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PREFACE

Borneo Engineering & Advanced Multidisciplinary International Journal (BEAM) is a peer-reviewed journal that publishes original theoretical and applied papers on all aspects of Engineering, Management, Business, Accounting, educations, IT and Linguistics to publish high-quality papers and references. The topics to be covered include, but are not limited to quantitative, qualitative, and hybrid research on new approaches to using technology to improve learning, design, and educational results. Articles on applied theory in educational practice, as well as practical applications of research, current policy initiatives and research evaluations, theoretical, pedagogical, and methodological challenges relating to educational technology, are all welcome. This journal is an open access journal that provides an online publication (published twice a year). I would also like to congratulate and thanks all individuals exclusively to technical and editorial boards for their interest and strong support to this publication.

Best wishes,

Dr. Habsah binti Mohamad Sabli

Chief Editor, **BEAM International Journal**

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Development of RFID-Based Attendance Solution for Kuali Agrobox Cafe

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Abstract

This project introduces an innovative solution for managing employee attendance system at Kuali Agrobox Cafe, a renowned eatery in Mersing. By implementing RFID technology, the system significantly simplifies the process of recording employee attendance. The core of this system relies on the utilization of RFID cards and scanners. The hardware components include the ESP32 as the controller board and the RC522 RFID Module as the card reader. To facilitate efficient data management, a MySQL database is designed using phpMyAdmin. This database stores essential information, including employee details, RFID tag data, and attendance records. Each employee is provided with an individual RFID tag, typically in card form. To record their attendance, employees scan their RFID tags near the RFID reader, strategically placed at entry and exit points. The RFID reader captures the specific ID tag, which is then transmitted to the system for processing. The collected attendance information is processed within the system, associating it with the respective employees. Managers have access to this data through a user-friendly interface, enabling real-time monitoring, report generation, and effective attendance management tasks. This RFID-based solution revolutionizes attendance tracking at Kuali Agrobox Cafe, offering efficiency and convenience to both employers and employees. It simplifies the recording process and provides real-time access to attendance data for enhanced management capabilities.

Keywords: - RFID attendance, RC522, real-time monitoring

1. Introduction

Manual employee attendance tracking presents various challenges that impede the effectiveness and precision of workforce management. The process demands consistent efforts from administrative personnel to collect, organize, and oversee attendance data, which becomes increasingly arduous over time. Manual systems are vulnerable to employee exploitation, enabling time theft through the manipulation of attendance records (Ula et al., 2021 and Mankilik, Kama & Isitua, 2022). The absence of authentication measures in manual procedures heightens the risk of fraudulent activities. Without the assistance of automated tools, the analysis of attendance trends or patterns becomes intricate (Mankilik, Kama & Isitua, 2022 and Suale et al., 2023).

Considering these challenges, the project's focus is on enhancing employee attendance management through the integration of Radio Frequency Identification (RFID) technology. Renowned for its global acceptance, RFID utilizes low-power radio waves for automated object identification (Joshi et al., 2020 and Suale et al., 2023). The system comprises RFID tags, antennas, readers, and transceivers to facilitate seamless data exchange (Hasman & Ahmad, 2022 and Joshi et al., 2020).

The implementation of an RFID-based system aims to optimize the process of recording attendance, reduce reliance on manual data entry, and reduce physical workload. In addition, it addresses environmental concerns by minimizing the use of paper, specifically adapted for

Kuali Agrobox Cafe's employee attendance system. Kuali Agrobox is one of the popular eateries in Mersing town. On a daily working day, the employer at Kuali Agrobox Cafe manually records employee attendance through an online system utilizing the WhatsApp application. Data accessibility may be restricted as manual records are typically stored in physical or local digital formats. Managers may not have real-time access to attendance data, making it difficult to effectively monitor attendance. The use of this method presents a challenge to administrators due to unsystematic and potentially overlapping attendance data and the risk of data loss (Choe et al., 2023 and Hatta et al., 2021). This difficulty has a great impact in various other aspects such as the management of the employee salary system.

This developed system relies on RFID cards for proof of attendance, storing electronic information that is accessible to RFID readers. Employees simply scan their card to the RFID reader. The system incorporates the RC522 RFID Module to read employee cards, transmitting ID information to ESP32 before recording it in the database. This user-friendly approach empowers administrators to efficiently access and manage employee attendance records. RFID-based attendance systems automate the attendance recording process, eliminating the need for manual sign-ins or paper attendance sheets. Both administrative staff and employees benefit from this automation as attendance data is rapidly and accurately gathered without the necessity for manual data entry. Overall, the purpose of this research is to:

1. Design employee attendance system by using RFID technology.
2. Develop employee attendance database using phpMyAdmin.
3. Provide a user-friendly interface that allows administrators to manage, view, and modify attendance data as needed.

2. Literature Review

The author conducts a comparative analysis with existing RFID-based attendance systems. Qureshi (2020) proposed attendance tracking challenges in educational institutions at King Abdul-Aziz University (KAU), Saudi Arabia. It aims to implement a Radio RFID-based attendance system to overcome existing issues like time consumption, errors, truancy, and lack of parental contact. The proposed system offers robust, secure, and automatic attendance, leveraging modern technology to provide web-based and mobile interfaces, daily absent reports, and automatic SMS alerts to parents/guardians. Using a case study approach, the system is developed and tested at KAU, featuring both web and mobile interfaces. Users can access customized reports to monitor students' status, anticipating significant improvements in monitoring mechanisms for informed decision-making by parents and teachers.

Hatta et al. (2021) introduced Web-Based Student Attendance System utilizing RFID technology records student attendance through RFID equipment, including transponder radios, receivers, and transmitters. When triggered, RFID tags transmit digital data to the reader, facilitating identification and record-keeping. Integrated with web-based principles, RFID cards and readers capture attendance, aiding teachers in reviewing and storing data in a dedicated database. This system enhances class progression by addressing frequent absences and enables easy student tracking within school premises. Data integrity is maintained within the school database, allowing teachers to access student information even after leaving school.

Research conducted by Choe et al. (2023) emphasizes the potential of RFID technology in establishing a sustainable student attendance system. This system, leveraging RFID technology, validates students' identity, venue, time, and date by accessing data from RFID tags integrated into student cards. Essential components comprise the Arduino Mega 2560 board, MFRC522 RFID reader, DS3231 Real-Time Clock (RTC) module, LCD display, Arduino Ethernet Shield R3, and power adapter. The system prioritizes three key elements: the web server, network connectivity, and interfacing device. The web server manages data storage, handles HTTP requests, and hosts a website for database interaction. Network connectivity facilitates user and device connection to the web server. Meanwhile, the interfacing device acquires student ID data, forwards it to the web server, maintains local real-time data, and showcases information on an LCD screen (Choe et al., 2023).

In this research, the author chooses ESP32 as board controller due to board GPIO's capabilities, ease of programming, community support and cost-effectiveness. These attributes collectively make the ESP32 a highly suitable choice for managing RFID-based attendance systems (Oner, 2021). RFID system consists of various components that are connected to one another by a dedicated communication path. As shown in Fig. 1 the components of the RFID technology. Each component is integrated into the system to implement the benefit of RFID solution. The list of components is tag, reader, and database. RFID tags are classified as either passive or active.

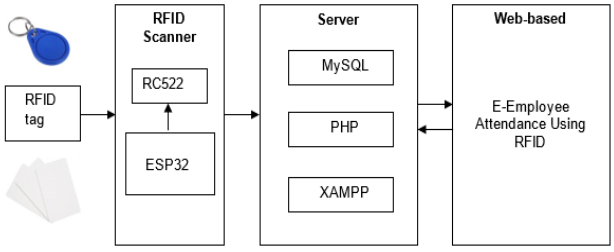


Fig. 1. Project block diagram

a) Tag

A passive RFID tag is one that does not have its own power supply. Thus, passive RFID tags must be in extreme proximity to an RFID reader and require the radio waves radiated by the reader to power the response, but active

RFID tags can complete entire functions if the device has its own battery power (Joshi et al., 2021).

b) Reader

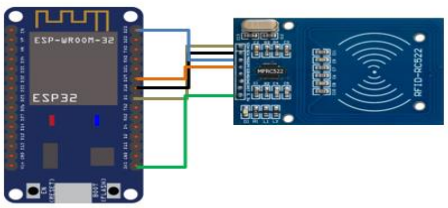
The RFID reader consists of an antenna and a radio frequency module, generating a high-frequency electromagnetic field (Hatta et al., 2021). Within the RFID reader, a microchip stores and processes data, accompanied by an antenna for signal reception and transmission. Reading information from the RFID tag requires proximity to the reader. Essentially, the RFID reader establishes an electromagnetic field, prompting electrons to pass through the tag's antenna, thereby energizing the chip (Oner, 2021 and Harum et al., 2023). In the context of this project, an ESP32 serves as the board controller for the RFID reader.

c) Database

A database is an organized collection of information, designed for easy access, management, and updates (Hatta et al., 2021 and Choe et al., 2023). In the proposed system, the author employs phpMyAdmin within the XAMPP environment to streamline database management and administration.

3. Methodology

This section provides a comprehensive overview and description of the system. Additionally, the electronic circuit's development and design, encompassing both software and hardware requirements, are illustrated in Fig. 2. To bring the presented system, a careful selection of hardware and software components is crucial. This selection is guided by three key criteria: cost-effectiveness, availability, and ease of programming. The RFID reader is seamlessly integrated into the ESP32 microcontroller device, forming an open circuit system through pins.



ESP32	RFID MFRC522
D5	SDA
D18	SCK
D23	MOSI
D19	MISO
D4	GND
3.3V	3.3V

Fig. 2. ESP32 connection to RFID module

The Arduino circuit facilitates signal transmission to a server powered by XAMPP, PHP, and MySQL, and serves as the repository for employee attendance records. At the front end of the developed system, a user-friendly web-based application, akin to a computer interface, interacts with the server. This integration is depicted in the block diagram of the proposed system as shown in Fig. 1.

3.1 Hardware Development

Correct wiring is essential for the integration of the ESP32 board and RFID MFRC522 module in the depicted project. Referring Fig. 2, the ESP32 requires six connections, namely D5, D18, D23, D19, D4, and 3.3V, to establish communication with the RFID module. Each of these connections serves a specific purpose in facilitating data transfer and control between the two components. Any deviation or error in the wiring arrangement can lead to communication failures and impact the overall functionality of the Arduino code.

3.2 Arduino Integrated Development Environment (IDE)

The Arduino Integrated Development Environment (IDE) serves as the primary platform for developing this system. The implemented code aligns with the desired output, displaying information such as the user's name, login time, and logout time as planned. Key parameters crucial for system operation include the hotspot name, password, device token, and URL. These details are essential prerequisites when executing the RFID functionality, ensuring the proper functioning of the system.

3.3 System and Database Design

The flowchart, illustrated in Fig.3, provides a comprehensive visual representation of the sequential steps involved in processing information within the developed project. Starting with raw data input, the flowchart systematically guides through diverse processing stages, logical decision points, and concludes by defining the program's outcome. This graphical representation serves as an effective tool to understand the software's information processing journey, elucidating the step-by-step flow from data initiation to program finalization.

The flowchart outlines a process where users employ an RFID Card, designated as an employee card by the company, to initiate scanning on the RFID module for detection. The RFID chip embedded in the employee card transmits data to the RFID Module. Subsequently, the ESP32 receives this transmitted data and undergoes processing through the database, facilitating the display of comprehensive records. These records provide detailed information about the employees who actively worked on the specific day as refer in Fig. 8. Referring Fig. 4, the author establishes four tables in the database. Among these, the user logs table takes precedence, serving as a pivotal repository where all database information is meticulously saved. This table functions as a comprehensive log, capturing and timestamping details about employee interactions with the RFID system. This

integrated system provides a robust solution for employee attendance tracking, ensuring accurate and organized records.

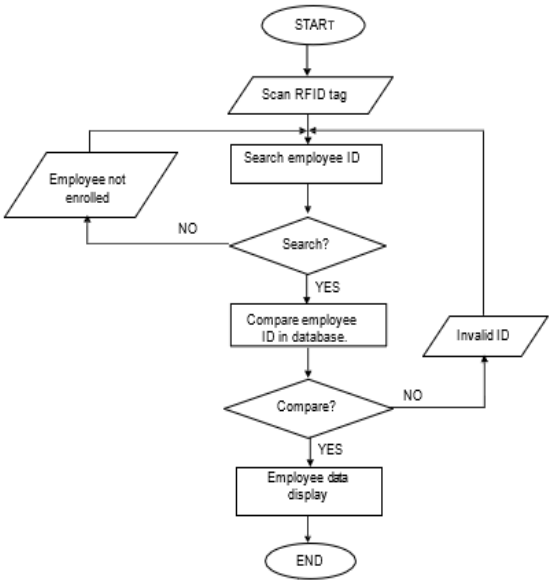


Fig. 3. Visual representation of of RFID card scanning process

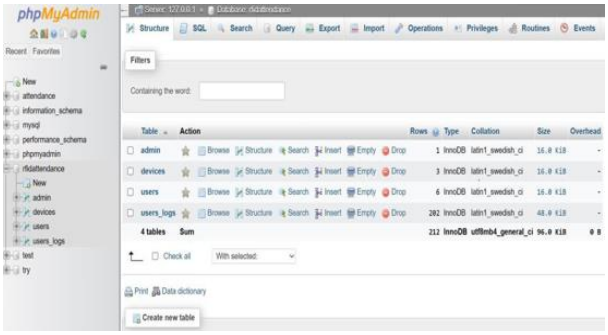


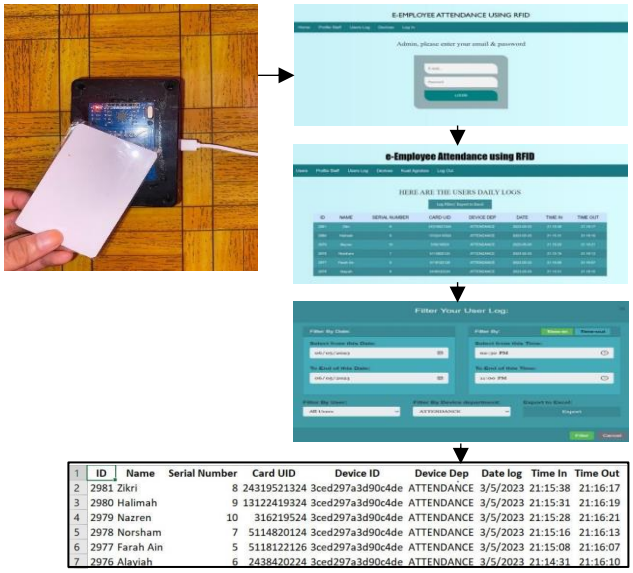
Fig. 4. Database design tables

4. Result and Discussion

This section described the successful conclusion of the project and presented a fully realized system. Key features include a polished website interface, a robust database ensuring secure data storage, and a detailed workflow prototype providing insights into the systematic development process. The discussion of project findings serves as a valuable resource for stakeholders, offering visibility into the project's evolution, understanding of the system's functionality, and the means to evaluate the final output. This comprehensive overview facilitates thorough understanding of proposed project successful.

4.1 Project Output

The system illustrated in Fig. 5 revolves around an RFID-based attendance management system. Staff members use RFID cards to scan, and the information is promptly displayed on a dedicated website accessible only to administrators. The user log page on the website provides key details crucial for attendance management such as Name, Card ID, Date, Time, Time In and Time Out.



	ID	Name	Serial Number	Card UID	Device ID	Device Dep	Date log	Time In	Time Out
2	2981	Zikri	8	24319521324	3ced297a3d90c4de	ATTENDANCE	3/5/2023	21:15:38	21:16:17
3	2980	Halimah	9	13122419324	3ced297a3d90c4de	ATTENDANCE	3/5/2023	21:15:31	21:16:19
4	2979	Nazren	10	316219524	3ced297a3d90c4de	ATTENDANCE	3/5/2023	21:15:28	21:16:21
5	2978	Norsham	7	5114820124	3ced297a3d90c4de	ATTENDANCE	3/5/2023	21:15:16	21:16:13
6	2977	Farah Ain	5	5118122126	3ced297a3d90c4de	ATTENDANCE	3/5/2023	21:15:08	21:16:07
7	2976	Alaviah	6	2438420224	3ced297a3d90c4de	ATTENDANCE	3/5/2023	21:14:31	21:16:10

Fig. 5. Data recording process after scanning an RFID card to the reader

4.2 System Design

The user log page becomes accessible post-admin login on the login page. It showcases staff data captured by scanning cards at the RFID reader. The displayed information includes the staff's name, ID, serial number, card UID, device department, as well as the date, time in, and time out. Refer Fig. 6, this user log page provides a comprehensive overview of the attendance records. Additionally, the system offers functionality to filter attendance records based on either the date or the employee's name, as illustrated in Fig. 7.

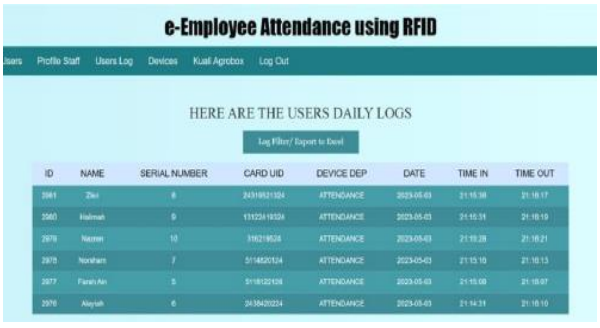


Fig. 6. Kuali Agrobox Staff Attendance Records

Fig. 7. The system capability to filter attendance record by date or employee name

Referring Fig. 8, the device manager features two essential buttons which are enrollment and attendance. Enrollment button is utilized for registering new cards within the RFID-based attendance system. It facilitates the process of adding new staff members or users to the system, associating their RFID cards for identification purposes. While attendance button is designed for staff members to scan their RFID cards, signifying their presence in the system. When pressed, it activates the RFID scanner, allowing staff members to record their attendance quickly and efficiently by scanning their ID cards.

Fig. 8. Device manager features

4.3 Database Recording System

The user logs table, illustrated in Fig. 9, plays a crucial role as a comprehensive log for user data, specifically catering to staff members. When staff members engage the RFID scanner to scan their ID cards, the system captures and meticulously stores relevant data. This recorded information includes intricate details about the staff member and is precisely timestamped with the current date and time. This systematic approach facilitating efficient tracking of attendance and user-related activities.

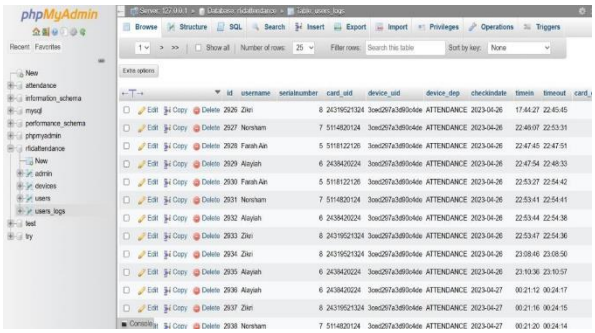


Fig. 9. A comprehensive record of staff attendance data

4.4 Client Feedback

This questionnaire as shown in Fig. 10 has been thoughtfully designed to gather essential feedback from respondents concerning the developed attendance system. The respondent pool, comprising clients from Kuali Agrobox and participants including lecturers and students engaged in the project's pilot phase (N=20), adds diverse perspectives to the evaluation process. Before answering the questionnaire, the researcher performed a direct demonstration to the respondents by showing the use of the attendance system directly or through a comprehensive step-by-step video display. This approach likely contributed to more informed and accurate feedback in the subsequent questionnaire.

According to Table 1, respondents generally express an affirmative sentiment, "Agree," with an overall mean score of 4.17 regarding their perception of the developed project. The highest mean is item 1 "I find difficulty when manually recording employee attendance" with mean score 4.45 and followed by Item 2 "The interface of the system is very attractive and uses appropriate colors". These high mean scores indicate a positive perception, highlighting the system's user-friendly interface and addressing challenges associated with manual attendance recording. Although items 6 and 7 have lower mean scores, but still maintain a high level of agreement among respondents.

Table 1. Finding of respondent feedback

	Item	Mean, $\bar{x}$
1.	I found difficulty when manually recording employee attendance	4.45
2.	The interface of this system is very attractive and uses appropriate colors.	4.40
3.	This system able to help companies record employee attendance well.	4.15
4.	This system has good security features.	4.15
5.	Adding new employee data is easy to implement using this system.	4.15
6.	Employee attendance data is easily checked using this system.	3.95
7.	The developed RFID reader can integrate well with the developed system.	3.95

The information collected serves as an important data source for researchers involved in system analysis studies. Respondents are encouraged to provide honest answers to assist the research group in improving the quality of the system for the benefit of all stakeholders.

5. Conclusion

The project has successfully accomplished its goal of constructing an RFID-based presence system seamlessly integrated with the ESP32 controller board. This endeavor yielded a straightforward attendance marking approach, surpassing the complexities of traditional methods. Notably, the system integrates a database utilizing the XAMPP server platform and PHPMyAdmin, ensuring real-time maintenance of records for every RFID card scan.

Based on feedback finding, responses revealed a positive reception from participants, affirming the effectiveness of the developed system. To further enhance project functionality in the future, the author recommends refining the attendance recording method by incorporating a feature to display total working hours. This enhancement aims to streamline salary payment processes.

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Employers' Satisfaction on The Effectiveness of The Student's Internship Program Klang Community College: A Survey for Two-Months Duration Internship Program

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Abstract

A two (2) month internship program is a short period for students to experience real work in a field or industry. This quantitative study was conducted with 36 respondents who are employers of internship students enrolled in the Computer and Network System Certificate Program at Klang Community College. This questionnaire consists of two parts, namely part A and part B. Part A has 7 items on employer demographics, and part B has 21 items covering aspects of knowledge, skills, and soft skills. Overall, the results show employers' responses a high interpretation of the effectiveness of the two-month duration internship program. This study has implications for the institution to maintain momentum and improve on these aspects so that students are ready to perform internship program with full commitment and explore new knowledge.

Keywords: - Effectiveness, employer, duration, internship

1. Introduction

Industrial or practical internship programs are compulsory at all levels of higher education in Institutions of Higher Learning (IPT) including Certificate, Diploma and Bachelor level. The objective of the internship program is to give students the opportunity to experience the real world of work, to be able to apply what they learned in college and to develop their interpersonal skills (Norhidayah, 2021).

The effectiveness of an internship depends on the duration of the placement that the student needs to commit to. This refers to a six-week study of the internship directed by the MOHE of Pakistan, which became an issue for the effectiveness of the internship program. The achievement of internship objectives depends on various factors as soon as the internship is planned and implemented. (Nauman & Hussain, 2018).

The benefits of the training period are dependent on the learning outcomes of the program that the student needs to achieve. Employers who take internship program will assess students on their mastery of knowledge and skills as well as the readiness of students with real jobs throughout the placement. (Tarmizi, et al., 2023). For employers, this is also an opportunity to engage students or employees in real work experience, giving them the opportunity to apply the knowledge and skills learned and develop students' talents and potential to improve their employability. A study by Ghani (2020) stated that graduates should be prepared with social skills, and employers expect future graduates to master communication skills at work.

1.1 Study Problems

The duration of the internship program found that lecturers were concerned about the effectiveness of students' internships for the two-month duration in a field or industry. The study involved about 41 students in an internship program for a two-month (8-week) duration in the final semester. It was essential to look at the quality of internships delivered by students to achieve industry expectations on knowledge, skills, and soft skills. Students were able to integrate their workability and performance into a real work environment to prepare themselves for employability after graduating from their studies. Therefore, this study was conducted to obtain feedback from employers on the effectiveness of the eight (8) weeks internship program.

1.2 Study Questions

The study involved industry responses in three (3) areas of knowledge, skill and software, which students implemented during the duration of the internship program. Satisfaction in the industry to have the internship program's effectiveness on the curriculum over two (2) months is as follows:

1. Employers respond to aspects of knowledge that students have developed and practiced.
2. Employers respond to aspects of practical skills that students master and practice.
3. Employers provide feedback on the aspects of soft skills practiced by students.

1.3 Objectives of The Study

Based on the question of the above study, this study focuses on three (3) objectives as below:

1. To find out the employer's feedback on the effectiveness of the internship program from students who were undergoing the internship program from the aspect of knowledge.
2. To find out the employers' feedback on the effectiveness of the internship program from students who were undergoing the internship program from the aspect of practical skills.
3. To find out the employers' feedback on the effectiveness of the internship program from students who were undergoing the internship program from the aspect of soft skills.

1.4 The Importance of The Study

This study is very important to all parties who are directly or indirectly involved in ensuring that the performance of internship program students will bring satisfaction to employers or industries. Some of the parties who will benefit from this study include:

1. Collaboration and Entrepreneurship Unit (UKK) Klang Community College
   - The output of the research provides data for UKK about the level of satisfaction of employers on the effectiveness of the internship. Therefore, enhancement activities for students can be planned to meet the employers' expectations.
2. Academic Unit
   - As a result of this study, the Academic Unit can identify aspects of the strengths and weaknesses of the curriculum that improve the formulation of learning and teaching activities.
3. Students
   - This study provides important information to students on aspects that will be evaluated and emphasized by employers. In turn, it provides an initial overview to students who will commit to the internship program to prepare themselves better in various aspects before stepping into real employment.

2. Literature Review

An appropriate duration of an internship program can be the best mechanism to increase employment opportunities for graduates. The adequacy duration of the internship program may vary depending on the students' performance during the internship. Students can participate themselves, adapt with flexibility, learning new skills to accomplish the task and learning curve. Such exposure finally guarantees employment after graduation (Gomez et al., 2023).

This duration should be taken into consideration to prevent students from experiencing boredom, fatigue, and exploitation. It needs to be well planned with coordination from the institution so that students can achieve the learning outcomes of the program and have the internship program effectively (O'Higgins & Pinedo, 2018).

It is natural for students to know the perspectives of employers who want to expose them to the real work environment. These perspectives vary according to the type, size, and culture of the organization, as well as the role and functions of the work. Perspectives are generally related to mastering technology skills, applying generic skills, and adhering to safety regulations and good practices (Noor & Abdullah, 2020).

The industry is interested in knowing the level of knowledge and skills of students in institutions as this factor helps them in finding skilled workers to minimize training and advertising expenses as well as reduce time effectively. Employers will look for experienced and skilled graduates who fulfil their business purposes. Educational institutions that conduct and implement internships for students are aimed at equipping them with employment skills and maximizing their employability (Yusof & Mohiddin, 2018).

3. Methodology

The study is carried out quantitatively. The 36 responders who supervised 41 students filled out the online questionnaire on "Google Form" for Certificate of Computer and Network Systems, Klang Community College students in Session II 2022/2023. This questionnaire is taken from the Ministry of Higher

Education's Internship Program Implementation Handbook Edition 2022.

The questionnaire contains two parts. i.e., Parts A and B. Part A consists of 7 industry demographic items, and Part B consists of 21 items covering knowledge, practical skills, and soft skills. The questionnaire uses a five-point Likert scale ranging from (5) representing "strongly agreeable" to (1) representing "strongly disagree" on each item designed to determine the level of effectiveness of LI by the employer.

All data obtained will be processed using the formula in the computer provided on the "Google Sheet". Analysis from this study will be able to assess employer feedback on the effectiveness of the internship program.

Table 1. The interpretation of the mean score (Nunnally & Bernstein, 1994)

Mean Score	Interpretation
1.00 to 2.00	Low
2.00 to 3.00	Medium Low
3.00 to 4.00	Medium High
4.00 to 5.00	High

4. Finding

4.1 Respondent's Background

A total of 36 responders are industry supervisors comprising of position, supervisor, and percentage as in Table 2.

Table 2. Distribution of respondents by position

Position	Number of Supervisors	Percent
Director/Manager	6	16.67
Supervisor	26	72.22
Head of Department /Head of Unit	3	8.33
Human Resources Officer	1	2.78
Summary	36	100

Next, the questionnaire divides the types of industries into two (2), namely the service industry and the manufacturing industry (refer to Table 2). The service industry consists of four (4) types of industries, while the manufacturing industry consists of two (2) types of industries (refer to Table 3).

Table 3. Types of industry under manufacturing industry and service industry

Type of Industry	Numbers of Service Industry	Number of Manufacturing Industry	Number of students
Information and Communication Technology	15		23
Research And Development	1		2
Pembinaan	1		1
Safety	1		13
Machinery and Services		1	1
Engineering Support		1	1
Summary	18	2	41

A total of 11 students in the industry have a staff of less than five (5) staff. Meanwhile, the industry has a staff of between 20-50, placing 17 internship students, shows the largest number (refer to Table 4).

Table 4. Number of students in industry by number of staff

No of Staff /Industry	No of Industry	No of Student
<5	10	11
6-19	6	11
20-50	2	17
51-150	0	0
151-500	0	0
>500	2	2
Summary	20	41

4.2 Descriptive Analysis

4.2.1 Knowledge Aspect

The score for knowledge aspects shows the highest mean score of 4.44 as illustrated on Table 5.

Table 5. Mean score for knowledge aspects

Questions	Score min	Interpretation
Knowledge	4.22	High
Put knowledge into practice	4.27	High
Mastery of Knowledge	4.44	High
Problem-Solving Abilities	4.13	High
Think Creatively	4.19	High

4.2.2 Skills Aspects

The score for skill aspects shows the highest mean score of 4.39 (refer to Table 6).

Table 6. Mean score for students skills

Questions	Score min	Interpretation
Appropriate Skills	4.33	High
Practicing Skills	4.33	High
Compliance with work	4.39	High
Meet Work Targets	4.34	High
Compliance with Safety Features	4.5	High

4.2.3 Soft Skills Aspects

The score for softskill aspects shows the highest mean score of 4.41 (refer to Table 7). All items show interpretations in high score. Only one result shows medium high or mean score 3.94 for students being able to communicate in English.

Table 7. Mean score for soft skills aspects

Questions	Score min	Interpretation
Accept Criticism	4.50	High
Adapt with work	4.41	High
Comply with the rules	4.50	High
Integrity	4.40	High
Capable to Plan	4.14	High
Work As a team	4.31	High
Leadership Characteristics	4.08	High
Able to Communicate	4.19	High
Capable to Communicate in English	3.94	Medium High
Able to work with minimum supervision	4.25	High
Optimize resources	4.36	High

4.2.4 Summary for From Mean Score from Each Aspects

The results from three (3) aspects are shown in Table 8. The conclusion for mean score for all aspects is 4.31, which is a high interpretation.

Table 8. Mean score per aspect of internship program

Aspects	Mean Score	Interpretation
Knowledge	4.26	High
Practical Skills	4.38	High
Soft Skills	4.28	High
Mean Score	4.31	High

5. Discussions

The findings from this study show that the industries' feedback on the effectiveness of internship program students who underwent eight (8) weeks of internship program in session II 2023/2024 was high. It was found that three (3) aspects measured, which are the knowledge aspect, skills aspect, and soft skills aspect, show a high mean score. According to this study, three (3) aspects of the internship program are not affected by the duration of the student's internship program.

The findings show that these three (3) aspects integrated into internship student programs are very significant for employers to be satisfied with students having internship programs in their place.

Therefore, early exposure during internship is beneficial for joining the workforce industry. Here, students are exposed to real concepts of working environment as well as theory blends with practice push them optimally. As a result, students will be equipped with knowledge, proficiency, and abilities for preparing themselves for the work market.

Therefore, the real essence of this internship is to give students the opportunity to step out of the campus environment to experience the changes and explore technological development in the country. (Yusof & Mohiddin, 2018).

The level of English proficiency among students scored a medium-high mean score compared to other mean scores. According to Zulkifeli et al. (2022), English proficiency is very important in today's needs because it is widely used to know current technology that demands students to coup the needs of the present. It can make students more knowledgeable and make it easier to communicate with individuals from all corners of the world and the most important thing is to increase students' chances of getting a good job nowadays. The findings of this study, supported by Mohamad et al. (2019) found that the failure of graduates to gain a place in the job market is often associated with students' weakness in mastering the English skills required by employers. In this regard, the institution is seen as a suitable place to apply English skills among students before becoming a graduate. Students who are provided with technical skills need to adapt that skill to a diverse industry ecosystem. The assigned tasks are varied depending on the industry and the needs of the organization. This requires students' skills to apply technical skills with a real working environment (Downs et al., 2024).

6. Conclusion

Overall, the industry is highly satisfied with the effectiveness of internship program students. This score needs to be maintained as these 8 weeks is a challenging period for students to apply and interpret skills during the internship program. Students need to prepare themselves as early as possible during their training and master the skills available in the industry quickly and efficiently to ensure that the three (3) aspects have a positive impact.

During the duration of the internship program, employers provide assignments related to the areas of the program that cause students to successfully apply their skills. Employers also play an important role by creating a work environment that aids the mastery of aspects and provides good guidance throughout the internship program. Collaboration between institutions, employers and students is very relevant to ensure the quality of internships prepares graduates of technical and vocational education (TVET) for the job market.

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Code-Switching in Bilingual Malaysian Polytechnic Settings

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Abstract

In a bilingual Malaysian polytechnic setting, this research investigates the phenomenon of code-switching. Changing between two or more languages when communicating is a common activity in a variety of linguistic circumstances. In Malaysian polytechnics, multiple languages are spoken, hence code-switching is frequently seen in daily interactions. The goal of this study is to learn how polytechnic students perceive the use of code-switching in English language instruction and to determine how frequently it occurs in their speech. The study investigates the impact of code-switching methods on language learners' capacity to learn a second language. This quantitative study used a Google Form link to obtain the questionnaire that served as the instrument. The data shows that students positively view the practice of switching between languages, particularly during verbal presentations, as it aids in improving both communication and language acquisition. The findings also suggest that students actively use code-switching as a method to enhance learning, rather than merely as a solution for not knowing certain words. Additionally, code-switching is found to offer psychological advantages, such as boosting students' comfort and confidence levels during their presentations. The study highlights the effects of language mixing on educational outcomes, offering guidance for teachers and decision-makers. It seeks to refine language education strategies, fostering a more inclusive and effective learning environment in Malaysian polytechnics by exploring the nuances of bilingual communication.

Keywords: - Code-switching, bilingual, Malaysian polytechnic, language learning, students' perceptions

1. Introduction

Code-switching, the use of multiple languages in educational settings, is a common feature in diverse societies worldwide, including bilingual countries like Malaysia. In institutions like polytechnics, where language diversity thrives, individuals frequently switch between languages during communication.

Despite being common in multilingual settings, code-switching has drawn the attention of scholars and language instructors. It's essential to comprehend the patterns, purposes, and effects of code-switching in educational settings to improve language teaching and learning methods. According to Bruss (1986), code-switching is the juxtaposition of two distinct grammatical systems or subsystems in a single speech transaction between interlocutors.

At Malaysian polytechnic institutions, the widespread use of multiple languages, both inside and outside the classroom, presents a unique opportunity to study code-switching and its impact on students' language proficiency. Code-switching is a common practice worldwide, especially when English is the primary language of instruction (Alang & Idris, 2018). Understanding code-switching patterns in multilingual contexts can greatly benefit language education research. This study aims to explore code-switching in bilingual Malaysian polytechnics and its influence on second language learning

as well as contribute to existing knowledge on bilingual language instruction.

By examining the relationship between code-switching and language learning, the study aims to advance bilingual language education in polytechnic settings and promote inclusive language teaching practices as well as enlighten language educators and policymakers about effective methods for enhancing language learning experiences in Malaysian polytechnics.

1.1 Problem Statement

Code-switching, the seamless alternation between languages, is prevalent in Malaysian polytechnics due to their language diversity. It is influenced by communicative competence, but its impact on language learning remains unexplored. This knowledge gap poses a challenge for educators aiming to enhance language learning outcomes in this context (Van et al., 2019).

Code-switching may influence language learners' learning process and their overall language learning experiences, but the extent of its impact and its specific functions within this educational context are yet to be thoroughly investigated (Narasuman et al., 2019). The absence of comprehensive research on code-switching's patterns, functions, and implications in Malaysian polytechnics hinders the development of tailored language education approaches that could cater to the diverse linguistic needs of students.

Furthermore, the coexistence of multiple languages in Malaysian polytechnics may lead to varying degrees of code-switching practices among students, possibly impacting the learning environment's inclusivity and effectiveness. Understanding the intricacies of code-switching and its potential impact on language learning within these polytechnic settings is crucial to ensure that language education programs align with students' linguistic backgrounds and foster a conducive learning environment.

In the bilingual Malaysian polytechnic context, code-switching practices may create challenges for language learning, especially when students face technical issues or time management difficulties. This can cause anxiety and hinder language learning progress. Understanding how code-switching affects language proficiency and its role in facilitating or hindering language learning is essential for evidence-based language education strategies.

1.2 Research Objectives

This study is aimed to achieve the following objectives:

1. Identify the perceptions of polytechnic students on using code-switching in English language classes.
2. Identify the frequency of code-switching among polytechnic students in English language classes.
3. Investigate the impact of code-switching practices on language learning among language learners.

1.3 Research Questions

Considering the gaps in the existing literature, the present study seeks to address the following research questions:

1. What are the perceptions of polytechnic students on using code-switching in English language classes?
2. How frequently do polytechnic students code-switch in English language classes?
3. How do code-switching practices impact language learning among language learners?

2. Literature Review

2.1 Code-Switching

Code-switching is a linguistic phenomenon that occurs when a speaker seamlessly switches between two or more languages within a single conversation or communication act. This ability is commonly observed among individuals who are bilingual or multilingual, meaning they have proficiency in more than one language. Multiple-language speakers can transition between languages during a single communication action (Mahootian, 2006). Hymes (1992) promotes communication competency where speakers are aware of when to speak and when to remain silent as well as what to talk about, when, where, and how. The concept of competence in communication is a crucial aspect of effective language use, especially in bilingual or diverse linguistic settings. It refers to speakers' ability to navigate language choices appropriately based on social, cultural, and contextual factors. Competent communicators possess the knowledge of when to use specific languages or varieties, when to switch between them, and how to adapt their language use according to the audience and the situation.

2.2 Code-Switching in Bilingual Malaysian Polytechnic

The act of switching between a first language and an optional language is known as code-switching in the educational setting. It is regarded as the quickest, easiest, and most effective way to communicate (Celario, 2022). Code-switching in the educational setting refers to the practice of alternating between two or more languages during the process of teaching and learning. It involves the seamless transition from one's first language (L1) to an additional or optional language (L2) and vice versa within the classroom context. Code-switching is prevalent in bilingual educational environments and has been observed in various educational systems worldwide. Code-switching in the educational setting, particularly the polytechnic context, is a valuable and versatile communicative tool. It fosters effective communication, enhances the learning experience, and accommodates linguistic diversity in classrooms. When used thoughtfully, code-switching contributes to a more inclusive, engaging, and enriching educational environment for both educators and students. Code-switching during classroom instruction is a benefit in

helping students to understand the material more so than when solely English is used (Abad, 2010). This highlights that code-switching is beneficial to language learners.

2.3 Code-Switching Effects on Language Learning

English is not only a universal language, but it is also the language of education because it is utilized in almost every type of instruction as well as in national and international exams (Leyaley, 2016). If one wishes to flourish in a knowledge-based economy in this era of industrialization and globalization, learning to speak and write English is crucial. As a result, several topics now need English as the language of instruction. Regular language use was believed to help students develop the necessary competency and fluency. Additionally, using code-switching in a language classroom will be seen as a helpful tool for student interaction and communication, provided that its goal is to effectively convey important information to students (Aljoundi, 2013). Additionally, students are more readily to try when code-switching is used because they are under less pressure to speak English accurately and effectively (Lee, 2010).

Students' second language limitations can be overcome by code-switching (Subon & Tarmim, 2021). Code-switching can play a significant role in helping students overcome limitations in their second language proficiency. When students are learning a second language, they may encounter challenges in understanding and expressing themselves due to their limited linguistic abilities. In such cases, code-switching, the strategic alternation between the second language and the student's first language, can offer valuable benefits in their language learning journey.

Apart from that, students were able to communicate thoughts through code-switching that they were unable to do so in other languages (Subon & Tarmim, 2021). The statement suggests that individuals, typically bilingual or multilingual speakers, can express their thoughts more effectively using code-switching compared to solely relying on other languages. In other words, code-switching allows them to communicate ideas, emotions, and complex concepts in a way that may not be possible when using a single language and this is also supported by Barbu, Gillet & Poncelet (2020) who stated that the ability of interlocutors to exhibit cognitive flexibility directly correlates with the frequency of language change.

3. Methodology

3.1 Research Design

This study adopts a descriptive research design that utilizes quantitative research method for data collection and analysis. The primary reason for choosing this design is to accommodate a substantial and diverse sample size, allowing for a broad and representative participation in the study.

3.2 Samples

A total of 121 students voluntarily participated in the study. In particular, the participants included 53 females and 68 males. The participants were Politeknik METrO Kuala Lumpur (PMKL) students enrolled in various Diploma programmes and took the English modules offered at the polytechnic.

3.3 Instrument

This study utilized a questionnaire as its research instrument, adapted from Al-Qaysi (2016). The questionnaire consisted of three sections: Section A collected demographic information such as gender, age, and years of study. Section B comprised of 9 items assessing the respondents' perceptions of code-switching usage in English language classes. Section C includes 6 items focusing on the frequency of code-switching in respondents' speech. All 15 items were in Likert-scale format.

In Section B, participants rated their perceptions on a scale of 1 to 5 (1 - Strongly Disagree, 5 - Strongly Agree), while in Section C, they indicated the frequency of their code-switching on a scale of 1 to 5 (1 - Never, 5 - Always). Before the main study, a pilot study was conducted with 10 respondents from the actual sample. The Cronbach Alpha's score of the pilot study indicated that the instrument demonstrated good reliability. Hence, the research instrument is deemed reliable and valid for use in the main study.

3.4 Data Collection Procedure

Before gathering the actual data, a pilot study was carried out with a convenience sample of 10 students to assess the questionnaire's feasibility and reliability. Subsequently, the questionnaire was distributed and responses from 121 respondents were collected. Additionally, the Google Form link was utilized to obtain online responses over a two-week duration.

3.5 Data Analysis

Once all the data from the students were gathered, descriptive statistics were conducted using SPSS (version 29). Prior to that, the pilot test was conducted to assess the questionnaire's reliability, and the findings are discussed in the subsequent sections.

4. Result and Discussion

A study on code-switching in bilingual Malaysian polytechnic settings revealed a range of attitudes toward the practice. While some students and faculty viewed code-switching as a practical tool for communication and learning, others expressed reservations about its impact on language proficiency. The mixed opinions highlight how code-switching influences preferred methods of instruction and interaction in these educational environments.

Bruss (1986) reliability analysis was used to examine the survey items. The survey results, based on Cronbach's Alpha, indicated a very high level of internal consistency, suggesting that the items within this scale are very reliable in measuring the concept of English Language Learning.

Table 1. Reliability analysis for code-switching on English language learning

Element	Reliability
Code-switching	0.809
English Language Learning	0.897

Table 2. RQ 1 - What are the perceptions of polytechnic students on using code-switching in English language classes?

Statements	Mean
1. I believe that code-switching enhances my communication skills in oral presentations.	3.7603
I believe code-switching helps me to develop my language skills in oral presentations.	3.7934
3.I believe that using code-switching shows that I am well-educated especially in oral presentations.	3.6860
4. I code-switch because I do not know the word in English (L2)	3.4380
5. I found code-switching helps me to convey new words easily.	3.8926
6.I believe that code-switching makes me feel more comfortable and confident in oral presentations.	3.7521
7.I found that code-switching allows me to express the ideas that I can't express in other language.	3.7273
8.I believe code-switching from the mother tongue (L1) in oral presentations helps me practice the second language that I use.	3.6694
9.I believe code-switching allows me to understand better of the content I am presenting.	3.7769

The study on code-switching in Malaysian polytechnic settings reveals that students generally view it positively, especially in oral presentations. Code-switching, or alternating between languages, is seen as a helpful tool for better communication and language learning. Respondents believe it enhances their ability to convey ideas clearly (M=3.7603) and aids in developing their language skills (M=3.7934).

According to Pallant (2020), the categorization of mean scores can be interpreted and divided into three main parts which are:

a. 1.00 - 2.33 (low mean score)
b. 2.34 - 3.66 (moderate mean score)
c. 3.67 - 5.00 (high mean score)

Interestingly, students don't just code-switch when they're stuck for a word in English; they also see it to make learning new words easier (M=3.8926). This suggests they value code-switching not just as a last resort but as a proactive learning strategy.

However, the study also uncovers some complexities. For example, the lowest mean score (3.4380) indicates that avoiding code-switching because of not knowing an English word isn't the primary reason for its use. This points to a more nuanced understanding of code-switching beyond just filling in language gaps.

Moreover, code-switching seems to have a positive psychological impact, making students feel more comfortable and confident during presentations. Despite these benefits, the study also hints at the challenges and mixed feelings students have about code-switching, such as concerns about how it reflects on their education or its role in effectively expressing complex ideas (Item 7).

Overall, this investigation into code-switching at Malaysian polytechnics suggests that while students see many benefits to this practice, there are also layers of complexity in how it is perceived and used. It is not just about switching languages when necessary; it's a strategic tool for learning, communication, and building confidence, even though it comes with its own set of challenges and considerations.

Table 3. RQ 2 - How frequently do polytechnic students code-switch in English language classes?

Statements	Mean
1. I use code-switching in my daily conversation.	3.6116
2. I code-switch from English (L2) to my mother tongue (L1) in oral presentations to simplify a theory or concept.	3.5372
3. I prefer to use more L1 in oral presentations when I do not know the word in English.	3.5537
4. I use my mother tongue (L1) more in a speech to ensure a smooth presentation.	3.4463
5. I code-switch when I am around my friends.	3.6446
6.I tend to code-switch when I am nervous during oral presentations.	3.5207

The investigation into code-switching practices among bilingual individuals reveals the sophisticated and deliberate way people alternate between languages in everyday life and formal settings. This habit, crucial to bilingual communication, fulfils various practical and psychological needs, as evidenced by the survey's numerical data, highlighted with specific average scores.

In daily conversations, code-switching's commonality is apparent, with an average score demonstrating a strong inclination towards mixing languages in informal interactions (M=3.6116). This figure suggests that bilingual speakers comfortably merge languages in their conversations, indicating a dynamic and adaptable communication style that utilizes their full linguistic abilities.

The use of code-switching in oral presentations, especially to clarify complex ideas, is confirmed and supported by the data (M=3.5372). This practice shows how language can be flexibly used to make messages clearer and more accessible, allowing speakers to adjust their language to the audience's needs.

Moreover, the survey highlights a frequent return to the native language when encountering unknown English

words, as shown by the average score (M=3.5537). This tendency underlines the mother tongue's importance as a fall back to ensure smooth and coherent communication.

The decision to use the native language more in speeches for seamless delivery is also noted in the survey results (M=3.4463). Though this score is somewhat lower, it implies a thoughtful balance between ensuring fluency and meeting the expected standards of language use, showcasing the complex decisions bilingual speakers make in different situations.

In social situations, especially with friends, code-switching is significantly more common, as indicated by a higher average score (M=3.6446). This suggests that code-switching plays a key role in creating an informal and welcoming environment, where switching languages enhances social ties and ease of communication.

Additionally, the survey identifies code-switching as a strategy to manage nervousness during presentations, with a notable average score (M=3.5207). This suggests that shifting to a more comfortable language can reduce stress and build confidence, helping speakers better manage public speaking challenges.

Overall, the survey casts light on code-switching as a sophisticated and intentional aspect of bilingual communication. The specific mean scores illustrate its broad use in various contexts, from making presentations clearer to easing communication in social and stressful situations. Far from being just an interesting linguistic feature, code-switching emerges as a vital communication strategy, enabling bilingual speakers to effectively engage in and enrich their interactions across languages.

Table 4. RQ3 - How does code-switching practices impact language learning among language learners?

Elements	Correlation
Code-switching on English Language Learning	0.739

The correlational analysis revealing a correlation coefficient of 0.739 between code-switching and English Language Learning provides insightful conclusions about the interplay between bilingual practices and language acquisition. This strong positive correlation indicates that there is a substantial relationship where increased engagement in code-switching is associated with enhanced outcomes in learning English as a second language.

5. Conclusion

In conclusion, the study on code-switching in Malaysian polytechnic settings concludes that students generally view code-switching positively, particularly in the context of oral presentations, enhancing both communication and language learning. It highlights code-switching as a strategic tool for learning and communication, with benefits that include increased comfort and confidence in presentations, despite some complexities and challenges.

For future research, it is suggested that the causal relationships between code-switching and language learning outcomes to be explored more deeply. Longitudinal studies could examine the long-term effects of code-switching on language proficiency. Additionally, experimental designs could investigate specific code-switching practices to identify which are most beneficial for language learning. This would provide more detailed guidance for educators on how to incorporate code-switching into teaching methodologies effectively.

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Gamification: Enhancing Financial Education and Motivation in Non-Accounting Students

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Abstract

This study examines the acceptance and impact of gamification in delivering financial concepts to non-accounting students. This innovative approach involves incorporating game elements to enhance students' understanding and interest. Game elements such as challenges, rewards, and competitions are integrated into financial learning, thereby increasing motivation and student engagement. Through empirical research, data is analyzed to assess the acceptance and effects of gamification. The study involves pre- and post-assessment tests using the T-Test method with 66 non-accounting students, specifically Diploma in Business Studies students taking the Business Accounting course. They were divided into a control group (traditional method) and a gamification learning group. The results demonstrate the effectiveness of this approach, with students in the gamification group achieving higher performance. Positive feedback from students indicates the effectiveness of gamification in capturing interest and motivation for complex topics. This study provides valuable insights into the effectiveness of gamification in delivering financial concepts to non-accounting students, contributing to higher learning innovation. Recommendations for further research include conducting more in-depth investigations, particularly in non-accounting courses at higher education institutions.

Keywords: - Gamification, financial education, motivation in learning

1. Introduction

In today's ever-evolving era of education, the use of technology and innovation in the learning process is becoming increasingly important. One interesting innovation that has expanded in recent years is the use of gamification to help non-accounting students understand finance. Gamification combines gaming and technology elements to enhance the effectiveness and enjoyment of learning. Gamification can be used as an alternative or supportive learning method in accounting education (Koç, 2023). In particular, the application of gamification using scan code technology on game boards (Wu et al., 2018), known as Scanning Code (SC), has gained popularity in the field of business accounting education.

The potential of integrating emerging technologies like Quick Response (QR) codes and Augmented Reality (AR) into traditional textbooks to enhance education in the 4.0 era (Toma & Turcu, 2022). These technologies have the potential to address current educational challenges and improve the quality of education. According to Aini et al. (2020), gamification can help educators assess the competence of their students while creating a more interactive and innovative learning environment. By incorporating gaming elements and scan code technology, teaching and learning can be made more engaging and stimulating for students.

In the context of financial learning, the importance of technological integration is widely recognized. In this regard, the exploration of gamification with scanning codes on the Scanning Code (SC) board game has proven

to be highly effective. This application not only improves the achievement of course information but also facilitates smoother communication between teachers and students. Additionally, various learning activities such as quizzes, tests, and assignments can be organized more effectively (Palau et al., 2003).

The focus of this study is to investigate the attitudes and achievement abilities of students in the use of gamification learning with scan codes on Scan Code (SC) board games, as well as their relationship with academic performance. The research subjects consist of students enrolled in the Business Accounting course for the Business Studies Diploma program at Polytechnic Mukah, Sarawak. By exploring the potential of gamification with scan codes on Scan Code (SC) board games, this study aims to highlight the importance of innovative and engaging teaching and learning methods in the field of accounting education.

The specific objectives of this study are as follows:

1. To study students' attitudes towards the use of gamification in learning financial concepts.
2. To analyze the effect of gamification on the understanding of financial concepts among non-accounting students.
3. To assess the relationship between students' acceptance of gamification and their academic performance in Business Accounting courses.

The project intends to explore the following research questions to fulfill these goals:

1. How do students feel about the application of gamification to the idea of learning finance?

1 What is the effect of gamification on the understanding of financial concepts among non-accounting students?

2 How is students' acceptance of gamification related to academic performance in the Business Accounting course?

The use of technology in the accounting field has undergone significant changes, particularly in accessing and analyzing data. Kumar (2020) suggests the use of technical sheets in accounting applications as a new method of analyzing accounting data. However, learning accounting, especially in the Business Accounting course, is often considered challenging. In the diploma program of business studies, the course is elective, with 38% of female students and 62% of male students opting to take business accounting courses. The performance of students on this course tends to be low, with the majority achieving a D level or below in the final exam (see Fig. 1).

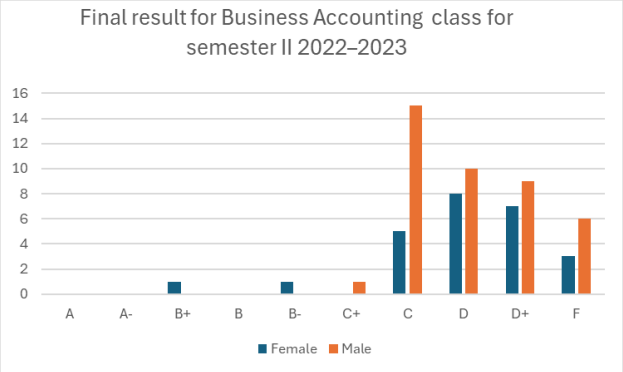

Fig. 1. Final examination results for male and female students taking Business Accounting.

The goal of gamification, which has been implemented as a learning approach in the Business Accounting course, is to solve this difficulty by making the learning process more dynamic and interesting. Technology, gaming components, and constructivism techniques are all combined in gamification learning using scan codes on the Scanning Code (SC) game board.

According to the theoretical basis of constructivism, cognitive structures are developed through new experiences and information. In a recent study, two groups were compared: the traditional learning group (DPM1A) and the gamification learning group (DPM1B). Scan code technology was used on SC game boards to facilitate the study. The outcomes demonstrated that gamification of instruction improved students' academic achievement. Additionally, differences based on gender were observed.

It was found that students who had a positive attitude towards gamification learning showed better academic performance. The use of technology, game elements, and constructivism through gamification learning by scanning the code on the SC game board can lead to more innovative accounting education. Additionally, the study suggests that there is a need for further research on the impact of gamification on non-accounting students on a broader level. The findings of this research can contribute to increasing the acceptance of gamification and understanding its impact on presenting financial concepts to non-accounting students.

Additionally, it is important to explore the long-term impact of scan code technology on SC gaming boards on students' understanding of financial concepts and its implications for improving the business finance curriculum. As shown in Fig. 2, this can also increase the number of digital learnings accessible through mobile facilities.

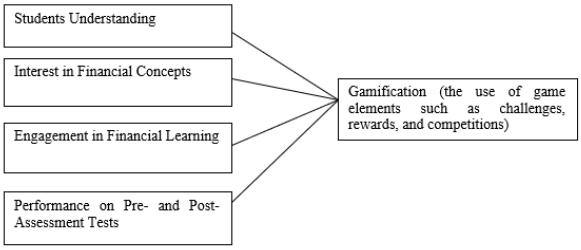

Fig. 2. Gamification as collaborative learning resources in technological education, (Páez-Quinde et al., 2023)

Learning through games is an effective way to enhance students' motivation and academic performance (Rohaila & Fariza, 2017). Students tend to show higher motivation to participate in unstructured learning, such as gamification (Chung, Shen & Qiu, 2019). This aligns with the theory that students tend to show greater interest in unstructured learning. Gamification, with its elements of challenge and reward, keeps players eager to try again and again (Sholahudin & Yenti, 2022). Therefore, the integration of gamification with scan code technology on the SC game board has the potential to increase students' motivation and improve their understanding of financial concepts.

Conclusively, the purpose of this research is to investigate the influence and acceptance of gamification in teaching non-accounting students' financial concepts. The objectives of the study include evaluating students' attitudes towards gamification, analyzing the effect of gamification on the understanding of financial concepts, and assessing the relationship between students' acceptance of gamification and their academic performance. By investigating these aspects, this study aims to contribute to the field of accounting education and highlight the potential benefits of gamification with scan codes on Scan Code (SC) board games. Further research is needed to explore the effects of gamification on non-accounting students at a broader level and to examine the long-term impact of scan code technology on SC gaming boards on students' understanding of financial concepts.

2. Methodology

The research was conducted on all students who had enrolled in the Business Accounting course at the Department of Commerce, Polytechnic Mukah, Sarawak in the first semester. A sample of 66 students was selected from the population based on their scores between 50% and 70%. They were randomly assigned to two groups - the Traditional Learning Group (DPM1A=32) and the Gamification Learning Group (DPM1B =34).

The study utilized questionnaires divided into sections to collect demographic data such as age, gender, and educational background of the respondents. The second section included questions related to student attitudes toward gamification learning. The third section explored the perceived effect of gamification use on students' learning outcomes. The questionnaire utilized in this research study was adapted from a previous investigation by Supathanarangsri et al. (2020).

The survey used a five-point Likert scale to gauge participants' responses, ranging from "strongly disagree" to "strongly agree" (Sekaran & Bougie, 2016). Data was collected for this study by distributing questionnaires to two groups: the traditional learning group and the gamification learning group. Respondents were given instructions to fill out the questionnaires based on their views and experiences of gamification learning. Scan code technology was introduced on the SC game board to enhance the learning experience, which added an innovative dimension to the study.

The collected data was analyzed using descriptive statistical methods to formulate statistics such as mean, maximum, average, and standard deviation. The T-test was employed to assess significant differences between the Traditional Learning Group (DPM1A) and the Gamification Learning Group (DPM1B). The study utilized the Pearson correlation test to evaluate the relationship and strength of the factors analyzed. Ethical considerations were carefully considered throughout the study. The privacy rights of the respondents were given top priority, and their anonymity was ensured. The participants were informed of the study's purpose and were given the option to withdraw at any time without any adverse consequences.

The study's results will be presented anonymously and used solely for research purposes. Ethical guidelines were followed to ensure participant well-being and rights. The study evaluated whether gamification improves financial concept learning in non-accounting students. The research objectives were addressed by employing a single control group with two sub-groups: the traditional learning group and the gamification learning group. The primary tool used was a questionnaire, and the data collected were analyzed using descriptive statistics, the T-test, and the Pearson correlation test. Ethical considerations were considered to ensure the participants' privacy and rights were safeguarded.

3. Result and Discussion

Based on the objectives of this study, the results showed a deep understanding of the acceptance and impact of the use of gamification in learning financial concepts among non-accounting students. Analysis of the questionnaire helps to achieve the first objective, which is to study the attitude of students toward the use of gamification. Each question has a standard deviation value and a mean value, with an average mean of 4.68. Students showed a high acceptance rate of 62% of female students agreeing compared to male students on learning through the gamification method, which has the potential to increase student motivation and engagement, as shown in Table 1.

Table 1. Students' views on the use of gamification to learn financial concepts (Devendren & Nasri, 2022)

Item	Mean	Std Deviation
Could you please clarify if you agree that using gamification can increase the engagement levels of financial education?	4.68	0.705
Do you think gamification can boost your interest in financial concepts?	4.74	0.686
Do you agree that playing games helps students learn financial concepts?	4.80	0.684
How much do you think gamification can help you understand money better?	4.83	0.571
Do you think gamification can help you learn finance?	4.76	0.703
Is gamification making learning about finance more enjoyable for you?	4.82	0.630
Do you agree that you have a good experience learning financial concepts by using technology like SC game board code scanning?	4.76	0.658
Does gamification help you understand financial concepts better and feel more confident?	4.83	0.622
How much does gamification encourage you to learn about money matters?	4.68	0.705
Do you agree to increase gamification in financial education to increase effectiveness?	4.67	0.730
Total average mean	4.68	

The study evaluates the positive impact of gamification on financial literacy, using standard deviation and mean values for each question. The mean value is 4.73. Female students were more agreeable than male students who engaged in gamification learning using scan codes on the Scanning Code (SC) game board showing an improvement in understanding financial concepts compared to traditional learning groups such as Table 2.

Table 2. Effect of gamification on financial concept understanding among non-accounting students (Rosli, Khairudin & Saat, 2019)

	Mean	Std Deviation
How much do you think using game-like aspects to study financial concepts may improve your comprehension of the subject?	4.76	0.703
Do game elements aid financial learning and retention?	4.74	0.686
Did using technology, such as scan codes on SC game boards, improve your understanding of financial concepts?	4.80	0.613
How much does gamification assist in connecting financial concepts with real-world situations?	4.73	0.646
Is financial learning more engaging with gamification to help maintain focus?	4.74	0.640
Do you agree that incorporating gamification in learning can enhance the understanding of financial concepts?	4.73	0.669
How much does gamification boost students' enthusiasm and interest in learning financial concepts?	4.62	0.718
Using gamification is an effective way to enhance financial literacy	4.76	0.583
The study explores the correlation between students' acceptance of gamification and their performance in Business Accounting courses.	4.71	0.651
Total average mean	4.73	

The third objective is to study how students' academic performance in the Business Accounting course relates to their acceptance of gamification. Each question has a standard deviation value and a mean value, for which the mean value is 4.66. The results showed a very highly positive relationship between gamification acceptance and academic achievement of students, showing that the higher the acceptance of gamification, the better the academic performance as in Table 3.

Table 3. The relationship between students' acceptance of gamification and academic performance in Business Accounting courses (de Oliveira Durso, Reginato & Cornacchione, 2019)

	Mean	Std Deviation
How much do you believe that using gamification to understand financial topics can boost your interest and motivation for Business Accounting courses?	4.56	0.636
Do you also think that learning about finance using games and scan code technology has improved your academic achievement in business accounting courses?	4.71	0.602
Do you agree that your experience is very positive during gamification learning about academic achievement in the Business Accounting course?	4.67	0.664
Do you feel that acceptance of gamification can give you additional impetus to achieve better academic performance?	4.77	0.652
How much do you believe that doing well academically in the Business Accounting course is directly tied to your comprehension of financial concepts through gamification learning?	4.62	0.651
Do you agree that there is a relationship between the enjoyment of learning through gamification and the academic performance achieved in the Business Accounting course?	4.65	0.712
Total average mean	4.66	

The study's T-test results show a significant difference in the acceptance and efficacy of gamification in teaching non-accounting students' financial concepts between the

Traditional Learning Group (DPM1A) and the Gamification Learning Group (DPM1B). The following are the study's objectives:

a) This study aims to explore students' perspectives on the use of gamification in education

A t-test was used to compare the interests of two groups: A (n=32, M=52.59, SD=7.255) and B (n=34, M=72.91, SD=7.779). When doing a statistical hypothesis test, the alternative hypothesis (H1) contends that a substantial difference exists between the two populations, while the null hypothesis (H0) implies that there isn't.

The study examined how well gamification and conventional approaches to teaching financial concepts compare. A T-test reveals that the Gamification Learning Group (DPM1B) exhibited a significantly greater rate of adoption of the gamification approach in comparison to the Traditional Learning Group (DPM1A). At a confidence level < 0.05, this suggests a true difference between the two groups. The mean score for DPM1A was 52.59, while for DPM1B, it was 72.91, which suggests a substantial difference supported by the T-test results ($p < 0.05$). Moreover, over 60% of female students agreed that gamification methods could improve their motivation and engagement in learning. This indicates that gamification has the potential to be an effective and engaging learning approach for students.

b) The objective of this study was two-fold: to analyze the impact of gamification on the understanding of financial concepts

The purpose of the study was to find out how well gamification may enhance students' comprehension of financial concepts. Group A ($n = 32$, mean = 1.52, SD = 0.504) and Group B ($n = 34$, mean = 63.06, SD = 2) were the two groups that were examined. The study found that DPM1B outperformed DPM1A in terms of academic achievement, with significant differences between the two groups ($p < 0.05$). Moreover, female students responded better to gamification learning, showing greater improvement in understanding financial concepts than in traditional learning groups. These findings suggest that gamification can be an effective strategy to enhance the motivation and learning outcomes of non-accounting students in Business Accounting courses. The study provides valuable insights for education providers to design and implement dynamic and engaging learning strategies to cater to the needs of today's digital-savvy learners.

c) The study aimed to investigate the relationship between gamification acceptance and academic performance in Business Accounting courses

The acceptance of gamification, as indicated by a Pearson correlation coefficient of 0.808 ($p = 0.00$, two-tailed) in a sample of n=66 students, underscores a strong positive relationship between gamification acceptance and academic performance. These findings align with the study's objective, suggesting that the positive correlation is potentially driven by factors such as increased engagement, motivation, interactive learning experiences, instant feedback mechanisms, intrinsic motivation, practical application of knowledge, consideration of individual learning styles, and the integration of technological literacy.

4. Conclusion

This study concludes that using gamification to teach finance to non-accounting students has a significant positive impact. Students responded positively to the use of game elements and scan code technology in learning, which was reflected in the significant T-test values. The study found that gamification improves understanding of financial concepts and that students who engaged in gamification learning using scan codes on the Scanning Code (SC) game board achieved better performance compared to traditional learning groups. The study also found a strong relationship between gamification acceptance and academic achievement.

The implications of this study suggest that education institutions should consider implementing gamification learning strategies into their Business Accounting curriculum to improve students' motivation, acceptance, and academic achievement. Furthermore, the study proposes measures to increase the effectiveness of gamification activities. This study contributes to the understanding of the impact of gamification in learning financial concepts and provides a platform for further research and the improvement of innovative learning practices in higher education. This study concludes that using gamification to teach finance to non-accounting students has a significant positive impact. Students responded positively to the use of game elements and scan code technology in learning, which was reflected in the significant T-test values. The study found that gamification improves understanding of financial concepts and that students who engaged in gamification learning using scan codes on the Scanning Code (SC) game board achieved better performance compared to traditional learning groups. The study also found a strong relationship between gamification acceptance and academic achievement.

The implications of this study suggest that education institutions should consider implementing gamification learning strategies into their *Business Accounting* curriculum to improve students' motivation, acceptance, and academic achievement. Furthermore, the study proposes measures to increase the effectiveness of gamification activities. This study contributes to the understanding of the impact of gamification in learning financial concepts and provides a platform for further research and the improvement of innovative learning practices in higher education.

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Beyond The Classroom: Harnessing Social Media for Post-Academic Education Marketing

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Abstract

This research investigates the employment of social media platforms by student entrepreneurs and their connection to income production. The objective was to examine students' business-related social media usage and its association with income generation. Respondents were drawn from students simultaneously engaged in studies at Polytechnic and College Community, partaking in the "Digital Entrepreneurship Booster" PENJANA KPT-CAP Program in Negeri Perak, 2022. A total of 100 participants were enrolled, with 39 respondents completing the questionnaires. Employing quantitative approaches, questionnaires were distributed, and data were processed using Social Package for Social Sciences (SPSS) version 23. Findings demonstrate a robust link between income generation and social media, with WhatsApp being the favored platform for entrepreneurial endeavors among students. These outcomes offer tangible implications. The study reinforces the drive to augment students' awareness and engagement with social media for business, urging further financial support for cultivating digital entrepreneurship throughout students' educational journeys.

Keywords: - Social media platform, income generation, student entrepreneur, digital entrepreneurship

1. Introduction

1.1 Social Media in The Mid Post-Academic Education

In the realm of modern education, the integration of social media transcends traditional classroom confines, ushering in an era of expanded post-academic education marketing. With societal transitions towards digital interconnectedness, a holistic understanding of this domain emerges as a pressing imperative. Internet adoption by Small and Medium Enterprises (SMEs) in Malaysia has been a subject of inquiry, with Alam (2009) shedding light on the nuanced factors underlying this phenomenon. Further delving into online consumer behavior, Arisah, Badari & Hashim (2016) navigate the intricate web of influencing factors impacting online purchase decisions. A localized exploration within Kuala Lumpur's diverse landscape unveils the complex matrix of online purchase behavior, as revealed by Asri & Hamid (2018). Meanwhile, Balan & Rege (2017) mine small businesses' social media patterns, illuminating the multifaceted dimensions of online engagement.

The pragmatic significance of pilot studies is underscored by Connelly (2008), accentuating their pivotal role in research design and execution. Elucidating the symbiotic relationship between entrepreneurship and social media, Olanrewaju et al. (2020) offer a panoramic review of existing literature, unraveling the entwined tapestry of innovation and connectivity. Öztamur & Karakadılar (2014) navigate the nexus between social media and SME marketing strategies, unraveling the intricate interplay of modernity and business growth. Within the realm of education, the influence of social media extends to post-academic marketing efforts, as explored by Rugova & Prenaj (2016), showcasing the versatile potential of digital platforms.

Business research methodologies take center stage through Schindler (2011), opening avenues to harnessing robust investigative frameworks. In the dynamic landscape of marketing, Shukla (2023) examines influencer marketing's profound sway on consumer behaviors, providing a lens into the realm of persuasive digital dynamics. Transitioning to empirical terrains, Wamba & Carter (2014) empirically probe the adoption of social media tools in SMEs, shedding light on the pragmatic integration of these tools. In the realm of research synthesis, Almeida, Gara & Kuruzovich (2020) systematically unpack the manifold ways in which entrepreneurs harness social media, mapping their strategies for organizational efficacy.

Moreover, the challenge of information overload finds resonance within the context of digital relationships, as illuminated by Chittenden & Rettie (2003), which paves the way for efficient engagement strategies. Hossain, Alam & Rahman (2016) unravel the enigma of mobile banking adoption in Bangladesh, excavating the underlying drivers and barriers. Furthermore, the cross-cultural dimensions of engagement within social media brand communities transcend boundaries, as explored by Manthiou & Singh (2020), leading to insights on cultural adaptation in branding practices. Meanwhile, Munasinghe, Matos & De Silva (2016) gauge the e-commerce readiness of SMEs in Sri Lanka, offering insights for enhancing digital adoption.

In the pursuit of sustainable competitive advantage, Azam, Siddiqui & Yosufzai (2023) delve into the intricate role of innovation performance within the dynamic landscape of social media marketing. The nexus between customer engagement and financial performance within the hospitality sector unfolds through Sheikh & Bejou (2019), prompting reflections on the mechanisms that underscore this symbiotic relationship. Amidst these multifarious explorations, this review embarks on a journey to delve into the realm of post-academic education marketing, embracing the transformative power of social media in a rapidly evolving educational landscape.

The pervasive influence of social media has permeated global societies, captivating individuals across diverse geographies, including Malaysia, and seamlessly weaving itself into contemporary daily routines. Within an ever-evolving world, social media has metamorphosed into an interconnected platform that transcends boundaries, enabling effortless communication, information exchange, and relationship formation on a global scale (Rugova & Prenaj, 2016). Notably, an array of popular social media platforms, such as Facebook, Twitter, Instagram, and LinkedIn, have materialized, facilitating user interactions with unprecedented ease. Consequently, this evolution has extended its reach into the business and marketing domains, as substantiated by Hassan, Nadzim & Shiratuddin (2015), forging an emergent realm where most businesses and entities integrate social media as a dynamic conduit for product promotion and revenue generation (He et al., 2017; Karimi & Naghibi, 2015; Lee, 2018 and Öztamur & Karakadılar, 2014).

Amid this landscape, social media platforms such as Facebook, Instagram, Twitter, and TikTok have emerged as pivotal realms for product marketing, fueled by their escalating user base, thereby cementing their status as potent avenues for digital promotion (Karimi & Naghibi, 2015; Wamba & Carter, 2014). Diverse strategies are wielded in this context, encompassing captivating visual content and compelling videos that serve to capture the attention of prospective customers, thereby enriching the product introduction process (Shukla, 2023). The rising prominence of influencers—individuals with a substantial social media following—adds another dimension to marketing strategies, effectively facilitating product exposure and engagement with a broader audience (Shukla, 2023).

2. Literature Review

2.1 Beyond the Classroom: Harnessing Social Media for Post-Academic Education Promotion

The modern landscape of global business has become intricately intertwined with various digital marketing strategies that encompass a multitude of platforms, including radio, mobile phones, the internet, television, and, significantly, social media, as vehicles for advertising and promotional endeavors (Rugova & Prenaj, 2016). Entrepreneurs now face an escalating need to adopt innovative approaches, leveraging ICT technology to facilitate communication and adapt to the ever-evolving technological trends (Rugova & Prenaj, 2016 and Dolega, Rowe & Branagan, 2021). Within this context, the role of social media has emerged as pivotal, offering a distinct channel for online communication and interaction that fosters relationship strengthening, ultimately enhancing business performance (Rugova & Prenaj, 2016 and Digital 2022: Another Year of Bumper Growth, 2022). The global prevalence of social media is underscored by the immense user base of platforms such as Facebook, which boasted 4.62 billion users worldwide in 2022, covering approximately 58.4 percent of the global population (Digital 2022: Another Year of Bumper Growth, 2022). This consistent surge in user engagement over the years has transformed social media into a potent tool for digital marketing, although there remain empirical gaps in comprehending its complete impact (Dolega et al., 2021).

In the context of Malaysia, the ubiquity of social media is equally striking, with approximately 30.25 million social media users as of January 2022 (Digital in Malaysia 2022, 2022). Notably, platforms like Facebook have garnered substantial usage, engaging 82.4 percent of Malaysia's eligible population and highlighting its potential as an effective marketing avenue (Digital In Malaysia 2022, 2022). Moreover, the utility of social media transcends personal usage, as students actively leverage social media platforms for business-related pursuits while concurrently pursuing higher education (Halim, 2022 and Mat et al., 2016). This phenomenon has also extended to higher education institutions, where the concept of digital entrepreneurship has been seamlessly integrated into curricula, aligning with the government's strategic objectives (Rugova & Prenaj, 2016 and Mat et al., 2016).

The field of entrepreneurship within the Malaysian context has witnessed a noticeable surge in interest, particularly within public higher education institutions like

Polytechnics and Community Colleges (Rugova & Prenaj, 2016). The incorporation of digital entrepreneurship education right from the inception of diploma programs reflects a congruence with national strategic objectives (Rugova & Prenaj, 2016). Research endeavors have been centered around students' behaviors as online shoppers, with studies examining factors influencing online purchasing decisions (Arisah, Badari & Hashim, 2016; Asri & Hamid, 2018; Nabot, Garaj & Balachandran, 2014 and Mat et al., 2016). However, a notable research gap remains in fully understanding the extent of student engagement in business activities through social media platforms. As businesses continue to integrate social media into their operational strategies, the potential for cross-disciplinary research in this evolving domain becomes more evident (Ilavarasan, Kar & Gupta, 2018).

The significance of social media in the entrepreneurial landscape extends beyond mere marketing, branching out into networking, information acquisition, and financing (Olanrewaju et al., 2020). This evolution has resulted in heightened company performance and increased innovation, thus underlining the profound impact of social media on overall business outcomes (Olanrewaju et al., 2020). The post-pandemic era has further accentuated the role of social media, prompting Chinese small and medium-sized enterprises to recalibrate their marketing strategies for sustained growth (Zhang, 2023). This transformative journey underscores the dynamic nature of social media's role in fostering business development. Consequently, the present study aspires to investigate the diverse social media platforms that students utilize to promote their businesses and explore the correlation between social media usage and income generation within the realm of student entrepreneurship.

Previous studies have examined the adoption of social media in the context of small and medium-sized enterprises (SMEs) or the impact of social media marketing on businesses, but this study provides a unique perspective by highlighting the specific preferences and behaviors of student entrepreneurs using social media for business purposes. Additionally, it emphasizes the role of WhatsApp as a preferred platform for these students, offering insights into the most effective digital tools for entrepreneurship in an academic setting. This novel focuses on student entrepreneurs' social media habits and their income generation potential and provides a fresh viewpoint on how social media can be harnessed for post-academic education marketing and entrepreneurship development.

2.2 Revenue Generation and Social Media

Venturing further into the realm of revenue generation, social media has assumed a multifaceted role in enabling individuals and entities to monetize their endeavors through strategic advertising and product offerings to a wider audience (Balan & Rege, 2017; Dahnil et al., 2014 and Karimi & Naghibi, 2015). The realm of e-commerce platforms has ushered in a distinct paradigm, permitting direct product sales, and fostering seamless online transactions, simultaneously curtailing marketing expenses through external channels such as online stores and Affiliate Marketing (Mack, Marie-Pierre & Redican, 2017). This seamless convergence of digital platforms and entrepreneurship, as suggested by Alam (2009), has catalyzed a transformative surge in income generation approaches.

This transformative landscape resonates notably with students, who, as illuminated by Nawi et al. (2017), embark on ventures leveraging social media platforms to promote products and services across global audiences unhindered by geographical limitations. This expansive reach not only facilitates broader market access but also capitalizes on the cost-efficiency intrinsic to smartphone-based advertising (Khan & Siddiqui, 2013). Within the ambit of education, the digital prowess of social media facilitates the confluence of accessibility, low overheads, and an extensive target demographic, culminating in a reliable avenue for sustained income generation for students (Nawi et al., 2017).

The influence of social media has grown immensely and is now a worldwide phenomenon that is extensively embraced, even within Malaysia (Digital 2022: Another Year of Bumper Growth, 2022 and Digital 2022: Malaysia — DataReportal – Global Digital Insights, 2023). This surge in popularity is owing to its integration into people's everyday lives, offering a diverse array of platforms like Facebook, Twitter, Instagram, and LinkedIn that facilitate seamless interaction (Rugova & Prenaj, 2016). These platforms enable users from all corners of the globe to easily communicate, exchange information, and cultivate connections. Moreover, social media has found a remarkable footing in the domain of business and marketing, gradually becoming a favored medium for promoting products and services and driving revenue (Hassan, Nadzim & Shiratuddin, 2015; He et al., 2017; Karimi & Naghibi, 2015; Lee, 2018 and Öztamur & Karakadılar, 2014).

As these platforms continue to burgeon, social media has become a pivotal player in the promotional landscape, offering substantial avenues for product marketing. Platforms such as Facebook, Instagram, Twitter, and TikTok have become central, harnessing their expanding user base to create an efficacious environment for digital promotion (Karimi & Naghibi, 2015 and Wamba & Carter, 2014). Employing a plethora of strategies, including captivating visual content and persuasive videos, these platforms captivate the audience's attention, fostering an enriched and immersive experience that aids in product introduction (Shukla, 2023). The rise of influencers, distinguished by their large social media followings, has introduced a novel dimension to marketing approaches, effectively extending the reach and influence of product promotion to a broader spectrum of users (Shukla, 2023).

The ramifications of this transformative landscape extend beyond marketing, encompassing the realm of revenue generation. By capitalizing on the global appeal of social media, individuals and entities can embark on strategic advertising endeavors and extend product offerings to a larger audience (Balan & Rege, 2017; Dahnil et al., 2014 and Karimi & Naghibi, 2015). The advent of e-commerce platforms further amplifies this phenomenon, allowing direct product sales and streamlining online

transactions. This approach also minimizes marketing expenditures by facilitating partnerships with external platforms such as online stores and Affiliate Marketing (Mack, Marie-Pierre & Redican, 2017).

This transformative impact is particularly pronounced within educational circles, where students are increasingly leveraging social media platforms to foster income generation (Nawi et al., 2017). The digital accessibility of these platforms facilitates student entrepreneurs' endeavors to introduce their products or services to a global audience, transcending the constraints of geographical boundaries (Nawi et al., 2017). This novel approach not only offers enhanced market penetration but also capitalizes on the cost-effectiveness of smartphone-based advertising methods (Khan & Siddiqui, 2013). Notably, social media's robust potential not only empowers students but also bolsters the broader scope of income generation through digital platforms (Alam, 2009 and Hruska & Maresova, 2020).

In conclusion, the far-reaching influence of social media transcends conventional paradigms, transforming both education and entrepreneurship. Its multifaceted roles, ranging from product promotion to revenue generation, underscore its dynamic presence within contemporary society. For students, particularly, this realm presents an alluring prospect to galvanize income generation, perpetuating a shift toward innovative paradigms of revenue creation (Rugova & Prenaj, 2016 and Digital in Malaysia 2022, 2022).

2.3 Emerging Challenges and Opportunities in Social Media Utilization for Post-Academic Education Marketing

Social media platforms have rapidly transformed into crucial channels for post-academic education marketing, yet there are still notable challenges and gaps in understanding its full potential. These platforms boast significant user bases worldwide, such as Facebook with 4.62 billion users in 2022, creating extensive avenues for online communication and relationship building (Digital 2022: Another Year of Bumper Growth, 2022).

In Malaysia, where approximately 30.25 million social media users were recorded in 2022, the opportunity for innovative education marketing strategies is vast (Digital in Malaysia 2022, 2022). However, despite these promising statistics, the extent to which social media can be effectively leveraged for post-academic education marketing remains underexplored.

Existing literature suggests that social media's impact extends beyond marketing to include networking, information acquisition, and financing, contributing to improved business performance and innovation (Olanrewaju et al., 2020). Nonetheless, more clarity is needed on the specific preferences and behaviors of student entrepreneurs using platforms like WhatsApp for business purposes while pursuing higher education (Halim, 2022).

This review paper aims to address these gaps by examining the current trends, challenges, and opportunities in social media utilization for post-academic education marketing. By doing so, the paper seeks to provide valuable insights into the potential of social media platforms as effective tools for promoting post-academic education and nurturing student entrepreneurship.

3. Methodology

The utilization of Statistical Analysis as a methodology holds a pivotal role in elucidating multifaceted phenomena within the context of post-academic education marketing through social media. Scholars have directed their research endeavors towards comprehending diverse facets of this domain, often addressing pressing issues intrinsic to contemporary business landscapes. Notably, studies by Alam (2009), Rugova & Prenaj (2016) and Öztamur & Karakadılar (2014) have shed light on pertinent topics, including the adoption of the internet in Malaysian SMEs, the incorporation of social media as a marketing tool for post-academic education, and the exploration of social media's role in SME marketing strategy. These researchers have employed surveys and case studies, in combination with Statistical Analysis, to uncover the complexities inherent to these issues. Additionally, Olanrewaju et al. (2020) conducted a comprehensive literature review, culminating in a synthesized understanding of social media's profound impact on entrepreneurship. In tandem with these inquiries, Asri & Hamid (2018) and Connelly (2008) employed survey and descriptive analysis methodologies to delve into the intricacies of online purchase behavior and the significance of pilot studies, respectively. Moreover, the systematic literature review by Almeida, Gara & Kuruzovich (2020) categorized social media usage patterns in entrepreneurship, underscoring its wide-ranging influence.

When embracing statistical analysis as a methodological approach, researchers have unveiled intricate relationships that drive critical outcomes. This approach enabled Shukla (2023) to scrutinize influencer marketing's influence on buying behavior, while Wamba & Carter (2014) identified factors influencing social media tool adoption among SMEs. Furthermore, Hossain, Alam & Rahman (2016) employed regression analysis to discern the factors influencing mobile banking adoption, while Sheikh & Bejou (2019) utilized the same technique to uncover the correlation between customer engagement and financial performance within the hotel industry. Cross-national comparisons, as conducted by Manthiou & Singh (2020), embraced structural equation modeling to explore cultural influences on consumer engagement in social media brand communities. The convergence of methodologies and statistical analysis facilitated a comprehensive evaluation of diverse subjects, as exemplified by Chittenden & Rettie (2003) and Munasinghe, Matos & De Silva (2016), who investigated managing information overload in online business relationships and assessed e-commerce readiness among SMEs in a developing country, respectively.

In summary, statistical analysis emerges as a versatile and integral methodology in unveiling intricate relationships and driving insights within the domain of harnessing social media for post-academic education marketing. This approach has enabled researchers to explore a diverse array of topics, ranging from influencer marketing and consumer behavior to the adoption of

internet technologies in SMEs. By amalgamating Statistical Analysis with various other methodologies, scholars have cast light on the multifaceted dynamics that underscore the efficacy of social media as a potent marketing tool.

3.1 Research Design

Employing a design based on statistical description, the initial objective of this research is to be addressed, while the secondary objective is sought to be answered through inference description. The methodology utilizes online surveys to gather quantitative data concerning the array of social media platforms employed by student entrepreneurs for business promotion, alongside the corresponding generated revenue. The survey encompasses inquiries related to the categories of utilized social media platforms, their frequency of utilization, the nature of businesses subjected to promotion, and the resultant income accrued. A supplementary insight, albeit not the central focal point, rests in the potential use of data derived from social media analytics tools to gauge the efficacy of marketing campaigns in channeling revenue toward student ventures. Pertinent metrics, encompassing engagement rates, click-through rates, and conversion rates, are anticipated to offer valuable insights into the efficacy of distinct strategies and tactics. However, it is acknowledged that the study's size and trial durations may limit generalizations from the outcome. Accordingly, future investigations should conscientiously consider the limitations inherent to this study. The augmentation of comprehension through interviews with students experienced in leveraging social media for business promotion may yield profound qualitative insights into their encounters, challenges, and accomplishments. Further interviews, potentially involving business proprietors collaborating with student entrepreneurs, could furnish additional perspectives on the potency of social media as a promotional conduit, warranting heed in subsequent analyses. Also, it is imperative to underscore that purposive sampling was undertaken.

3.2 Pilot Study

Our preliminary study, characterized by a relatively modest sample size, serves as a precursor to a more expansive inquiry. As elucidated by Connelly (2008), a pilot study serves diverse purposes, encompassing instrument adequacy assessment, feasibility evaluation, protocol design, and sampling strategies validation. Moreover, it offers preliminary data collection, effect size gauging, and research assistant training. The study's demographics encompass participants from Polytechnic and Community Colleges attending the "Digital Entrepreneurship Booster" program, sponsored by the Ministry of Higher Education, and aiming to equip participants with digital marketing prowess and entrepreneurial acumen. This program's expenditure amounts to RM300,000 and strives to transform participants' entrepreneurial perspectives, enhance income generation via GIG Economy activities, and bolster graduates' marketability through skills training. It encompasses students actively engaged in on-campus businesses. Details of the distribution of participants involved are shown in Table 1.

Table 1. Distribution of total participants

NO.	INSTITUTION NAME	NUMBER OF STUDENTS
1.	Kolej Komuniti Kuala Kangsar	5
2.	Politeknik Ungku Omar	4
3.	Politeknik Sultan Azlan Shah	5
4.	Kolej Komuniti Chenderoh	3
5.	Kolej Komuniti Gerik	6
6.	Kolej Komuniti Sungai Siput	6
7.	Kolej Komuniti Taiping	7
8.	Kolej Komuniti Batu Gajah	6
9.	Kolej Komuniti Bagan Serai	6
10.	Kolej Komuniti Pasir Salak	5
11.	Kolej Komuniti Teluk Intan	5
12.	Kolej Komuniti Manjung	7
13.	Kolej Komuniti Bagan Datuk	5
14.	Kolej Komuniti Gopeng	5
15.	Kolej Komuniti Tapah	5
	TOTAL	**100**

The distribution of total participants in the study encompasses students from various institutions, all of whom were actively engaged in the "Digital Entrepreneurship Booster" program, an initiative sponsored by the Ministry of Higher Education. With an allocated budget of RM300,000, this program aimed to empower participants with digital marketing expertise, foster entrepreneurial acumen, and elevate graduates' marketability through skill enhancement. The diverse institutions participating in this initiative include Kolej Komuniti Kuala Kangsar, Politeknik Ungku Omar, Politeknik Sultan Azlan Shah, Kolej Komuniti Chenderoh, Kolej Komuniti Gerik, Kolej Komuniti Sungai Siput, Kolej Komuniti Taiping, Kolej Komuniti Batu Gajah, Kolej Komuniti Bagan Serai, Kolej Komuniti Pasir Salak, Kolej Komuniti Teluk Intan, Kolej Komuniti Manjung, Kolej Komuniti Bagan Datuk, Kolej Komuniti Gopeng, and Kolej Komuniti Tapah.

The distribution of participants' numbers across these institutions is illustrated in Table 1. Within this cohort of 100 participants, 39 actively took part in the answering process. This aligns with Connelly's (2008) suggestion that a pilot study's sample size should account for 10% of the intended main study sample size. Furthermore, Cooper & Schindler (2011) emphasized the importance of determining the sample size based on the type of investigation, while Hill (1998) stipulated that the pilot study's sample size should consist of 100 participants. Isaac & Michael (1995) also provided insights, indicating that a pilot test involving 10-30 individuals was deemed adequate for such endeavors.

The distribution of total participants within the study reflects a diverse range of institutions participating in the "Digital Entrepreneurship Booster" program. The sample size of 100 individuals, with 39 actively engaged in the answering process, is consistent with both scholarly recommendations and established principles. This stratified approach ensures a comprehensive exploration of the program's impact and provides a solid foundation for deriving meaningful insights.

4. Result

The development of the item source for this study, focusing on "Item Source Development," aimed to address the study's objectives. The formulation of the questionnaire items draws upon the collective observations and experiences of researchers within the field of entrepreneurship involving polytechnic and community college students. As the primary intent of this study is to conduct a survey and ascertain general relationships, the questions are not designed to be exhaustive in nature. Despite the limitations inherent in the questionnaire's development, it is anticipated that this initial framework will offer preliminary insights, laying the groundwork for potential future investigations into the subject's depth. Table 2 illustrates the item sources for the development of the questionnaires.

Table 2. Item sources development

Measurement	Number of Questions	Total of Items	Sources
Demographic factors	Section A: Q1-Q2	2	Develop by researcher
Category Of Students Entrepreneurs	Section B: Q3	1	Develop by researcher
Types of products sold on social media	Section C: Q4	1	Develop by researcher
Revenue generation on social media	Section D: Q5-9	5	Develop by researcher

The construction of this questionnaire does acknowledge certain limitations given its broad nature. However, it is expected that the insights garnered from pilot data collected from individuals engaged in the study will inform subsequent iterations of this research, potentially expanding on the same or related issues within a specific population context (Connelly, 2008).

4.1 Statistical Description

Fig. 1 shows the gender distribution involved in answering the question. The analysis was carried out using statistical package version 23 software. From Fig. 1, it is evident that out of the total participants, 7 individuals (17.9%) identified as men, while 32 individuals (82.1%) identified as women. This distribution contrasts with findings from the "Digital 2022: Malaysia — DataReportal – Global Digital Insights" report, which reported a higher proportion of men using social media compared to women. It is noteworthy that the gender distribution among respondents in this study does not align with the broader trend observed in the digital landscape.

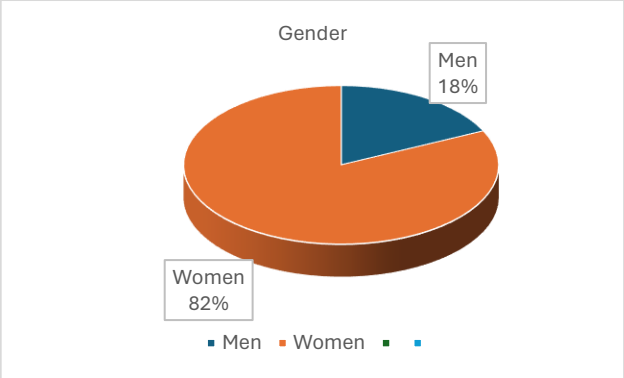

Fig. 1. Gender distribution

This gender-based analysis is essential in understanding the demographic composition of the participants and provides insights into the dynamics of post-academic education marketing through social media. However, it is worth considering the limitations of this study, such as its sample size and potential biases that may affect the generalizability of these results.

In related research endeavors, scholars have delved into the impact of social media on business practices, particularly in the context of small and medium-sized enterprises (SMEs). This subject has garnered attention from various researchers, including Alam (2009), Balan & Rege (2017) and Makudza et al. (2020). Such studies explore the nuances of digital engagement and its consequences for different facets of business operations. While this present study contributes to the discourse, further research is warranted to gain a comprehensive understanding of the intricate relationship between gender and post-academic education marketing through social media platforms.

In summary, the analysis of gender distribution among respondents reveals an interesting deviation from broader digital trends. This observation underscores the need for a deeper exploration of the gender dynamics in post-academic education marketing on social media, considering various socio-cultural and contextual factors. This study adds to the growing body of research focusing on social media's impact on business practices, particularly within the realm of SMEs. Nevertheless, more comprehensive investigations are required to illuminate the multifaceted connections between gender and social media engagement in the context of post-academic education marketing.

Fig. 2 presents the distribution of students among different types of entrepreneurial endeavors in the context of post-academic education marketing. The results indicate that most students engaged in drop shipping, accounting for 48.70% of the sample. This category surpassed the other three categories, namely product founders (23.10%), agents (20.10%), and affiliates (7.7%). It is noteworthy that

the drop shipping model has gained substantial traction among students, potentially due to its low entry barriers and capacity to generate supplementary income. The findings underscore the significance of this business model in the realm of post-academic education marketing through social media platforms.

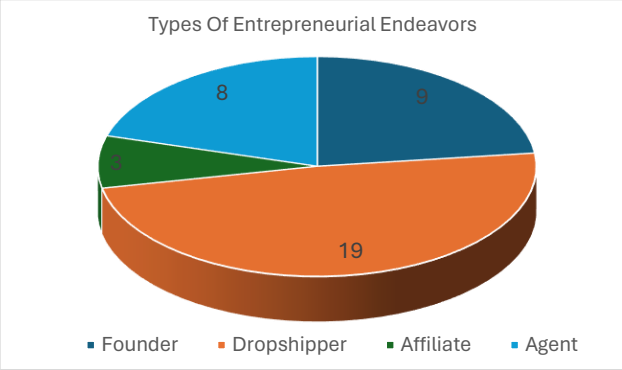

Fig. 2. Types of entrepreneurial endeavours

The prevalence of drop shipping as the dominant entrepreneurial category among students mirrors the current business landscape. This model's advantages, including minimal initial investment and flexibility, align well with students' resources and aspirations. Moreover, the drop shipping model relieves entrepreneurs from inventory management and shipping responsibilities, enabling them to focus on marketing and customer engagement. It is noteworthy that while drop shipping offers various benefits, challenges such as product quality control and competition should also be acknowledged.

Multiple researchers have explored the intersection of entrepreneurship and social media in the context of small and medium-sized enterprises (SMEs). Scholars like Dolega et al. (2021), Wamba & Carter (2014) and Olanrewaju et al. (2020) have contributed to this body of knowledge by investigating the utilization of social media tools by entrepreneurs. These studies collectively illuminate the multifaceted nature of contemporary business practices and the integral role of social media. However, the phenomenon of students engaging in post-academic education marketing through social media platforms remains relatively understudied, necessitating further research to comprehensively grasp its nuances and implications.

In conclusion, the results pertaining to the distribution of entrepreneurial types among students shed light on the prevalence of drop shipping as a favored model. This outcome signifies the alignment between the drop shipping model and students' aspirations and resources. While this study contributes to the growing discourse on the convergence of entrepreneurship and social media, more comprehensive investigations are warranted to comprehensively explore the intricacies of students' engagement in post-academic education marketing through social media platforms.

Fig. 3 provides insights into the duration of student entrepreneurs' engagement in business activities through social media platforms. According to the data, a substantial proportion of respondents, accounting for 84.60% of the total sample, reported running their businesses for less than one year. This finding underscores the prevalence of relatively short-lived entrepreneurial endeavors among students in the context of post-academic education marketing. Understanding the implications of this period of involvement on income generation necessitates further investigation. Future studies should delve deeper into this aspect to unveil the intricate dynamics at play.

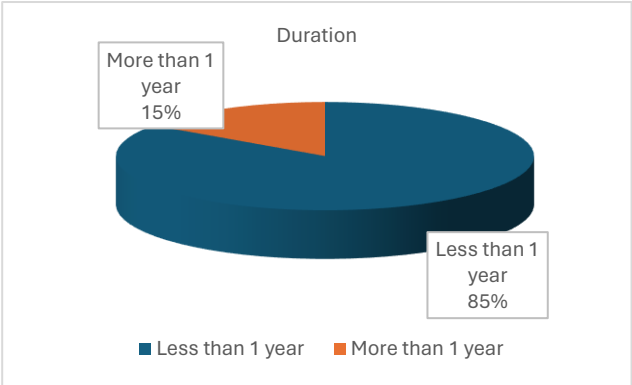

Fig. 3. Duration of student entrepreneurs' engagement

The investigation proceeded to examine the preferred social media platforms utilized by student entrepreneurs for their businesses. The analysis revealed that WhatsApp takes the lead with 35.90%, followed closely by Instagram at 33.30%. Interestingly, these findings deviate from the trends highlighted in "Digital 2022: Malaysia — DataReportal – Global Digital Insights," which might be surprising. Especially, considering that Instagram, boasting a user base of approximately 15.5 million individuals in Malaysia by early 2022, is well-positioned for businesses seeking to promote visually appealing products and interact with their target audience. While WhatsApp can serve marketing purposes to some extent, its messaging-oriented nature and lack of public engagement mechanisms and advertising platforms could render it less effective than Instagram for business promotion.

Numerous researchers have explored the interplay between entrepreneurship and social media within the sphere of small and medium-sized enterprises (SMEs). Scholars such as Lee (2018), Mack et al. (2017) and Ilavarasan et al. (2018) have delved into the utilization of social media tools by entrepreneurs, enriching the body of knowledge surrounding this intersection. Although these endeavors offer valuable insights into the broader entrepreneurial landscape, limited attention has been directed towards the specific temporal dimension of student entrepreneurs' engagement in post-academic education marketing through social media platforms. Thus, more comprehensive investigations are warranted to capture a holistic understanding of this phenomenon.

In summary, the findings concerning the period of student entrepreneurs' involvement in business activities through social media platforms highlight the prevalence of relatively short-term engagements. Notably, most respondents reported engaging for less than one year. The utilization of specific social media platforms such as

WhatsApp and Instagram for business purposes further adds complexity to the evolving landscape. However, these results should be interpreted with caution, given the discrepancies with existing trends. Despite the contributions of previous studies, the temporal dimension of student entrepreneurship in the context of post-academic education marketing remains understudied, demanding further exploration to uncover its intricacies. The results of this analysis are summarized in Fig. 4.

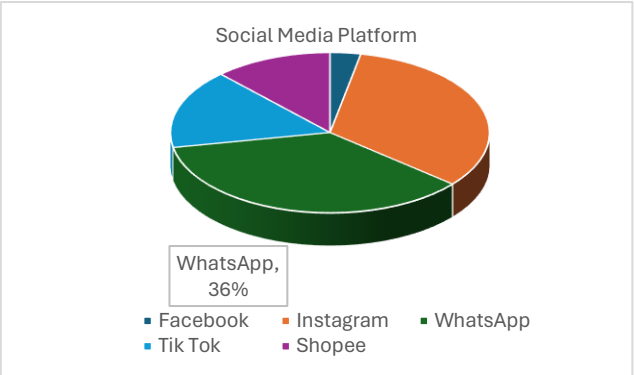

Fig. 4. Social media platform

The outcomes of the investigation shed light on the social media platforms employed by businesses for their promotional endeavors. Notably, WhatsApp emerges as a preferred choice for marketing activities, even when compared to more comprehensive platforms like Instagram. Various factors may account for this preference. Firstly, WhatsApp's extensive user base and its longer presence in the digital landscape foster familiarity and ease of use. Many business operators might opt for a platform they are already accustomed to, rather than navigating the learning curve associated with a new platform.

A distinctive advantage of WhatsApp is its direct communication capabilities, allowing businesses to engage with customers through private messages. This feature may appeal to certain enterprises that find private interactions more convenient than public content posting, which is characteristic of platforms like Instagram. Furthermore, WhatsApp's interface facilitates personalized exchanges with customers, potentially enhancing the level of customer-business interaction. Notably, while Instagram boasts an integrated advertising platform, it can be economically burdensome for smaller businesses to run ads. Conversely, WhatsApp offers a cost-effective approach due to its no-cost nature, particularly advantageous for budget-constrained small businesses.

Additionally, WhatsApp's potential for targeted communication should not be underestimated. Though Instagram provides tools for pinpointing specific audiences, WhatsApp also lends itself to tailored approaches. Businesses can form group chats or send messages directly to customers who have shown interest in their products or services. This allows for a more personalized and precise form of promotion, catering to individual customer preferences. Nevertheless, it is crucial to acknowledge the limitations of this study, as its scope is confined. The comprehensive scope of the approach and its potential are yet to be fully ascertained.

In the realm of business promotion, Instagram stands out as a platform favored for its potential to showcase products and services. This contrasts with the situation observed in this study, where WhatsApp maintains relevance despite its relatively more limited features. The dynamics at play here demand deeper analysis, particularly in scenarios where Instagram's advantages for businesses seeking product and service visibility might hold true. A nuanced exploration is warranted to unveil under which circumstances the platform preferences align or diverge.

Conversely, WhatsApp remains a valuable tool, especially for businesses that prioritize personalized communication and prudent resource allocation. In conclusion, the choice between these platforms is not devoid of complexity, as it hinges on the distinct goals and requirements of individual businesses. Further investigations are pivotal to comprehending the intricacies and implications of social media platform selection for post-academic education marketing.

4.2 Validity and Reliability

The investigation's core facet pertains to the credibility and consistency of the collected data and the ensuing analysis. Subsequently, the focus veers towards assessing the veracity of utilizing social media for income generation among student entrepreneurs. The resultant analyses are presented through adjusted odds ratios accompanied by 95% confidence intervals. In this segment, emphasis is placed on the instrument's reliability value (Cronbach alpha) as an indicator of its consistency in generating technical sound results across multiple measurements. Notably, McMillan and Shumacher (2006) propose that a coefficient value ranging between 0.7 and 0.8 signifies a comparatively robust reliability level. Evidently, Table 3 showcases a reliability value of r = 0.795.

Table 3. R value

R value	*0.795*

The examination presents the findings pertaining to student perspectives on utilizing social media for business endeavors. Table 4 outlines the various perceptions encompassing the use of social media platforms for income generation within entrepreneurial pursuits. Notably, the highest mean value is attributed to the perception that engaging in sales through social media channels can augment overall revenue. Subsequently, the perception of achieving revenue beyond initial expectations garners the subsequent highest minimum score. Mean values are presented alongside their respective standard deviations (SD) for reference. The minor standard deviation value, measuring below 1.0, denotes a consistent trend in respondents' responses. Nonetheless, it is imperative to acknowledge that the fifth item displays varied responses among all participants.

Table 4. Income generation using social media

	N	Mean	Std. Deviation
Revenue on social media is more than trading on offline platforms	39	3.641	.7066
Making money on social media is easy	39	3.897	.7538
Revenue from social media is off-term	39	4.026	.7066
Selling on social media can add revenue	39	4.179	.6833
I already generate income from social media	39	2.949	1.2967

The obtained results highlight the perceptions held by respondents concerning the utilization of social media for income generation. Table 4 displays the mean and standard deviation values for each perception item. Among the perceptions, the notion that engaging in commerce via social media platforms can yield revenue holds the highest mean value, followed by the belief that revenue generated from such endeavors can surpass initial expectations. The presentation of data includes both the mean and standard deviation (SD) as indicators. Notably, the minor standard deviation value, measuring less than 1.0, implies a consistent trend in respondents' evaluations. However, it is noteworthy that the fifth item garnered uneven responses across all participants.

Most of the participants exhibit strong concurrence with the perspective that leveraging social media for sales can result in revenue augmentation. Additionally, there is notable consensus that the revenue stemming from social media ventures possesses the potential to exceed projected anticipations. The growing integration of social media into daily life, redefining interactions with businesses and the community, could account for this agreement. This notion of revenue surpassing expectations can be attributed to various factors. Firstly, social media platforms have enabled businesses to extend their reach to a more expansive and diverse audience than ever before. The capability to target specific demographics, preferences, and behaviors empowers businesses to engage with individuals most inclined towards their products or services. Lin et al. (2021) also reveals in their study that social media use enhances marketing effectiveness. Secondly, social media facilitates personalized and captivating customer interactions. By harnessing platforms such as Instagram, Facebook, and Twitter, businesses can foster strong customer relationships, cultivate brand loyalty, and foster a community centered around their offerings. Lastly, social media serves as a cost-effective medium for promoting products and services, particularly beneficial for small businesses and entrepreneurs with limited marketing resources. As asserted by Balan & Rege (2017), social media represents a low-cost mechanism for heightening customer awareness. By leveraging social media to generate excitement about their brand, businesses can stimulate sales and revenue without substantial expenditures on traditional advertising approaches.

Regarding the inquiry item "I've generated income using social media," the lowest mean score is evident. Several factors could contribute to the challenges some individuals face in generating income through social media. Simply possessing a social media account is insufficient for revenue generation. Success hinges on a well-conceived strategy encompassing clear objectives, target audience, content planning, and engagement tactics. The absence of a coherent strategy could hinder the creation and maintenance of an engaging and consistent social media presence. Zhang (2023) contributes insights into several marketing strategies that leverage social media.

Consistency emerges as a pivotal element in amassing a social media following and fostering revenue. Irregular or sporadic posting may fail to sustain followers' attention or their interest in the brand. Formulating a content calendar and adhering to a consistent posting schedule can foster sustained engagement and audience interest. Active engagement constitutes a critical facet of social media strategy, surpassing mere content publication. Responding to comments, interacting with fellow users within their niche, and actively seeking new followers all contribute to a thriving social media approach. While the temptation to target the widest possible audience on social media may be strong, this approach could hinder revenue generation. Dolega, Rowe & Branagan (2021) have found that while social media amplifies web traffic, it does not significantly affect product orders and sales revenue. Concentrating on a specific niche or audience permits the cultivation of a more devoted and engaged following, more prone to investing in products or services. The competitiveness inherent in various industries or niches within social media underscores the difficulty in distinguishing oneself. Correspondingly, findings from Makudza, Mugarisanwa & Siziba (2020) indicate that while social media is a potent tool, its usage must be fine-tuned to mitigate the generation of content distorting sound customer behavior. The creation of unique, high-quality content and the utilization of diverse media types, such as videos and live streaming, can aid in differentiating the brand and elevating prospects for success. Similarly, Zhang (2023) provides guidance to aspiring entrepreneurs, emphasizing the importance of brand image construction and strategic utilization of different approaches. Diagrams offered by Zhang (2023) outline a comprehensive model for effective social media marketing.

4.3 Inferential Description

The next analysis looked at perceptions of generating income using social media platforms. The analysis also considered the duration of student engagement in business on social media as shown in Fig. 4. As the values were not normally distributed, non-parametric tests were used for all statistical analyses. Table 5 illustrates the Spearman Rho Correlation Coefficient, revealing the correlation between online platform usage and perceptions of revenue generation. With a correlation value of $r = 0.77$, falling within the range of -1 to +1, it is evident that a positive relationship persists between these variables. Specifically, increased frequency in the use of social media platforms correlates with higher income generation. Significance was set at $P = 0.05$ for all statistical assessments.

Table 5. Spearman rho correlation coefficient

Correlations				
			Online Platforms	Perceptions of Revenue Generation
Spearman's rho	Online Platforms	Correlation Coefficient	1.000	.048
		Sig. (2-tailed)	.	.770
		N	39	39
	Online Platforms	Correlation Coefficient	.048	1.000
		Sig. (2-tailed)	.770	.
		N	39	39

Furthermore, Table 6 provides insights into the relationship between social media use and income generation through Chi-Square tests. The Pearson Chi-Square yielded a value of 15.311[a], and the Likelihood Ratio returned 17.803. While the significance level was 0.225, the Linear-by-Linear Association revealed a value of 0.586. Given that 18 cells (90.0%) exhibited expected counts lower than 5, the minimum anticipated count was 0.05.

Table 6. Relationship of social media use with income generation

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	15.311[a]	12	.225
Likelihood Ratio	17.803	12	.122
Linear-by-Linear Association	.297	1	.586
N of Valid Cases	39		
a. 18 cells (90.0%) have expected count less than 5. The minimum expected count is .05.			

The Chi-square analysis, employed to identify associations between variables with a nominal scale, involves comparing observed and expected frequencies. Through the calculation of a chi-square statistic, the squared deviations between these frequencies are summed and divided by the expected frequencies. Comparison with a critical value based on desired significance level and degrees of freedom determines the existence of significant differences. In this context, the analysis aimed to ascertain whether a relationship existed between revenue generation and online platforms. The null hypothesis (Ho) posited that no such relationship existed, while the alternative hypothesis (Ha) suggested otherwise.

Chi-Square test results indicate 15.311, and the Sig value was 0.225. As such, the test confirmed the acceptance of Ha, implying a connection between income generation and online platforms. The outcomes of this analysis align with expectations, underscoring the importance of in-depth exploration into digital technology's role in online business, particularly in the context of student learning. Social media's potential to widen audience reach and enhance brand visibility is a significant takeaway. By creating captivating content and establishing a robust online presence, businesses can attract and retain customers, potentially leading to increased revenue. Notably, platforms like Facebook and Instagram offer direct product selling features, streamlining the purchasing process, and bolstering revenue. A strong online presence further fosters brand recognition and trust, ultimately boosting sales and revenue. Overall, understanding social media usage patterns provides businesses with a competitive advantage, enabling heightened brand awareness, customer satisfaction, quality, reach, and profitability (Hruska & Maresova, 2020).

5. Conclusion

In reaching a resolution, the present investigation extends the groundwork laid by prior research that initially illuminated students' engagement in commerce via social media while pursuing their studies. The foremost deduction that can be extracted from this undertaking asserts a notable linkage between revenue generation facilitated by social media and the platforms themselves. This exploration marks an initial stride towards acquiring deeper insights concerning the interplay between digital instruments and resources offered to amplify the optimal utilization of social media, particularly in aiding students in income generation endeavors through these platforms.

Of significance to the realm of scholarship is the fresh revelation of an intrinsic connection binding social media platforms to the process of revenue generation among student enterprises. Such disclosures enhance our comprehension of social media's role in cultivating student entrepreneurship and fostering avenues for generating income. The examination at hand posits that the strategic employment of social media platforms emerges as a potent instrument, empowering students to showcase their enterprises and materialize income streams. By grasping the dynamics of the digital tools and provisions bestowed, students stand poised to optimize their engagement with social media, thereby magnifying their capacities for revenue creation.

Furthermore, this inquiry further fortifies antecedent research, which had previously outlined students' forays into the commercial domain through social media during their academic tenure. A novel augmentation comes to the forefront, characterized by the identification of an association between social media platforms and the act of revenue generation—a dimension hitherto unexplored in earlier investigations. Collectively, this analysis confers noteworthy contributions unto the entrepreneurial and social media domain, ushering in insights concerning the intricate relationship underpinning social media platforms and the revenue-generating mechanisms intrinsic to student-run enterprises.

The outcomes of this study bear notable implications for educators, policymakers, and entrepreneurial enthusiasts invested in nurturing student entrepreneurship and engendering income channels by means of social media platforms. By delving into the symbiotic rapport between these platforms and revenue generation, this study advances the discourse on leveraging digital tools to amplify the entrepreneurial prowess of students,

effectively bridging the realms of academia and commerce in an increasingly interconnected digital landscape.

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Teaching the English Language in the Industrial Revolution 4.0 (IR4.0): Educators' Challenges and Opportunities

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Abstract

The Industrial Revolution 4.0 has brought forth new opportunities and challenges for lecturers of the English language. Integrating technology and artificial intelligence has transformed how we communicate, learn, and work. It has provided new opportunities for lecturers to innovate and create interactive and engaging learning modes. However, IR4.0 has also created challenges for lecturers as they must keep up with rapidly changing technology trends and the demands of the modern workforce. This paper explores the challenges and opportunities that arise as educators adapt to this new era. This paper explores the various challenges and opportunities that arise as educators adapt to this new era. The methodology employed in data collection for this study is a descriptive qualitative structure using library research. The findings of this study revealed that educators perceived various challenges in teaching English, such as the need to develop new skills, competencies, and teaching strategies, adapt to changing students' needs, cope with the increasing expectations and workload, and have difficulty comprehending complex technical terms. On the other hand, opportunities include leveraging technology to enhance language learning, create personalized learning experiences, and promote digital literacy among students. The study suggests that English language educators must embrace the opportunities offered by IR4.0 while also addressing the challenges that come with it. This will require a combination of adaptability, creativity, and resilience in the face of constant change. This study also recommends that future studies may be conducted on real challenges and opportunities among educators in a real classroom environment.

Keywords: - Learning English, Industrial Revolution 4.0, educators' opportunities and challenges

1. Introduction

IR4.0 is a term used to describe the current technological trend of automation, data exchange, and expert systems transforming the world around us. With the rise of IR4.0, businesses and individuals are quickly adapting to keep up with new technological advancements. In this globalization era, it is essential to learn English as it has become the de facto language of international communication, and technology advancements are driving businesses to communicate with their counterparts worldwide. Professionals proficient in English will have a significant advantage in the job market, enabling them to work with international clients and access global opportunities without language barriers. Therefore, learning the English language has become a critical skill in this era of IR4.0, where technology and globalization are driving the economy. Carr (2003) identified the internet as a significant aspect since it was envisioned as a public infrastructure rather than a private technology. Graddol (1997) states that technology is central to globalization, impacting education, work, and culture.

This proved a correlation between the English language and the development of IR4.0. The researcher is interested in conducting more studies on how to teach English in the IR4.0 era to broaden the understanding and knowledge of

teaching English in this new era. This research focuses on discovering and exploring the challenges and opportunities of teaching English in the IR4.0, as well as solutions for the creative classroom, and whether it may assist educators in improving their resources and expertise in English language acquisition.

1.1 Research Questions

The above issues of interest have triggered the following research questions that need to be defined in this study:

1. What are the challenges of Industrial Revolution 4.0 on English language teaching?
2. What can English educators do to improve their professionalism in Industrial Revolution 4.0?

1.2 Research Aims

The objectives of this study are:

1. To discover the challenges of Industrial Revolution 4.0 on English language teaching.
2. To find possible ways or opportunities to improve English educators' professionalism in Industrial Revolution 4.0.

1.3 Significance of the Study

The intended outcome of this study is to provide educators with information and solutions to address the challenges and opportunities posed by IR4.0 and to help enhance their professionalism by understanding the impacts of English language teaching. Correspondingly, students will gain knowledge on learning English in the context of IR4.0 and how it contributes to developing their critical thinking and problem-solving skills, communication skills, motivation, productivity, and both soft and hard skills, all of which are essential for their success in the future.

2. Literature Review

2.1 Definition of Industrial Revolution 4.0

IR4.0 refers to the fourth phase of the Industrial Revolution, characterized by integrating technology into the manufacturing sector. This involves using data exchange, automation, and emerging technologies such as artificial intelligence, machine learning, and the Internet of Things (IoT) to create "smart factories" that are more efficient, flexible, and responsive to customer demands. It is seen as a significant transformation of the manufacturing and production landscape, potentially creating new business models, and working methods.

The IR4.0 has been the subject of much research and analysis in recent years. According to Li, Hou, and Wu (2017), the Industrial Revolution 4.0 is characterized by integrating digital, physical, and biological systems. It is driven by technologies such as the Internet of Things (IoT), artificial intelligence (AI), robotics, and blockchain. They agree that these technologies can potentially transform how we live and work. Görmüş (2019) added in his research that this era will lead to significant changes in the workforce. He predicts that new jobs will be created. Still, workers will also need to develop new skills to stay relevant in a rapidly changing job market due to AI and automation becoming more prevalent.

Hassoun et al. (2022) mentioned in their research that Industry Revolution 4.0 has the potential to address global challenges such as climate change, food security, and healthcare. For example, IoT enables sensors to help farmers optimize crop yields and reduce water usage, while AI-powered healthcare systems can improve patient outcomes and reduce costs.

Overall, researchers view IR4.0 as a transformative force that has the potential to bring about significant societal and economic changes. However, they also caution that careful planning and collaboration will be required to ensure that it benefits everyone. Therefore, it is crucial to investigate its dimensions to realize business and everyday life efficiencies.

2.2 Challenges and Opportunities of Industrial Revolution 4.0 in Education

One of the biggest challenges of IR4.0 is the impact on the workforce. As automation and AI become more prevalent, many jobs will be automated or transformed. This will require workers to develop new skills to stay relevant in a rapidly changing job market. This requires a shift in education, focusing on developing critical thinking, problem-solving, creativity, and adaptability skills. Ismail et al. (2020) study mentioned that there is a need for educational institutions to adapt their curricula and teaching methods to ensure that students are equipped with the skills they need to thrive in an IR4.0 world.

Another challenge of IR4.0 in education is the digital device, which refers to unequal access to digital technologies and the internet. This can create educational disparities, with some students having access to the latest technologies and others needing to be included. As a result, the gap between the "haves" and "have nots" will create further alienation, lack of trust, and social unrest (Kayembe & Nel, 2019). In addition, Mhlanga (2020), in his study of South Africa's readiness for IR4.0 in education, proved that there is a big gap between urban and rural universities' access to digital technologies. He stated that rural universities find it difficult to catch up with urban universities, forcing them to lag, leading to widespread inequality in the education sector. To address this challenge, there is a need for policies and programs that ensure that all students have equal access to digital technologies and the Internet.

However, IR4.0 presents significant opportunities in education. Integrating digital technologies can enhance the learning experience and provide students with new opportunities to learn and collaborate. For example, virtual and augmented reality technologies can create immersive learning experiences that engage students and help them visualize complex concepts. AI-powered educational software can personalize learning and provide instant feedback to students, helping them learn at their own pace and style. Additionally, IR4.0 can offer new opportunities

for lifelong learning, as workers need to continuously update their skills to stay relevant in a rapidly changing job market. In their study, McKee and Gauch (2020) suggested that the institutions must be reconsidered considering IR4.0 and merging technologies. Institutions' design and organization should be altered for digital learning: learning spaces in institutions should be established for digital learning, laboratories should be reformed, and learning should be extended outside of instructions so that it may happen anywhere, at any time (AWAT). Educators will shift to managing learning, mentoring, and guiding student skill development.

Another opportunity for IR4.0 in education is the potential for greater collaboration and knowledge exchange. The global nature of IR4.0 means that students and educators can collaborate with peers worldwide, sharing knowledge and expertise to solve global challenges. This can lead to the development of new ideas and approaches and help create a more connected and inclusive society. As Priya Sharma (2019) mentioned, one of the IR4.0 requirements is developing human capital to fulfill knowledge and expertise needs. Therefore, she stated that the education sector in this era needs a production and knowledge exchange program and expertise exchange programs worldwide to ensure the success of using augmented reality technologies in education.

In conclusion, IR4.0 presents both challenges and opportunities in education. These include the impact on the workforce, the digital divide, the potential for immersive and personalized learning experiences, and greater collaboration and knowledge exchange. While these challenges are significant, they can be addressed through effective policies and programs that ensure all students have equal access to digital technologies and the internet and that educational institutions adapt their curricula and teaching methods to ensure students have the skills to thrive in an IR4.0 world.

2.3 Challenges in Teaching the English Language in Industry Revolution 4.0

IR4.0 has significantly changed how we live, work, and learn. Integrating technology into our daily lives has transformed how we communicate, access information, and acquire knowledge. The impact of IR4.0 has been profound in education, with new challenges arising for educators as they strive to prepare students for the future. One area where these challenges are particularly acute is teaching English.

English is the global language of business, science, and technology. As such, students must master the language to succeed in the modern world. However, teaching English in IR4.0 presents significant challenges that must be addressed if students can acquire proficiency in the language effectively.

One of the primary challenges of teaching English in IR4.0 is the ever-evolving nature of technology. New tools and platforms are constantly emerging, and educators must adapt their teaching methods to keep pace with these changes. This requires a deep understanding of the technology and its potential uses in the classroom. Educators must also be proficient in the use of technology themselves, which can be a challenge for those who did not grow up with it.

Another challenge of teaching English in IR4.0 is the changing nature of the workforce. The rise of automation and artificial intelligence (AI) means that machines now perform many jobs that previously required human workers. This has led to a shift in the skills in demand, emphasizing creativity, critical thinking, and problem-solving. English educators must ensure that their students develop their skills alongside their language proficiency.

The use of technology in the classroom also presents challenges related to engagement and motivation. Students are often more interested in technology-based activities than traditional classroom lessons. Educators must find ways to incorporate technology to enhance learning and engagement rather than detract from it. This can be a delicate balancing act, as too much technology can lead to distraction and disengagement.

Finally, teaching English in IR4.0 requires a fundamental shift in how we think about language learning. Traditional teaching methods focus on memorization and rote learning, but more is needed in the modern world. Students must be taught to think critically, communicate effectively, and collaborate. This requires a more holistic approach to language learning that emphasizes real-world communication and practical skills.

To conclude, teaching English in IR4.0 presents a range of challenges that must be addressed if students are to acquire proficiency in the language effectively. Educators must adapt their teaching methods to keep pace with changing technology while ensuring students develop the skills needed for the modern workforce. With the right approach, English educators can prepare their students for success in the globalized, technology-driven world of the 21st century.

2.4 English Classroom Practice in Industrial Revolution 4.0

Teaching in the IR4.0 necessitates the evolution of instructional methodologies. Teaching must evolve so that students learn how to apply, analyze, and create what they learn in the classroom rather than just remembering and understanding a specific curriculum topic. In the context of the English classroom, adopting technology presents challenges and opportunities for effective classroom practice.

One of the key opportunities presented by IR4.0 in the English classroom is the ability to access a wealth of authentic and diverse language input. With the internet, students can access a wide range of English language materials, including news articles, videos, podcasts, and social media. This allows students to engage with English in real-world contexts and develop their language skills more authentically. Educators can also use technology to bring authentic materials into the classroom, such as video conferencing to connect students with English-speaking peers worldwide.

Another opportunity presented by IR4.0 is the ability to personalize learning. Technology can be used to gather data on student performance and provide individualized feedback and support. For example, educational software

can provide targeted practice exercises based on a student's strengths and weaknesses. This allows educators to customize instruction and better meet the needs of individual learners.

The use of technology also allows for more interactive and engaging classroom activities. With digital tools such as games, quizzes, and interactive whiteboards, teachers can create more dynamic and participatory learning experiences. This can help increase student motivation and engagement, leading to better learning outcomes.

However, adopting technology in the English classroom also presents challenges that must be addressed. One challenge is the need for teachers to adapt their teaching methods to incorporate technology effectively. This requires a deep understanding of the technology and how it can enhance learning. Teachers must also be proficient in the use of technology themselves, which can be a challenge for those who did not grow up with it.

Another challenge is balancing the use of technology with traditional teaching methods. While technology can be a powerful tool for learning, it is not a substitute for face-to-face and human interaction. Teachers must find ways to incorporate technology to enhance learning and engagement rather than detract from it.

Finally, the use of technology raises concerns about equity and access. Only some students have equal access to technology; some may need more digital literacy skills to use it effectively. Teachers must ensure that all students have equal opportunities to access and use technology in the classroom.

Technology can provide access to a wealth of authentic language input, personalized learning, and interactive and engaging activities. However, it also requires teachers to adapt their teaching methods and ensure all students have equal access and opportunity to use technology effectively. With a suitable approach, technology can be a powerful tool for enhancing English language learning in IR4.0.

3. Methodology

3.1 Research Design

The research employed a descriptive qualitative design to uncover the challenges and opportunities faced by educators in teaching English during the IR4.0 era. The researcher opted for a qualitative research design because this methodology allows for exploring and discovering information from various sources, such as books, journals, articles, and theses. Qualitative research is advantageous for examining and comprehending complex topics, elucidating beliefs and behaviors, and recognizing societal norms. Consequently, it is the most appropriate approach for this study.

3.2 Data Collection Technique

The data collection method employed in this study was library research, which addresses a range of inquiries. As per Zeid (2004), library research is a form of investigation that leverages library resources to obtain data. It employs library resources to acquire and scrutinize data, and the researcher synthesizes and amalgamates their thoughts to produce a coherent and well-defined conclusion. The researcher consulted various sources in this study, including books, journals, and articles as references. Library research is a systematic investigation that adheres to tools, regulations, and methodologies. In essence, the data gathered through library research is unrestricted by temporal and spatial constraints. George, M. (2008) highlights that the advantages of employing a library research approach are the availability of a diverse range of materials for research references and categorizing all topics in the library research methods. Therefore, researchers can readily access data without limitations in space and time.

3.3 Data Analysis Technique

This study analyzed the data obtained through library research using the coding technique. Coding is a ubiquitous practice in qualitative research, and it is a crucial component of the analytical process that enables researchers to disintegrate their data and reconstitute it in a meaningful manner. Cresswell (2015, p.156) describes coding as dissecting qualitative text data to discern their outcomes before reconstructing the data significantly.

Three coding phases were employed to analyze the data obtained through library research: open coding, axial coding, and selective coding. During the first phase, open coding, the data were disintegrated into discrete units of meaning. In the subsequent phases, axial and selective coding, the categories were linked to their subcategories to generate more detailed and comprehensive explanations. The specific coding categories were then arranged around a central explanatory concept until an analytical process permitted the theory to surface.

The initial step in the data analysis process involves reading and identifying the challenges and opportunities teachers encounter in IR4.0. The researcher evaluated the data based on the study's objectives: to uncover the difficulties or challenges posed by IR4.0 on English language teaching and to ascertain potential ways of enhancing English teachers' proficiency in the IR4.0 era. Secondly, the researcher transcribes the data after analyzing journals, books, and articles. Thirdly, the data are condensed to determine which information is pertinent and valuable for the study and are then sorted into various categories. Subsequently, the researcher scrutinizes the information related to the study's objectives. Following the analysis, the researcher will make an informed decision based on the evidence gathered from the books, journals, and articles.

4. Result and Discussion

The findings are to answer the first and second research questions in this research. Based on the data acquired through library research, the results are presented descriptively, and a discussion follows to clarify and substantiate the explanation cohesively.

4.1 Create Challenges for Unprepared Educators

Implementing IR4.0 in English language teaching may lead to a skills gap among educators. As technology evolves, new skills are required to operate and maintain these machines. Educators may require additional training and upskilling to effectively use technology in language teaching. Oriji et al. (2016) conducted research that found that educators often display a significant degree of reluctance to incorporate technology into their teaching methods. They are either unwilling to change their long-held practices or feel inadequately equipped to utilize technology to enhance student learning. Many educators are accustomed to conventional teaching methods and may feel uncomfortable using technology.

Despite the expectation that educators keep up with the latest teaching technologies (Burroughs, 2017), some educators still need to adhere to traditional methods (Azmi, 2020). This conventional approach to teaching tends to limit student engagement and can impede the learning process. However, some educators may feel uncomfortable with technology and require time to learn new tools and software, as Oriji et al. (2016) reported. As a result, there is a looming fear that English language teachers may lose their jobs, leading to unemployment and loss of income.

4.2 Decrease the level of Engagement Between Educators and Students

The second primary challenge of IR4.0 on English language teaching is decreasing the level of engagement between educators and students due to the possibility of dehumanization. In most cases, machines and robots cannot replace human interactions, especially in language teaching. Language instruction involves interpersonal communication, such as building rapport with students, providing personalized feedback, and engaging in active discussions. The use of technology in language teaching may result in the loss of the human touch, leading to a decrease in the quality of education provided.

Our society is advancing rapidly in technology, making information easily accessible from anywhere (Shahroom & Hussin, 2018). Teachers increasingly rely on online educational tools to deliver instruction, which can limit face-to-face interaction between teachers and students' tendency to hinder open communication. Consequently, the use of technology has diminished the level of engagement and involvement of educators with their students. One argument posits that technology further disconnects from reality and steers individuals toward a more cybernetic existence (Sutton, 2013, as cited in Assyifa, 2020).

4.3 Required a Strong Internet Connection

According to Kozinski (2017), knowledge knows no age or boundaries. Many students desire to continue learning regularly, but attending classes can sometimes be challenging. Fortunately, technology has provided a solution, allowing students to access missed topics through websites at their convenience, regardless of location. However, this solution has limitations; the internet connection quality affects the accessibility of lecture videos and content, as noted by Sutton (2013, as cited in Assyifa, 2020). Additionally, compared to physical lectures, online lectures often fail to motivate students due to the digital divide, leading to unequal access to learning opportunities.

Moreover, implementing IR4.0 in English language teaching may also result in increased costs. Integrating technology in education comes with a high price tag. For instance, schools may need to invest in hardware, software, and internet connectivity. This may lead to an increase in tuition fees, making education inaccessible to some students.

4.4 Exhibit a Lack of Concentration

Many students have made text messaging their preferred pastime and frequently use their cell phones, even during lectures. The constant connection to the Internet has led to a decline in focus and concentration in academic pursuits, as well as sports and extracurricular activities, to some extent (Raja & Nagasubramani, 2018).

Several critical attributes of effective schools are commonly recognized, including a solid commitment to ensuring academic success for all students, a refusal to accept excuses for poor performance, a willingness to experiment with different strategies, a sustained effort to engage parents and the community, an atmosphere of mutual respect and collaboration, and a dedication to continuous improvement and professional development.

4.5 Educators' Awareness and Embrace Technology Into their Teaching Methods

In IR4.0, educators must be aware of and embrace technology to remain effective. Technology offers various tools and resources that can be integrated into teaching methods to enhance the learning experience. For instance, teachers can use multimedia resources to deliver engaging and interactive lessons, online platforms to facilitate student communication and collaboration, and gamification to create a fun and challenging learning environment.

By embracing technology, educators can provide their students with relevant and engaging learning experiences that foster their language skills and prepare them for the demands of the modern world. Moreover, by keeping up with the latest technological developments, educators can continually adapt their teaching methods to meet their students' changing needs and preferences. To sum up, Yahya (2018) suggests that the conscious and systematic implementation of all advancements related to IR4.0 will inevitably result in positive outcomes for achieving our national education objectives.

4.6 Foster a Collaborative Relationship with Students

Fostering a collaborative relationship with students is crucial in improving the professionalism of English language teachers in the IR4.0 era. Collaboration promotes active student engagement and creates a more conducive

learning environment for effective language learning. Educators can achieve this by involving students in decision-making, encouraging peer learning and feedback, and creating a culture of inclusivity and mutual respect.

Collaboration also helps educators better understand their students' needs, preferences, and learning styles, allowing them to tailor their teaching methods to suit their needs better. Ultimately, a collaborative relationship with students can enhance the quality of teaching and improve the overall learning experience. Srinivas (2011) states that learners can actively exchange diverse beliefs, present and defend ideas, question other conceptual frameworks, and converse with peers within a collaborative learning environment.

4.7 Enhance the Proficiency and Expertise of Teachers

To keep up with the demands of the IR4.0 era, English language educators need to continually enhance their proficiency and expertise. According to Thomas (2010, as cited in Assyifa, 2020), there is a need for highly skilled educators who can utilize the advancements in superfast information technology to enhance the quality of the teaching and learning process in every educational institution, thereby preparing highly competent global human resources. This can be achieved through professional development programs that improve their pedagogical skills, language proficiency, and knowledge of the latest teaching methods and technologies.

Additionally, educators can participate in peer mentoring and coaching programs, attend conferences and workshops, and engage in self-reflection and evaluation to continually improve their teaching practices. By enhancing their proficiency and expertise, English language teachers can provide their students with high-quality language education that meets the demands of the modern world. This can lead to better language proficiency and increased confidence among students, ultimately improving their chances of success in their personal and professional lives.

5. Conclusion

In conclusion, teaching the English language in the era of Industrial Revolution 4.0 requires educators to be equipped with a critical learning mindset, updated pedagogical skills, and proficiency in utilizing technology for better teaching. Integrating online platforms through blended and hybrid learning can provide opportunities for students to enhance their language skills and engage in collaborative learning. However, balancing technology with face-to-face communication is essential to maintain meaningful interaction between students and educators. Educators should also continuously adapt to the changing demands of the IR4.0 era and strive for professional growth and development to ensure their students' academic success. By implementing effective strategies, educators can help students thrive in the digital age and prepare them for future challenges.

5.1 Recommendations

Based on the findings of this research, several areas could be explored in future research on teaching the English language in the IR4.0 era. Firstly, further research can be conducted to investigate the effectiveness of blended learning as a teaching strategy for the English Language in the IR4.0 era. This study should compare the performance of students who undergo traditional classroom teaching and blended learning.

Secondly, research can be conducted to identify the challenges and opportunities of using technology in teaching the English Language in the IR4.0 era. This study could investigate the perceptions of educators and students towards the use of technology in English Language learning and identify the factors that affect the implementation of technology in language teaching.

Lastly, further research can be conducted to explore the impact of IR4.0 on the assessment of English Language learning. This study could investigate the effectiveness of traditional assessment methods in measuring students' proficiency in alternative assessment methods more suitable for the digital age.

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Exploring the Use of Google Jamboard for Interactive Collaboration in a Language Learning Environment

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Abstract

Google Jamboard is a web-based platform that can be used for interactive collaboration in language learning. This study explores how students perceive and adopt Google Jamboard for collaborative language learning activities using the Technology Acceptance Model (TAM) as a theoretical framework. TAM examines technological adoption through perceived usefulness and ease of use and this study expanded to include fun, attitudes, and behavioural intentions. This research adopts a quantitative methodology using surveys with questionnaires to gather data from 45 participants. The analysis focused on the aspects of fun perception, usefulness, ease of use, attitudes, and intentions towards using Jamboard, revealing mean scores between 3.33 and 4.44 with 'Fun Perception and Attitude' scoring the highest at 4.44. This showed the significance of Jamboard's appeal due to its user-friendliness, convenience, and engaging nature. The analysis also confirms all proposed hypotheses indicating that perceived ease of use, usefulness, and the 'fun' aspect of Jamboard significantly affect the students' attitudes and their intention to use Google Jamboard. Thus, these findings suggest the potential to integrate Google Jamboard to teach language and enhance student motivation and interest, offering significant implications for educators aiming to leverage technology tools for improved learning outcomes in language education.

Keywords: - Google Jamboard, collaboration, technology acceptance model

1. Introduction

Over the last few years, technological advancements have significantly reshaped language education, with an emphasis on interactive multimedia tools. The change towards interactive multimedia has been emphasized by Jiang, L., Meng, H., and Zhou, N. (2021), who note its profound impact on language learning patterns. Moreover, Kennedy (2020) points out a prevalent assumption, which remains to be meticulously confirmed, suggesting that integrating interactivity in digital or online educational contexts inherently leads to increased student engagement and, consequently, expands learning experiences. Among the tools that have gained prominence in this evolving landscape is Google Jamboard. As described by Abdel-Reheem Amin (2020), Google Jamboard, part of Google's Apps for Education, is a web-based platform that supports online learning processes. Specifically, it is a digital whiteboard within the Google Suite, intended to foster a comprehensive collaborative experience in virtual educational settings. This functionality is mainly beneficial for collaborative language learning, significantly augmenting the effectiveness of such endeavours. Additionally, Khoiriyah, Kairoty, N., & Virdhausya Aljasysyarin, A. (2022) emphasize that Jamboard offers an array of functionalities adeptly suited for language education, further underscoring its utility in this domain.

The use of Computer-Assisted Language Learning (CALL), particularly through web-based platforms such as Google, has gathered considerable attention within academic circles. Numerous studies, including those conducted by Islam (2019) and Nanthinii (2020), have

focused on investigating the effectiveness of these tools in improving the four fundamental language skills: listening, speaking, reading, and writing.

Previous research has examined the effects of these digital tools on numerous aspects of language learning, including communication skills and oral proficiency, as thorough in the works of Ebadi and Ebadijalal (2020), and the improvement of academic writing abilities, as explored by Alharbi (2020), Ebadi and Rahimi (2017), and Tsai (2020). The objective of this research is to examine the perception of students in Technical and Vocational Education and Training (TVET) at Community Colleges pertaining to the use of Google Jamboard for interactive smartboard applications. Furthermore, it is hoped that this study will provide a more reflective understanding of students' perceptions of the technological resources employed in language education, with a special focus on the acceptance and usability of Google Jamboard.

Google Jamboard has been successfully integrated with many cloud-based applications to enhance real-time collaboration between educators and students. This integration objective is to make a more dynamic and collaborative educational experience during virtual face-to-face sessions, as highlighted by Virto, N.R. & López, M.F.B. (2020). The platform allows educators to participate with students in varied activities, such as idea sketching, problem-solving, or collaborative drawing. Accessible through smartphones or laptops through a Google account, the Jamboard offers convenience and flexibility in its use.

The Google Jamboard is expected to serve as an effective alternative learning tool for TVET English educators. The groundwork of this research is through the framework of the Technology Acceptance Model (TAM) initially developed by Davis in 1989. By comprehending the TAM model and its application to Google Jamboard, educators and language learners can make informed decisions concerning the integration of this tool into their language learning practices.

When considering the application of TAM to Google Jamboard, it's important to investigate into the specific aspects of language learning that can be addressed with this tool. It presents two main factors that influence students' attitudes and behaviours toward technology: perceived usefulness and perceived ease of use. TAM proposes that the perceived ease of use and perceived usefulness of technology are key predictors of a user's attitude toward using the technology, which in turn influences their behavioural intentions and actual usage. Furthermore, TAM recommends that perceived ease of use directly influences the perceived usefulness of the technology. Within the framework of TAM, perceived usefulness is defined as the extent to which a user expects that utilizing the technology will enhance their job performance. Conversely, perceived ease of use is the degree to which a user believes that the operation of the technology will be effortless. These two elements are recognized as separate factors that affect the user's attitude toward technology use. Additionally, it is hypothesized that perceived ease of use not only affects attitude towards using the technology but also influences perceived usefulness.

Fig. 1 illustrates the research model adopted in this study, which represents the TAM, notably omitting the actual system use component. Furthermore, this model incorporates an external variable, namely the 'fun aspect,' to examine its influence on perceived usefulness and ease of use. The hypothesis suggested in this investigation suggests that if learners recognize Google Jamboard as an effective platform for interactive collaboration in language learning and believe is user-friendly, such perceptions are likely to foster positive attitudes towards its usage. These positive attitudes are expected to enhance their intention to employ Google Jamboard for language learning purposes. Ultimately, this could significantly influence Google Jamboard's adoption and effectiveness in educational environments.

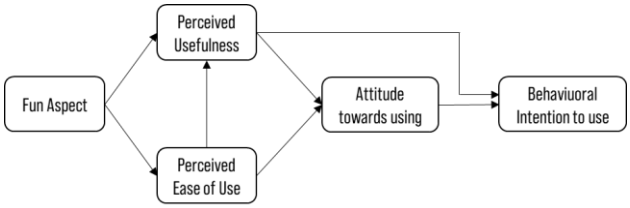

Fig. 1. Conceptual framework

The research hypotheses, developed in alignment with the TAM model as depicted in the diagram and specifically adapted for the application of Google Jamboard in a language learning context, are outlined as follows:

H_1: Perceived ease of use positively affects the perceived usefulness of Google Jamboard.

H_2: Perceived ease of use positively affects attitudes towards using Google Jamboard.

H_3: Perceived usefulness positively affects attitudes towards using Google Jamboard.

H_4: Perceived usefulness positively affects the intention to use Google Jamboard.

H_5: Attitudes towards using Google Jamboard positively affect the intention to use Google Jamboard.

H_6: Students' perceptions of the 'fun' aspect of Google Jamboard positively affect their intention to use Google Jamboard.

2. Methodology

The respondents of this study were students enrolled in the Workplace English course at Klang Community College. Questionnaires were distributed to fifty participants through an online platform. A total of 45 completed questionnaires were received.

The questionnaire is divided into three sections: Section A gathers demographic information, Section B collects data pertinent to the constructs under investigation, and Section C accumulates respondents' opinions. The instrument was adapted and refined by Davis (1993). Responses were measured on a 4-point Likert Scale, where 1 represents 'strongly disagree' and 4 signifies 'strongly agree'. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS).

Correlation analysis was utilized to evaluate the hypotheses in this research. The interpretation of the correlation coefficients follows the guidelines provided by Hair, Black, Babin & Anderson (2010). A correlation coefficient ranging from 0.00 to 0.20 (or -0.00 to -0.20) indicates a negligible to weak relationship. Coefficients between 0.21 and 0.40 (or -0.21 to -0.40) suggest a weak positive (or negative) correlation. A moderate positive (or negative) correlation is indicated by coefficients ranging from 0.41 to 0.60 (or -0.41 to -0.60). Coefficients between 0.61 and 0.80 (or -0.61 to -0.80) denote a strong positive (or negative) correlation. Finally, a coefficient ranging from 0.81 to 1.00 (or -0.81 to -1.00) is interpreted as a very strong positive (or negative) correlation.

3. Result and Discussion

This study aims to explore the factors that influence the acceptance of Google Jamboard. The demographic data of the respondents are summarized in Table 1. The distribution of respondents by gender shows that 60% are male. Regarding device preference for accessing Google Jamboard, laptops are commonly used by 57.78% of respondents, followed by desktop computer at 31.12%, and smartphone at 11.12%. In terms of familiarity with Google Jamboard, a substantial proportion of respondents, 84.4%, reported prior usage, whereas 15.6% indicated they have never used it.

Table 1. Demographic profile

Variable		Frequency	Percentage
Gender	Male	27	60.00
	Female	18	40.00
Types of devices used to access Google Jamboard	Laptop	26	57.78
	Desktop	14	31.12
	Smartphone	5	11.12
Experience with Google Jamboard	Yes	7	84.4
	No	38	15.6

Table 2 shows the statistical measures for each variable, including the mean, standard deviation, skewness, and kurtosis. The means are relatively close, ranging from 3.3000 to 3.4444, with a collective average of 3.394, indicating that the responses were generally favourable. Standard deviations are also relatively similar across items, suggesting a consistent spread of responses. Most distributions are slightly left-skewed, indicating a tendency for responses to cluster towards the higher end of the scale, except "Behavioural Intention to Use," which has a positive kurtosis indicating heavier tails. The kurtosis values for other items suggest lighter tails than a normal distribution, indicating fewer extreme values. The 'Perception of Fun Aspect and Attitude' received the highest mean score of 3.44, while the 'Behavioural Intention to Use' had the lowest at 3.30. The closeness of the mean scores across various items within each category suggests a consistent inclination among participants toward choices that range from 'agree' to 'strongly agree'.

Table 2. Descriptive analysis

Item	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Perception Fun Aspect	3.4444	.53537	-.467	.354	-.560	.695
Perceived Usefulness	3.4111	.56447	-.378	.354	-.819	.695
Perceived Ease of Use	3.3722	.55551	-.381	.354	-.337	.695
Attitude	3.4444	.57626	-.520	.354	-.502	.695
Behavioural Intention to Use	3.3000	.48734	-.391	.354	.504	.695
Valid N (listwise)						

Table 3 presents the results of the correlation analysis conducted to evaluate the hypotheses. The hypothesis *H_1, Perceived ease of use positively affects the perceived usefulness of Google Jamboard*, the data shows a strong positive correlation between Perceived Ease of Use and Perceived Usefulness (.923, p<.01), supporting H_1. The results of this research align with the discoveries of Pothier (2021), signifying that Jamboard was successfully employed due to its association with Google and its accessibility without the necessity for account registration and facilitating broad usage. This proposes that students who find Google Jamboard easy to use also perceive it as more beneficial. This relationship emphasizes the importance of designing intuitive and user-friendly interfaces to augment perceived utility. The study highlights the significance of usability in enhancing the value of educational technology tools like Google Jamboard, thereby encouraging their efficient adoption and application.

For *H_2, Perceived ease of use positively affects attitudes towards using Google Jamboard*; revealing a strong positive correlation between Perceived Ease of Use and Attitude (.891, p<.01), which supports H_2. This finding proposes that the ease of use significantly influences students' attitudes towards Google Jamboard; more accessible platforms lead to more positive attitudes. The user-friendly interface of Google Jamboard is important to foster positive attitudes toward educational technology tools. It reassures students to integrate the platform into language learning and collaborative activities. Similar to other Google tools, it helps students communicate and collaborate effectively by offering real-time access and a multi-person editor (Khoiriyah, 2021).

For *H_3, Perceived usefulness positively affects attitudes toward using Google Jamboard*; showed the correlation between Perceived Usefulness and Attitude is very strong (.936, p<.01), providing strong support for H_3. This means that the more beneficial students find Google Jamboard, the more positive their attitude towards using it. This outcome shows that a higher perceived usefulness of Google Jamboard among students correlates with a more

positive attitude toward its usage. In alignment with Piccardo, E., Antony-Newman, M., Chen, L., & Karamifar, B. (2021), students in higher education perceived online collaborative tools as both cognitively beneficial and motivational. Additionally, positive feedback from students on Jamboard's usefulness supports the findings of Kabir et al. (2020), who argued that technology plays a vital role in sustaining engagement among students, peers, and learning materials. This highlights the critical role of perceived usefulness in determining positive attitudes towards technology.

Table 3. Correlation analysis

		Perception Fun Aspect	Perceived Usefulness	Perceived Ease of Use	Attitude	Behavioural Intention to Use
Perception Fun Aspect	Pearson Correlation	1	.956**	.845**	.929**	.811**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	45	45	45	45	45
Perceived Usefulness	Pearson Correlation	.956**	1	.923**	.936**	.838**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	45	45	45	45	45
Perceived Ease of Use	Pearson Correlation	.845**	.923**	1	.891**	.843**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	45	45	45	45	45
Attitude	Pearson Correlation	.929**	.936**	.891**	1	.890**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	45	45	45	45	45
Behavioural Intention to Use	Pearson Correlation	.811**	.838**	.843**	.890**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	45	45	45	45	45

**. Correlation is significant at the 0.01 level (2-tailed).

For H_4, *Perceived usefulness positively affects the intention to use Google Jamboard*; a strong positive correlation between Perceived Usefulness and Behavioural Intention to Use (.838, p<.01), H_4 is supported. Studies have confirmed that students' perceptions of digital technologies pointedly impact their intentions to integrate these resources into the classroom. Favourable perceptions of digital technologies among students are associated with higher levels of involvement and motivation, leading to enhanced educational achievements (Liu et al., 2018). This relationship suggests that students who perceive Google Jamboard as useful are more likely to express an intention to use it. The implication is clear: enhancing the usefulness of Google Jamboard can directly influence students' intention to adopt and use the platform.

For H_5, *Attitudes towards using Google Jamboard positively affect the intention to use Google Jamboard;* there is a strong positive correlation between Attitude and Behavioural Intention to Use (.890, p<.01), supporting H_5. This finding proposes that students' positive attitudes towards Google Jamboard significantly predict their intention to use it, highlighting the importance of fostering positive attitudes to encourage adoption and usage. Khoiriyah (2022) observed a positive attitude towards the application despite recognizing technological issues as a barrier and provided pedagogical recommendations. Furthermore, a study by Irmayani, Masruroh, & Wulandari (2022) verified that digital tools such as Jamboard can enhance students' interest and participation in the educational process. The authors claim that digital tools empower students to take ownership of their learning, resulting in a more positive attitude towards the subject matter.

For H_6, *Students' perceptions of the 'fun' aspect of Google Jamboard positively affected their intention to use Google Jamboard; showed* a strong positive correlation between the Perception Fun Aspect and Behavioural Intention to Use (.811, p<.01), supporting H_6. This indicates that the more students perceive Google Jamboard as fun, the more likely they are to intend to use it. These results align with Ching's (2021) study, which found that respondents had positive attitudes toward Jamboard's features and customization options, thus enhancing the learning experience and leading them to perceive it as fun. This finding highlights the value of integrating engaging and enjoyable basics into educational technology to increase student engagement and acceptance rates.

The analysis provides strong empirical support for all six hypotheses, indicating that perceived ease of use, perceived usefulness, and the 'fun' aspect of Google Jamboard significantly affect students' attitudes and their intention to use the platform. These results propose that educational technologies that are easy to use, useful, and fun can suggestively enhance student engagement and willingness to accept such technologies. The finding of this study is consistence with Uke (2021) who reported its utility for many purposes, including conducting group activities, sharing ideas, and monitoring learning activities.

For developers and educators, focusing on these aspects can be significant to the successful application and utilization of educational tools like Google Jamboard. The engaging and interactive nature of Jamboard possibly enhances the learning experience, thereby increasing its perceived usefulness to learners (Davis, 1989). Therefore, incorporating Google Jamboard into language learning settings could positively influence student motivation, and engagement, and facilitate language acquisition (Ari, 2021).

4. Conclusion

This study confirms the acceptance of the hypotheses proposed. It focused on examining the use of Google Jamboard for language learning, particularly its usefulness in enhancing collaborative efforts in a language learning setting. The results, derived from the Technology Acceptance Model (TAM) questionnaire, confirmed a high level of student acceptance towards using Jamboard. The application was widely viewed as positive and user-friendly, highlighting its potential as an effective e-learning tool. This research augments understanding of the factors influencing students' readiness to engage with e-learning tools, including their perceptions of the content's playfulness and interest.

The analysis led to two significant recommendations. Firstly, for the enhancement of theoretical literature, it is important to re-evaluate the TAM with different student or user demographics. This study did not integrate actual technology usage into the model; therefore, future studies should include this factor to provide a more comprehensive assessment of TAM's effectiveness in predicting student acceptance of Google Jamboard. Additionally, the study's small sample size may present bias, signifying the need for replication of this research across other Technical and Vocational Education and Training (TVET) institutions.

In conclusion, Google Jamboard is a valuable digital resource for e-learning, addressing the needs of 21st-century education which includes fostering creativity, enhancing communication, and improving technology literacy along with information and communication technology (ICT) skills. It facilitates a student-focused approach to teaching and learning, significantly elevating the learning skill within the context of interactive collaboration in language learning environments.

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Sustainable Construction Revolution: Fly Ash as Artificial Fine Aggregate and Fiber Glass as Innovative Additive in Lightweight Concrete

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Abstract

The paradigm of sustainable construction is undergoing a revolutionary transformation with the integration of novel materials. This study explores the use of fly ash as an artificial fine aggregate and fiber glass as an innovative additive in the formulation of lightweight concrete. The research aims to enhance the sustainability of construction practices by reducing the environmental impact associated with traditional concrete production. The final compressive strength and absorption tests were conducted, and the results were compared with those of conventional lightweight concrete. The collected data will undergo analysis to ascertain the strength of lightweight concrete across various content ratios while maintaining consistent size. As a result of various compositions, the concrete revealed different properties. The density ranged from 1804 to 2070 kg/m^3, and the corresponding strength ranged from 13.5 to 29.6 MPa. The durability research results of tested lightweight concretes showed that, despite considerably higher water absorption, a comparable water permeability and comparable or better freeze-thaw resistance in relation to normal-weight concrete may be present. Through a series of experiments and analyses, the study investigates the mechanical properties, durability, and environmental benefits of the developed lightweight concrete. The findings reveal a synergistic effect between fly ash and fiber glass, resulting in a lightweight concrete that not only exhibits improved performance but also contributes to the overall sustainability goals of the construction industry. This abstract provides a glimpse into the transformative potential of adopting fly ash and fiber glass in lightweight concrete, paving the way for a more eco-friendly and resilient future in construction.

Keywords: - Sustainable construction, compressive strength, absorption tests

1. Introduction

Lightweight aggregates (LWA) are specified in international standards like EN 13055, ASTM C330M, ASTM C331M, and ASTM C332. The ASTM standards distinguish between LWA for structural lightweight concrete, LWA for the application in masonry lightweight concrete and LWA for insulating concrete. Besides their origin, the definition of the aggregate properties, mainly the density, is important to distinguish between normal weight and lightweight aggregate. ASTM C330M and ASTM C331M give upper limits for the loose bulk density 1120 kg/m3 for fine LWA, 880 kg/m3 for coarse LWA and 1040 kg/m3 for the combination of fine and coarse LWA (Thienel, Haller & Beuntner, 2020).

The surge in popularity of lightweight concrete in recent years can be attributed to its myriad advantages, presenting a compelling alternative to traditional concrete. Technological advancements, coupled with an enhanced understanding of concrete properties, have played a pivotal role in the widespread adoption of lightweight concrete (Kayali, 2005; Chandra & Berntsson, 2002; Clarke, 1993 and Domagała, 2015).

Similar in composition to conventional concrete, the distinguishing factor lies in the use of lightweight aggregates or a combination of lightweight and normal-

weight aggregates. Unlike standard lightweight concretes that rely on natural sand as fine aggregates, our project endeavors to address this norm by introducing a specialized lightweight concrete that not only upholds structural integrity but also contributes to resource conservation (Hossain, Ahmed & Lachemi, 2011; Liu, Chia & Zhang, 2011 and Lotfy, Hossain & Lachemi, 2016).

The primary motivation behind this project is to overcome the challenges associated with reinforcing lightweight concrete while simultaneously addressing the critical issue of conserving natural resources, particularly the scarce materials of coarse aggregates and sands. In doing so, this study aims to strike a balance between structural for roof decks performance and environmental responsibility.

Beyond its utilitarian aspects, our study extends into the realm of aesthetics, envisioning lightweight concrete as a versatile material capable of serving as a decorative panel. This dual-purpose approach not only enhances the practical applications of lightweight concrete but also adds an artistic dimension to its potential uses in construction and design (Zhang & Gjvorv, 1991).

Moreover, this research project takes a bold step towards sustainability by incorporating waste and recyclable materials, notably fly ash, at optimal levels. By doing so, we aspire to curtail the quantity of waste generated annually, aligning our efforts with broader initiatives aimed at promoting responsible waste management practices and reducing environmental impact.

In essence, our project stands at the intersection of technological innovation, structural reinforcement, environmental stewardship, and aesthetic enhancement, envisioning a future where lightweight concrete emerges not just as a practical choice but as a sustainable and versatile solution for the construction industry (Srinivasan et al., 2016 and Vijay, 2015).

Fly ash, a byproduct of combustion, traditionally relegated as waste, is now assuming a pivotal role in sustainable construction. This introduction explores how this artificial fine aggregate, rich in pozzolanic properties, not only diverts waste from landfills but also enhances the durability and strength of lightweight concrete, aligning structures with environmental responsibility (Thienel, Haller & Beuntner, 2020).

Fig. 1. Rapid identification method of fly ash quality (Alpa, 2022)

Integrating fiber glass as an innovative additive in lightweight concrete brings forth a host of possibilities, enhancing both the structural and environmental aspects of the material. Here are some ideas for utilizing fiber glass in lightweight concrete which combine fiber glass strands within the concrete mix to reinforce its tensile strength. This not only improves the overall durability of the lightweight concrete but also allows for the creation of thinner and lighter structures for roof decks without compromising structural integrity. It also introduces microfiber glass particles to enhance the crack resistance of lightweight concrete. The fibrous nature of glass can act as a barrier to crack propagation, leading to a more resilient and long-lasting material. Fiber glass can be an impact-resistant additive, especially in applications where lightweight concrete may be exposed to external forces. The flexibility and strength of fiber glass can absorb and distribute impact energy effectively, minimizing potential damage (Priyadharshini, Ganesh & Santhi, 2011; Nadesan & Dinakar, 2018 and Wasserman & Bentur, 1996).

Fig. 2. Fiber glass Chopped Strand

The study aims to achieve the following objectives:

1. To produce Eco-Friendly and decorative lightweight concrete by incorporating fly ash and fiber glass as additive mixtures and substituting fly ash as the artificial aggregate simultaneously.
2. To assess the compressive strength and water absorption characteristics of the lightweight concrete produced with the mentioned additives.
3. To compare the compressive strength of the lightweight concrete incorporating fly ash and fiber glass with that of conventional lightweight concrete.

In summary, the study aims to develop a sustainable and aesthetically pleasing lightweight concrete using eco-friendly materials, evaluate its mechanical properties such as compressive strength and water absorption, and make a comparative analysis with conventional lightweight concrete.

2. Methodology

The methodology for the research project "Sustainable Construction Revolution: Fly Ash as Artificial Fine Aggregate and Fiber Glass as Innovative Additive in

Lightweight Concrete" follows a systematic and comprehensive approach.

2.1 Literature Review

Conduct an extensive review of existing literature on the use of fly ash and fiber glass in lightweight concrete. Explore properties, strengths, and weaknesses of lightweight concrete with these additives. Identify gaps in knowledge to understand the state of the art in sustainable lightweight concrete.

2.2 Material Characterization

Characterize properties of raw materials (fly ash and fiber glass) through laboratory testing. Examine particle size distribution, chemical composition, and physical properties of fly ash. Evaluate fiber glass properties, including length, diameter, and tensile strength.

2.3 Mix Design Optimization

Develop various lightweight concrete mix designs with different ratios of fly ash and fiber glass. Conduct trial mixes to determine optimal combinations for strength, durability, and sustainability. Consider variations in fly ash percentages, fiber glass lengths, and other relevant factors.

2.4 Concrete Sample Preparation

Prepare concrete samples based on optimized mix designs.

2.5 Mechanical Testing

Perform comprehensive mechanical testing on concrete samples, including compressive strength. Conduct tests at various curing periods to analyze strength development over time.

2.6 Data Analysis and Interpretation

Analyze collected data using statistical tools. Interpret results in the context of research objectives.

2.7 Conclusion and Recommendations

Summarize findings and draw conclusions based on research outcomes. Provide recommendations for practical application of sustainable lightweight concrete. Suggest areas for future research and development in the field.

3. Result and Discussion

The research involved the analysis of data obtained from a series of tests, including compressive strength and water absorption tests, conducted on lightweight concrete with different ratios. Each test was performed on individual sample test cubes, allowing for a comprehensive evaluation of the durability of the lightweight concrete under varying ratios. The aim was to assess how changes in composition influenced both compressive strength and water absorption, providing valuable insights into the overall performance and robustness of the concrete under different conditions. The standard for water absorption in lightweight concrete is less than 12%. Based on the data obtained in Table 1, the entire testing ratio is consistent.

Table 1. Water absorption test

Ratio	Cube size (mm)	Sample	Day	Density (kg/m³)	Weight (kg)		Percentage of absorption (%)	Percentage average of absorption (%)
					Before	After		
Concrete Control 1:2	100 x 100 x 100	1	7	2014	2.014	2.067	2.632	2.650
		2		1912	1.912	1.963	2.667	
		3	28	2040	2.040	2.102	3.039	3.011
		4		1978	1.978	2.037	2.983	
1:2:1		1	7	1784	1.784	1.875	5.100	4.516
		2		1704	1.704	1.771	3.932	
		3	28	1778	1.778	1.850	4.049	4.145
		4		1769	1.769	1.844	4.240	
1:2:2		1	7	1750	1.750	1.875	7.143	5.827
		2		1774	1.774	1.854	4.510	
		3	28	1756	1.756	1.825	3.929	4.201
		4		1766	1.766	1.845	4.473	
1:2:3		1	7	1731	1.731	1.798	3.871	3.945
		2		1817	1.817	1.890	4.018	
		3	28	1743	1.743	1.816	4.188	4.339
		4		1715	1.715	1.792	4.490	

Table 1 and Fig. 3 shows that the 1:02:02 admixture ratio absorbs 5.112% more water after seven days compared to the other three ratios. However, after twenty-eight days, the water absorption percentages for the 1:02:01, 1:02:02, and 1:02:03 ratios are similar, ranging from 4.145% to 4.339%. In contrast, the concrete control has the lowest water absorption percentages at 2.650% for seven days and 3.011% for twenty-eight days.

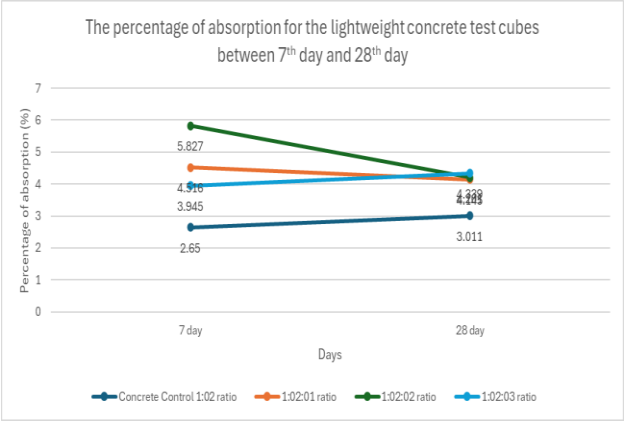

Fig. 3. The percentage of absorption for the lightweight concrete test cubes between 7th day and 28th day

Based on Table 2 and Fig. 4, the 1:02:02 admixture ratio exhibits the highest compressive strength, measuring 23.12 MPa at seven days and 29.61 MPa at twenty-eight days, surpassing the other three ratios. In contrast, the 1:02:01 admixture ratio shows the lowest compressive strength at 13.50 MPa for the seven-day test. The compressive strength drops significantly for the 1:02:03 admixture ratio, recording 17.14 MPa at seven days and 18.43 MPa at twenty-eight days. Notably, the concrete control demonstrates superior strength at twenty-eight days,

surpassing both the 1:02:01 and 1:02:03 admixture ratios with a strength of 16.78 MPa.

Table. 2. Results of compressive strength test

Ratio	Cube size (mm)	Sample	Day	Weight (kg)	Density (kg/m³)	Load (kN)	Averge Load (kN)	Compressive Strength (Mpa)	Average Compressive Strength (Mpa)
Concrete Control 1:2	100 x 100 x 100	1	7	2.067	2015	168.6	167.75	16.86	16.78
		2		1.963		166.9		16.69	
		3	28	2.102	2070	245.3	229.40	24.53	22.94
		4		2.037		213.5		21.35	
1:2:1		1	7	1.875	1814	125.0	135.00	12.50	13.50
		2		1.771		145.0		14.50	
		3	28	1.850	1847	174.0	229.45	17.40	22.95
		4		1.844		284.9		28.49	
1:2:2		1	7	1.875	1860	232.9	231.20	23.29	23.12
		2		1.854		220.5		22.95	
		3	28	1.825	1835	299.9	296.10	29.99	29.61
		4		1.845		292.3		29.23	
1:2:3		1	7	1.798	1844	163.7	171.35	16.37	17.14
		2		1.890		179.0		17.90	
		3	28	1.816	1804	173.7	184.30	17.37	18.43
		4		1.792		194.9		19.49	

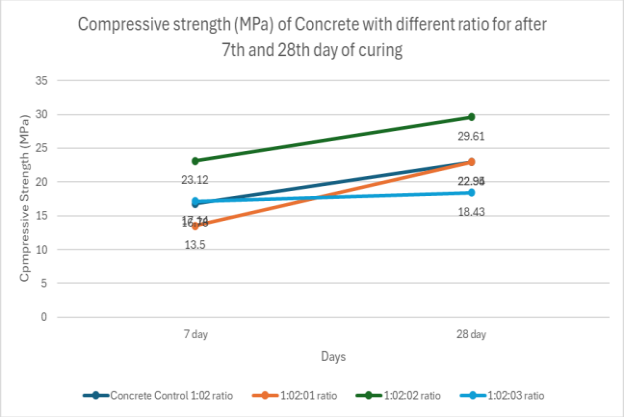

Fig. 4. Compressive strength of concrete with different ratio for after 7th and 28th of curing

In analyzing the compressive strength data from the conducted test, variations among samples are evident. The 1:02:02 admixture ratio stands out with the highest compressive strength for both testing durations compared to the other three samples. The 1:02:01 admixture ratio records the lowest compressive strength at seven days, attributed to its lighter weight than the other cubes. However, its strength equals that of the concrete control at twenty-eight days due to the presence of fiber glass content. The compressive strength peaks at the 1:02:02 admixture ratio but declines rapidly at the 1:02:03 admixture ratio, likely due to the mixture reaching its strength limit.

4. Conclusion

Regarding water absorption, the results indicate varying percentages among the samples. The 1:02:02 admixture ratio exhibits the highest water absorption, attributed to its fiber glass content. In contrast, the 1:02:03 admixture ratio shows lower water absorption due to a higher concentration of fiber glass. The control concrete has the lowest water absorption, as it lacks additional components that readily absorb water. The 1:02:02 admixture ratio emerges as the most suitable choice, effectively controlling water absorption.

In terms of compressive strength, the samples display different values. The 1:02:02 admixture ratio stands out with the highest compressive strength for both seven and twenty-eight days. The 1:02:01 admixture ratio exhibits lower compressive strength at seven days due to its lighter weight but matches the control concrete at twenty-eight days, thanks to its fiber glass content. The compressive strength peaks at the 1:02:02 admixture ratio but decreases rapidly at the 1:02:03 admixture ratio, suggesting a limit to the strength achievable. To ensure the accuracy of the obtained data, the researchers emphasize the importance of conducting future research and tests with precision and care.

The research has demonstrated the transformative potential of incorporating fly ash as an artificial fine aggregate and fiber glass as an innovative additive in lightweight concrete. This sustainable construction revolution not only enhances the structural properties of the material but also contributes significantly to reducing environmental impact and conserving natural resources.

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System Analysis and Design Assessment: Adapting 15 Steps of PBL in Programming Education

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Abstract

This study examined students' perception on the initial implementation of Problem Based Learning (PBL) approach in solving problems of Laboratory Worksheet Activity (LWA). The problem-solving covered Topic 2 (Preliminary Analysis) in the System Analysis and Design (SAD course). The implementation of PBL was applied to students who were undergoing System Analysis and Design courses. Fifteen steps PBL in programming education were applied in solving problems of Laboratory Worksheet Activity for Topic 2. Qualitative and Quantitative techniques were employed using descriptive analysis and thematic analysis. The problem-solving session was carried out by having students work in small groups under the guidance of facilitators. Findings showed that students deem the PBL approach to be unfamiliar and it takes time to get started. Despite rejection by a few students, PBL mainly, was acknowledged as beneficial in terms of the solving problem process systematically as well as encouraging collaborative learning. Implications from this study found that even though students accepted PBL positively, urge, effort, and scaffolding from the instructors were essential. Predominantly, students were satisfied with the implementation of PBL in completing LWA. It was suggested that PBL settings to be implemented throughout the semester to investigate the implementation thoroughly. Implications for practice that may be implemented in future are discussed.

Keywords: - Problem based learning, system analysis and design, PBL

1. Introduction

Problem-based Learning (PBL) has gained recognition as a powerful method for fostering problem-solving skills, collaborative teamwork, and high-order critical thinking. Across various disciplines, including Computer Science and System Analysis and Design (SA&D), educational institutions are increasingly embracing PBL (Aspy & Aspy, 2022; Balykbaeva et al., 2021; Yew & Goh, 2016; Marti et al., 2006 and Bentley et al., 2002). PBL's effectiveness has been observed across different educational settings, from the macro to micro levels (Chen et al., 2020 and Tan, 2003). Fundamentally, the PBL infusion of micro level is more appropriate to be implemented in course level as a preparatory step prior to entirely applying it in SAD course. The implementation was distinctly evaluated in terms of point of readiness as well as improvisation that may be required to acquire a fruitful outcome. This study described students' experience on PBL implementation for LWA 2 in System Analysis and Design course. The purpose of this study is twofold: to assess students' readiness for PBL and to propose enhancements for future implementations. Understanding students' readiness towards PBL is pivotal as it directly influences the success of PBL initiatives and student learning outcomes. Moreover, it sheds light on the challenges and opportunities associated with PBL adoption in SA&D education. In the past, PBL has been introduced in various forms and durations. However, the specifics of previous implementations and their outcomes are essential to inform the need for improvement. By examining

existing implementations, we can identify areas for refinement and better understand the factors contributing to the success or challenges of PBL in SA&D courses.

2. Literature Review

Systems Analysis and Design (SA&D) is a course that emphasizes the phases involved in the System Development Life Cycle (SDLC) (Shelly & Rosenblatt 2012 and Surendren et al., 2005). In SDLC basically, problem identification must be investigated during an earlier phase and an effective solution should be proposed. Team members must apply good communication skills throughout the processes (Gould, 2016). On that point, the Teaching and Learning (T&L) method that is suitable to be adopted to gain learning outcomes such as PBL should be applied.

PBL is a T&L method that triggers the learning process by solving real world problems (Ikawati, 2020). Students are expected to obtain learning outcomes in the process of problem-solving. The process can yield positive critical thinking ability impact, problem-solving skills, and knowledge (Zamroni et al., 2020 and Yusof et al., 2015). In PBL, students can assess what they know and determine what they need to know. Students are also required to compile information and collaborate in evaluating ideas pertinent to solution and direct it to fact searching activity. In the meantime, instructors play the role as facilitator to scaffold learning activity while students lead the learning process in a team (Hmelo-Silver, 2004; Savery 2015; Scott 2014 and De Graaf & Kolmos 2003).

PBL is implemented widely in engineering (Hadibarata et al., 2023) and computer science fields (Hutchins & Biswas, 2024) throughout various levels including course, cross-course, curriculum, and projects. The implementation requires specific settings according to the respective level (Chen et al., 2020). To practice PBL, careful and thorough preparation is required. Therefore, the implementation of PBL should be done in stages to get feedback from the parties involved for improvement. The initial setting of PBL can be set up with course level. At course level, PBL elements were instilled in the problem-solving case. On the other hand, PBL units were implemented to improve students' understanding and knowledge application (Williams, 2011). The adoption of PBL in a course contributes to knowledge management and practical skills (Dong and Guo 2014 and Chaparro-Pelaez et al., 2013). Moreover, it requires minimal coordination from educators. PBL can be infused in a curriculum based on three approaches: mega, macro, and micro levels. Micro levels are more suitable to be implied at course level (Tan, 2003).

Together with PBL setting and strategies, the procedure of problem solving has been emphasized as well. Originally, seven steps in PBL problem solving procedure were introduced in medical education (Schmidt, 1983). The seven steps of PBL are widely adopted by practitioners across various institutions and disciplines. However, effective adaptation of PBL in specific fields, such as programming courses (Aires et al., 2023), often requires modifications. In programming, where tasks involve writing code to solve problems, create simulations, or develop software applications, these modifications become necessary. These activities are aimed at fostering problem-solving skills, logical thinking, and creativity among students (Sulaiman et al., 2023). Consequently, to accommodate the unique demands of such disciplines, the original seven-step PBL process has been expanded to include 15 steps (Bawamohiddin & Razali, 2017). The 15 steps in programming education were performed in three meetings. Steps in the first meeting involve 1) Form a group and determine role of group members; 2) Distributing problem; 3) Review problem; 4) Identify problem; 5) Brainstorming; 6) Sketching explanatory model; and 7) Summarize learning issues. Then, students will engage in a self-learning session which involves steps 8) Gather information individually; 9) Design program; and 10) Prepare a summarized report. Next, in the second meeting, students will conduct steps 11) Synthesize information of problem needs and program; 12) Develop program; 13) Completing technical report. Eventually in the third meeting, steps 14) Presenting program and 15) reflecting will be executed by students to complete the solution.

Notwithstanding guidelines on setting or problem-solving procedures already discussed in previous studies, the implementation of PBL is exacting to begin with. It requires both teachers and students to transfer from the conventional learning approach to PBL. It affects students' motivation and performance especially to work in a team (McQuade et al., 2018). Students also are expected to be students-centric, that needs students to enforce higher learning ability. The self-learning process has been pointed out as a challenging process (Henry et al., 2012; Hu, Ortiz and Sriraman, 2014 and Lutsenko, 2018). Therefore, PBL must be implemented gradually in stages and requires post implementation evaluation. At this point, students' perception and attainment must be investigated. According to these representations, the paper strives to report the results on the micro level of PBL implementation in the System Analysis and Design course using the 15 steps of PBL in programming education.

3. Result and Analysis

This study used quantitative and qualitative techniques. Both quantitative and qualitative analyses were employed to investigate students' perception on PBL implementation in assessments. The main data included questionnaires. The themes of the outlined results were generated by the questions in this questionnaire. The data were first collected and analyzed (Patton, 1990). The survey was carried out after applying PBL strategy.

Participants. The goal of this study is to probe students' perception on PBL implementation during SAD, DDT program, in June 2020. The participants were 17 students who are taking the course ranging from age 19 to 20 years.

Research Design. The research design was adapted from the framework of PBL in programming education (Bawamohiddin & Razali, 2017). The adaptation focused on 15 steps of problem-solving activities involving students and facilitators. A micro-level approach of PBL

can be applied as a methodology in a course because it is more suitable to be enacted for certain topics within a certain period. This is because a micro-level approach of PBL requires minimum commitment and resources. Consequently, this approach is particularly suggested for PBL pioneer implementation (Tan, 2003 and Yusof et al., 2005).

The research design was to halve two sessions of teaching methods. The first session implemented traditional teaching methods, whereas the second session adopted PBL strategy in problem solving of Lab Work Sheet (LWA). The study adopted 15 steps of PBL for programming education, to solve LWA 2 in SAD coursework assessment. The SAD course consists of 4 hours per week encompassing two hours lecture for the first period and 2 hours practical for the second period. Two weeks were allocated to complete the T&L of Topic 2. Therefore, the implementation of the PBL approach was arranged in two weeks corresponding to the T&L planner. The arrangement of T&L started in the two hours in the first period in Week 1. Class introduction and explanation of course outline was delivered and then continued with lecture of Topic 1. Subsequently, exercise related to Topic 1 was distributed and completed in the following class session in the same week. The exercise was given to strengthen students' knowledge on Topic 1. Next, LWA 1 was distributed in the following week. Since LWA is group work, group formation was required, and students organized their solution before submitting and presenting it in the second period in the same week. The LWA 1 answering process took place in a laboratory with facilitator assistance. Overall, the LWA 1 completion took two weeks. Next, PBL method was implemented in the third week of the semester. The procedure of implementation is described precisely in the next section.

The Procedure of Implementation. PBL strategy was initiated in the third week of the semester. The entire process took two weeks to complete. Overall, the implementation structure entailed three face-to-face meetings and one self-learning session. The problem-solving strategy adapted the 15 steps of PBL in programming education. The reason for applying the 15 steps of PBL in programming to solve problems in SAD assessment is because of the problem-solving features in a programming course corresponding to SAD course. The Association for Computing Machinery (ACM) and IEEE Computing Society Joint Task Curricular (2014) emphasizes students' skills on dealing with problem-solving tasks. The SA&D course emphasizes such topics as systems development life cycle, communication with both users and developers, and a variety of standard tools, techniques, and heuristics relevant in preparing requirements and design specifications. The knowledge elements of the course reflect the principles and techniques used in the analysis and design aspects of software development. Specifically, in this course the students apply the techniques and tools of the procedure centric structured methodology for producing the intermediary system artifacts (from inception to design) of software development.

Table 1. Comparison of the traditional and 15 steps of PBL in programming education

The traditional teaching method	The 15 steps PBL adaptation
First Meeting	**First Meeting**
I. Class introduction and explanation of the course outline using powerpoint, (First Meeting)	I. Class introduction (First Meeting)
II. Explanation about Topic 1	II. Explanation of PBL planner III. Distribute PBL template. IV. Initiate PBL step 1-7 during class facilitate by facilitator 1) Form a group and determine roles of members 2) Distributing LWA 3) Review LWA 4) Identify problem 5) Brainstorming 6) Sketching explanatory model 7) Summarize learning issues
Second Meeting	**Self-Learning (One week)**
III. Perform exercise to comprehend knowledge of Topic 1 during lab session (2 hours) with Facilitator guidance.	8) Gather information 9) Design program 10) Prepare a summarize report
Third Meeting	**Second Meeting**
V. Distribute LWA 1 and completion activity with facilitator guidance (2 hours).	11) Synthesize information of problem needs and program (second meeting) 12) Complete answer 13) Write technical report
Fourth Meeting	**Third Meeting**
VI. Presentation of LWA 1 answer VII. Reflection (second week - practical session - 2 hours)	14) Present 15) Reflection

However, the programming development step was not relevant. Therefore, modifications were made in steps 11 and 12 by replacing the programming activity with SAD related solutions. Prior to PBL strategy implementation, facilitators have explained about the expected learning outcomes as well as the PBL planning. PBL template was used to scaffold students to complete the whole process. PBL template contains information of learning outcome to achieve, problem, probing questions to encourage students to initiate the PBL process (what information you know, what information you need to know, why is your answer reasonable) and reflection. The process mechanism is as follows:

i. In the first meeting, PBL template and LWA were distributed to the students. Students initiated the PBL steps 1 – 7 with facilitator guidance. Students filled in the required information (what information do you know, what information you need to know, why is your answer reasonable). The facilitator directed students to answer questions in the template to address solutions to the problem.

ii. After that, students conducted self-learning sessions individually. Students were advised to look up information in SAD e-books, online information, and any appropriate sources. Students were required to organize searched information.
iii. In the second meeting, each student presented the searched information and synthesized it in the group to produce possible solutions related to the problem. Students developed answers using any software and wrote technical reports.
iv. Finally, in the third meeting students presented the answer and facilitator commented and gave feedback. Then the session was closed with reflection.

Data Collection. A descriptive, online survey was developed and distributed after the implementation of PBL strategy to the 17 students. The questionnaire was designed according to the purpose of the study, including satisfaction of PBL adoption in problem solving. The survey contained both quantitative and qualitative questions. The questions are as follow:

1. The PBL method can stimulate my desire to learn.
2. The PBL method allows me to understand learning outcomes better.
3. The PBL process can enhance problem-solving strategy.
4. I am able to produce a solution using the PBL method effectively.
5. Overall, I am very satisfied with PBL.
6. What is your opinion/suggestion of PBL?

4. Discussion

The analyzed data described students' perception on PBL approach towards problem-solving activity. Overall, students were positive to the PBL approach in solving laboratory worksheet activity no. 2 (Table 2). Nevertheless, there were also students who found it useless and a hassle to be adopted. Students perceived that PBL approach stimulated their learning desire (70.6%), while 11.8% of students were undecided and the rest (11.8%) disagreed with the approach. Data analysis also positively concurs that PBL approach helped them understand learning outcomes better (70.6%), compared to 17.6% undecided students on the item and 11.8% students disagreed. Students were also perceived to enhance their problem-solving strategy (76.5%). Data analysis further indicated positive results on PBL as it was able to produce solutions effectively (76.5%). Lastly, data revealed that students were content with PBL implementation (64.7%). However, 23.5% students were unsure, while 5.9% students disputed that they were optimistic on PBL implementation.

Qualitative evidence confirmed this positive finding when respondents made comments such as “PBL is a useful learning approach”, “I like PBL in my learning because I understand what to do. Time not wasted”, “Apart from the traditional approach, I find it helpful. For problem-solving, it's kind of a systematic way.” Students also commented on fruitful cooperation in group work “This PBL style is something that I like. Problem-solving activity can be structured. Most importantly, all group members participated very well”, “I like to use PBL to solve problems. The problem-solving process is very orderly, in stages. All students had to participate. There are no free riders in the group”. Some feedback also stated that it was hard to pursue PBL initially, yet they adapted to it ultimately. This was supported by comments as follows, “I think it’s hard at first to use PBL… But gradually we can accept it. It sorts of forced one to think harder”, “Need more time and practice to get used to this approach”, “Hard to adapt to it at first, but I can do it finally” Even so, negative remarks were also rendered. Some responses depicted students rejecting the idea of implementing PBL in the learning process such as “I don’t like PBL. Tired of thinking too much”, “I struggled with thinking a lot”. The negative comments reflected that students were reluctant to move out of their comfort zone and wanted to stick with conventional approaches.

Table 2. Students' perception on PBL approach towards problem-solving activity

	Strongly agree		Agree		Undecided		Disagree		Strongly disagree	
	n	%	n	%	n	%	n	%	n	%
The PBL method can stimulate my desire to learn.	2	11.8	10	58.8	3	17.6	2	11.8	0	0
The PBL method allows me to understand learning outcomes better.	4	23.5	8	47.1	3	17.6	2	11.8	-	-
The PBL process can enhance problem-solving strategy.	5	29.4	8	47.1	2	11.8	2	11.8	-	-
I am able to produce a solution by using PBL method effectively.	6	35.3	7	41.2	2	11.8	2	11.8	-	-
Overall, I am very satisfied with PBL.	7	41.2	4	23.5	4	23.5	1	5.9	1	5.9

PBL needs students to participate actively in learning strategies and practice self-directed learning. Initially, students reluctantly coped with the transition from traditional approach to active critical thinkers. The challenge started when the PBL approach directed students to take control and be active in their learning process. No lecture was delivered before the problem-solving process took place. In addition, the learning process was driven by solving problems that were unable to be defined in the first meeting. The problem-solving process was tough for them. However, most of the students found PBL as a useful and systematic way in T&L. Also, this approach triggered critical thinking and polished problem solving and promoted creative thinking. Therefore, it is undeniable that PBL does offer a beneficial impact to the students' learning process. As the 15 steps PBL implementation was worth

practicing for the SAD course, thorough implementation of PBL in programming education that is adapted to the SAD course should be implemented to elucidate on the perspective of students, lecturer, and management. Therefore, the implementation of PBL should be conducted throughout the semester to assess the entire process. Readiness to implement the approach requires time and meticulous preparation before making it as one of the main T&L methods for the course. Instructors should plan the implementation concisely before applying the method throughout the semester to gain fruitful outcomes. The planning should take a few important elements into account such as syllabus content, scaffolding techniques or tools, staff upskilling, and the most crucial part is the problem creation because the problem is the heart of PBL.

5. Conclusion

The paper intends to manifest students' experience regarding the implementation of the 15 steps of PBL in solving problems in the SAD course. Students positively perceived PBL in terms of upgrading their problem solving and critical thinking skills. In addition, PBL also was acknowledged as promoting collaboration in teamwork. Aside from enhancing the mentioned skills, PBL also helped students to organize the problem-solving process in a more systematic way. A multi-dimension commitment from various stakeholders is required to ensure the success of the PBL implementation in the SAD course, particularly from students and facilitators.

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