strategies in solving mathematical and numeracy problems including spatial, verbal, memory, and procedural strategies, among others. Furthermore, play was a primary need for early childhood. Play activities can stimulate creative thinking and develop numeracy skills in early childhood (Fauzan & Mat Zaini, 2015; Wolska-Długosz, 2015). Previous research has shown that individual differences in children's early numeracy can be observed already before formal schooling begins and this highlights the necessity for developing effective intervention programs to support low-performing preschoolers, which can prevent them from being at risk of later mathematical learning difficulties (Aunio et al., 2015). The purpose of this study is to develop a teaching aid as an instructional media to stimulate numeracy skills in children so that all children's numeracy skills can be adequately produced. In this study, ASSURE Model (Heinich et al., 1996) was used to develop the Pabino Kit. Feedback from the teachers proved that children were feeling pressure to spend time on adult led teaching of Mathematics, in which children's enjoyment often seemed limited and children sometimes asked 'how to count, what is the number?', with a view to returning to learn through play with their friends. Often, children would struggle to sit on chairs or manipulate objects and find it difficult to recognize the numbers or count the objects. In addition, engagement in independent Mathematics learning was low, with children rarely accessing the basic skill concepts in Mathematics, or using a limited set of skills in early Mathematics. Furthermore, the simple problems skill can overcome when allowing children to explore and give them direct daily life experiences (Riana et al., 2023).

3. METHODOLOGY

Sample

This study involves the assessment of n=75 participants age 4+ until 5+ to see difference between the mean score pre-test and post-test of children's mastery to learn number concepts using Pabino Kit. The sample was selected by purposive sampling which refers

to the participants who had no early schooling experiences. We run the pre-test in the early year of school as well as the post-test after three months of using the Pabino Kit. This study uses a quantitative research design through a survey method that involves the collection of staged sampling data where the researcher first selects a group or organization before obtaining the names of individuals from the group to be used as a study sample (Creswell & Creswell, 2018).

Developing Teaching Material for Early Mathematics

Pabino Kit is constructed with readily accessible and repurposed materials, which can inadvertently impart knowledge to youngsters about the principles of environmental sustainability. For instance, items like egg cartons, plastic cups, and envelopes can be repurposed and reused. Also, the utilization of information technology in the development of Pabino Kit facilitates educators in updating their teaching aids resources, in addition to the materials already available. The digitization of Pabino through Google Sites can serve as a valuable tool for both educators and parents to facilitate home-based teaching. The planning, production, and development of Pabino innovation have been formulated according to the ASSURE Instructional Model, a comprehensive framework consisting of six sequential processes, as proposed by Heinich, Molenda, and Smaldino in 1996. This study embarked on a journey to explore the process of developing Pabino Kit based on early Mathematics matters, teaching aids, children's learning and cognitive development stages theories. Through an integrative literature review, meta-analysis, and a deep dive into the implications for Mathematics education, we have applied six steps (ASSURE) as a significant procedure in developing the Pabino Kit (Table 1).

Pabino Kit

To facilitate the assessment of children's ability in solving common problems related to numbers and operations ideas, we have developed a kit that is suitable for learning early Mathematics. Pabino Kit was developed using the ASSURE Model (Heinich et al., 1996) to provide educators with a systematic approach for designing and executing play-based activities that connect mathematical principles in everyday experiences. The development of Pabino Kit is based on the problem among children in mastery of number concepts and basic Mathematics operations. Pabino Kit was also built taking into account children's interest in playing and experiencing fun learning. Also we came out with an assessment that can merge with the Pabino Kit. There are five items that include 25 assessment questions (Table 2) used to measure the level of mastery number concepts and basic Mathematics operations including addition and subtraction before and after using the Pabino Kit.

Table 1 Relation of ASSURE Model in Developing Pabino Kit

Process	Justification
A = 'Analyses Learner'	Identifying the general characteristics of children such as the characteristics of existing knowledge regarding aspects of children development and interest. The basis for the development of the Pabino Kit is based on the problem of preschool children who cannot identify and recognize the value of number concepts and number operations.
S = 'State Objective'	Based on the curriculum in KSPK, the objective to be achieved is the mastery of number concept and basic operations in Early Mathematics component of the Science and Technology Pillar according to the children's level of readiness and development.
S = 'Select Method, Media and Material'	Based on the context of learning objectives, Pabino Kit uses a learning through playing approach, the selection of various existing resources and multimedia applications or digital materials such as Google Sites and G-Developed through the spread of QR code.
U = 'Use Media and Material'	Researcher need to; Use appropriate materials such as multimedia, existing materials and other materials suitable for the presentation session if necessary.
R = 'Require Learner Participation'	Provide a fun learning experience and encourage opportunities for students to communicate effectively to explore aspects of child development. Actively involving children in learning groups, communicating and even prioritizing elements of 6C skills in line with the educational needs of the 21st century.
E = 'Evaluation Instruction'	The overall evaluation of the Pabino Kit prototype draft involves the views of preschool teachers, ECE lecturers, teacher trainees, and parents through questionnaires and interviews. This feedback is used as the basis for the development of this innovation.

Table 2 Items Details in Pabino's Assessment

Items	Justification
Item 1: Number Recognition	Children will say the number shown by the assessor and then the children have to place the counting stick according to the number that has been said.
Item 2: Simple Addition Range 1-10	By using the Pabino Kit, children solve the questions provided. (6 questions)
Item 3: Simple Addition Range 11-20	By using the Pabino Kit, children solve the questions provided. (6 questions)
Item 4: Simple Subtraction Range 1-10	By using the Pabino Kit, children solve the questions provided. (6 questions)
Item 4: Simple Subtraction Range 11-20	By using the Pabino Kit, children solve the questions provided. (6 questions)

4. RESULTS & DISCUSSION

Common Issues with the Number Concepts and Basic Operations Among Children

This study is carried out according to two phases assessment which are pre-test and post-test of using Pabino Kit. This study intends to see the effectiveness of Pabino Kit in mastering number concepts and basic operations among children as well as being able to encourage children enjoy learning early Mathematics. A Paired Samples T-test was used to test the hypothesis and to examine children assessment. It showed the significant difference mean level of each items measured between pre-test and post-test.

Table 3 Mean Comparison Between Pre-test and Post-test Using Pabino Kit

Items		Paired Samples Statistics		
		Mean	N	Std.Deviation
Item 1	Pre-test	40.93	75	22.31
	Post-test	73.27	75	29.87
Item 2	Pre-test	32.22	75	20.01
	Post-test	73.56	75	31.25
Item 3	Pre-test	16.44	75	15.62
	Post-test	61.78	75	40.53
Item 4	Pre-test	23.56	75	19.78
	Post-test	70.00	75	37.07
Item 5	Pre-test	14.00	75	13.98
	Post-test	62.22	75	40.39

The table above shows the mean difference between each items of pre-test and post-test in this study. Before use of Pabino Kit, the highest mean is Item 1 which is number recognition (M=40.93, SD=22.31) and the lowest mean is Item 5 which is children complete the subtraction operation within the range of 11-20 (M=14.00, SD =13.98). Overall, these means suggest that after using Pabino Kit (intervention) in mastering number concepts and solving basic Mathematics operations, the mean score of children's achievement was higher after the intervention.

Table 4 Paired Samples T-Test Analysis of Using Pabino Kit

Pre-test & Post-test	Mean	Std. Deviation	t	df	Sig.
Item 1	-32.33	11.34	-24.69	74	.00
Item 2	-41.33	17.19	-20.82	74	.00
Item 3	-45.33	26.92	-14.58	74	.00
Item 4	-46.44	21.63	-18.60	74	.00
Item 5	-48.22	28.81	-14.45	74	.00

A Paired Samples T-test was performed comparing the pre-test and post-test score of children's achievement to master number concepts (Item 1) and basic Mathematics operations (Item 2-Item 5). Based on Table 4 above, Item 1 showed that the mean difference is negative (M=-32.33, SD=11.34) and this result revealed, there is a significant difference t(74)=-24.69, p=.00. For Item 2, the mean difference is negative (M=-41.33, SD=17.19), t(74)=-20.82, p=.00 and it could be interpreted as significant difference. Then, Item 3 showed that, the mean difference is negative (M=-45.33, SD=26.92 and there is a significant difference when t(74)=-14.58, p=.00. Hence, the mean difference is negative (M=-46.44, SD=21.63), t(74)=-18.60, p=.00 for Item 4 and is different at post-test score. Then, the mean difference is negative (M=-48.22, SD=28.81), t(74)=-14.45, p=.00 for Item 5 and significantly different at post-test score.

The finding was proofed of using Pabino Kit in enhancing children's numeracy skills. It could be interpreted as this teaching aid as medium can improve children understanding in mastering number concepts and solving simple basic operations including addition and subtraction range 1-20. In line with that, children could understand counting through playing, learn the concept of honesty, learn to obey the rules and learn how to bring themselves in a game (Riana et al., 2023). Sartika (2017), stated the teaching and learning process can arouse new desire and interest, stimulate motivation and learning activities and bring

children psychological influences. Hence, this educational tool providing hands-on, interactive and engaging learning numeracy experience through multi-sensory application which is, children can use their multiple skills such as communication, physical and social while solving the Mathematics problems. Therefore, the effectiveness using teaching aids is to integrate them into a well-designed curriculum that aligns with the development stage of early childhood.

Improving numeracy skills through play can build a concrete understanding among children when they had hands-on activities that help children develop a deeper understanding of abstract mathematical concepts. Then, visual representation like Pabino Kit make abstract concepts more tangible and support the development of number sense. Besides, this educational tool have sense of concept reinforcement through repetition in different formats. Also, children will try and error as a basic life skill in bringing up themselves. Although, Pabino Kit support a gradual skill progression because it designed starting with simple manipulative and gradually moving to more complex tools helps children build a strong foundation in numeracy.

Furthermore, Pabino Kit support the individual and collaborative learning when it can be adapted to meet individual needs such as interactive technology allows for personalized learning experiences, addressing specific challenging or providing additional practice for children who may need it. Similar to Pabino Kit, our team have came out with utilization of technology through Pabino Google Sites and it is easily use that have various inputs on early Mathematics for children and interactive games make it easier for users to benefit from the development of Pabino. It is suitable as a reference for educators and even parents as a teaching medium that focuses on the mastery number concepts and basic operations. Apart from that, collaborative learning foster communications and teamwork while reinforcing numeracy skills. In a nutshell, the use of educational tools such as Pabino Kit have element of fun and excitement to the learning process. Engagement and motivation derived from games activities capture children's interest and motivation, making them more eager to participate in numeracy-related task. On top of that, educators provide motivation, guidance also evaluation to determine whether children have mastered the expected ability. Overall, the implementation of teaching aids like Pabino Kit in early numeracy is practically improve the learning outcomes.

Encouraging Children to Learn Early Mathematics as an Need Analysis

The importance of early Mathematics education has drawn increasing attention in recent years. A survey research design was used to collect data of 64 samples from school teachers. Data were collected by answering 10 questions through google forms. Numerical analyses were conducted and this study could form a basis for discussions regarding encouraging children to learn early Mathematics in preschool. Based on the survey, majorities teachers with more than 10 years experiences contributed 48.4%, followed by 20.3% with 1-5 years experience, 18.8% with less than 1 year experiences and 12.5 % with 5-10 years experiences. Majorities of the teachers which carry 93.8% with early childhood background and only 6.2% with other qualifications. Then, 51.6% samples were from urban area and 48.4% from rural area. Then, 79.7% samples involved in teaching and learning in preschools meanwhile only 20.3% participated in nursery field. In addition to the demographic, education status is also demonstrated to be foundational for lifelong development. Majorities of the samples were 65.6% obtained degree, 25% with diploma, 5% with masters and 4.4% with PhD holders (Table 5).

Table 5 Demographics of the Samples

Items	Percentages			
Experience of the samples	10 years above (48.4%)	5-10 years (12.5%)	1-5 years (20.3%)	Less than 1 year (18.8%)
Status of education	Diploma (25%)	Degree (65.6%)	Masters (5%)	Ph.D (4.4%)

Table 6 Questions for Encouraging Children to Learn Early Mathematics

No.	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	I can identify the current curriculum content such as *Kurikulum Standard Prasekolah Kebangsaan* (KSPK) and *PERMATA Negara* which are geared towards Early Mathematics elements.	0	7.8	29.7	34.4	28.1
2.	I am good at planning Early Mathematics based learning activities in a meaningful way.	1.6	10.9	37.5	37.5	12.5
3.	I am good at designing interesting and fun Early Mathematics based learning activities.	1.6	12.5	37.5	34.4	14
4.	I am good at planning Early Mathematics based learning activities in an integrated manner with various learning strands.	1.6	9.4	39.1	31.3	18.6
5.	I am good at handling Early Mathematics based learning activities in a meaningful way.	1.6	12.5	40.6	34.4	10.9
6.	I am good at planning student assessment based on Early Mathematics activities very effectively.	1.6	15.6	34.4	37.5	10.9

Refer to Table 6, majorities of the teachers choose neutral or agree for all questions regarding Encouraging Children to Learn Early Mathematics. For example, 40.6% neutral and 34.4% agree choose by the teachers who able to handle early Mathematics based learning activities in a meaningful way. In addition, 39.1% neutral and 31.3% agree were choose by the teachers for good at planning early Mathematics based on learning activities in an integrated manner with various learning strands. It revealed, 64 educators have a good understanding of the current curriculum whether KSPK or PERMATA Negara. This findings showed, educators can align the learning standard with suitable activity for children. Nevertheless, educators seem to have no right choice about handling early Mathematics activities even though they well knew about curriculum. In early childhood education, educators play an important role in encouraging children improving skills especially in four domain of development namely literacy, numeracy, physical and social-emotional. Focus on this study, encouraging children to learn early Mathematics is essential for building a strong foundation in numeracy skills. Teachers implement the teaching of early Mathematics with the practice method of writing numbers, while children should have to make calculations of common things around them to enable them to master early Mathematics concepts well (Shin et al., 2019).

Educators can introduce mathematical concepts through play and fun activities to make the learning session enjoyable and capture children's interest. Using of daily life context will make children connect the numeracy skill with problem solving in their daily life basis. Relating mathematical concepts with real life situation will help children to see the relevance of numeracy skills. Additionally, educators as guidance to help children by providing a variety of counting manipulative like blocks, counting beads or buttons will allow them have hands on experiences that engage with mathematical concepts and making abstract ideas more concrete. Learning activities also a way to help children improving their curiosity that also helps them foster a positive attitude toward learning Mathematics.

Learning for children needs to use a principle from easy to difficult. This principle takes into account the cognitive and emotional development of children and helps them build a solid foundation before moving on to more challenging levels. Meanwhile, educators that are good handling learning activities might introduce age appropriate challenge to keep children engaged. Challenges that are just beyond their current skill level can encourage them to stretch their abilities and build problem solving skills. The key is, educators have to create a positive and supportive learning environment where children feel encouraged to explore and enjoy mathematical concepts. By making this numeracy skills engagement and relevant to their daily lives, educators can instill a love and fun learning early Mathematics in children.

5. CONCLUSION & RECOMMENDATION

Ultimately, Pabino's innovation is suitable and can serve as a catalyst for transformation in educational innovation, with a particular emphasis on numeracy skill. Moreover, engaging in enjoyable educational activities can foster children' enthusiasm for the realm of Mathematics at a young age, serving as an incentive for educators to develop more efficient instructional materials. The subsequent information presents the outcomes of interviews conducted with educators and lecturers, particularly in the domain of Early Childhood Education. Thus, the use of teaching aids such as Pabino Kit can help children improving their mathematical concepts especially the achievement in mastery number concepts and solving simple operations in their daily life. Furthermore, through this study it can be promote that developing teaching aid is the medium of teaching efficiency in early childhood education.

Suggestions for Improvement

The improvement of an innovative product is very important to guarantee the quality and usage requirements. Based on questionnaire data and interviews with teachers, lecturers and teacher's trainer, the following is a list of improvements that have been proposed and taken into action by the study group:

i. It is necessary to increase the number of Pabino Kit for each child involved.
ii. Carry out a study about numeracy skill readiness on indigenous or refugee children using Pabino Kit.
iii. The display of lines representing numbers can be replaced by more multi-sensory forms.
iv. Lines on the calculation board can be added to sensory elements.

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Chapter 40
Rolling InOnAt: Play and Learn Prepositions of Time ‘In’, ‘On’, and ‘At’

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ABSTRACT

Gamifying education involves integrating elements of game design into the learning framework and fostering an environment that encourages social interaction, which contributes to learners’ growth. Gamifying learning creates a positive atmosphere for engagement and enjoyment, which is important for language learning, particularly in grasping complex concepts in grammar components such as the prepositions of time ‘in’, 'on', and ‘at’. "Rolling InOnAt" is a board game aimed at helping players practice using the prepositions of time 'in,' 'on,' and 'at.' In a study involving 48 conveniently selected participants, the effectiveness of this board game was systematically assessed. Surveys were administered to gauge participants' perceptions of its impact on their proficiency with the prepositions of time ‘in’, 'on', and ‘at’. The results revealed a unanimous consensus among participants, emphasising that "Rolling InOnAt" significantly contributed to their comprehension and confidence in using the prepositions of time ‘in’, ‘on’, and ‘at’ independently, without the need for instructor guidance. Participants enthusiastically expressed a willingness to recommend the board game to fellow English language learners, citing its affordability and suitability as pivotal factors.

Keywords: Language Learning, Gamifying Learning, Grammar, Prepositions of Time, Board Game

1. INTRODUCTION

It is common for instructors to provide students with online or physical grammar worksheets. The repetitive nature of these traditional grammar drills may demotivate students. In addition, grammar components such as the prepositions of time 'in,' 'on,' and 'at,' can be difficult for students across various age groups due to first language interference. The need for an innovative and engaging learning tool becomes apparent in such scenarios. "Rolling InOnAt" is a board game designed to specifically target the comprehension and usage of prepositions of time. Unlike conventional methods, this game offers a refreshing and enjoyable approach to learning the prepositions of time ‘in’, ‘on’, and ‘at’. By incorporating elements of play, "Rolling InOnAt" transforms language education into a dynamic and effective classroom experience. This board game addresses the monotony associated with traditional grammar practices, offering a more interactive and engaging alternative for students. For English language B1 level learners in their initial semester, "Rolling InOnAt" serves as an effective learning tool, making the process both fun and instructive. The game not only facilitates

language comprehension but also enhances motivation and participation in the English language classroom.

2. LITERATURE REVIEW

2.1. Language Games and Its Benefits Towards English Language Learning

Language education is a dynamic field that continually seeks innovative approaches to engage learners and enhance the effectiveness of English language instruction in the classroom (Tajino et al., 2016). Numerous studies have found that language games and innovations contribute to the effectiveness of the pedagogical strategies employed by English language instructors in teaching the English language in the classroom to ensure learners' engagement. According to Dehghanzadeh et al. (2021), based on the systematic review of 22 publications spanning the years 2008 to 2019 that were selected to examine the relationship between the use of gamification and learners' experiences, the review indicates that the studies reported various beneficial effects of gamification on learners' learning experiences and their overall educational achievements. In addition, the review also found that gamified English learning lessons and environments have successfully generated positive learning experiences among learners that include increased levels of learning engagement, motivation, enjoyment, and fun. Studies discussed underscore the valuable contribution of language games and innovations in shaping effective pedagogical strategies and ensuring learner engagement in English language classrooms. The concept of gamification, with its widespread popularity across diverse domains, demonstrates the integration of game elements to shape behaviour, enhance motivation, and foster increased engagement.

2.2. English Language Learners' Difficulties in Learning Prepositions

Difficulties in using English language prepositions as English language prepositions lack rules governing their usage, and others, having various functions, can pose challenges in their correct application by EFL learners (Abdalla, 2021). Similarly, numerous factors contribute to the difficulty that English learners face with prepositions. Some of these challenges stem from the characteristics of prepositions in English and the distinctions between prepositions in English and those in the learners' native language (L1) (Lindstromberg, 1996; Lorincz & Gordon, 2012). A study conducted by Abdalla (2021) examined the challenges associated with using proper English prepositions and explored potential solutions. The study discovered that students encountered difficulties in employing accurate prepositions after specific verbs, struggled with identifying the correct prepositional phrases, and faced similar challenges in using English prepositions both in written assignments and daily communication. The study suggested that students should review their overall usage of English prepositions and engage in more practice, specifically with prepositions following certain verbs. Damayanti and Sundari (2022) examined the patterns and key discoveries in studies addressing primary error types and causes related to the use of prepositions among second or foreign language learners. To achieve this goal, articles sourced from databases such as Google Scholar, Eric, and Garuda Ristek were scrutinised, and the selected articles were subsequently analysed. The chosen articles were analysed using content analysis, and the findings revealed that the predominant error type among learners in using prepositions is the incorrect application of prepositions. Simultaneously, the primary cause of these errors stems from interlingual interference. This study focuses on providing enjoyable practice for students who have difficulties learning dull grammar components such as the prepositions of time 'in', 'on', and 'at'. The board game

aims to help students understand the complex usage of the prepositions of time ‘in’, 'on', and ‘at’.

3. METHODOLOGY

3.1. Research Questions

The objective of this study is to evaluate students’ perceptions of using a board game to practice the usage of the prepositions of time ‘in’, 'on’, and ‘at’. Therefore, this paper attempts to answer the question: What are the students’ perceptions of ‘Rolling InOnAt’ in improving their understanding of the prepositions of time ‘in’, 'on',’ and ‘at’?

3.2. Research Procedures

This study spanned a duration of two weeks, with sessions held once a week during English language classes. Two lessons were dedicated for the purpose of this research. Initially, prior to introducing the lessons, participants were asked to complete a pre-test questionnaire focusing on the topic of the preposition of time. Subsequently, participants were asked to play Rolling InOnAt twice. Following this, participants were presented with a post-test questionnaire to gauge their comprehension of the subject matter. The utilisation of pre-test and post-test assessments in language learning has undergone extensive scrutiny and has consistently demonstrated its positive impact. The data derived from these pre-test and post-test questionnaires are instrumental in assessing the significance of Rolling InOnAt in aiding participants' language learning.

3.2.1 Rules of the Board Game

There will be four players. Each player puts their counter on START. A player will roll the dice and move his or her counter on the board based on the Dice Roll Rules. When the counter lands on a red circle, the player takes one question from the Question Cards. The player reads the questions from the Question Cards and states own's answers before reading answers from the Question Cards. Then, the player will move his or her counter on the board based on the reward or punishment in the Question Cards. If the player answers the question correctly, they will move their counter two boxes forward. However, if the player answers the question incorrectly, they will have to move their counter one box backwards. After that, the next player will roll the dice. The game is completed when a counter reaches END.

3.3. Data Collection and Analysis

The target participants of this study are English language B1-level learners at a local university. 48 players were selected based on convenience sampling and were surveyed regarding the use of ‘Rolling InOnAt’. The participation of the players was voluntary and consented to. There were five questions on the mastery of the prepositions of time ‘in’, ‘on’, and ‘at’ for the participants to answer before and after playing the board game. After playing the board game, the participants were given five additional questions on the effectiveness of the board game in assisting them to comprehend the concept of the prepositions of time ‘in’, ‘on’, and ‘at’. By using the link the researchers provided, the participants responded to the Google Form survey. The data collected was analysed quantitatively using SPSS to compare the means of the participants’ responses before and after playing the board game.

4. RESULTS

Paired sample T Test was conducted to compare means for 5 items in Pre and Post Test. The results are shown in Table 1 and Table 2. Next, Descriptive analyses were performed to analyse students' feedback concerning the game and the results are shown in Table 3.

Table 1: Paired Samples Test Comparing Means of Response Before and After Playing Rolling InOnAT

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	PRE 1 I have problem using prepositions in, on, at - POST 1 I have problem using prepositions in, on, at	.958	1.570	.227	.502	1.414	4.228	47	.000
Pair 2	PRE 2 I mastered preposition in, on, at - POST 2 I mastered preposition in, on, at	-1.542	1.254	.181	-1.906	-1.178	-8.517	47	.000
Pair 3	PRE 3 I can use all prepositions to create sentences - POST 3 I can use all prepositions to create sentences	-1.062	1.210	.175	-1.414	-.711	-6.084	47	.000
Pair 4	PRE 4 I can differentiate preposition in, on, at - POST 4 I can differentiate preposition in, on, at	-1.313	1.114	.161	-1.636	-.989	-8.164	47	.000
Pair 5	PRE 5 I feel confident using preposition in, on, at - POST 5 I feel confident using preposition in, on, at	-1.125	1.160	.167	-1.462	-.788	-6.719	47	.000

Table 1 presents the results of a paired sample T Test on participants' beliefs before and after playing Rolling InOnAt. Items labelled with PRE indicate the participants' beliefs before playing Rolling InOnAt, and items labelled with POST represent the participants' beliefs after playing the game. The results show that there are significant differences between the pre- and post-tests for all 5 items (1: "I have a problem using prepositions in, on, at", 2: I mastered prepositions in, on, and at", 3: "I can use all prepositions to create sentences", 4: "I can differentiate prepositions in, on, at" and 5: "I feel confident using prepositions in, on, at") tested in this study. The differences between these means are detailed in Table 2.

Table 2: Paired Samples Statistics On Pre And Post Test

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PRE 1 I have problem using prepositions in, on, at	3.17	48	1.191	.172
	POST 1 I have problem using prepositions in, on, at	2.21	48	1.010	.146
Pair 2	PRE 2 I mastered preposition in, on, at	3.33	48	1.136	.164
	POST 2 I mastered preposition in, on, at	4.88	48	.334	.048
Pair 3	PRE 3 I can use all prepositions to create sentences	3.83	48	1.173	.169
	POST 3 I can use all prepositions to create sentences	4.90	48	.309	.045
Pair 4	PRE 4 I can differentiate preposition in, on, at	3.60	48	1.047	.151
	POST 4 I can differentiate preposition in, on, at	4.92	48	.279	.040
Pair 5	PRE 5 I feel confident using preposition in, on, at	3.46	48	1.166	.168
	POST 5 I feel confident using preposition in, on, at	4.58	48	.498	.072

Table 2 shows the mean of responses in the pre- and post-tests. For pair 1, the mean of the post-test (M = 2.21, SD = 1) is lower than the pre-test (M = 3.17, SD = 1.19) for item 1: “I have problems using prepositions in, on, and at." Data from table 1 shows that this difference is significant (t(47)=4.23, p=0) and this result suggests that students’ problems at using prepositions had significantly reduced after playing the game. Moving to Pair 2, the mean of the post-test (M = 4.88, SD = 0.33) is higher than the pre-test (M = 3.43, SD = 1.14) for item 2: “I mastered prepositions in, on, and at." Data from table 1 shows that this difference is significant (t(47) = -8.52, p = 0), and this result suggests that students have significantly mastered prepositions in, on, and at after playing the game. Next, for Pair 3, the mean of post-Test (M=4.9, SD= 0.31) is higher than pre-test (M=3.83, SD=1.17) for item 3: “I can use all prepositions to create sentences”. Data from table 1 shows that this difference is significant (t(47) = -6.08, p = 0), indicating that this game has significantly improved students’ ability to use all prepositions to create sentences. Similar results can be observed for pair 4, where the mean of the post-test (M = 4.92, SD = 0.28) is higher than the pre-test (M = 3.6, SD = 1.05) for item 4: “I can differentiate prepositions in, on, and at." Data from table 1 shows that this difference is significant (t(47)=-8.16, p=0), and this result suggests that students’ ability to differentiate the prepositions has significantly improved after playing the game. Lastly, for pair 5, the mean of the post-test (M = 4.58, SD = 0.5) is higher than the pre-test (M = 3.46, SD = 1.17), for item 5: “I feel confident using prepositions in, on, and at." Data from table 1 shows that this difference is significant (t(47) = -6.72, p = 0), and this result suggests that this game has significantly improved students’ confidence to use prepositions in, on, and at.

Table 3: Descriptive Statistics of Feedback on Rolling InOnAt Game

	N	Minimum	Maximum	Mean	Std. Deviation
POST 6 This game helps me to understand preposition in, on, at	48	3	5	4.67	.694
POST 7 This game helps me to understand preposition without referring to instructor	48	3	5	4.60	.644
POST 8 This game is suitable for all ages	48	3	5	4.81	.532
POST 9 This game is affordable for all ages	48	4	5	4.96	.202
POST 10 I would recommend playing this game to master preposition in, on, at	48	3	5	4.85	.412
Valid N (listwise)	48				

Table 3 shows the students' feedback on the Rolling InOnAT game. The scale for all of the items was 1 (strongly disagree) to 5 (strongly agree). Table 2 shows that all five items have a score of 4.60 or above. This indicates that, in general, participants in this study strongly agreed that Rolling InOnAT helps them to understand prepositions (in, on, and at) (M = 4.67, SD = 0.69), and understand it without having to refer to their instructor (M = 4.60, SD = 0.64). They also strongly agreed that the game is suitable (M = 4.81, SD = 0.53) and affordable (M = 4.96, SD = 0.2) for all ages. All of the participants strongly agreed that they would recommend playing the game to master prepositions in, on, and at (M = 4.85, SD = 0.41).

5. DISCUSSION

The results of the study show that 'Rolling InOnAt' has the potential to assist English language learners to practice the prepositions of time 'in', 'on', and 'at on their own. Students should be accustomed to independent learning, as this would benefit them in mastering certain skills outside the classroom. Furthermore, this can be a good skill for students to apply in their personal lives. It is important to note that the students agree to recommend the board game to other English language learners despite not having mastered the prepositions of time 'in', 'on', and 'at' or being able to use the prepositions of time 'in', 'on', and 'at' after the session. This shows the success of the board game in changing the players' perceptions regarding the benefits of the game.

6. CONCLUSION

In conclusion, 'Rolling InOnAt' can be considered a good board game for practice using the prepositions of time 'in', 'on', and 'at', as it was enjoyed by the 48 players in this study and they would strongly recommend it to others.

7. RECOMMENDATION

There are a few issues that can be considered for future studies, including comparing the effectiveness of different grammar components using the board game, exploring the relationship between the students' mastery of prepositions of time 'in', 'on', and 'at' in two phases, namely, before and after using the board game, and studying the impact on the mastery of prepositions of time 'in', 'on', 'at' when using the board game for the long term.

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Chapter 41
Producing Breakfast Cereal from Artocarpus Altilis (Breadfruit)

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ABSTRACT
This research explores the potential of substituting the primary ingredient in corn-based cereal with breadfruit, a nutrient-dense fruit originating from the Pacific Islands. Despite its limited commercial production and lesser-known status in Malaysia, breadfruit offers high antioxidant levels, abundant vitamin C content, and essential amino acids. The study investigates the feasibility of incorporating this nutritionally valuable fruit into cereal production, emphasizing its potential benefits in regions with limited awareness of breadfruit. The objective of the research is to introduce the new flavour of cereal that made from uncommon based product and providing nutrition and tasty convenience food. In conclusion breadfruit flakes who replaces existing common ingredients used in any other breakfast flakes is more nutritious, giving eaters a taste of the local fruit. In and brings the taste of breadfruit closer to the eater. Packed with all the nutrients, breadfruit can be eaten for breakfast and anytime.

Keywords: breadfruit, nutritious, breakfast

1. INTRODUCTION

1.1 Research Background

This research aims to showcase the substitution of the primary ingredient in corn-based cereal with breadfruit, utilizing the same production method as traditional corn-based cereal. The focus is on highlighting the nutritional richness of breadfruit, an underappreciated fruit in Malaysia, with origins in the Pacific Islands. The fruit boasts high antioxidant levels, abundant vitamin C content, and a significant presence of essential amino acids. According to the Department of Tropical Plant and Sciences, Hawaii (2021), breadfruit (Artocarpus altilis Fosberg) is a starchy fruit grown on a long-lived perennial tree. Originating in the Borneo-New Guinea region, it has been disseminated across tropical climates. Most breadfruit varieties also produce small number of fruit throughout the year. Fresh breadfruit is always available, but somewhat rare when not in season. Breadfruit (Artocarpus Altilis) is a carbohydrate rich food and staple diet in some developing countries of the world (Graham, 1981).

Despite being widely cultivated in household gardens, commercial production remains limited, primarily occurring in the Pacific and Caribbean islands. This study aims to shed light on the potential benefits of incorporating this lesser-known yet nutritionally valuable fruit into

cereal production, particularly in regions where awareness of breadfruit remains limited, such as Malaysia. The nutritious starchy fruit is rich in iron, calcium, potassium, magnesium, and fibre. Some varieties are good sources of anti-oxidants and carotenoids (Kalaheo, 2009).

Cereal, also known as grain, refers to any grass (family Poaceae) yielding starchy seeds suitable for food. Most grains share similar dietary properties, being rich in carbohydrates, comparatively low in protein, and naturally deficient in calcium and vitamin A. Cereals are commonly cultivated and used as human food in their raw grain form or as ingredients in various food products. They are also widely used as animal feed, contributing to the production of meat, dairy, and poultry products for human consumption. Additionally, cereals find industrial applications in the production of various substances such as glucose, adhesives, oils, and alcohols. Today, cereal food is a popular breakfast option globally due to its quick preparation and high nutritional value. Ingredients like milk, grains, sugar, fruits, mixed nuts, and berries are commonly used to enhance cereal nutrition. Opting for whole grains and minimizing added sugars is recommended for those seeking the healthiest cereal options, especially for individuals with heart conditions or diabetes, who may benefit from the higher fiber content in whole grain cereals.

2. LITERATURE REVIEW

2.1 Breadfruit (Artocarpus Altilis)

Breadfruit (Artocarpus Altilis) has been a staple in traditional agroforestry systems in Oceania, offering numerous varieties with various culinary applications. Rich in carbohydrates, dietary fiber, vitamins (especially vitamin C), and minerals like potassium, calcium, magnesium, and phosphorus, breadfruit can be consumed in different forms, such as roasted, boiled, fried, and mashed. Other than that Breadfruit is gluten free and its protein is complete, providing all of the essential amino acids necessary for human health (Ragone,2011).

Its name is derived from the texture of the moderately ripe fruit when cooked, similar to freshly baked bread and having a potato like flavor. Breadfruit also can be eaten once cooked, or can be further processed into a variety of other foods. Breadfruit trees usually produce large crops at certain times of the year. Preservation of the harvested fruit is an issue through. One traditional preservation technique is to bury peeled and washed fruit in a leaf lined pit where they ferment over several weeks and produce a sour, sticky paste (Craig & Ragone,2018).

2.2 Benefits in Breadfruit

Breadfruit (Artocarpus Altilis) stands out as a carbohydrate-rich dietary essential and a staple in certain developing nations worldwide, as highlighted by Graham in 1981. This unique tree not only produces a starchy staple, a crucial source of carbohydrate energy for sustenance, but also offers effective canopy cover to prevent erosion and mitigate global atmospheric CO2 accumulation. Beyond its role as a vital food source, the nutritious starchy fruit is notable for its richness in iron, calcium, potassium, magnesium, and fiber. Additionally, specific varieties of breadfruit serve as excellent sources of antioxidants and carotenoids, as observed in the research by Kalaheo in 2009.

2.3 Cereal in breakfast habbit

Breakfast is considered the most important meal of the day, providing essential nutrients needed for nutritional health in adolescents. According to Doyle 2013, regular breakfast

consumption is associated with physical benefits, including lower body mass index (BMI), reduced risk of type 2 diabetes, and improved cognitive performance. It also has mental benefits, such as improved overall well-being and health-related quality of life. Consuming breakfast provides energy throughout the day, promotes a more active and productive lifestyle, and contributes significantly to daily nutrient intake, including folate, iron, B vitamins, and fiber. Breakfast consumption among children is linked to higher nutritional adequacy, improved cognitive performance, higher school attendance, better mood, and reduced risk of excess adiposity. Ready-to-eat cereals (RTEC) are commonly consumed for breakfast, providing a convenient and nutritious option (Griffiths, 2014).

3.0 METHODOLOGY

3.1 Introduction

The production of Breadfruit Cereal involves the use of honey, salt, baking soda, butter, and wheat flour. Quality maintenance and retaining the taste of breadfruit, known for its high carbohydrates and nutritional content, are prioritized. The fully mature breadfruit is chosen for its sweet and soft taste. The preparation involves experimentation with production techniques, and the product is tested by culinary arts students at Polytechnic Merlimau Melaka.

3.2 Standard Recipe

Table 2 Standard Recipe for breadfruit flake

NO	ITEMS	QUANTITY
1	Butter	30 gm
2	Honey	20 gm
3	Wheat flour	250 gm
4	Baking soda	10 gm
5	Bread fruit puree	250 gm
6	Salt	5gm

3.3 Preparation of The Product

1. Place the cut breadfruit, butter, honey, wheat flour, baking soda, and salt in a food processor until it forms dough.
2. Transfer the mixture to a small bowl.
3. Form small balls / rolled and mould the size of raisins, squash, and place on a silicone mat on a tray.
4. Bake for 20 minutes, shaking the pan halfway through to prevent burning. Cool completely and store in an airtight container at room temperature.

4.0 RESULTS AND DISCUSSION

The findings present the analysis results from the questionnaire distributed to students at Politeknik Merlimau Melaka. The respondents, totaling 40, provided insights into their perceptions of Breadfruit Cereal through questions related to end product, texture, flavor, smell, packaging, and color. The data was analysed using the Statistical Package for the Social Sciences (SPSS) version 22 to get the mean, score and percentage result. The interpretations mean score scale that used to analyse as shown as Table 2.

Table 3 Standard Recipe for breadfruit flake

	Mean	Interpretation
Easy to eat	4.6	Highest
Flavour	3.3	Moderate
Taste	4.8	Highest
Texture	4.4	High
Aromatic Smell	3.4	Moderate
Strong Smell	3.2	Moderate
Suitable Packing	4.3	High
Attractive Colour	4.7	Highest
Overall Mean	4.3	High

4.1 Discussion

Detailed discussion of the analysis results, addressing the research questions and offering suggestions for product improvement. The chapter also provides an overview of Breadfruit Cereal's acceptance among culinary arts students at Politeknik Merlimau Melaka.

4.1.1 To Review the Level of Acceptance of Breadfruit Cereal Among Diploma in Culinary Arts Students

The acceptance of Breadfruit Cereal is evident from the questionnaire responses, where most respondents expressed satisfaction with the product. The mean values fall within an acceptable range, indicating the likelihood of acceptance by the community at Politeknik Merlimau Melaka. The product, featuring breadfruit as the main ingredient, offers a healthier breakfast option, which respondents are willing to try.

4.1.2 Texture

The high mean score of 4.4 for texture suggests that respondents found Breadfruit Cereal's texture appealing. The similarity to other cereals in terms of texture contributed to its positive reception.

4.1.3 Easy to Eat

With a mean score of 4.6, respondents found Breadfruit Cereal easy to eat, particularly without the need for milk. The crispiness of the cereal contributed to its convenience.

4.1.4 Flavor

While the flavor received a moderate mean score of 3.3, the inclusion of cinnamon powder and the sweet taste of honey made the flavor acceptable to respondents.

4.1.5 Taste

A high mean score of 4.8 for taste indicates that respondents overwhelmingly accepted the taste of Breadfruit Cereal, showcasing its potential as a preferred option.

4.1.6 Aromatic Smell

Respondents moderately agreed with the aromatic smell of Breadfruit Cereal, with a mean score of 3.4. The use of local fruit, resembling banana aroma, contributed positively.

4.1.7 Strong Smell

The moderate mean score of 3.2 for a strong smell suggests that respondents agreed to some extent with the strong scent of breadfruit, contributing to the aromatic appeal.

4.1.8 Suitable Packaging

With a high mean score of 4.3, respondents approved of the packaging used for Breadfruit Cereal, emphasizing its effectiveness in preserving the product.

4.1.9

The highest mean score of 4.7 for attractive color indicates that the combination of golden brown colors from the baked dough was visually appealing and widely accepted by respondents.

5.0 CONCLUSION

In conclusion, respondents widely accepted the Breadfruit cereal product, as indicated by its high mean range and absence in the low range. This suggests that the community at Politeknik Merlimau Melaka is likely to embrace the product. The analysis of data demonstrates an overall positive reception of breadfruit cereal by respondents, considering both mean and categorized scale.The researcher developed a novel product featuring breadfruit as the primary ingredient for cereal, presenting a healthier alternative for breakfast. This product is anticipated to find acceptance among customers, providing them with the opportunity to explore a fresh culinary experience. Lastly, it is essential to encourage the younger generation to discover local fruits and adopt healthier eating habits. The introduction of innovative options like breadfruit cereal contributes to this cause, giving a source of pride as we can offer a healthier breakfast alternative crafted from locally sourced breadfruit.

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Chapter 42
Time to Pick, Point and Click!: Immersing in 360-degree Video Games

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ABSTRACT
"Time to Pick, Point, and Click!" introduces a groundbreaking concept in language learning, seamlessly merging immersive gameplay, storytelling, and panoramic landscapes within a dynamic hotel environment. This virtual game offers a unique approach to linguistic proficiency, fostering a transformative learning experience where users not only acquire language skills but apply them in practical, story-driven scenarios. Beyond language learning, the essay explores the game's sustainability aspects, emphasizing its virtual nature as a step towards a more eco-friendly educational landscape. The inclusion of storytelling elements and panoramic landscapes adds depth to the language learning experience, creating an engaging virtual space that goes beyond conventional methods. As a concept paper, it envisions "Time to Pick, Point, and Click!" as a visionary concept reshaping language education practices, emphasizing creativity, critical thinking, and problem-solving within an immersive and visually captivating virtual environment. The essay sets the stage for future developments, envisioning an ongoing journey where technology and education converge to provide innovative language learning experiences through compelling storytelling and panoramic landscapes.

Keywords: 360° video games, immersive gameplay, storytelling, panoramic landscape, linguistics proficiency

1. INTRODUCTION

In the ever-changing landscape of interactive entertainment, the emergence of 360° video games transforms the way players engage with digital experiences (Xhako et al., 2023). "Time to Pick, Point, and Click!" extends an invitation to enthusiasts for an intellectually stimulating journey into the immersive landscapes of virtual gaming. Within these environments,

narratives unfold with each viewpoint, and novel dimensions of gameplay reveal themselves with every interaction (Tong et al., 2021). At its core, this virtual game tour explores the dynamic facets of 360° video gaming, emphasizing the fusion of virtual reality and storytelling, challenging conventional boundaries, and captivating players within a comprehensive digital experience.

Beyond its entertainment value, "Time to Pick, Point, and Click!" positions itself as an innovative force, introducing novel dimensions to teaching and learning activities. As aptly put by Pinho et al. (2021), immersive adventure game via360° video transcends conventional gaming experiences, providing a panoramic perspective on the challenges and innovations inherent in designing virtual landscapes. As the captivating facets of "Time to Pick, Point, and Click!" are explored, it becomes apparent that this experience transcends the mere realm of gaming; it stands as an innovative and sustainable form of interactive entertainment that redefines engagement with virtual worlds. Students are encouraged to envision the possibilities of immersion, where gaming seamlessly integrates with the teaching and learning experience, offering a new frontier for educational exploration and immersive storytelling within an academically driven context (Bahng et al., 2023).

2. BACKGROUND OF THE GAME

“Time to Pick, Point, and Click!" The virtual game tour unfolds within the vibrant ambiance of a hotel, presenting an innovative approach to language learning. Imagine a scenario where students are not just players but language enthusiasts navigating through the intricacies of a hotel environment. The choices they make at the hotel counter, in the cafe, and various checkpoints become pivotal moments in an educational journey.

This immersive language learning experience is meticulously crafted to provide students with a practical and engaging platform. The game encourages them to pick choices that mirror real-life situations within a hotel, offering a dynamic way to learn and practice phrases commonly used in hospitality settings. The hotel setting becomes a virtual language classroom, where students explore, interact, and absorb language skills organically.

The game transcends traditional language learning methods by seamlessly integrating into the virtual hotel landscape. The fusion of virtual reality, storytelling, and language acquisition takes center stage, challenging the boundaries of conventional education and captivating students in an educational digital universe.

Stepping into the shoes of travelers navigating through the hotel, students encounter language challenges at every turn. Whether checking in at the counter, placing an order in the cafe, or engaging in casual conversations, each choice is a building block for language mastery. The game becomes a comprehensive language learning tool, offering a panoramic perspective on language acquisition in a virtual setting.

As we explore the captivating facets of “Time to Pick, Point, and Click!", the hotel serves not only as a backdrop for an entertaining game but as a gateway to practical language learning. It's a space where students can apply language skills in authentic scenarios, transforming the gaming experience into a valuable educational journey. With each click and choice, students are not only immersed in the richness of a virtual hotel but are actively mastering phrases essential for real-world interactions. The game, in essence, becomes a bridge between virtual exploration and language proficiency, offering a novel and effective approach to language learning within the dynamic landscape of interactive entertainment.

3. EDUCATIONAL OBJECTIVES

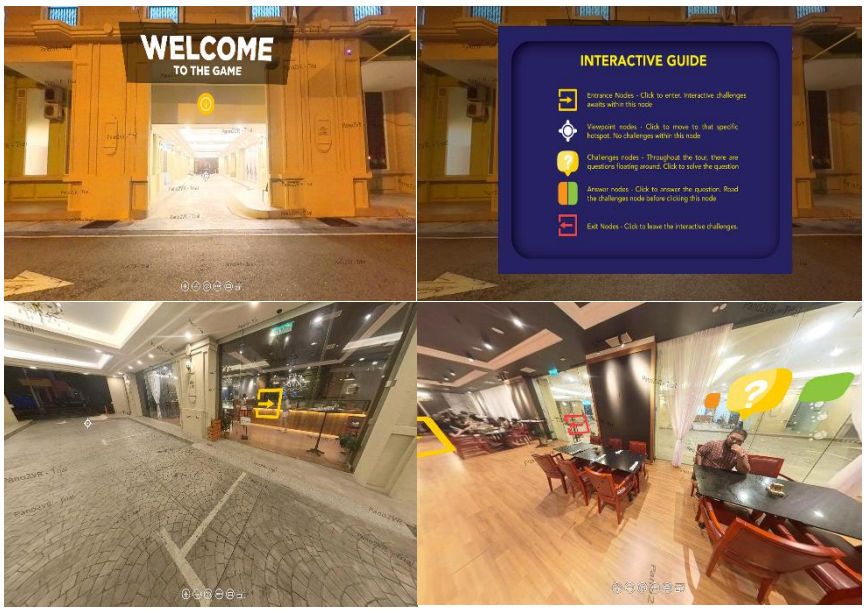
This virtual game set within the vibrant hotel environment becomes a hub for honing creative minds.The game strategically weaves critical thinking challenges into the virtual hotel's fabric. Decision-making scenarios demand thoughtful consideration as students face communication hurdles at the front desk or navigate language barriers in the cafe. Through these scenarios, players not only learn a language but also develop a critical mindset.

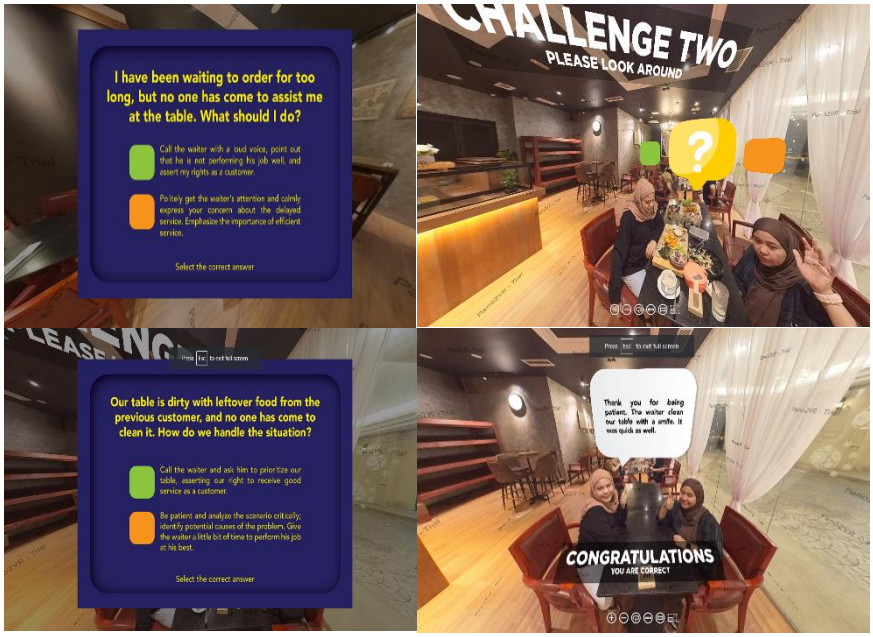
Problem-solving takes center stage as effective communication becomes the key to overcoming challenges. The game encourages collaborative learning, fostering teamwork and innovative problem-solving. Immediate consequences for decisions create a dynamic feedback loop, sharpening quick thinking and adaptability.

"Time to Pick, Point, and Click!" goes beyond the traditional, encouraging innovative language use. In various hotel scenarios, students explore and experiment with language, enhancing their ability to express thoughts creatively. The game becomes a transformative journey, equipping learners with not just language skills but also critical thinking and creative problem-solving abilities.

In this virtual realm, students do not merely pick up a language; they navigate a dynamic learning experience that mirrors the complexities of real-world communication. As we explore "Time to Pick, Point, and Click!" we witness the emergence of learners who not only speak fluently but also think critically and solve problems creatively—a testament to the game's transformative power in education.

4. "TIME TO PICK, POINT, AND CLICK!": A VISUAL EXPLORATION OF LANGUAGE LEARNING





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Chapter 43
Exploring the *e-Modul Garamia*: An Innovative Approach to Enhance Student Understanding in the Preparation of Salt Content Standard

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ABSTRACT
The *e-Modul Garamia* serves as an innovative tool developed through Inquiry Based Science Education (IBSE) approach to assist Form Four Students in Malaysia in understanding the preparation of salts in Chemistry subject. This is a developmental research using ADDIE model as the instructional design model in developing *e-Modul Garamia*. This study also identified the validity and usability of the e-module. Three instruments were used in this study, namely e-module content validity evaluation form, e-module feature validity evaluation form and e-module usability questionnaire. The e-module has been validated by three experts for content validity and another three experts for feature validity. The findings show that the *e-Modul Garamia* obtained satisfactory Item-level Content Validity Index (I-CVI) of 1.00 and has good feature validity with a percentage of agreement of 98.5%. A total of 360 Form Four students were involved as samples in studying the usability of the e-module. The data were analyzed using descriptive statistics. Four constructs that represent usability of the e-module, namely usefulness, ease of use, ease of learning and satisfaction are all at high level with mean of 4.29 (SD = 0.56), 4.29 (SD = 0.59), 4.23 (SD = 0.64) and 4.33 (SD = 0.62). Overall, the e-module obtained an average mean score of 4.29 (SD = 0.53), indicating a high level of usability. In conclusion, the *e-Modul Garamia* demonstrates good validity and is well-received by students for learning the Acid, Base, and Salt Chapter, specifically involving Preparation of Salt Content Standard. The implication of the study is that *e-Modul Garamia* promotes self-learning among students in the context of the Acid, Base, and Salt Chapter.

Keywords: Salt; Validity; Usability; e-Module; Inquiry Based Science Education

1. INTRODUCTION

In the ever-evolving landscape of education, an intriguing trend has emerged showing a noticeable decline in the number of secondary school students in Malaysia opting for STEM subjects. Only 15.2 percent or 62,250 out of approximately 415,000 Form Three students nationwide chose the science stream when stepping into Form Four for the 2023/2024 session (Media Mulia, 2023). This figure prompts concerns regarding the nation's future in

nurturing local talent in Science, Technology, Engineering, and Mathematics (STEM) to face the challenges of the Fourth Industrial Revolution (IR 4.0). Makgato (2019) states that technological advances, digital connectivity and globalization lead to the restructuring of the job market that requires high technical skills in STEM education to support a successful economy. Malaysia needs to produce students who are STEM literate and competent in the field of science and technology to contribute to the well-being of mankind and promote the country's economic growth (Kamisah Osman, 2015). The Chemistry subject, which is also one of the STEM fields, is perceived as difficult by students and causes students' motivation to study Chemistry to decrease. According to Sudigdo and Perdana (2020), many students still think that Chemistry is one of the subjects that is difficult to understand, hence students' motivation to study Chemistry is low. The Chemistry subject is taught in secondary schools in Malaysia for students who take the Science stream in Form Four and Five. Preparation of Salt is a Content Standard in the Learning Area of Acid, Base and Salt under the Theme of Interaction between Matter in the Curriculum and Assessment Standards Document (CASD) of the Chemistry Secondary Schools Standard Curriculum (SSSC).

2. LITERATURE REVIEW

Previous studies indicate that Acid, Base, and Salt are identified as the most challenging learning area for students, with the Preparation of Salts being the most difficult Content Standard among students (Marlina Mat Napes & Aisyah Mohamad Sharif, 2022; Nur Atiqah Mohd Redzuan & Lee, 2023). Safurah Abdul Jalil et al. (2017) stated that the main issue that may contribute to why students find the topic of salt difficult is that because it includes many calculations, it requires students to remember many equations of salt formation, preparation and properties. Therefore, a method that can help students remember the material and the steps to prepare soluble and insoluble salt easily in a fun way is needed (Esther Rani Doraiseriyan & Muhd Ibrahim Muhamad Damanhuri, 2021). The use of electronic modules, or e-modules, has the potential to capture students' interest in learning and facilitate the understanding of abstract concepts (Saraswati & Linda, 2019). E-modules equipped with multimedia elements such as text, audio, video, and animation can aid students in comprehending the steps involved in salt preparation more effectively. According to Irwansyah et al. (2017), the use of multimedia can minimize intrinsic and extrinsic cognitive loads, facilitating the export of information, retention, and processing. As a result, the learning content becomes more dynamic, effective, and enjoyable. The IBSE approach with the 5E learning model encourages active student participation through exploration and hands-on activities to develop understanding of science concepts. Based on a study by Asda and Andromeda (2021), the use of e-modules based on guided inquiry learning is effective in improving student learning outcomes. Therefore, this study aims to develop the *e-Modul Garamia* through IBSE with the 5E learning model for the Content Standard of Preparation of Salt. This study also evaluates the validity and usability of the *e-Modul Garamia* in terms of usefulness, ease of learning, ease of use and satisfaction.

3. METHODOLOGY

The developmental research design was used in this study. This study also used a quantitative descriptive survey method using a questionnaire as a data collection tool for the perception of e-module usability. The ADDIE design model is the backbone in the development of the e-Modul Garamia which includes five phases, namely the analysis, design, development, implementation and evaluation phases. In the analysis phase, a needs analysis was carried out by distributing questionnaires to students to identify the Learning

Areas and Content Standards in the Chemistry subject that pose the greatest difficulty for students. In design phase, the chosen learning strategy was the IBSE approach, incorporating the 5E Learning Model. Moving on to the development phase, it encompassed the creation of learning videos along with the development of quizzes and reinforcement exercises. Additionally, the validity of both the e-module content and its features was assessed in this phase. A pilot study was conducted in one of the schools in Hulu Langat district, Selangor and involved 30 students. Cronbach's alpha value for all items obtained was 0.916. This value has excellent correlation strength according to Hair et al. (2006). In the implementation stage, the *e-Module Garamia* was deployed for use by Form Four students engaging with the Preparation of Salt Content Standard. Finally, the evaluation phase aims to get student feedback after using the *e-Modul Garamia*. Questionnaires were distributed to students to measure the usability of the e-module from the aspects of usefulness, ease of use, ease of learning and satisfaction.

The study encompasses a population of 2,768 Form Four students in the Hulu Langat District, Selangor, enrolled in the Chemistry subject. Utilizing the sample size determination table by Krejcie and Morgan (1970), the recommended sample size is 338 respondents from a population of 2,800 individuals. Employing a simple random sampling technique, 18 schools were chosen from the total of 37 schools in Hulu Langat. Subsequently, cluster random sampling was employed, with Form Four students in each selected school grouped into clusters of 20 students. From each school, one cluster was then randomly chosen as the sample, resulting in a total of 360 participants selected from the 18 schools.

4. RESULTS AND DISCUSSION

The learning material in the *e-Modul Garamia* includes the Learning Standard videos in the Content Standard of Preparation of Salt, extra videos for additional information, brain teasers as well as quizzes and reinforcement exercises. The I-CVI value obtained for each item is 1.00. This value is accepted for the number of experts less than five as suggested by Lynn (1986). This shows that the expert panel has agreed that every learning material, quizzes and reinforcement exercises are related to the Content Standard of the Preparation of Salt in the CASD of the Chemistry SSSC. The *e-Modul Garamia* feature validity value obtained is 98.5 percent. This validity value is high because it exceeds the minimum value of 70 percent as stated by Tuckman and Waheed (1981). The USE questionnaire by Lund (2001) was adapted in this study to test the usability of *e-Modul Garamia* in terms of usefulness, ease of use, ease of learning and satisfaction. Nielsen (1994) states that a method to describe the results of usability measurement usually takes the mean value of each variable used. Therefore, the mean value and standard deviation for each item, each construct and the entire item in the questionnaire were measured. Table 1 shows the overall data analysis of the usability of *e-Modul Garamia* as well as the interpretation of mean score. Based on Pallant (2010), a mean score of 3.67 to 5.00 indicates a high mean score interpretation.

Table 1 Overall Data Analysis of the usability of *e-Modul Garamia*

Construct	Mean (M)	Standard Deviation (SD)	Interpretation of Mean Score
Usefulness	4.29	0.56	High
Ease of Use	4.29	0.59	High
Ease of Learning	4.23	0.64	High
Satisfaction	4.33	0.62	High
Overall Mean Average	4.29	0.53	High

5. CONCLUSION & RECOMMENDATION

Drawing from the study's outcomes, it is evident that *e-Modul Garamia* has been successfully developed with a good content validity index value of 1.00. The feature validity, assessed through an expert agreement percentage of 98.5%, also attests to the robustness of the *e-Modul Garamia* features. In addition, the results of data analysis find that the overall mean average value for the usability of this e-module is 4.29. This data shows that most respondents agree with the usability of *e-Modul Garamia* for aspects of usability, ease of use, ease of learning and satisfaction. Therefore, the usability of *e-Modul Garamia* for each construct is interpreted to be at a high level among Form Four students. It is strongly recommended to undertake further research to empirically assess the effectiveness of *e-Modul Garamia* to provide valuable insights into its impact on enhancing student understanding and learning outcomes in the Preparation of Salt Content Standards.

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Chapter 44
Artificial Intelligent Human Recognition and Gesture-Controlled Load Transporter for Industrial Applications

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ABSTRACT

The objective of this project is to establish intuitive control of load transporter through the collaborative efforts of human interaction and artificial intelligence. The control mechanism involves the use of hand, facilitated by image processing using Python libraries such as OpenCV, MediaPipe, and SciKit-learn, which analyze the video feed captured by the camera. The system recognizes eight pre-registered right-hand gestures, namely “Follow”, “Turn left”, “Turn right”,” Strafe left”, “Strafe right”, “Forwards”, “Backwards”, and “Stop”, all of which have been trained for gesture recognition. Pose recognition is employed to categorize the relative motion of the human in relation to the transporter. The transporter successfully executes command through gestures with a 1.5 second delay. Its 25-degree camera field of view enables consistent tracking of human object within 3.61-meter distance, allowing for an extensive 5.686m2 area of free movement. Additionally, hand gesture recognition is optimized within 0.5 meters, with varying levels of recognition for different gestures. In conclusion, the intelligent load transporter, incorporating machine learning models from Mediapipe and Scikit-learn, effectively enables user-controlled movement without the need for physical controllers.

Keywords: Gesture control, Machine Learning, Human Following, Image processing, and Load transporter.

1. INTRODUCTION

In the current era of modern industries, the efficient movement of heavy loads is often a formidable challenge. From troublesome test jigs to weighty metal objects and intricate machinery, the manual transport of these industrial essentials can lead to inefficiencies, safety concerns, and increased operational costs.

Manual handling activities involve the transporting or supporting of a load, which includes lifting, lowering, pushing, pulling, carrying, restraining, or holding manually using human energy and forces. According to the Malaysian Department of Occupational Safety and Health of the Ministry of Human Resources guidelines on manual handling, these activities contribute to 40% of reported musculoskeletal disorders (MSDs) cases in Malaysia. MSDs often involve strains and sprains mainly to the lower back, shoulder, and upper limbs. They can result in protracted pain, disability, medical treatment, and financial stress for those afflicted with them. Often, employers find themselves paying the bill, either directly or through

employee's compensation insurance, which accounts to nearly RM4 mil in the year of 2014. (Guidelines for Manual Handling at Workplace, 2018)

Published on the National Library of Medicine, a study delved into quantifying the Maximum Acceptable Frequency of Lift (MAFL) for manual material handling tasks in Malaysian males, an area with limited research on lifting frequency in developing countries. Subjects lifted loads of 1 kg and 5 kg, revealing distinct MAFL variations. The mean frequencies for 1 kg and 5 kg loads were 6.8 and 5.5 cycles/minute, respectively, with corresponding energy expenditure values of 4.16 and 5.62 kcal/min. Significantly different MAFL, energy expenditure, and Ratings of Perceived Exertion (RPE) ($p < 0.05$) emphasized increased physiological effort for heavier loads. These findings highlight the necessity of evaluating physiological responses for task design aligned with worker capacities, mitigating the risk of Work-Related Musculoskeletal Disorders (WRMSDs).(Widia et al., 2019)

Mental fatigue, resulting from prolonged cognitive demands, negatively impacts endurance performance. Studies, including 11 articles, show a decline in endurance metrics with higher perceived exertion. Physiological variables in shorter tasks are unaffected, highlighting the duration and intensity's role in mental fatigue-induced physical performance decline.(Van Cutsem et al., 2017)

It's within this context that this paper finds its purpose. The aim of this project is to infuse the essence of artificial intelligence into load transportation, achieved through collaboration with human operators. By real-time computer vision, the transporter will have the ability to detect humans, and interpret the operator's hand gestures. The prototype would enable the operators to remotely control the load transporter without physical contact and with less mental fatigue.

2. LITERATURE REVIEW

Human assist robots revolutionize collaboration, leveraging advanced robotics and artificial intelligence (AI) to enhance human capabilities. These robots navigate diverse environments, interpret gestures, and respond to verbal cues. Applications span healthcare, aiding in patient care and rehabilitation, to manufacturing, increasing efficiency and safety. Equipped with intuitive interfaces, they offer accessibility for users with varying technical expertise. As a transformative force, human assist robots signify a promising era of cooperation between humans and machines, promising increased productivity and improved quality of life across various industries.

The palette jack and forklift are the example of the common human assist load transporter that is widely used in the industry. The powered lifting mechanism, making it easier for operators to lift and maneuver loads. Motorized assistance significantly reduces the physical effort required for material handling, improves efficiency, and minimizes the risk of injury. Aside from the advantages of the load transporter, they have some limitations. They require manual operation, causing physical strain on operators, and their maneuverability can be challenging in tight spaces. Training for operators is necessary, and the risk of accidents is present.

Gesture-controlled load transporters offer a simpler and more intuitive way of operating. Using pre-setting gestures that are almost similar to natural gesture, these systems reduce the need for extensive training and physical effort. They are designed for better maneuverability, making them suitable for various environments. Additionally, safety features like obstacle detection enhance workplace safety, marking a shift toward more user-friendly and efficient material handling solutions. The load transporter incorporates cutting-edge technologies such as computer vision, machine learning algorithm, gesture sensors, artificial intelligence, and omnidirectional mobility systems.

MediaPipe's on-device hand tracking and pose estimation offer real-time solutions using mobile cameras, aligning with industrial demands. BlazePose's convolutional neural network architecture further contributes to human pose estimation for interactive applications. A comparison between YOLOv7 and MediaPipe favours the latter due to its real-time image processing capabilities. These studies collectively inform the project's foundation, ensuring efficient human-machine interaction and gesture control.(Bazarevsky et al., n.d.; Zhang et al., n.d.)

In a gesture-controlled transporter, OpenCV and MediaPipe can be integrated to create a robust and responsive system. OpenCV may be employed for general image processing tasks, such as capturing video frames, filtering noise, and extracting relevant features from the image. MediaPipe, with its specialized modules, can then be used for more advanced tasks like hand tracking and pose estimation. By combining the capabilities of both libraries, the transporter can effectively recognize and interpret human gestures in real-time, allowing users to interact with the transporter through intuitive hand movements.

3. METHODOLOGY

3.1. Hardware Devices

Figure 1 provides an overview of the devices (hardware) used in the project, comprising an ESP32-WROOM microcontroller, a laptop, and a phone. Each device operates in sync via a Wi-Fi connection. The phone serves as the frontal visual input, while the laptop and ESP32-WROOM act as the CPUs that process the inputs to generate different outputs. The outputs of the MCU are then translated into physical execution on the motors that move the transporter.

Figure 2 shows the schematic diagram of the connections of the ESP32-WROOM module, motor drivers, and power supply, which are mounted onto the car chassis (prototype). The ESP32 expansion board is powered with 5V from the left L298N motor drivers, and it regulates the 5V to 3.3V using the AMS1117 voltage regulator on board for powering the ESP32 module. The ESP32 pins that are connected to the motor drivers consist of PWM and GPIO pins, which control the speed and direction of the motors.

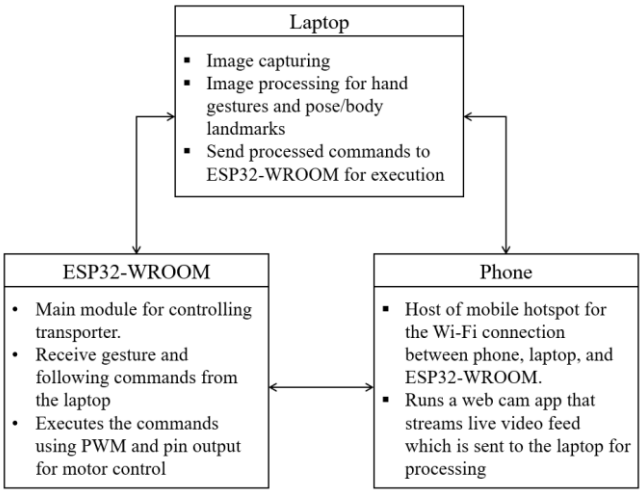

Figure 1: Hardware devices

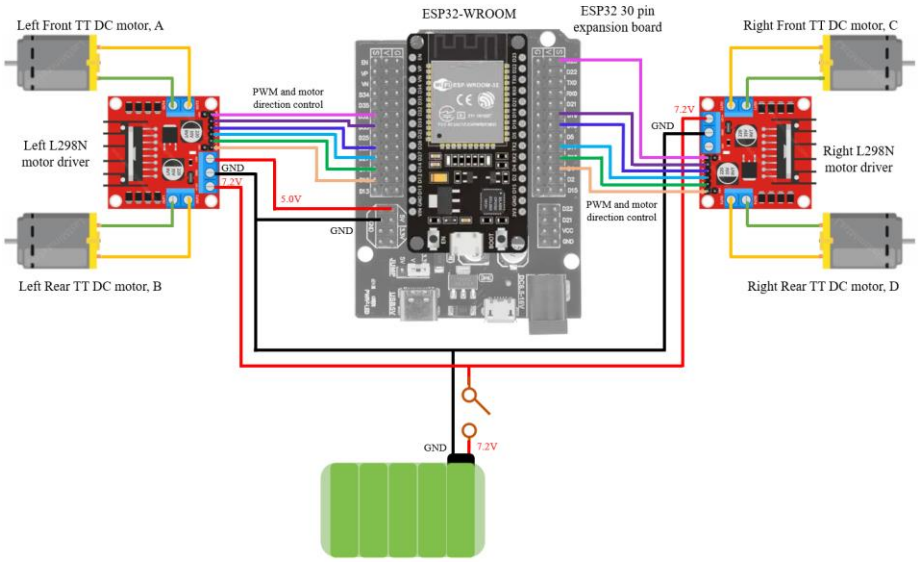

Figure 2: Prototype schematic

3.2. Data Training for Gesture Recognition

The left diagram in Figure 3 above shows the process of obtaining the machine learning model using Scikit-learn. This process involves capturing the hand landmark data (3D coordinates) and training a classification model based on the collected data. The right-side illustration in Figure 3 depicts an abstract representation of how hand gestures are classified in terms of functionality. Applying this methodology involves utilizing the MediaPipe hand recognition model to extract the coordinates of the landmarks (landmarks shown in Figure 4). The collected data is then separated into 70% for training and 30% for testing. A total of three classification algorithms are trained (Ridge Classifier, Random Forest Classifier, and Gradient Boosting Classifier) and tested to export the most accurate model (out of three). After the gesture recognition model is trained, it is utilized for real-time hand gesture recognition with OpenCV image processing. Figure 4 shows the 21 hand landmarks (using the MediaPipe hand recognition model) and the trained gesture recognition models (using SciKit-Learn classification algorithms).

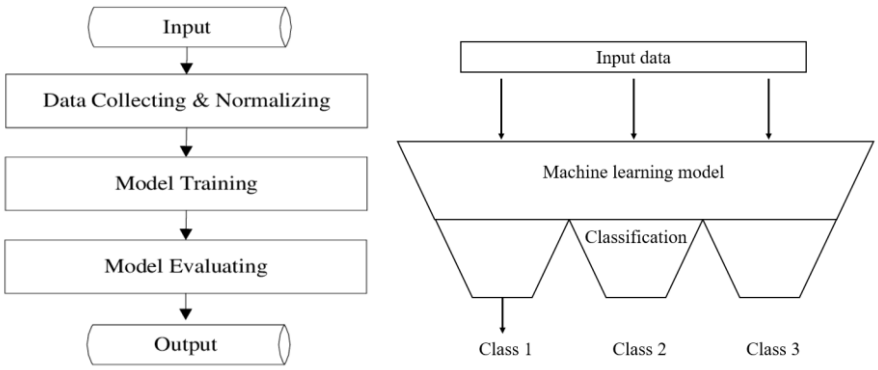

Figure 3: Model training process and Illustration of classification

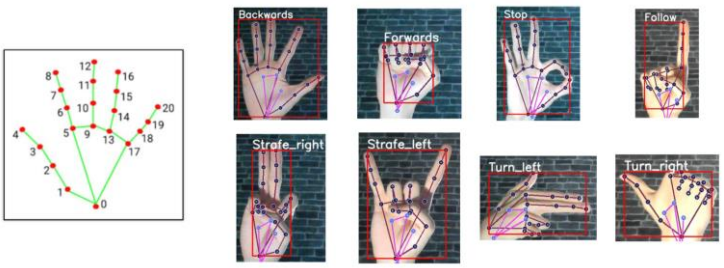

Figure 4: Recognition of eight hand gestures

3.3. Positional Tracking

In Figure 5, the illustration outlines the approach employed for tracking the human's position. Initially, the centre of the human torso serves as the reference point (depicted as a white dot) for determining the individual's location. Subsequently, leveraging the functionalities within the OpenCV library, the coordinate of the centre point is assessed against five threshold lines, encompassing left/right weak pan thresholds, left/right hard pan thresholds, and the within/out of range threshold. This results in a classification of ten distinct positions by the program, which is then sent to the ESP32 module via Wi-Fi communication.

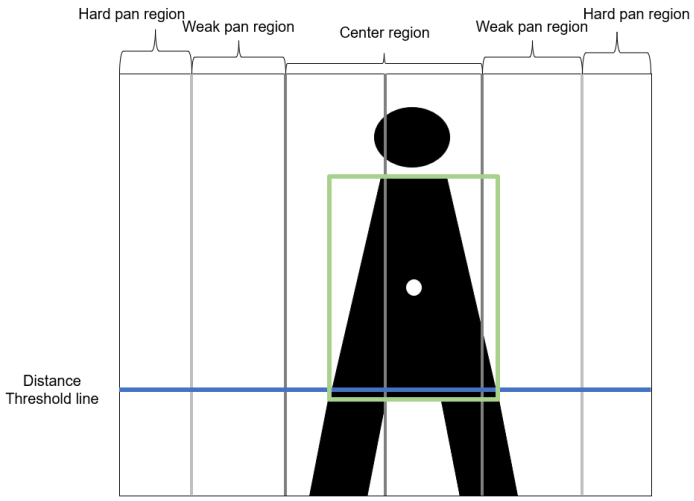

Figure 5: Categorisation of human's position

4. RESULTS & DISCUSSION

4.1. Accuracy of gesture recognition vs distance

Table 1 Gesture Recognition Accuracy vs distance, obtained with 108 MP, f/1.8, 26mm (wide), 1/1.52", 2x zoom

Distance, m	Gestures Recognition Accuracy, %							
	Forwards	Backwards	Turn Left	Turn Right	Strafe Left	Strafe Right	Follow	Stop
0.5	100	100	100	100	100	100	100	100
1	100	100	100	85	5	0	100	100
1.1	85	60	100	20	0	0	100	100
1.2	25	40	100	0	0	0	100	100
1.3	0	15	5	0	0	0	100	100
1.4	0	0	0	0	0	0	100	100
1.5	0	0	0	0	0	0	100	100

Table 1 shows the combination of all the accuracy plots for each gesture. By comparison, the strafe right gesture is the least accurate, while the gestures follow and stop are the most accurate as they can be recognized at 1.5 meters. Based on the data, Overall accuracy ranking by distance is Follow, Stop, Turn Left, Backwards, Forwards, Turn Right, Strafe Left, and Strafe Right. All gestures can be recognized at 1 meter except the strafe right gesture.

4.2. Delay of gesture recognition

Table 2 displays the conducted test to determine the delay amount (comprising processing time and confirmation iteration) from recognizing a gesture to sending the gesture command to the ESP32-WROOM (from the laptop). The program requires repeated recognition of a gesture for 10 cycles before confirming it as a command, aiming to prevent accidental commands. The total duration taken is obtained by accumulating each loop duration. The overall delay is approximately 1.54 seconds.

Table 2 Time Taken for sending gesture command

Loop count to 10	Duration, ms
1	436.5
2	109.2
3	108.6
4	111.4
5	123.7
6	117.3
7	131.6
8	129.9
9	149.5
10	123.5
Total	1.5412 seconds

4.3. Field of View, Panning Thresholds, and freedom of movement

Table 3 Field of View and panning threshold angles

Position	Angle, °
Maximum FOV	24.97
Hard pan threshold	17.81
Weak pan threshold	4.72

Table 3 shows the test conducted to identify the angle of maximum field of view, weak pan threshold and hard pan threshold, which is based on the specifications of the camera (108 MP, f/1.8, 26mm (wide), 1/1.52", 2x zoom)

The maximum Field of View (FOV) for the transporter is 2 * 24.97° = 50°. The maximum detection distance for humans is 3.61 meters, determining the area within which the transporter can detect humans (illustrated in Figure 6). In essence, the human object can move freely within this region (5.686m²), and the transporter can detect and adjust its position until it comes to a stop in front of the human object.

5. CONCLUSION & RECOMMENDATION

In conclusion, Python libraries such as OpenCV, MediaPipe, and Scikit-learn can be implemented to effectively recognize hand gestures and human position, enabling the prototype to track and follow the human user. Results indicate that the hand recognition function has limitations; distances exceeding 1 metre can lead to gesture recognition failures. Additionally, the field of view (which accounts for the area of freedom of movement) and the delay in gesture recognition demonstrate significant limitations. Future enhancements include Raspberry Pi integration to fully eliminate the use of three separate devices that use Wi-Fi communication, Python multiprocessing for improved frame processing, a panning function for a 360-degree field of view, a controllable zoom camera to increase gesture recognition accuracy, and lastly, an increase in the dataset used for training the gesture recognition model.

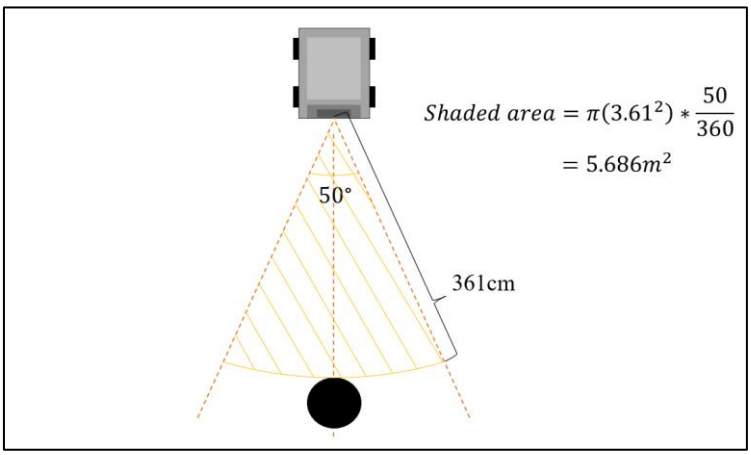

Figure 6: Freedom of movement

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Chapter 45
Developing e-PeKTISS Smartphone Application as Online Teaching and Learning Resource

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ABSTRACT
e-PeKTISS is an e-learning smartphone application as a teaching and learning online platform. It is focusing on Pedagogy, Cocurriculum, Technology, Soft Skills and Social Sciences. It will be used to teach and consulting trainee teachers and counsultation programmes with school teachers community. It can save cost and environemntat freindly and can be used anytime and anywhere.plication has been built to help get information easily, quickly and accessible anywhere.

Keywords: Technology; Pedagogy; Cocurriculum; Social Science

1. INTRODUCTION

Information Technology and Communication (ICT) innovation is one of the important things in today's global life. Its huge impact in human life requires the efforts of many parties to increase the level of computer use and the practice of innovation in Teaching and Learning (PdP), especially among lecturers and students of Institutes of Higher Education (IPT) (Amirul Saidah Mad Nordin et al., 2023)With innovation in education technology, this will help improve the competence of lecturers and trainee teachers. This competence is based on clear technological knowledge and extensive pedagogical knowledge as well as in-depth knowledge of the content of Teaching and Learning (Eng C.Y. & Keong T.C., 2019). Past studies show that the use of ICT innovation in teaching is at a moderate level (Saharia Ismail et al., 2021). Therefore, with the existence of this innovation can help increase the use of ICT in PdP.

2. LITERATURE REVIEW

Currently, the digitization of education is nothing new. The idea of digitization of education is accepted at almost all levels of learning, from kindergarten to higher education institutions. This idea is the transformation of the education system in Malaysia which aims to create a line of educators and students who are creative, innovative, efficient and enthusiastic in line with the needs of the times and also in line with the wishes of the Industrial Revolution 4.0 (Amirul Saidah Mad Nordin et al., 2023). So innovation in education is very necessary in improving the academic achievement of students. According to the Fourth Edition Hall Dictionary, innovation means something newly introduced such as new methods, systems, customs and others (Kamus Dewan Edisi Keempat, 2005) ICT in the era of globalization now

demands that educational institutions make changes in order to remain relevant in terms of the preparation and development of human capital (Eng C.Y. & Keong T.C., 2019). Tsai C. C. in (Saharia Ismail et al., 2021) states that the improvement of this technology not only leads to the development of the learning environment but also has an impact on teachers and students in their PdP concept.

3. OBJECTIVES

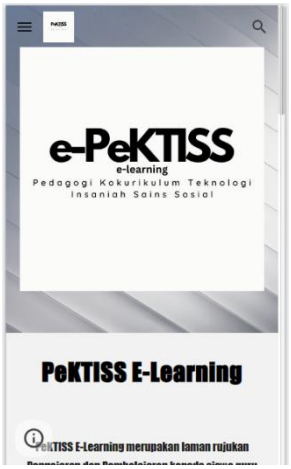
To help provide a digital platform as a reference for IPGM courses application was introduced to student teachers and lecturers. The objective of developing this e-PeKTISS application is:

1. Build a smartphone digital platform for IPGM courses reference resources
2. Build a digital platform that makes it easy for trainee teachers to share information for Teaching and Learning implementation activities.
3. Provide a smart phone digital platform regarding IPGM courses so that it is easy, accurate and fast to access.

4. PRODUCT DEVELOPMENT

The development of this e-PeKTISS by using the AppsGeyser.com platform to build smartphone applications. Through this application, the application will refer to the e-PeKTISS Google Site. With this it will help to make it easier for IPGM courses information to also be accessible via computer.

5. PROCESS



Through this application, the admin has filled in information related to IPGM courses and its implementation at the IPGM level. It provides pages related to the Pedagogy, Cocurriculum, Technology, Soft Skills and Social Science reference documents and others.

6. DISCUSSION AND RECOMMENDATION

Users findings state that this application meets the teaching and learning requirements of IPGM courses. It is easy to use and can be anywhere. Therefore, it is suitable for the KRS learning environment that is carried out outside the classroom.

Lecturers who use the e-PeKTISS application state that the application is very helpful when conducting IPGM courses activities and delivering lectures as well. It can be taken anywhere and can be used any time. Apart from that, the usage guide helps how to install and how to use.

Students informed that this application is easy to install. It is also very helpful during IPGM courses lectures. For students who undergo practicum, they can use it while teaching. It is easy and fast for them to get IPGM courses information.

7. CONCLUSION

This application got a good response from users who are students and lecturers of IPGM courses. The experts stated that the references used are compatible with the IPGM courses curriculum and are easy to understand. Therefore, it can be concluded that this application is effective and able to help users to get information about IPGM courses easily, accurately and quickly.

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Chapter 46
The Development of Predict-Observe-Explain-Visualization (POEV) Module to Reduce Students' Misconception in the Topic of Chemical Bonding

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ABSTRACT
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 95 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 and structure questions were used in this study and analysis shows that the data were normally distributed. The data collection was analyses descriptively according to 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. Furthermore, there was no significant difference between experiment and control group for student achievement in pretest ($t(93) = .096$, $P > 0.05$). Students' achievement in posttest score analysis revealed a significant different between experimental and control group ($t(93) .000$, $P < 0.05$). This study supports using POEV module significantly improve the conceptual understanding and reduce misconception in the topic of chemical bonding.

Keywords: POE Learning Strategy, misconception, Chemical bonding, Visualization

1. INTRODUCTION

Chemical bonding is one of the topics in chemistry subject that students always experience in misconceptions (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). Various studies have revealed that students struggle to picture the structure and form of molecules and atomic structure in chemical bonds since this capacity necessitates strong visual abilities**.** The main challenge for chemistry teachers is to visualize this abstract concepts in the minds of students, (Kuit and Osman, 2021). Therefore, visualization skills are essential to help students understand abstract concepts in the topic of chemical bonds. Thus, the development of visualization aids is very helpful in improving visualization skills among students.

As a result, various visualization aids have been developed to create virtual molecular and atomic structures. 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).

2. LITERATURE REVIEW

In the field of teaching, sub microscopic chemical problems present both intellectual and visual challenges. It is difficult to demonstrate the nature of atoms and molecules during physical and chemical changes since doing so necessitates a solid grasp of the three levels of representation as well as the capacity to understand symbolic representation in chemistry. Johnstone, (1993) claims that because students have a heavy cognitive load, they frequently use symbolic representation without comprehending the chemical topics thematically related with these representations. A study by (Aliyu and Talib, 2020) on Nigerian secondary schools found that due of the static depiction of molecules, the majority of them were unable to explain macroscopic and symbolic representation and comprehend the chemical idea related to the nature of matter. Consequently, the efficient use of instructional strategy and resources can facilitate the transition between these levels and encourage higher order thinking, both of which improve chemistry learning (Mohamed-Salah and Alain, 2016).

Teaching techniques changed from using traditional ways to use blended learning in accordance with the advancement of educational technology in the IR 4.0 such integrated multimedia as visualisations aids combine with printed module (Soares *et al.*, 2020). Visualization tools have been used to describe the form of molecules (sub microscopic levels) and the properties of chemical molecules (macroscopic levels), and help students understand the concept of transition between levels (macroscopic, sub microscopic and symbolic).Building on constructivism theory (Piaget, 1954),and cognitive theory of multimedia learning (Mayer, 2017), the POEV module is proposed in this work. One of these innovations is through the implementation of the Predict-Observe-Explain (POE) learning strategy that was developed by White and Gunstone is integrated with guided visualisation aids. The visualisations aids that had been used in this research is learning video that disseminated through TikTok platform. These learning video that integrated in the POEV module will help students to complete the task in the module. An observation through video is used to implement the POE technique. Students make predictions about the future and provide justifications for them based on their understanding.Students explain any differences between their predictions and the observations' findings if there are any (Islamiyah *et al.*, 2022). The POE learning strategy is more effective compared to 5E learning strategy (Karsli Baydere, 2021)

3. METHODOLOGY

Quasi-experimental research with a pretest-post-test control group design was the methodology. Thirteen multiple-choice, three-tier diagnostic tests for section A and structural questions for section B about chemical bonding comprise the pretest and post-test utilized in this study. Ninety- five form 4 pupils who studied chemistry are the samples, chosen using purposive sampling. Two groups are created from the sample: a control group (47 students) and an experimental group (48 students). The POEV module (together with a guided learning video via TikTok) was utilized by the experimental group. The control group, meanwhile, is utilizing the POE module (without watching the instructional video on 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 and confident (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 and T-test were used to analyze the data.

3.1. Result and discussion

Five experts (Expert Judgment)—a material expert, a learning expert, and a media expert—validated this POEV module. The expert evaluated the product's viability in terms of its content or components. The product's viability in terms of the presentation component was evaluated by the learning specialist. I-cvi value for expert agreements is 1.0 shows that the content in this module is high validity and reliability.

3.2. Data analysis

The data was analysed descriptively by calculating the percentage of each level of understanding. Table 1 shows the percentage of each level of understanding.

	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

FKY = understand the concept and confidence, TFK = not understand the concept, FKTY= understand but less sure, M= Misconception.

The result show that, percentage of students that understand the concept and confidence for experimental group (70.80%) is higher than control group which is 25.6 %. Meanwhile, 67.80% of students in control group had misconceptions about this topic compared to only 25.53% students in experimental group had misconceptions about chemical bonding.

The research data also was analysed using Statistical Package for Social Science (SPSS) software version 26, followed by hypothesis testing using t-tests. The table 2 below show shows the post-test statistical analysis of the control group and the experimental group.

Group	n	mean	Standard deviation	Value of t	df	Sig
Experimental group	48	69.00	12.826	1.680	93	.000
Control group	47	52.53	10.938			

Based on table 2, the value of t (93) =1.680, p = .000, (p < .05), shows that there is a significant difference between the mean scores between the two study groups t (2-sided at the 95% confidence level). This shows that there is a significant difference in the mean post test score for both control and experimental groups. The results show that the mean score of the control group students is lower compared to the experimental group. The effect size measured by Cohen's d formula is 1.5. This value shows a significant effect on the mean value according to Cohen's agreement. This shows that the POEV learning strategy is more effective in improving students' understanding of concepts in the topic of chemical bonding.

4. CONCLUSION

Having a high-quality chemistry education is essential to developing human capital that can succeed in scientific fields. There are a lot of opportunities in the improving teaching and learning strategy to improve student's visualisation skills. Getting students to mentally picture abstract concepts is chemistry teacher's biggest task. Therefore, the use of learning strategy that integrated with guided visualization elements facilitates students' grasp of the notion of chemical bonding. This POEV teaching strategy can also be used to teach chemistry to science majors in matriculation, diploma, and bachelor's degree programs in higher education institutions, as well as upper secondary school students**.** For the future recommendation, this POEV strategi also can be implement to another topic in chemistry subject.

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Chapter 47
Mazemind Numeric Quest

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ABSTRACT

Mazemind Numeric Quest (Number Maze), is a STEM invention that introduces an engaging number maze game. This project merges traditional maze challenges with precise mathematical reasoning, replacing pathways with numerical elements. A number maze typically refers to a puzzle or game in which the player navigates through a grid or maze filled with numbers, following a set of rules or clues related to numerical patterns. Players decipher rules tied to numerical patterns, applying mathematical operations for maze traversal. The game enhances reverse thinking skills, addressing the challenge students face in utilising this technique. Beyond testing critical thinking, Number Maze captivates students, making it their preferred choice for interactive mathematics learning. The innovation impacts student learning, schools, educators, and STEM interests. The technically excellent game offers a brain workout, balancing complexity with accessibility. Practical applicability spans education, physical education, social interaction, and therapy. With promising market potential, Number Maze has been commercialized, meeting the perpetual demand for innovative educational tools. The game's scientific rigor integrates logic and problem-solving, fostering comprehensive learning. The project's originality lies in the unique design of the Number Maze game, providing an enjoyable and interactive maths learning experience supported by positive student feedback.

Keywords: Number Maze, STEM, Mathematics tools, Mathematics puzzle, Recreational mathematics.

1. INTRODUCTION

1.1 Project Background

A "number maze" typically refers to a puzzle or game in which the player navigates through a grid or maze filled with numbers, following a set of rules or clues related to numerical patterns. Number mazes are intriguing puzzles that blend the challenge of a traditional maze with the precision of mathematical reasoning. Within these grids, numerical elements replace the more conventional pathways, creating a unique landscape where players navigate not through physical barriers but through the intricacies of numbers.

In a number maze, each cell is assigned a numerical value, and the challenge lies in deciphering the rules that dictate movement through the grid. These rules often involve

mathematical operations, requiring players to calculate, strategize, and apply logical thinking to successfully traverse the maze. The objective can vary, ranging from reaching a specific destination to solving complex mathematical puzzles.

Whether designed for educational purposes, to entertain, or to test problem-solving skills, number mazes offer a dynamic and engaging way to explore mathematical concepts. This fusion of logic and arithmetic creates an immersive experience that challenges participants to think critically while navigating the numerical pathways of the maze. There have been several research related to number mazes for the past few years. Wagner in 1993, investigated with 32 students on a "number maze" consisting of over 400 two-digit combinations in which the task was to draw a continuous line connecting 60 numbers. Records were obtained over a period of 30 days with 2 trials per day for each subject. The scores were based on the sum of the number of combinations included in the pattern for each trial. Ramani et al. (2012) examined whether a theoretically based number board game could be translated into a practical classroom activity that improves Head Start children's numerical knowledge. Playing the number board game as a small group learning activity promoted low-income children's number line estimation, magnitude comparison, numeral identification, and counting. They also found improvements when a paraprofessional from the children's classroom played the game with the children. Through their observations, the game-playing sessions revealed that paraprofessionals adapted the feedback they provided to individual children's improving numerical knowledge over the game-playing sessions and that children remained engaged in the board game play after multiple sessions.

Moreover, Sonnenschein et al. (2016) conducted two studies that explored the effectiveness of using Chutes and Ladders (maths board games) with a specialized counting procedure with Head Start families. Implementation proved to be challenging and children did not improve as much as in previous classroom-based interventions. Elofsson et al. (2016) examined the effects of playing number games (linear number board games, circular number board games, and nonlinear numerical activities) on the development of number knowledge and early arithmetic. They included a passive control group consisting of 114 5-year-old preschool children. In their findings, the positive effects of playing linear number board games support the representational mapping hypothesis. The finding concerning calculation provides support to the assumption that a linear representation is important for early arithmetical learning. In 2019, Khan et al. developed a board game “Number Maze” in order to enhance children’s numerical cognition, logical mind, and motor skill ability in the age group of 3–5 years. In their research, they used a prototype design of this game board that includes a flat horizontal surface with numerous pathways with a light source, a handheld mover stick, and a display board. A basic logic that a given number can be expressed as a sum of other small numbers is used, and the paths are followed to achieve the target.

1.2 Problem Statement

In mathematical problem-solving, the reverse thinking solution is one technique that can be applied to ensure whether the obtained answer is correct or incorrect. However, it is challenging for students to understand how to utilize this method. Therefore, the introduction of the number maze game will help students identify how to use reverse thinking interactively and engagingly. Hence, a question to be addressed is whether the number maze can assist students in comprehending the inverse method interactively and engagingly. Is the game of number maze the preferred choice for students to play?

Therefore, utilizing the Number Maze challenge not only tests students' critical thinking and problem-solving skills but also captivates them to continue solving the puzzle

because the game is highly interactive and enjoyable. Therefore, the Number Maze challenge becomes the students' first choice for playing and learning about mathematics.

1.3 Objectives

The objective of Mazemind Numeric Quest, also known as the Number Maze, is to enhance students' reverse thinking skills through an interactive mathematical tool. This engaging activity aims to stimulate a different approach to problem-solving by challenging students to think in reverse order. Additionally, the quest serves to reinforce and solidify the student's understanding and utilization of various mathematical tools. By combining the elements of interactivity and mathematical exploration, Mazemind Numeric Quest seeks to make the learning experience not only educational but also enjoyable for students.

2. BENEFITS TO INTENDED USER AND SOCIETY

Number Maze is an educational game that helps students to learn more about numbers, patterns, and sequences. As well as helping to improve basic maths skills, this kind of game-based learning approach can also be considered as a pedagogical approach of the twenty-first century that has many advantages in enhancing STEM education, particularly among the current generation, who face a great deal of difficulty dealing with mathematics due to a fear of it. Meanwhile, from the perspective of educators/teachers, using this game can assist them in integrating it into the actual syllabus, thereby enhancing student understanding and making the learning process enjoyable and non-stressful. Rather than relying solely on the written test, the understanding evaluation can now be based on both the game's score and administered repeatedly until the student has mastered the syllabus.

Moreover, the game can also be regarded as a puzzle game in which the students are challenged to apply critical thinking skills in order to solve problems successfully. The students can enhance their cognitive skills by regularly playing the game, which helps them improve their problem-solving, logical reasoning, spatial awareness, and decision-making abilities, which are useful in their studies and everyday life.

3.NOVELTY AND UNIQUENESS

Number Maze is a puzzle game where players navigate through a maze of numbers to reach the end goal. The maze is typically presented as a grid of squares, with each square containing a number. The player starts at one end of the maze and must navigate to the other end by selecting numbers in sequential order. For example, if the player starts on the number 1, they must select the square containing the number 2, then 3, and so on, until they reach the end of the maze. However, the catch is that the player can only move to a square if it is adjacent to the current square and contains the next sequential number.

Number Maze can vary in difficulty, with some mazes having a simple layout and others featuring more complex patterns and obstacles. The game can also incorporate power-ups or bonuses, such as extra time or the ability to skip a number, to make the gameplay more interesting and challenging.

4.LITERATURE REVIEW

Weng (2022) suggested that creativity plays a crucial role in shaping students' attitudes toward learning and their problem-solving abilities. Additionally, the use of a game-based learning approach, particularly a logical thinking game, can be an effective tool for improving

the logical thinking skills of elementary school students. However, it's important to consider the limitations and context of the study, as well as its implications for future research and educational practices.

Lasa et. al (2020) analyzed various STEM educational proposals in the context of mathematics education. The research highlights STEM activities where mathematics primarily serves practical functions, using numbers and units to measure quantities and geometric content for modeling technological prototypes. Some STEM activities deviate from their intended principles, with lower levels confusing STEM with science laboratory projects, and higher levels introducing complex mathematical content. Despite a few activities being guided science laboratory projects, the overall finding is that most STEM activities have the potential to create self-directed learning experiences, allowing students to apply personal problem-solving techniques before formalizing mathematical content with teachers.

Stohlmann (2019) integrated steM education through open-ended game-based learning within a technological context. Stohlmann (2020) emphasized the integration of mathematics into science, technology, engineering, and mathematics (STEM) activities, a noticeable gap lies in the exploration of innovative approaches specifically tailored for mathematical education. The previous literature showed the capability of utilizing game-based learning in mathematics as an effective method for enhancing engagement and comprehension by employing diverse representations.

Anam et. al (2021) studied employed the Class Room Action research method and learning puzzles models to motivate students in learning mathematics. The study observed that the implementation of the puzzle model improved the learning results of students on polygon material mathematics.

Al-Absi (2017) suggested valuable insights into the effectiveness of incorporating puzzles and games as instructional tools to bolster students' mathematical thinking. It underscores the positive impact of such an approach. Moreover, the study highlights that this benefit is not contingent on students' initial self-efficacy beliefs in mathematics, as there was no significant difference in mathematical thinking improvement between students with high and moderate self-efficacy levels when exposed to the experimental teaching approach.

While previous literature has extensively explored various STEM educational proposals within the realm of mathematics education, there remains a distinct gap in the literature concerning innovative and interactive approaches specifically targeting mathematical concepts. In this context, this present paper addresses this gap by introducing the Number Maze, an engaging and educational tool designed to enhance mathematical understanding through hands-on, interactive experiences through the Number Maze game. Unlike traditional STEM activities, the Number Maze uniquely focuses on cultivating reverse thinking skills, strategic planning, and logical reasoning in the context of mathematical navigation. This study presents the development, implementation, and positive outcomes of the Number Maze in the realm of mathematics education.

5.METHODOLOGY

5.1 Technical Excellence

At its core, Number Maze combines intricate mathematical principles with an innovative puzzle design, challenging players with reverse thinking methods, numerical sequences, and spatial navigation. This isn’t just a game; it’s a brain workout that enhances cognitive skills in a fun, engaging way. But what truly sets it apart is how it balances complexity with accessibility, making it enjoyable for all skill levels. Its intuitive design, cross-platform compatibility, and responsive user interface ensure a seamless experience for every player.

Beyond entertainment, Number Maze has made a significant educational impact, receiving accolades in various academic settings for making mathematics appealing and accessible. In essence, Number Maze exemplifies not just game design excellence but also a breakthrough in blending learning with play. The above statements highlight the key aspects of Number Maze's technical excellence and educational impact.

6. RESULT AND DISCUSSION

6.1 Feedback and Impact

The Number Maze game is built on the foundation of number relationships, requiring a deep understanding of how the order of numbers influences efficient navigation. Players engage in strategic thinking, meticulously planning their route to reach the target number by employing critical thinking and logical reasoning to evaluate various paths. The ability to recognize patterns within the maze becomes instrumental in identifying shortcuts or more efficient routes. In some instances, solving the maze necessitates a process of trial and error until the correct order is discerned. Fundamentally, the game seamlessly integrates logic and problem-solving skills, presenting players with challenges that demand both strategic thinking and the correct application of reverse thinking skills for successful maze navigation.

Throughout the game sessions, students not only develop proficiency in understanding the concept of a number maze but also acquire valuable insights into the application of reverse thinking. The facilitator plays a pivotal role in guiding students through the steps of effectively using reverse thinking, ensuring a comprehensive grasp of the mathematical concepts involved.

Feedback from students further substantiates the efficacy of the Number Maze activity. A total of 28 students participated in the activity, all providing positive feedback, refer to Figure 1. Figure 1 illustrates that students exhibit a greater preference for the Number Maze game when compared to the other available gaming options. Beyond being enjoyable, the activity fosters interactive and comprehensive learning of mathematics. Students strongly agreed that they learned something valuable from this STEM activity, and there is observable evidence that students have developed an increased affinity for mathematics after participating in the program.

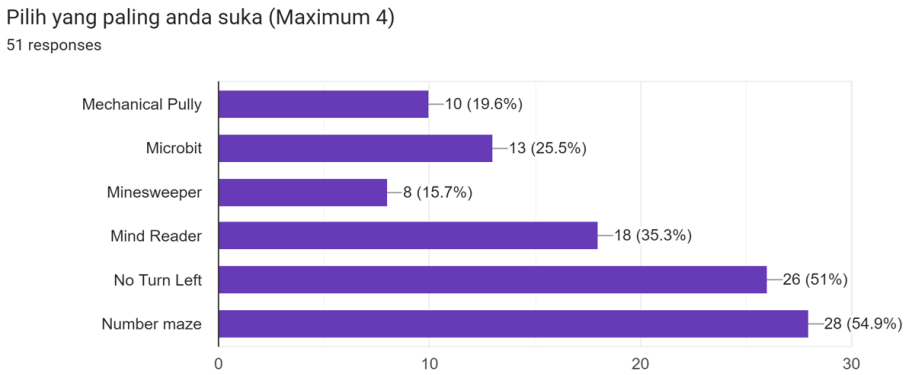

Figure 1. Students' preferences based on the activities offered

The success of the Number Maze highlights students' strong enthusiasm for engaging and enjoyable experiences in learning mathematics. This is evidenced by the feedback received from students who participated in the Number Maze activity, as illustrated

in Figure 2. According to the feedback, the majority of the students affirmed that their involvement in this activity led to acquiring new knowledge from the mathematics exhibition booths. They expressed a keen interest in delving deeper into mathematics following their attendance at the exhibition, and they intend to share information about this program with their friends. Moreover, they hope that similar exhibitions will be held in the future, and their enjoyment of mathematics has notably increased as a result of their participation in this program. The positive reactions from students underscore the potential effectiveness of the Number Maze game as a valuable tool for enhancing mathematics education, fostering both enjoyment and comprehension among participants.

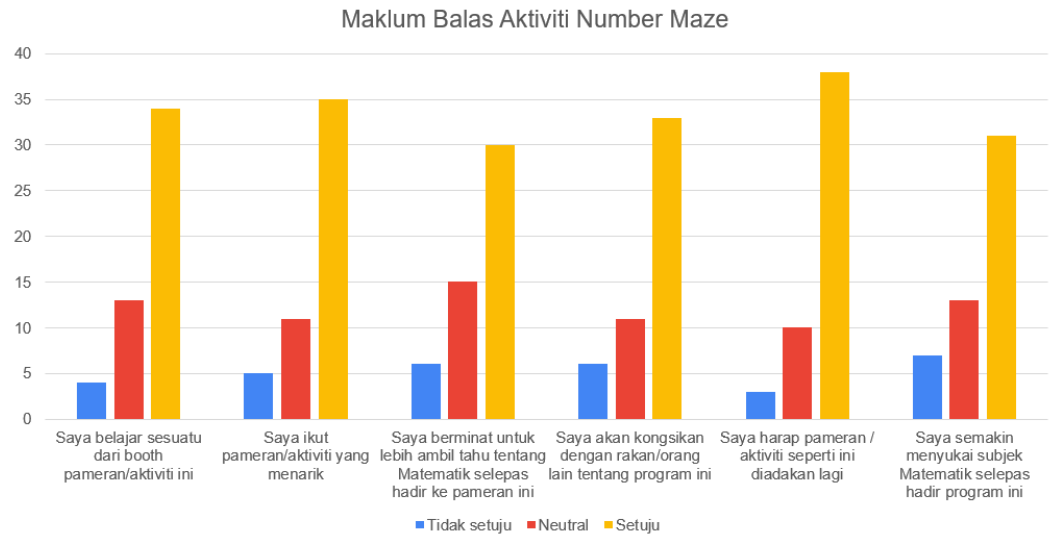

Figure 2. Students' Feedback on Number Maze's Activity

6.2 Practical Applicability

A number maze game has practical applicability across different contexts, including education, physical education, social interaction, and therapy. It's an engaging educational tool for teaching mathematics and enhances mathematical concepts and logical reasoning. It consists of different levels of complexity which are suitable for various age groups, both children and adults. It also promotes physical activity and teamwork in physical education, aids motor skills development in therapy, and is versatile for various environments. The durable design ensures real-world implementation in schools, fitness centers, and therapy centers, making it a practical invention.

6.3. Market and Commercialization Potential

The number maze game has been copyrighted and can be commercialized. The game could have a broad market potential, appealing to various groups within the educational sector. The potential audience might include students, teachers, and schools. This game can cater to different age groups, from primary school to secondary school, offering varying levels of difficulty to suit different skill levels. It could be used as a fun way to reinforce number concepts, problem-solving, and critical thinking. Educators are always looking for engaging

resources to supplement their lessons. A number maze game that aligns with the curriculum and aids in teaching mathematical concepts would be of interest to them.
Additionally, companies that create educational materials might be interested in incorporating this game into their offerings. This could extend to online platforms and educational software. The number maze game can indeed possess strong commercial potential, tapping into the educational market where there's a perpetual demand for innovative and effective teaching tools. The commercial viability of the maze game can be promising, especially as it offers a fun factor and competitive pricing.

7. CONCLUSION

In conclusion, Mazemind Numeric Quest, embodied by the innovative Number Maze game, represents a significant advancement in STEM-based education, particularly in mathematics. The project successfully merges the challenges of traditional maze-solving with precise mathematical reasoning, introducing students to an engaging and interactive learning experience. The game not only enhances critical thinking and problem-solving skills but also addresses the challenge of reverse thinking, providing students with a unique approach to mathematical problem-solving. The positive outcomes, as evidenced by student feedback, affirm the game's impact on learning and its potential to foster a deeper appreciation for mathematics. The practical applicability of Number Maze extends beyond education, encompassing physical education, social interaction, and therapy. With its technical excellence and market potential, the commercialization of Number Maze meets the demand for innovative educational tools, making a notable contribution to the intersection of STEM and mathematics education. Overall, Mazemind Numeric Quest, through the Number Maze game, stands as a pioneering and effective tool for enhancing mathematical understanding and engagement.

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Chapter 48
The Use of Bizpitchmasters.edu as a Web-Based Learning Platform for Business Pitching

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ABSTRACT

Bizpitchmasters.edu emerges as a digital innovation designed specifically for students enrolled in the MPU22012 Entrepreneurship course at polytechnics. Recognizing the challenges students face in mastering the art of Business Pitching and the need to integrate theoretical knowledge with practical application, Bizpitchmasters.edu offers a comprehensive and student-centered platform. Not only designed for easy access via computers and mobile phones, Bizpitchmasters.edu also integrates dynamic and interactive AI technology. Self-paced online learning enables students to access the platform flexibly from anywhere. This allows students to tailor their learning process to their needs, fostering a deeper understanding and enhancing Business Pitching skills more effectively. As a cutting-edge innovation in entrepreneurship and online education, Bizpitchmasters.edu aligns with the vision of Leap 9 in enhancing the effectiveness of teaching and learning on a global scale. Following the website implementation, a survey was conducted to capture students' experiences and perspectives regarding the teaching innovation. The results revealed that Bizpitchmasters.edu not only heightened enthusiasm, confidence, creativity, self-directed learning, and collaborative learning skills but also served as an inspirational approach. This methodology propels students on a journey from novices to experts, effectively preparing them to tackle real-world challenges in the workplace. Through adaptive learning, integration of the latest technology, and a focus on experiential learning, Bizpitchmasters.edu shapes students as competent and forward-thinking future entrepreneurs.

Keywords: digital innovation, Business Pitching, student-centered platform, AI technology

1. INTRODUCTION

The teaching and learning process in the present era is no longer confined to the classroom alone but can occur anywhere and at any time. The education system has undergone another evolution in educational technology with the introduction of digital learning to enhance the level of teaching and learning. Web-based learning allows teaching and learning to take place without location and time constraints, aligning with the direction of self-directed learning among polytechnic students. In entrepreneurship education, students need to be proficient in business pitching. This requirement necessitates students to understand the concepts and effective presentation techniques. They require video demonstrations and notes that can be studied repeatedly. Web-based learning serves as a one-stop center that enables students to access these needs.

Web-based learning in Malaysia has witnessed a significant evolution, transforming the traditional landscape of education. Embracing the digital era, web-based learning has become a cornerstone of the Malaysian education system, offering diverse opportunities for students, professionals, and lifelong learners.

Entrepreneurial pitches often include a summary of the problem a business is trying to solve, how the business provides a unique solution, the competitive advantages of this approach, a description of the business model, the associated financial projections, as well as the biographies of the entrepreneurial team (Ekhardt et al., 2006).

1.1 Problem Statement

Traditional approaches to entrepreneurship education exhibit a significant deficiency in providing a comprehensive and interactive learning experience. The conventional methods employed in these educational frameworks often fall short in facilitating a holistic understanding of entrepreneurial concepts, leaving students grappling with the challenge of translating theoretical knowledge into practical, real-world business pitches. The gap between theory and application creates a barrier to effective learning, hindering students from acquiring the essential skills and insights necessary for success in the dynamic landscape of entrepreneurship. As a result, there is a pressing need for innovative solutions that bridge this divide and offer a more engaging, experiential approach to entrepreneurship education.

1.2 Objective

a. Conduct an assessment of the overall user experience on Bizpitchmasters.edu, focusing on satisfaction with the website.
b. Evaluate users' willingness to actively endorse Bizpitchmasters.edu to others.
c. Examine users' grasp and mastery of business pitching concepts introduced through Bizpitchmasters.edu.

2. LITERATURE REVIEW

Now more than ever, there is an urgent need to bring the power of communication and persuasion back to pitching. The understanding of emotions and psychology that has enabled speakers to inspire and motivate audiences for centuries must be readily embraced and utilized, alongside exciting findings from neuroscience about how the brain works. Advances in technology and the ever-increasing popularity of social media has led to the rise of the twitpitch, e-pitch, virtual pitch, and video pitch. Pitching through these media, without the benefit of the physical presence or voice, requires different approaches (Martin, S., 2012).

Lin, M. -H et al, 2017 in their research stated that students are tested and proceeded questionnaire survey to understand the opinions about digital learning. The research results conclude that 1.digital learning presents better positive effects on learning motivation than traditional teaching does, 2.digital learning shows better positive effects on learning outcome than traditional teaching does, 3.learning motivation reveals significantly positive effects on learning effect in learning outcome, and 4.learning motivation appears remarkably positive effects on learning gain in learning outcome.

F. Cheng et al, 2017 investigate the effect of user’s learning style on user’s satisfaction on the web-based learning system and their learning effectiveness. By using the Kolb’s learning style model, the research indicates that the satisfaction of the web-based learning system has significant influence on the learning performance of learners while

different learning styles learners have no significant effect to the satisfaction on using the web-based learning system.

M. Khalifa, 2002 studied the relative effectiveness of two different types of Web-learning environments: distributed passive learning (DPL) versus distributed interactive learning (DIL) environments. In the DPL environment, the Web is only used to deliver linear learning material, such as Word files and PowerPoint slides. In the DIL environment, however, the learning material is in hypertext format, providing the learner with more exploration and interactivity capabilities.

3. METHODOLOGY

The methodology is divided into three main sections:

1. Survey Development: Creating a comprehensive survey instrument aligned with the three objectives to gather data on user experience, interest in promoting the website, and business pitching understanding.
2. Sampling Strategy: Employing a random sampling approach to ensure representation from diverse user groups.
3. Data Collection: Distribute surveys to participants and collect responses.

4. RESULTS AND DISCUSSION

Based on the survey, the findings reveal the following:

4.1 User Experience Evaluation

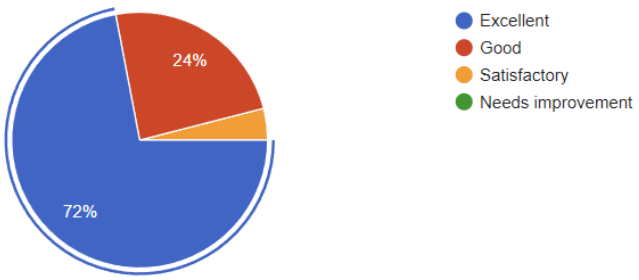

Figure 1: The pie chart showing the percentage of users' experience.

The overwhelmingly positive responses to the question regarding the overall experience with Bizpitchmasters.edu for learning about business pitching are indicative of a highly successful and well-received platform. A notable 72% of respondents described their experience as excellent, underscoring a widespread satisfaction and appreciation for the learning resources provided by the website. This majority rating suggests that a significant portion of users found the platform to exceed their expectations, emphasizing its effectiveness in delivering valuable content and fostering a positive learning environment. Furthermore, the 24% who rated their experience as good contribute to the overall positive sentiment, indicating a consistent level of satisfaction even among those who may have had slightly more reserved feedback. The combined high percentages in the excellent and good categories suggest that Bizpitchmasters.edu has successfully met or surpassed the needs of a substantial majority of

users, positioning itself as a commendable resource for individuals seeking to enhance their understanding of business pitching.

4.2 Interest in Promoting the Website:

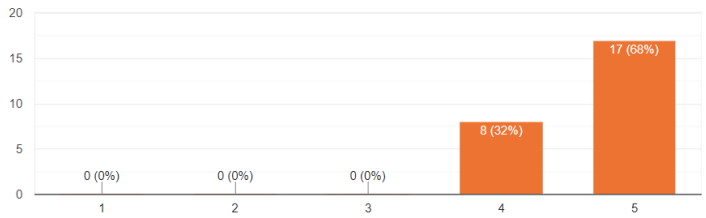

Figure 2: The bar chart showing the percentage of users' interest of sharing the website.

A substantial 68% of respondents gave Bizpitchmasters.edu the highest rating of 5 on the recommendation scale, underscoring an overwhelmingly positive consensus. Users expressed satisfaction with various aspects of the program, including the quality of guidance, practical insights, and real-world applicability. Testimonials highlighted the impactful experiences individuals had, showcasing the program's effectiveness in fostering valuable skills. While 32% rated it at scale 4, potentially indicating some varied preferences or expectations, the majority's positive feedback suggests that Bizpitchmasters.edu is a commendable resource worth exploring. Encouraging personal exploration, considering individual preferences, and noting the program's strengths can help potential users make informed decisions based on their unique needs and goals.

4.3 Assessment of Business Pitching Understanding:

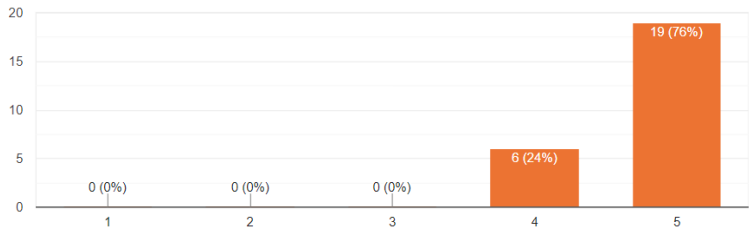

Figure 3: The bar chart showing the percentage of users' understanding the businesspitching introduced through bizpitchmasters.edu.

The notably positive response to the question about the contribution of Bizpitchmasters.edu to understanding business pitching is evident in the data, with 76% of respondents giving it the highest rating of 5 on the scale. This suggests a significant impact on the participants' comprehension and knowledge of business pitching. The majority's favourable response implies that the content provided by Bizpitchmasters.edu has been instrumental in enhancing understanding, potentially covering key concepts, strategies, and practical insights. Additionally, the 24% who rated it at scale 4 still indicate a positive sentiment, albeit with a slightly less emphatic response. Overall, these results suggest that

Bizpitchmasters.edu has been successful in effectively imparting valuable knowledge and insights into the realm of business pitching for a majority of its use.

5. CONCLUSION & RECOMMENDATION

In conclusion, the findings shed light on the considerable value and effectiveness of bizpitchmasters.edu, as indicated by the overwhelmingly positive recommendations and the program's substantial contribution to users' understanding of business pitching. The user feedback underscores the program's proficiency in delivering practical and impactful educational content. Acknowledging individual preferences and considering the commendable overall ratings, Bizpitchmasters.edu emerges as a highly recommended platform, adeptly catering to diverse needs and providing valuable insights and skills in the field of business pitching.

While Bizpitchmasters.edu has received positive feedback, there is always room for improvement to enhance user experience and cater to diverse learning preferences. To enhance the learning experience on Bizpitchmasters.edu in the future, integrating a discussion forum for participants to share insights and collaborate might help to improvise a dynamic learning community. In addition, providing guest lecturers from industries might help to enrich the educational content.

Bizpitchmasters.edu not only heightened enthusiasm, confidence, creativity, self-directed learning, and collaborative learning skills but also served as an inspirational approach. This methodology propels students on a journey from novices to experts, effectively preparing them to tackle real-world challenges in the workplace. Through adaptive learning, integration of the latest technology, and a focus on experiential learning, Bizpitchmasters.edu shapes students as competent and forward-thinking future entrepreneurs.

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Chapter 49
An Arabic Language Learning System (ALLS) for None-Native Speakers: A Requirements Model

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ABSTRACT

Recently, the Arabic language learning systems have become very diverse with the development of human thought. Accordingly, several web and mobile applications were developed and used by different none-native speakers. However, to date, there is no any requirements model or standard for Arabic language learning system (ALLS). The requirements model assists in developing systems improves the reliability of the system deliverables. Thus, this study aims to construct a requirements model for ALLS by using Unified Modelling Language (UML). To achieve this aim, the Agile Kanban method was adopted due to its flexibility, responsiveness, and reliability in developing software projects. The results present the requirements model of ALLS using three core UML diagrams: use case diagram, sequence diagram, and class diagram. In addition, an ALLS prototype was developed in order to prove the requirements included in the constructed model. Future work will focus on evaluating ALLS requirements model and prototype through participating a group of none-native speakers of Arabic language.

Keywords: Requirements model, learning system, Arabic language, none-native speakers

1. INTRODUCTION

Arabic is one of the global languages spoken by more than 500 million native speakers in more than 20 countries extending from the Arabian/Persian Gulf in the east to the Atlantic Ocean in the west (Saputra, Anwar, & Fikri, 2023). The Arabic language was codified in the Quran, and it is read and spoken by thousands of millions of Muslims across the globe (Kah, Zeroual, & Lakhouaja, 2017). Recently, the Arabic language learning systems have become very diverse with the development of human thought. Saputra et al. (2023) affirm that students' difficulty in learning language is impacted by the absence of a language environment that can be applied appropriately.

The none-native speakers of Arabic language confirm that they use mobile apps to communicate with people. However, they complain that the existing apps do not provide an effective learning as well as still have numerous challenges that negatively impact their

learning process. In fact, they face problems, especially learning vocabularies and constructing the right sentences in the right place. In addition, the none-native speakers usually have a trouble when speaking with Arab in terms of difficulty to deliver their idea or needs. They also have difficulty when listening to Arab and understanding what they say as the most Arab quickly speak. Although some of the none-native speakers can read and write Arabic words, phrases, and stories; nevertheless, they cannot understand the meaning. One of the key issues of learning Arabic language is the difficulty of communicating and exchanging conversations with any Arab.

Base on the above-mentioned challenges, it is clear that there is a highly need to develop a comprehensive Arabic language learning system (ALLS) for none-native speakers. ALLS will provide a complete and accessible platform for none-native speakers to learn the Arabic language. It will enhance understanding and retention of Arabic vocabularies through engaging and interactive exercises. ALLS will focus on improving listening and speaking skills, together with continuously updating the platform based on user feedback and the evolution of language learning methodologies. The users of ALLS will be people who are none-native speakers. In addition, learners who are in medium levels of studying the Arabic language. Moreover, ALLS will be directed to learners who suffer from difficulty in listening and speaking.

Up to the researcher's knowledge, no standard or generic model has been established regarding the ALLS. In this context, Alaidaros, Baageel, Balahual, and Alsayed (2022) claimed that having a standard or generic requirements model would simplify the software development process for system analysts and developers. Modelling the requirements of ALLS is highly needed in order to be used as a guideline. Hence, this study aims to construct a requirements model for ALLS using unified modelling language (UML). The contribution of current study is directed to help developers of learning systems as well as learners who are from none-native speakers of the Arabic language.

This paper is structured as follows. Section 2 reviews some of the existing Arabic language learning systems. Then, section 3 describes the methodology employed to achieve the study aim. Section 4 presents the ALLS requirements model and briefly explains ALLS prototype. Section 5 concludes the study and outlines some of future work.

2. LITERATURE REVIEW

There are several systems, developed by specialized companies, focus on helping people in learning different languages. The following subsections explain some examples of Arabic language learning systems.

2.1 Arabic Vocabular 2 (AV2) App

Arabic Vocabular 2 (AV2) is a mobile app works offline and teaches Arabic vocabularies by providing audio and visual content for each word in the app. It is an easy-to-use app and distinguished by a small size compared to other apps. However, AV2 App has some drawbacks, such as the lessons are fixed and do not evolve over time. In addition, it does not have an interaction with the user, which makes it less enjoyable during the learning process. Using the app, learners can only learn sentences after completing a certain number of words.

2.2 Arabic Vocabulary Application (AVA)

Arabic Vocabulary Application (AVA) is a mobile app teaches the Arabic language based on user native language. The user of AVA can choose his/her native language, and the app will provide lessons of Arabic accordingly. AVA has wonderful photos make users engage with

the learning process, with beautiful images accompanied by words or sentences. It provides interesting and enjoyable questions, such as matching sentences, completing the blanks, and even translating sentences from Arabic to the user native language by tapping on the Arabic sentence. Nevertheless, AVA app is not easy to use in which there is no clear progression from one topic to another. AVA app has only six sentences available; however, the remaining should be purchased to continue learning.

2.3 Duolingo App

Duolingo is a mobile and web app used for learning different languages. It provides engaging animations upon entering the program, which familiarize the users with its interfaces. Duolingo app offers a feature that allows users to find friends by synchronizing their contacts. It has a special animation that welcomes users back who are inactive for a period of time. After completing a lesson, Duolingo app displays the number of correct and incorrect answers, and it encourages users when they answer five consecutive questions correctly. Nonetheless, all Duolingo stages are only based on taping and listening, whereby users do not use writing skill. In the other hand, the speaking and listening skills require users to subscribe and pay. Moreover, in the case of selecting the wrong answer, the correct answer is provided. Accordingly, the user is given another chance to choose the answer after attempting to answer the question.

To sum up, Table 1 provides a comparison between the existing learning languages systems and the proposed ALLS.

Table 1 A Comparison Between Existing Systems and The Proposed System

Existing Systems	Company	System Type	Security	Interface Language Support	Slang Support	Animation Support
AV2	WAAW Daud Company	Mobile App	Yes	English	No	No
AVA	Eci British Group	Mobile App	No	Arabic & English	No	No
Duolingo	Luis Von Ahn	Mobile App &Web App	Yes	Arabic & English	No	Yes
Proposed System (ALLS)	Researchers	Mobile App &Web App	Yes	Arabic, English & East Asian Languages	Yes	Yes

Table 1 illustrates that the existing systems provide various features and have different advantages. However, these systems do not support slang feature as it is crucial feature for none-native speakers. In addition, the ALLS would be a mobile and web app developed based on the requirements. Besides supporting Arabic and English languages, ALLS will support East Asian language. Overall, it is clear that the proposed system (ALLS) contains the best of all existing systems.

3. METHODOLOGY

The current study adopted the Agile methodology, which is the most approach used in software development organizations (SDOs) (Alaidaros, Omar, & Romli, 2020). In particular, the Agile Kanban method was used during developing ALLS, because the method has gained significant importance and massive use within SDOs (Omar, Alaidaros, & Romli, 2020). In this study, five stages, were followed to achieve the study aim.

Figure 4: Methodology stages

In the first stage, data and information related to the study were collected using the literature survey method (Machi & McEvoy, 2016). This stage was conducted to have a comprehensive knowledge of requirements modelling and to identify the common features and functions that included in similar languages learning systems. In the second stage, the ALLS requirements were elicited from several none- native speakers. They were interviewed in order to explain the problems faced as well as their needs to learn Arabic language. The interview method was used as it is a time-saving approach in which the interviewees provide their answers based on the questions asked (Alaidaros, Omar, & Romli, 2021). The outcome of this stage is a list of ALLS requirements.

In the third stage, ALLS requirements model was constructed based on the list of functional requirements identified in the previous stage. To do so, UML was used as it is a standard language used contracting requirements models and software systems (Alaidaros, Omar, & Abdullah, 2017). UML has various notations used to depict the different views of a software system design (Pressman, 2010). However, this study focused on presenting three main UML models, which are use case diagram, sequence diagram, and class diagram (Ambler, 2012). In the fourth stage, an ALLS prototype was developed to give an overview of the whole system with a focus on user interaction. Prototyping was used because it is an effective development method primarily used to demonstrate basic functions and features to the intended users (Alaidaros, Omar, Romli, & Hussein, 2019). ALLS prototype was developed using Flutter (Nagaraj, Prabakaran, & Ramkumar, 2022), Django (Mele & Belderbos, 2022), and PostgreSQL (Kurako & Orlov, 2023). The selection of Flutter and Django frameworks were made due to their various features in developing front-end and back-end mobile applications, while PostgreSQL was chosen because it is identified as the as a powerful object-oriented database management system.

In the last stage, the constructed model will be evaluated using the developed ALLS prototype. To do so, different experts from academic institutions as well as set of none-native speakers of Arabic language will be selected to participate in evaluating ALLS to confirm that requirements are achieved.

4. RESULTS & DISCUSSION

This section presents the results and discusses the finding of the current study. It starts by showing the ALLS use case diagram followed by depicting one of the ALLS sequence diagrams. Then, ALLS class diagram is illustrated and finally some of the ALLS prototype interfaces are provided and briefly explained.

4.1 Use Case Diagram

A use case diagram is a visual representation of the relationships between actors and use cases. In UML, the actor provides a service to the system, while the use case is the specification of sequences of actions that interact with system actors (Sommerville, 2016). The results of analysing the requirements of ALLS revealed that there are numerous actors and various use cases. In ALLS, the actors can be admin or user, and each one of them has particular use cases. Figure 2 shows the use case diagram that visualizes the functional requirements of ALLS user.

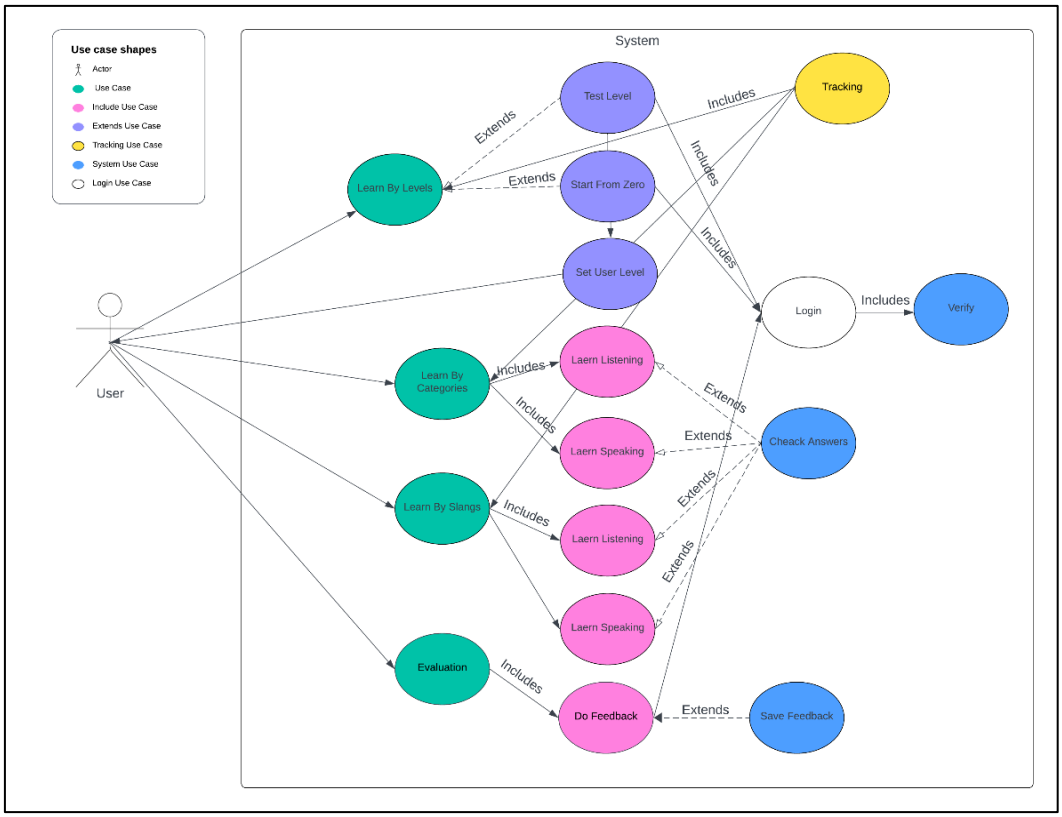


Figure 2: User use case diagram

4.2 Sequence Diagram

The sequence diagram is a demonstration of the interaction between objects involved in the system. It also illustrates the messages between the different objects in its sequence and can show different messages to different objects (Pressman, 2010). This study constructed various sequence diagrams according to the use case specification. Figure 3 shows the sequence diagram for the learn by level use case, which the ALLS users can use to learn through a sequence of levels.

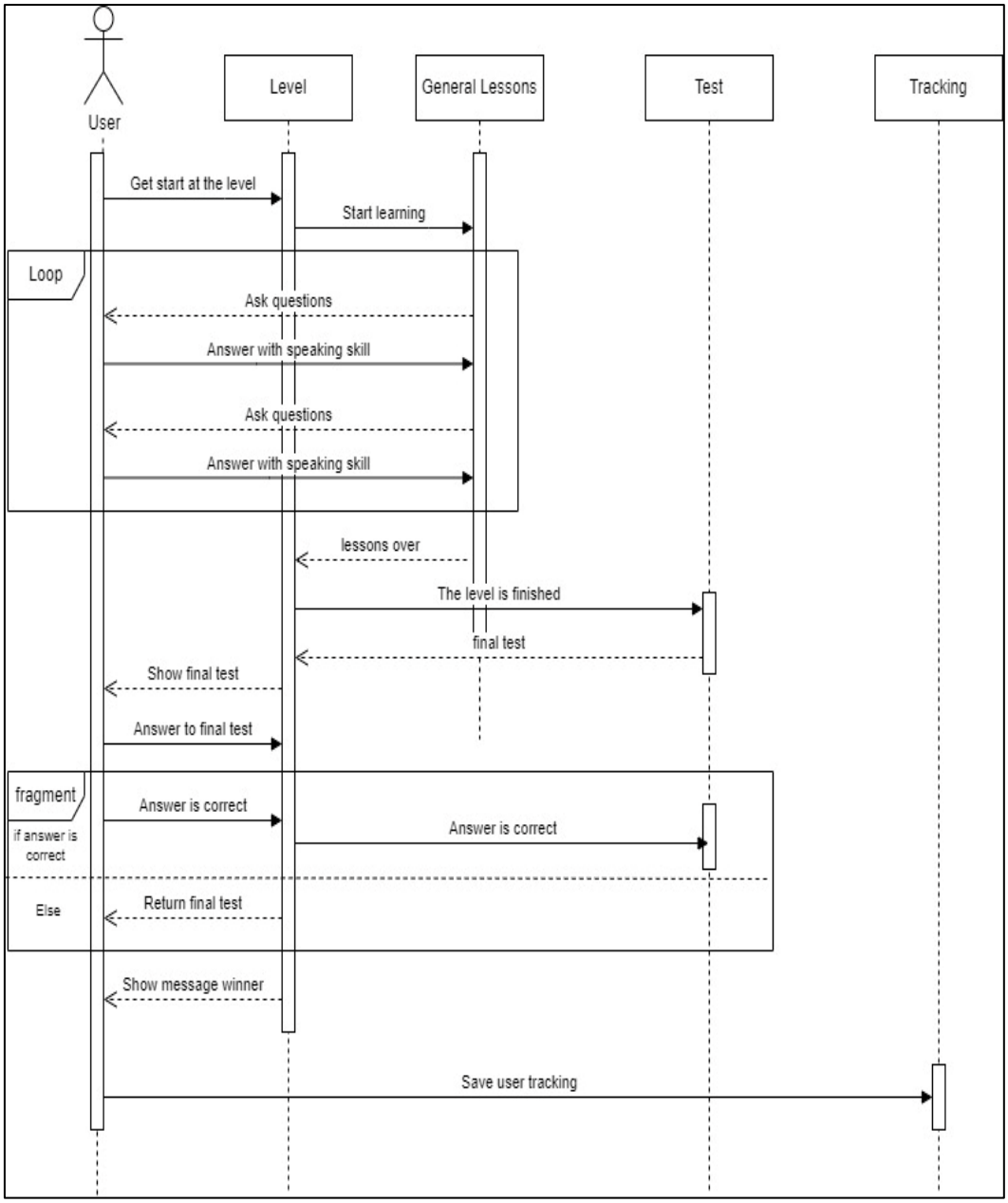


Figure 3 Sequence diagram for learn by level

4.3 Class Diagram

A class diagram shows system classes and the relationships between them. It identifies methods and variables for all objects, which are specific entities in the system or sub system (Pressman, 2010). Figure 4 depicts the class diagram of ALLS.

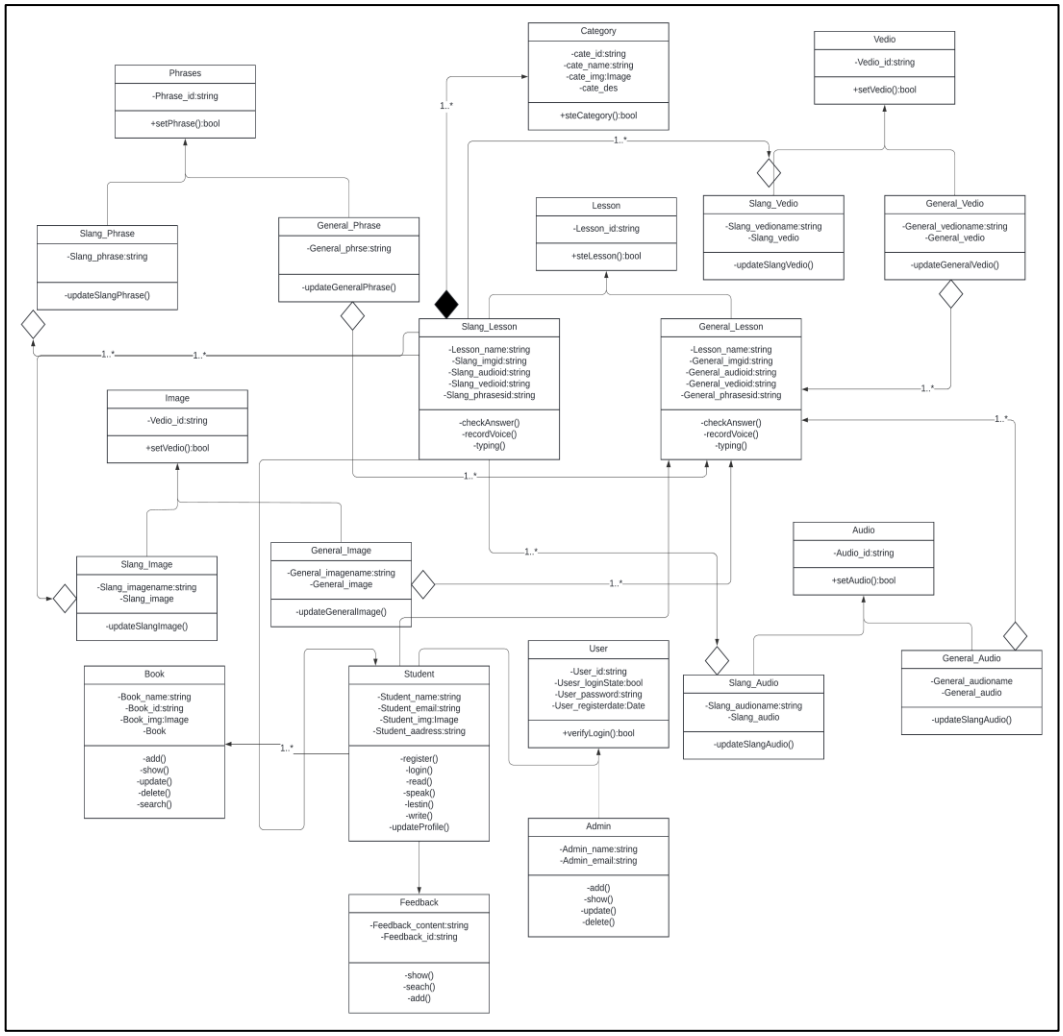


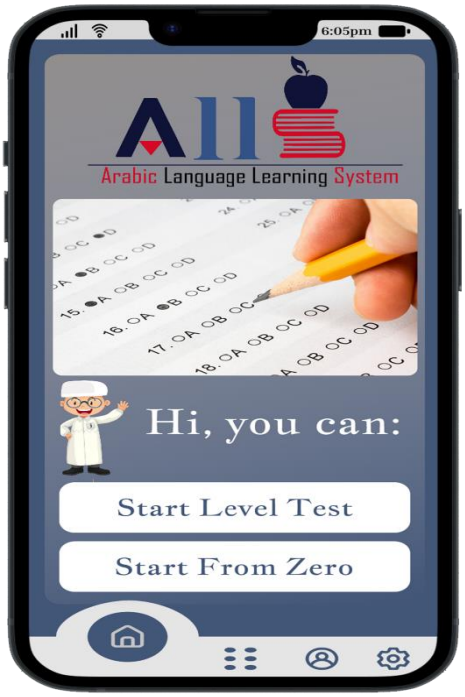
Figure 4 ALLS class diagram

4.4 ALLS Prototype

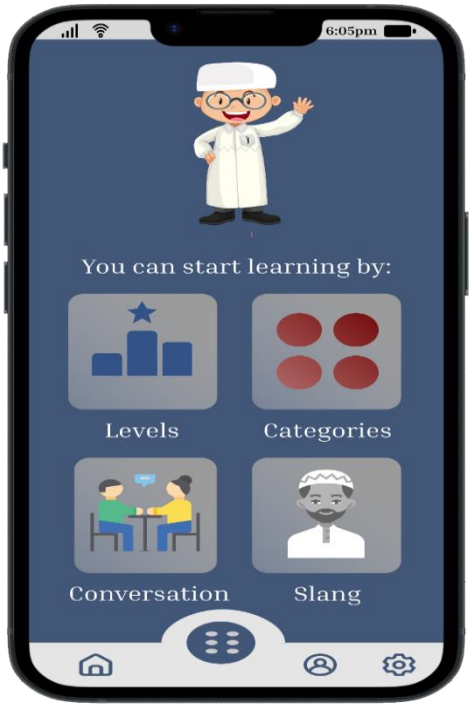
This subsection shows different interfaces of ALLS prototype, which was developed by Flutter and Django frameworks, as well as PostgreSQL as database platform. Figure 5(a) demonstrations ALLS login page, which are used by admin and users. User name and password are required to login for registered users. However, users who do not have accounts can sign up and register. Figure 5(b) depicts the ALLS starting page, in which user can have two options; (1) to sit for Arabic level test or (2) to start learning from zero.

Figure 5(c) shows the ALLS main page, whereby users can choose their learning mode. They can start learning by category, by level, by conversation, and by slang. Figure 5(d) displays several lessons provided by ALLS when users select learning by category. The lessons focus on teaching different skills, such as listening and speaking, in numerous locations, e.g. school, restaurant, hospital, and so on.

(a)



(b)



(c)

(d)

Figure 5 ALLS prototype interfaces

5. CONCLUSION & RECOMMENDATION

This study illustrated the requirements model of the ALLS for none-native speakers. The model was constructed using UML, and the three main diagrams, which are which are use case diagram, sequence diagram, and class diagram, are presented. Besides the model, an ALLS prototype was developed using Flutter, Dart, Django, and PostgreSQL. Future work will be directed to construct the complete ALLS requirements model, as this study limited to the three main UML diagrams. Moreover, a further study will focus on evaluating ALLS requirements model and prototype through participating a group of none-native speakers of Arabic language.

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Chapter 50
E-Module The 5 Minutes Spark

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ABSTRACT
This article presents an interactive e-module titled "The 5 Minutes Spark" designed to facilitate engaging introductory activities for higher education mentoring sessions. Developed at Universiti Teknologi MARA, this e-module provides a collection of lively 5-minute ice-breaker activities tailored for mentorship programs. Integrating multimedia and technology elements, activities revolve around themes aligned with UiTM's A.D.A.B approach. Implementation of UiTM's BizMath mentoring revealed positive outcomes including increased student motivation, enjoyment, participation, and peer learning. Mentors also reported improved confidence in facilitating activities. Despite limitations requiring ongoing enhancements, findings showcase the module's potential to enrich introduction engagement and learning experience in university mentoring contexts through innovative customized e-learning solutions. This project contributes a model for evidence-based, purpose-built e-learning innovations matching contemporary education needs.

Keywords: E-module; Mentorship; Ice-breaker activities; Student engagement; Innovation

1. INTRODUCTION

The need for effective and engaging learning experiences is crucial in higher education. One common approach is through mentorship programs, which provide an opportunity for more experienced students or faculty to guide and support newer students. However, starting mentorship sessions can be challenging, as the first few minutes are critical for setting the tone and getting students engaged. This is where "the 5 minutes spark" comes in.

The 5 minutes spark is an interactive e-module specially designed to facilitate highly engaging and student-centered introductory activities for mentorship sessions. This e-module provides a collection of carefully designed 5-minute ice-breaker activities tailored specifically for use at the start of mentorship sessions.

This e-module innovatively integrates uitm's signature a.d.a.b approach, which emphasizes key principles of assess, design, analyze and build-in belief. Activities revolve around themes like analyze, design, assess, and believe, providing focused sessions to pique student interest. Detailed step-by-step instructions, stimulating discussions, and interactive elements like videos and quizzes make sessions lively and thought-provoking.

Early implementation results have been promising, garnering positive feedback from users. The 5 minutes spark has shown potential for integration into diverse mentoring

programs and teaching contexts beyond its initial scope. This article provides an in-depth look at this exciting innovation in introductory e-learning modules for higher education.

2. PROBLEM STATEMENT

Mentorship programs in higher education are essential for supporting students' personal, emotional, cognitive, and career development. However, traditional approaches to introducing mentorship sessions often fail to engage student interest and participation. Sessions frequently start with mundane ice-breaker activities that do not stimulate critical thinking or meaningful discussion. This presents a missed opportunity for sparking curiosity, interaction, and active learning from the start. Research has shown that quality introductory activities that spark curiosity and interaction lead to more fruitful mentor-mentee relationships and improved learning outcomes.

However, existing online content for ice-breakers relies heavily on static information and text-based guidance, lacking step-by-step instructions and interactive elements to dynamically engage students. Mentoring programs in higher education vary from informal/short-term to formal/long-term, where faculty with useful experience, knowledge, skills, and/or wisdom offer advice, information, guidance, support, or opportunity to another faculty member or student for that individual's professional development (Alkhatnai, 2021). Additionally, peer mentorship programs in universities have been found to enhance students' academic success, collaboration with peers, communication skills, decision-making and problem-solving, acceptance of diverse cultures, and personal reflection (Rawana et al., 2015). Mentorship programs have the potential to significantly impact various aspects of students' academic and personal development.

Moreover, the impact of mentorship on faculty preparedness to develop online courses has been studied, indicating the effectiveness of mentoring in higher education (Olesova, 2019). Additionally, the need for broad evaluations of peer mentorship programs has been highlighted, which can inform educational leaders to improve mentorship support available for students (Lombardo et al., 2017).

Therefore, there is a need for an interactive, student-centered e-module that provides a collection of lively, thought-provoking introductory activities designed specifically for higher education mentorship contexts. The 5 Minutes Spark e-module aims to innovatively integrate technology and contemporary learning approaches to fill this gap.

3. METHODOLOGY

The 5 Minutes Spark e-module was developed using a design-based research approach. This involved the process of design, evaluation, and refinement. The module was designed by a team of educators at UiTM.

To identify learner needs and mentorship context requirements, interviews were conducted with 8 mentors from UiTM's students for the BizMath program. Literature on best practices for ice-breaker modules and student engagement was reviewed. The ADDIE framework steered development:

3.1 Analysis

The team analyzed mentorship program objectives, student profiles, and existing modules used. Gaps and needs were identified.

3.2 Design

Team brainstorming generated creative ideas for highly engaging 5-minute activities matching program needs. Selection emphasized variety, multimedia interactivity, and learner-centeredness based on A.D.A.B UiTM which contain analyze, design, assess and built in belief.

3.3 Development

Activities were polished into a complete module integrating instructional design principles. Interactive elements like videos and quizzes were added to boost engagement.

3.4 Implementation

The module was piloted with 8 BizMath mentor groups for 1 semester, using observation, surveys, interviews, and learning analytics to gather user feedback.

3.5 Evaluation

Feedback from the pilot guided refinements to the module design and content to optimize usability and learning experience.

The refined module was then rolled out for all BizMath mentors. Several evaluation methods monitor ongoing impact: pre-post mentor surveys, session observations, interviews, Google Form feedback, and usage analytics. Results continue to shape improvement for the 5 Minutes Spark module.

4. RESULTS AND DISCUSSION

4.1 RESULTS

4.1.1 Usability and Functionality

User surveys indicated the e-module was easy to navigate and access, with a mean System Usability Score of 86/100. Over 90% of mentors rated the step-by-step instructions as clear and complete. Usage analytics showed strong adoption, with most mentors accessing the module weekly.

4.1.2 Content quality and diversity

Mentors overwhelmingly agreed activities were innovative, interesting, and relevant to students. The varied themes and activity formats (discussions, simulations, videos, etc.) were highlighted as key strengths. Over 80% of mentors rated the quality of content as high and felt there was sufficient diversity.

4.1.3 Engagement and Collaboration

Observations found students were actively engaged during module activities, with increased peer discussions. Mentors reported activities sparked lively participation and exchanges between students. Students indicated higher enjoyment, motivation, and peer bonding after using the module.

4.1.4 Impact on Mentoring Programs

Improved student-mentor engagement was reported after introducing the module in sessions. Mentors felt more confident facilitating introductory activities with the module's guidance. Program satisfaction increased significantly among mentors and mentees according to post-surveys.

4.1.5 Challenges and limitations

Some mentors needed time to adjust to the new activity-based introductory approach. Occasional technical issues accessing module links and videos. Activities may need adjustment for smaller vs larger mentorship groups.

4.2. DISCUSSION

The 5 Minutes Spark e-module demonstrates promising utility as an engaging introductory activity resource for higher education mentoring programs. Results indicate it enhances student motivation, enjoyment, and participation when used to kickstart mentorship sessions.

The module's interactive multimedia activities were viewed as interesting, novel, and relevant by users. This aligns with literature emphasizing the value of learner-centered introductory activities that provide variety, stimulation, and meaningful connections by Muliandi et al. (2021) which emphasized the role of interactive multimedia in promoting critical thinking skills among students (Muliandi et al., 2021). Additionally, the use of interactive multimedia has been shown to enhance cognitive learning outcomes in senior high school students Findings suggest the module's student-focused design and integration of technologies like video and mobile access effectively created an engaging learning experience.

Another success factor was the module's adaptability to diverse mentoring contexts. While initially created for UiTM's BizMath program, it received positive feedback when piloted in other disciplines. However, some fine-tuning may help tailor activities better for different group sizes and profiles.

The detailed activity guidance empowered mentors to facilitate interactive discussions more confidently. This scaffolding helped mentors shift to a more student-driven introductory approach, building crucial skills. Yet, adapting to this new style remains an ongoing process requiring continued mentor training.

The 5 Minutes Spark module provides an innovative model for introductory e-learning resources to enhance student engagement and learning in university mentoring initiatives. Wider implementation and research across more programs will further refine best practices. This project contributes an example of evidenced-based development of interactive learning purpose-built for any student.

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Chapter 51
Carbonana Snack

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ABSTRACT

The selection of the Carbonana snack innovation product was sparked by the problem of dumping banana peels that were thrown away near the Kuala Selangor Vocational College. In addition, the potential and benefits of banana peels have given researchers the idea to produce snacks that use banana peels as the main ingredient. The waste material that is banana peel is chosen as the main material because it is easily available & can solve the problem of wasting banana peel. This study focuses on nutritious light snacks that are liked by all groups. Carbonana Snack has three flavors which is cheese, spicy and chocolate. This study was also conducted to identify the level of acceptance of Carbonana Snack products that use banana peel as the main ingredient. The implementation of data collection for this study was carried out through the distribution of questionnaires. A total of 24 respondents among lecturers in the Hospitality Department of Kuala Selangor Vocational College answered this questionnaire. The data obtained from the questionnaire was analyzed in the form of a chart to identify the percentage of acceptance of the products produced. The results of data analysis show that respondents gave good feedback on Carbonana Snack from the evaluation aspect in terms of taste, appearance and smell. In conclusion, the innovation of banana skins is very relevant to be implemented because it is able to provide an alternative for the Malaysian community to choose healthy snacks while helping to reduce the 'waste' of banana skins in an effort to make use of banana skins that are often thrown away.

Keywords: Banana peels, Snacks, .

1. INTRODUCTION

The potential and benefits that banana peels have sparked the idea of producing a nutritious snack substitute to snacks sold on the market. Banana peels is preferred as the main ingredient as it contains high in fiber, protein, vitamins, potassium and magnesium. At the same time, to make the public aware of the importance of reducing waste and environmental care when banana peels are among the waste. In addition, it can open the eyes of the public that fiber can not only be obtained from wheat or vegetables, but can also be obtained from banana peels. Snacks are a favourite food for Malaysians that are easy to eat at leisure or anywhere. These foods are foods that are easy to eat or take some time to prepare either

when it's cold or hot. According to the health portal written by Dr Suriani Binti Sukeri (2014) emphasizes that snacking is defined as food and soft drinks taken between main meals. It will reduce hunger and supply energy before the next main meal time. According to him, the frequent intake and number of snacks will have a bad effect especially if the food is high in sugar and fat. This indirectly invites individuals who are overweight as well as various diseases. The innovation product produced is a pasta snack based on carbonara-flavoured banana peels. It is a product derived from the previous Pasta de' Banana innovation made from banana peel. For the production of this snack, banana peels are processed and added carbonara seasoning ingredients to ensure that the product becomes a healthy snack product. The ingredients used to produce Carbonana Snack are very readily available and the way they are produced is simple and cheap.

2. LITERATURE REVIEW

2.1 Innovation Products

Innovation is a method of producing or making improvements to a new product, product or service existing for the better. This means that every organization is either profit-based or will not compete to come up with creative ideas for the benefit of a joint organization. Innovation to produce something new in the market will change the equation between demand and production (*supply-demand equation*) of a product or service.

2.2 Dietary Fiber

Carbohydrates can be divided into two groups which are simple carbohydrates and complex carbohydrates depending on the level of polymerization (Cho et al., 1999). Wherein, simple carbohydrates including monosaccharides and disaccharides and complex cobohydrates are polysaccharides and even dietary lint. Dietary fiber is part of the plant components that can be eaten but cannot be digested or absorbed by the human small intestine. Fiber will carry out perfect or partial fermentation in the human colon (Gelroth and Ranhotra, 2001). Dietary fiber can be divided into several groups such as polysaccharides, oligosaccharides, and allied compounds namely cellulose, hemiselulose, lignin, pectin, etc.

2.3 Sources of Dietary Fiber

There are two important types of dietary fiber which are water-soluble fiber and fiber that is insoluble in water. The difference between the two types is that the fibers that are soluble in water will absorb water during the digestion process thus the volume of feces can be increased and even for the fibers that are not soluble in the water will remain unchanged during digestion and help the frequency of movement of the intestinal processes. Both types of fiber are able to increase bulk and soften the fiber stool accelerating movement in the intestine. There is no denying that fruits and vegetables such as guava, bananas, tomatoes and others also contain high in fiber.

2.4 Banana Peels

Bananas were the second largest production fruit in the world in 2007 with a total production of 81.3 million metric tons and accounted for 16% of the world's total fruit production (FAO, 2009). Banana peels represent 40% of the total weight of bananas (Tchobanoglous et al., 1993). The world's high production of bananas is a problem for banana by-ingredients

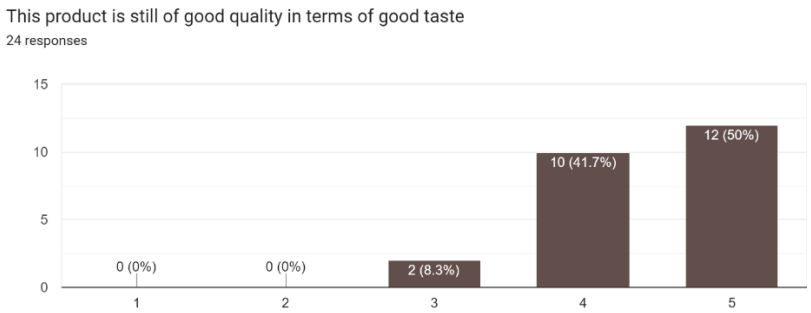
especially the peel part to be disposed of. The increase in by-products will burden the problem of environmental pollution as studies have shown that banana peels contain high levels of potassium and require a longer time to be disposed of through natural processes compared to other fruit waste (Emaga et al., 2007). The resumption of banana by-products can reduce the problem of environmental pollution that is intensifying today. Therefore, banana peels are usually reused in cattle feed and poltry (Dormond et al., 1998), fertilizer for plants or as a source of alkali in the manufacture of soap (Udosen and Enang, 2000). Studies have shown that banana peels are rich in dietary fiber, protein, essential amino acids, polyunsaturated fatty acids and potassium (Emaga et al., 2007). The National Cancer Standard Institute shows that banana peels are tosic free and safe to eat as a source of antioxidants (Someya et al., 2002). Banana peels have high potential to be used as a source of fiber that can increase the nutrient content of bread. Nevertheless, banana peels are still poorly used in everyday dietary practices.

3. METHODOLOGY

Researchers use the ADDIE Model so that product construction studies can be produced according to proper and orderly procedures. The data collection method used for this study is through quantitative studies . The quantitative method used in this study is in the form of discriptive which is the survey method using the questionnaire. This questionnaire is given to lecturers from the Department of Hospitality, Kuala Selangor Vocational College. The researchers distributed the questionnaires to 24 lecturers. The researcher provides the respondent with a questionnaire after trying the product. Researchers use the ADDIE Model so that product construction studies can be produced according to proper and orderly procedures.

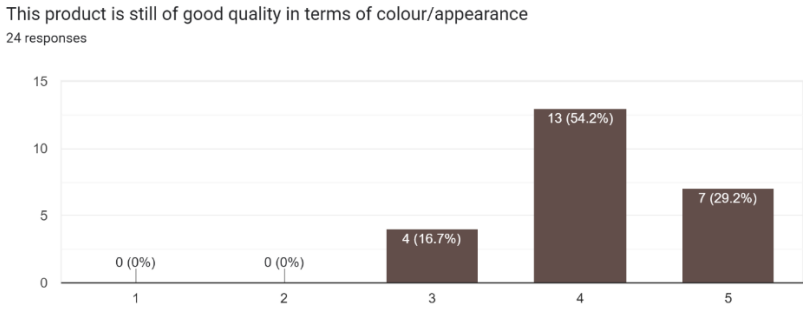
4. RESULT AND DISCUSSION

The questionnaire is one of the ways to obtain feedback data from respondents whether they agree or not with the statement given in the questionnaire.



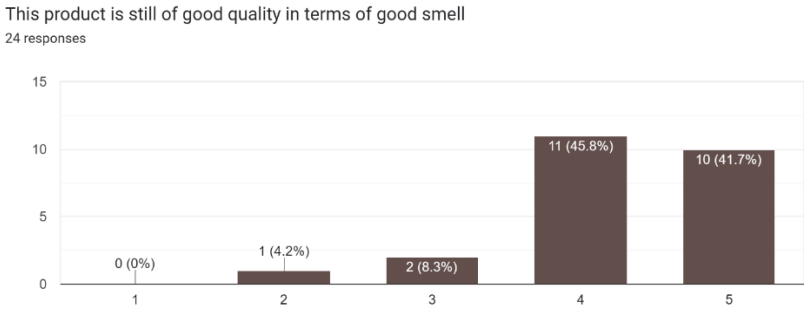
Graph 1: Product quality in taste

Based on this Figure 1 50% of Hospitality lecturers strongly agree that the taste of carbonana products is of good quality, 41.7% agree and 8.3% are unsure.



Graph 2: Product colour/appearance quality

Based on this second draft, 54.2% agreed with the color of the product, 29.2 were strongly agreeable and 16.7% less certain.



Graph 3: Product smell quality

The third Graft showed 45.8% agreed, 41.7% strongly agreed, 8.3 were unsure while 4.2% disagreed with the smell of Carbonana products

5. CONCLUSION AND RECOMMENDATION

In conclusion, this study has been successfully produced and achieved all the objectives set. The main objective of the researchers is to develop snack products using waste which is banana peel can be implemented well. In fact, researchers can also introduce to the public about nutritious snacks based on banana peels. In addition, this study allows the use of bananas as a whole without any waste. In the product evaluation also shows the results of the respondent's level of acceptance of the product very positive and encouraging. Snack Carbonana products are also able to compete with existing snack products in the market as we promise quality, nutritious products and also respond to the government's recommendation to GO-GREEN & eliminate the waste of banana peels

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Chapter 52
Integrating ScholarSync in Academic Supervision

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ABSTRACT

This study explores the need for ScholarSync, a cutting-edge application designed to transform communication and management of research supervision between supervisors and supervisees, in improving academic supervision. Targeting postgraduate and undergraduate students, ScholarSync stands out as an innovative tool which organises crucial conversation points, manages academic writing management and improve the communication between supervisors and supervisees. Its functionalities include sophisticated note-taking, efficient task coordination, cooperative document editing and also integrated calendar synchronization. These functions are all crafted to appeal to users with different level or skills in using technology. The research process, involving detailed market scrutiny and progressive prototype development, leads to a decisive conclusion. Thirty (n=30) academicians who are involved in academic supervision processes either as supervisors or supervisees were chosen for this study. The results distinctly highlight a convincing desire and preference among respondents of the study for ScholarSync's launch, suggesting its key role in enhancing supervisor-supervisee relationship, bolstering research administration, and improving educational outcomes.

Keywords: Scholarsync, academic supervision, research supervision, academic management, communication

2. INTRODUCTION

Academic supervision, particularly in postgraduate and final year undergraduate studies, is a critical aspect of the educational process. However, it faces challenges, notably in maintaining effective communication and tracking progress (Suriati et al.,2022). Supervisors and supervisees often struggle with keeping a comprehensive record of meetings and decisions, leading to miscommunication and inefficiencies (Pyhältö et al., 2012; Brown, 2019). The challenges may occur due to various factors, such as the busy schedules of both students and supervisors, differing communication styles, or the lack of clarity in expectations. To overcome these obstacles, institutions can promote regular and structured meetings between students and supervisors, utilize online platforms for communication and document sharing, and provide training to supervisors on effective mentoring and monitoring techniques. By

addressing these challenges, academic supervision can be enhanced, leading to improved learning outcomes for students.

Existing tools and methods for tracking academic supervision activities are often fragmented and not specifically tailored to the unique needs of this domain (Wang & Byram, 2019). Generic project management software and traditional note-taking methods lack the specialized features needed for effective academic supervision (Iwashokun & Ade-Ibijola, 2022). Therefore, there is a need for a comprehensive and specialized software solution that can streamline academic supervision processes and support effective communication and collaboration among supervisors and students. Such a software should have features like progress tracking, task assignment, and real-time feedback mechanisms to ensure efficient supervision. Additionally, it should also provide a centralized platform for document sharing and storage to facilitate easy access to relevant materials for both supervisors and students.

Technology has the potential to transform academic supervision, yet there is a gap in solutions that are specifically designed for this purpose (Rupiah, 2021). A tool that can seamlessly integrate note-taking, task management, and document collaboration could address these challenges (Huet & Casanova, 2020). By incorporating these features into a single platform, supervisors and students can streamline their communication and collaboration processes, ultimately enhancing the overall effectiveness of academic supervision. Such a tool would not only save time and effort but also foster a more organized and productive supervisory relationship. ScholarSync is an innovative application that improves communication and management of research supervision. Thus, the current study explores the need for ScholarSync in enhancing academic supervision by addressing challenges between supervisors and students.

4. LITERATURE REVIEW

The progression of academic supervision management, especially the interactions between supervisors and supervisees, is a key aspect in scholarly education studies. Supervisor-supervisee relationships are crucial for the triumph of postgraduate and undergraduate studies, shaping both the methodology and the results of academic pursuits. The nature of these interactions has transformed over periods, influenced by evolving scholarly environments, technological progress, and shifts in teaching methods.

Traditionally, academic supervision has shown a range of methods, from directive to more participatory forms. The efficiency of these methods greatly influences the calibre of research and the developmental progress of supervisees. Lately, there's been an increased acknowledgement of the necessity for a more refined and flexible approach in supervision that considers individual variances and the unique requirements of supervisees (Mackey et al., 2015).

The use of technological tools and online environments has additionally altered the field of academic supervision. Digital mentoring and remote guidance practices have surfaced, introducing novel opportunities and challenges in sustaining productivity (Prihatin et al., 2021). These developments have called for a rethinking of conventional academic supervision techniques to ensure their continued effectiveness in a digitally influenced era.

Another important aspect of supervisor-supervisee relationship is effective communication is an important factor that profoundly shapes the research trajectory and its end results. The supervisor-supervisee connection depends greatly on the effectiveness and clarity of their communication, moulding the professional and scholarly path of the supervisee. In agreement with this, Saleem and Rana (2020) emphasize on the influence of communication on the progression and level of research conducted by supervisees.

Xing et al. (2023) observe that an integrated communication based on face to face and the use of technology offer increased adaptability and are also able to introduce and mitigate distinct challenges in sustaining the quality of the supervision exchange. Martin et al. (2022) builds on this, pointing out the risks of misunderstandings and the necessity to adapt to these new channels to maintain the integrity between supervisors and supervisees.

The efficiency of communication in the context of supervision depends not just on the method of interaction but also on the nature and richness of the exchanges. Almeatani et al. (2019) argue that transparent and regular communication is crucial for setting shared understanding and realistic goals concerning the thesis. This view is supported by Heide et al. (2018), who advocate that strategic communication approaches are essential for aligning the ambitions and plans of the supervisor and supervisee, thereby enhancing the overall effectiveness of the research endeavour.

The personal aspect of communication in mentorship, encompassing abilities like compassion, attentive listening, and emotional backing, is equally vital. Waheed (2021) discusses the significance of these abilities in creating a supportive and stimulating environment, significantly contributing to the supervisee's scholarly and emotional health. This approach to dialogue is not merely about knowledge transfer or feedback but also about cultivating a strong and trusting rapport between the supervisor and the supervisee. Furthermore, the implications of proficient communication extend beyond the immediate supervisor-supervisee relationship, influencing wider academic results. Zaheer and Munir (2020) identified a positive link between proficient communication in academic supervision and successful thesis completion, as well as enhanced research quality.

5. METHODOLOGY

Data was collected and analysed using Statistical Package for Social Science (SPSS) Version 26. A sample of 30 academicians who are involved in academic supervision participated in this study. The sample size was determined based on Brown (1995) who mentioned that the general rule for a preliminary study should include at least 30 subjects or respondents. In addition, a study conducted by Totton et al. (2023) who analysed 761 preliminary studies found that the median and ideal number of research subjects is 30. The data obtained from this method is presented in descriptive statistics. This study employed a 5-point Likert scale (1-Disagree to 5-Strongly agree) to gauge respondents' feedback regarding the aspects of academic supervision preferences integrated in ScholarSync.

6. RESULTS

Table 1 indicates the aspects of academic supervision preferences that are integrated in ScholarSync among respondents who are currently involved in academic supervision either as supervisor or supervisee. The overall mean shows that the fundamentals integrated in ScholarSync are preferred by the respondents and a significant number of respondents agree that ScholarSync can improve the overall supervision management and communication between supervisors and supervisees.

Table 4 Academic Supervision Preferences Integrated in ScholarSync

Items	Mean	Standard deviation
Integrating sophisticated note-taking capabilities	4.13	0.73
Incorporating task management system	4.37	0.69
Integrating cooperative document editing	4.1	0.71
Integrating calendar synchronisation	4.23	0.72
Improving overall supervision management capabilities	4.67	0.47
Improving effective communication in supervision	4.60	0.56

7. DISCUSSION AND CONCLUSION

The data obtained from the respondents indicates a generally positive reception towards the development of ScholarSync to assist the process of supervision. This suggests that such features integrated in the app is likely perceived as significantly beneficial towards those who are involved in academic supervision. The high mean scores across all features indicate a strong agreement among participants that these integrations can significantly enhance the effectiveness of the supervision experience.

8. RECOMMENDATION

Based on the findings of this study, it is recommended that all the features and aspects suggested for the development of ScholarSync should be implemented. In future research, it is also recommended that an exploration of practical implementations to examine the outcomes and innovate further improvement.

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