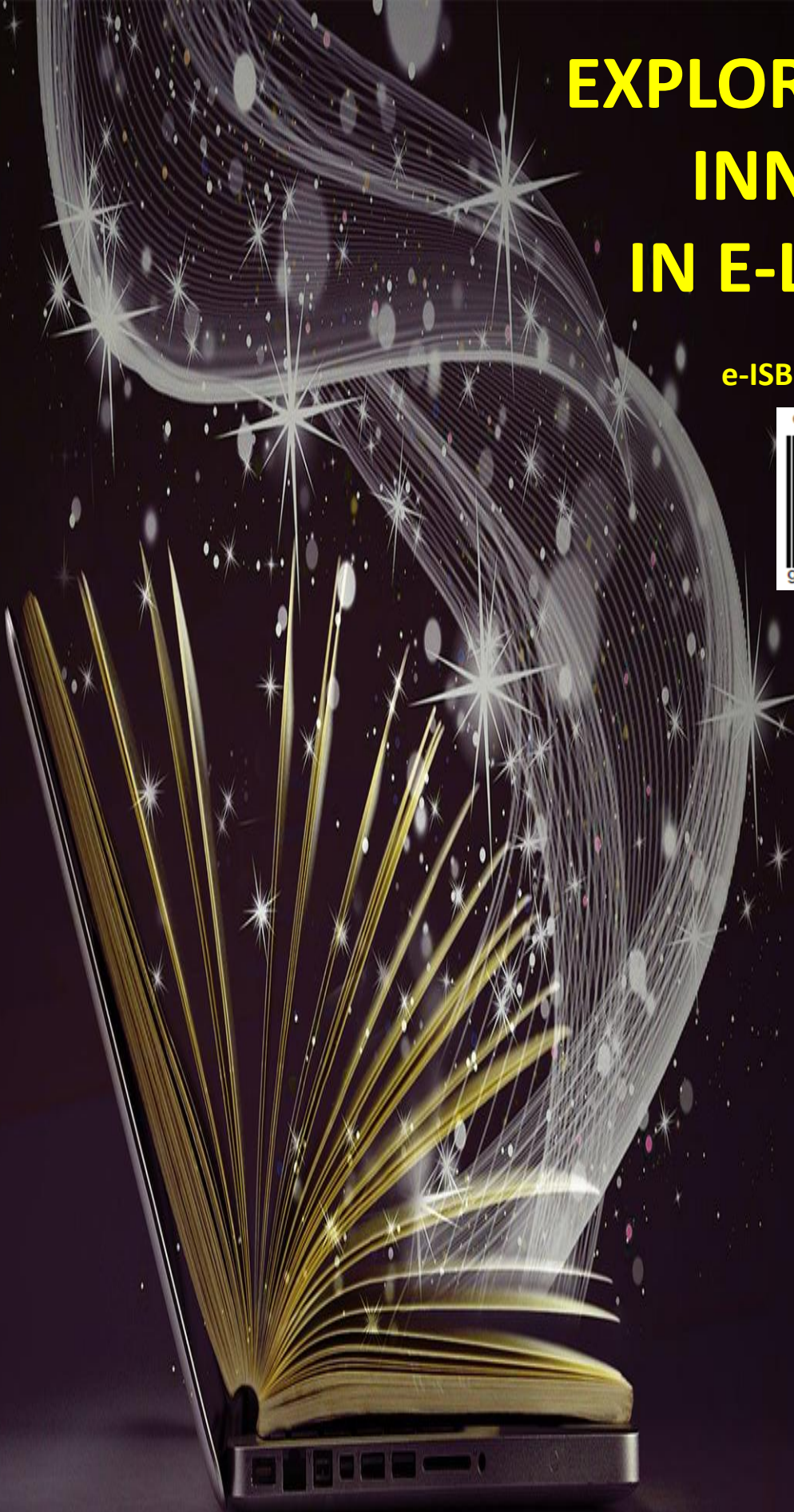


# EXPLORING NEW INNOVATION IN E-LEARNING

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**SIG CS@e-Learning**

**Unit Penerbitan**

**Jabatan Sains Komputer & Matematik (JSKM)**

**Universiti Teknologi MARA Cawangan Pulau Pinang**

# **EXPLORING NEW INNOVATION IN e-LEARNING**

## **EXPLORING NEW INNOVATION IN e-LEARNING**

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## PREFACE

Alhamdulillah, the fourth edition of ebook under SIG of e-Learning@CS has been successfully published. Representing the editorial board, I want to express my appreciation to all authors for their participation in this e-book edition. I wish to express my sincere appreciation to Madam Norazah Umar, the Program Coordinator for the Department of Computer and Mathematical Sciences (JSKM) who has given words of encouragement in making this publication a reality.

Starting from 2022, the committee of SIG e-Learning@CS has decided to publish this eBook twice a year. This e-book will be published in April and October each year following the evaluation period of MyATP 2.0 system. The fourth edition of the e-book focuses on innovation in teaching. The authors are encouraged to share experiences and ideas that have been applied and implemented since the Open Distance Learning (ODL) approach was introduced during Movement Controls Orders (MCO). A total of 16 papers have been submitted by JSKM lecturers and varieties of teaching innovations have been elaborated and well explained by the authors.

The SIG CS@e-Learning will continue and actively participate in the publication of academic articles in high impact journals such as MyCite, ERA, Scopus & WoS. Since the University has set the new rules for staff promotion, the SIG group under the Publication Unit of JSKM is already strategizing the planning towards achieving the department and university KPI. It is hoped that JSKM will achieve the highest number of academic articles published in high impact journals in the next 5 years, Insha'Allah.

***Ts. Jamal Othman***  
*Chief Editor*  
*SIG CS@e-LEARNING*  
*Exploring New Innovation in e-Learning*  
*Vol. 3, 2 Apr 2022*

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## **e-BOOK AWARENESS and USAGE AMONG UiTM CPP STUDENTS**

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### **ABSTRACT**

*Millions of dollars are spent each year by academic libraries to make electronic resources available to students for free. However, free access to e-books might not keep students interested in and using them. Thus, a small-scale online survey of e-book awareness and usage among Universiti Teknologi MARA, Cawangan Pulau Pinang (UiTM CPP) students was implemented. Its objectives are to identify the reasons of using and not using e-books. A total of 202 students in UiTM CPP responded to this survey about how they use e-books for learning, how they search for them, what devices they use to get them, and how they read and use them. Part of the survey shows that 62.9% of students found it is free and easy to access e-books, whereas 27.7% preferred printed books. In general, it can be concluded that most of the students are aware and make full use of the availability of e-books in the library.*

**Keywords:** e-book, e-book awareness, e-book usage, university students

### **Introduction**

E-book is an electronic version of a printed book and can be accessed portable electronic devices or a computer. It had been introduced almost 20 years back and since then it has become increasingly a crucial part of the academic libraries including Perpustakaan Tun Abdul Razak (PTAR), UiTM CPP. Besides the printed version books, e-books are now one of the main resources available in the digital collections. Lots of money being spent by the libraries in order to keeping up to date with the latest editions especially academic e-books since they are expanding vastly.

According to the study done by Casselden & Pears (2020), respondents preferred e-books for a variety of reasons, including convenience and accessibility, portability, navigability, and the ability to act as a preview to judge the utility of a certain book. They further found that the learning strategies employed by students also were occasionally challenged by the use of e-books, and the technology used to access the e-books resulted in issues completely engaging with content. Additionally, from survey and interviews done by Lin et al., (2020), half of the respondents still preferred print textbooks to e-textbooks, and e-textbooks were not positioned to replace print textbooks for university students in Taiwan.

When it comes to the importance of e-books, students liked the convenience of not being bound by time or distance. The findings also demonstrate that students were unfamiliar with e-book resources

and how to use them, and that software and hardware limitations can limit digital reading, and due to the new design, taking notes can be difficult (Luo et al., 2021). Majid et al., (2019) states that the capacity to save multiple e-books on personal devices, convenience of utilizing e-books, and no need to go to the library were viewed as key benefits by students. Whereas, eye strain, poor quality scanned e-books, and small smartphone screens were some of the disadvantages of e-books.

A study also found that students who had used an e-text in the study were more excited about using them again in the future than those who hadn't, and this seems to be a good thing for teachers who are thinking about switching to e-texts but are worried about how students will react (Sommers et al., 2019). Due to the above findings, and in order to learn more about why or why not students prefer e-books, new samples among students in UiTM CPP were taken and analyzed.

## **Methodology**

In this study, students from all semesters (diploma and degree) were given a simple survey shared through WhatsApp and Telegram. The questionnaires adapted from Abdullah and Gibb (2006) were in Google form and divided into three sections. The first section is the demographic questions on gender, age, faculty, level of study and semester. In the second part, the students were asked on their awareness of the existence of e-books. The last section is on the reasons of using or not using e-books. The survey was conducted from 19<sup>th</sup> January 2022 until 16<sup>th</sup> January 2022 and a total of 202 students responded to the survey.

## **Results and Discussion**

Table 1 shows a demographic study of 202 respondents who answered the survey. Female students contributed 59.4% of the results and majority of the students (55.9%) are between 18-20 years old. This indicates many diploma students who participated in this survey (59.4%). 40.1% are semester 3 students, 24.3% are semester 1 students and the rest are other semester students.



Table 1: Demographic information

No	Item	Total Sample	
		N	%
1.	Gender:		
	Male	27	40.6
	Female	120	59.4
2.	Age:		
	18-20 years	113	55.9
	21-24 years	82	40.6
	25-30 years	7	3.5
3.	Levels of Study:		
	Diploma	120	59.4
	Degree	82	40.6
4.	Semester:		
	Sem 1	49	24.3
	Sem 2	3	1.5
	Sem 3	81	40.1
	Sem 4	11	5.4
	Sem 5	27	13.4
	Sem 6	5	2.5
	Sem 7	19	9.4
	Sem 8	5	2.5
	Others (Sem10/graduate)	2	1.0

In addition to the demographic information, the survey also reveals that 81.2% of them were aware of the existence of e-books on the PTAR's website. However only 60.9% realised that PTAR did have a promotion on the use of e-books. Furthermore, the percentage of students who used (47.5%) and didn't use (52.5%) e-books before the study was conducted is more or less the same.

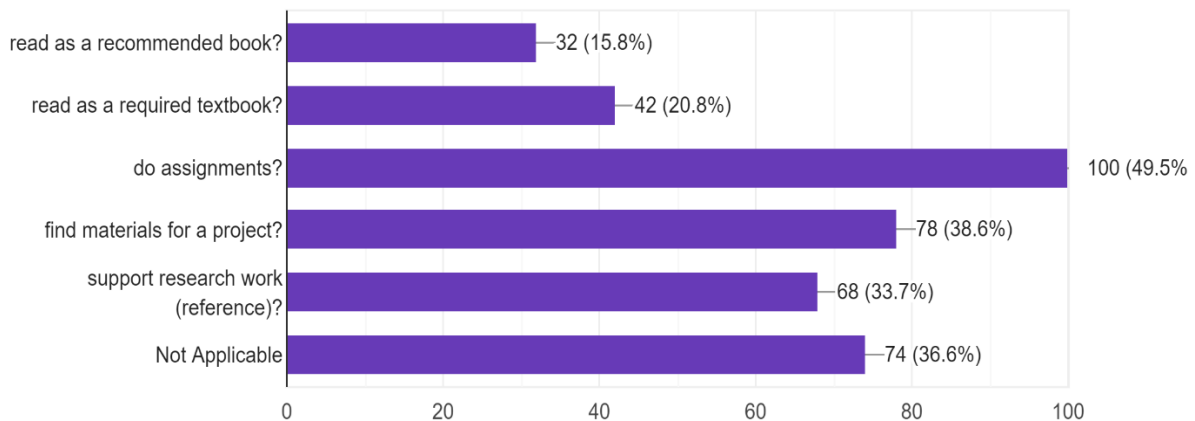


Figure 1: Purposes for using e-books.

From Figure 1 above, it can be clearly observed that most of the students used e-books to complete their assignments (49.5%). Whereas, 72.3% used e-books to find materials and support their projects or research works. 36.6% of them used e-books as a recommended or required textbook. There were also 36.6% of the students who did not used e-books (not applicable). Out of 202 respondents, 63.9% of them accessed the e-books using their personal computer or laptop, 45% used their android phone and only 6.4% used the tablet.

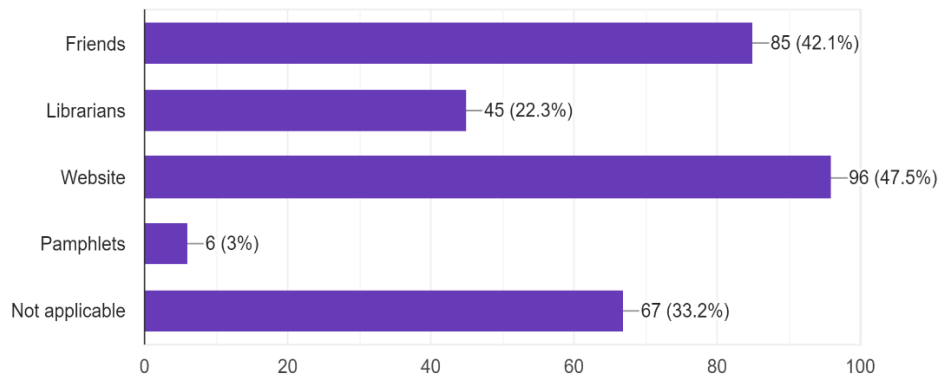


Figure 2: How do students find about e-books.

As Figure 2 illustrates, most of the students found about e-books in PTAR through the websites (47.5%) and their friends (42.1%), 22.3% from the librarians, and 3% from the pamphlets distributed around the campus. For the non-applicable (33.2%) probably came from those who did not aware or used e-books. The survey also disclosed that 48.5% of the students preferred reading the e-books on screen and 25.7% would rather print the e-books.

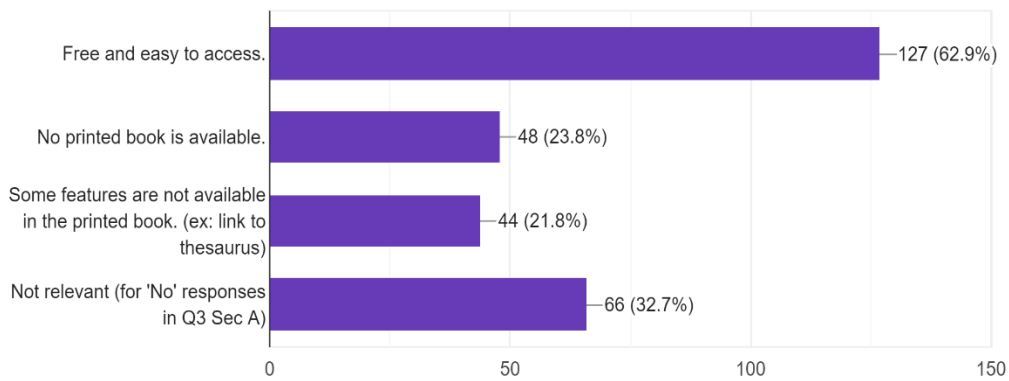


Figure 3: Reasons for using e-books.

When the students were asked why they used e-books, 62.9% responded that e-books are free and easy to access. 23.8% of them said that no printed book was available and 21.8% agreed that some features were not accessible in the printed textbook. 32.7% were those who did not use e-books.

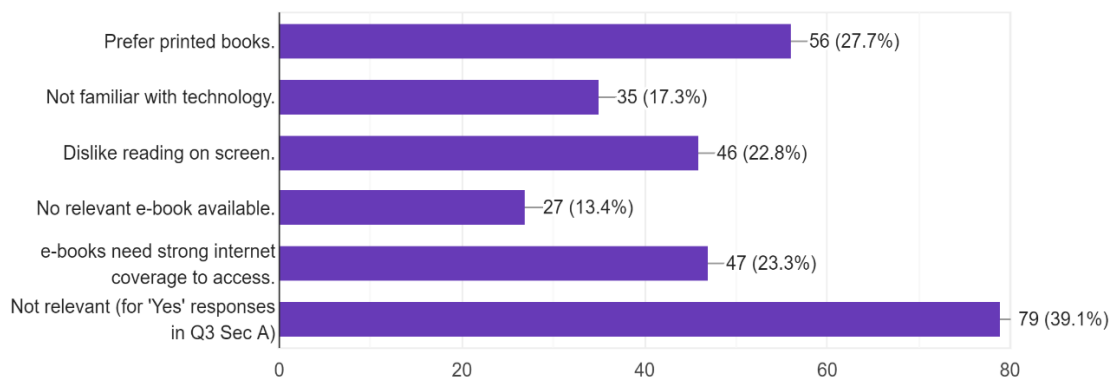


Figure 4: Reasons for not using e-books

Figure 4 shows that 27.7% of the students preferred printed books, 22.8% dislike reading on screen and 23.3% said that strong internet coverage is needed to access e-books. In addition, about 17.3% were not familiar with the technology and 13.4% said that no relevant e-book is available. Out of the 202 respondents, 39.1% used e-books during their study.

### Conclusion

In short, most of the results supported the studies done by previous researchers mentioned in the introduction. Nevertheless, some of the findings in this study could still be questionable. For instance, if the students can't find the e-books, do they willing to buy or rent the print books? Students should also

be asked on whether they want to used e-books after the survey. In future, the survey can further investigate on the advantages and disadvantages of using e-books among UiTM CPP students.

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## DESIGNING PERSUASIVE TECHNOLOGY TO PERSONALISE LEARNING ACTIVITIES IN FuPla PORTAL

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### ABSTRACT

*Nowadays, learning portals are becoming one of the popular learning tools in this era of pandemic. The existing of this tool becomes an essential necessity in the growth of Online Distance Learning (ODL). Challenges during ODL are students' engagement in the learning process. Interactive multimedia (CSC253) course involved theoretical terms which can drives students to lose their interest and focus in learning. The content consists of fundamental concept which require students to have high memorizing skills. Online teaching and learning tools are used to help students learning and engaging on online learning. Persuasive technology is used as crucial component for long terms engagement. This study has investigated the concept of persuasive and potential elements to be implemented for ODL and further developed the FuPla portal to incorporate elements of think, cooperate, involve and learn independently in a fun way. This portal is developed based on the gaming concept incorporating persuasive technology.*

**Keywords:** *online distance learning, persuasive technology, portal, gaming*

### Introduction

Teaching and learning is a process of disseminating and acquiring knowledge that takes place in every nation in the globe. This process evolves throughout ages as the community's influence by government, technologies, and modernization grow. Over time, technology has evolved into a critical component of the educational system and a fundamental instrument for improving education.

Due of pandemic concerns, online teaching and learning has been a viable alternative to face-to-face teaching for a few years. The pandemic challenges force institutions to shift away from traditional face-to-face study and toward online distant learning (ODL). Open distance learning (ODL) is defined as a flexible learning method aimed at teaching students virtually through Internet technology. The learning paradigm itself shifts from a heavy reliance on lecturers to nearly self-learning and isolation in the student's hometown. As a result, future education is increasingly reliant on online technology, which is now popular among today's youth.

Several studies have been conducted to identify the potential, performance and challenge of ODL among students. Libasin et al. (2021) have studied the performance of online learning specifically

on Calculus subject. The study split the performance that happen either via synchronized and asynchronized approach. The result showed that the assessment significantly higher among undergraduate students that study via synchronized, compared to asynchronized method. Further, Othman et al. (2022) has investigated the performance pre-university students on basic mathematics subject that happen fully via online learning. The students split into 2 groups: 1) study via assistant of mathematical teaching model via online learning. And 2) study without teaching model via online learning. The result showed that significant improvement in students' assessments within the group with mathematics teaching model compared to students that learn without model. Both of these study shows that the engagement between instructor and students in anyway have the significant impact in motivating students to follow the lesson thoroughly.

In addition, several studies that incorporating various tools in teaching online in order to increase the two-way communication among instructor and students has improved students' attraction and motivation when learning online. Yusoff et al. (2020) has investigated the student's interaction when teaching and learning via google online and KAMI application as interactive and easy to be implemented for online education. Further, the similar research was done again by Yusoff et a. (2021) that have investigated the impact of WhatsApp as an interactive instructional tool for ODL. The study showed very good feedback from students and even better compared to face-to-face in terms of student's ability to engage in lesson, enjoy the interactive communication and did not shy to ask questions and give responses. Another study by Rahman and Ghani (2021) has investigated and discover the effectiveness of notability and the use of ipad as a tool for teaching and learning Calculus on online class. The results positively showed the increment of active learning due to creativity of instructor in implementing different tools in online teaching.

As a result, there are numerous advantages and potential aspects of ODL for modern teaching and learning. Decentralization of the teaching process and individualised learning, flexible access at any time or place, promotion of active learning student motivation and satisfaction, cost-effectiveness and reduced instruction time, consistent delivery of instructional content, cost reduction and reuse of instructional material, and increased access to information are all advantages of educational strategies based on the web or e-learning tools (Alvarez et al., 2017). Despite all of its advantages, the ODL is still in its infancy to declare success. Garcia-moales et al. (2021) has described the barriers of ODL from perspective of three agents: students, professors and institutions. The main hurdle comes from students who have technological issues, such as internet connection accessibility and cost. Universities have given this issue their undivided attention, such as allowing low-income students to reside in hostels that provide both accommodation and internet access. Following that are physiological and attitude concerns

such as difficulty maintaining focus in a purely online situation, boredom, isolation, and a lack of self-organizing capabilities. These concerns have been ongoing and highly subjective, as they differ amongst students, courses, and instructors or professors.

This study will discuss on persuasive technology that will enable to monitor students in terms of attitudes, behaviour and belief throughout the online learning process. The rest of this article will discuss the concept of persuasive technology and development of FuPla portal based on the Persuasive technology.

### **Concept of Persuasive Learning for on Online learning**

A growing variety of information technology systems and services are being developed in order to influence user attitudes, behaviour, or both. Persuasive Technology (PT) refers to technologies that are designed to change users' behaviour, attitudes, and beliefs about an issue without resorting to intimidation or deception. Persuasive Technology intervention has been found to be successful in motivating people to attain a certain goal in a variety of domains, including health, physical activity, and even education (Alok, 2020; Orji, 2018;Widyasari, 2019).

According to Behringer et al (2013), persuasive technology is tool developed from several principles of persuasive design (PD) that covers different aspect of persuasion and become crucial when implementing for e-Learning. Figure 1 shows persuasive technology at the intersection of interactive computer technology and persuasion.

The propose of persuasive design strategies consist of elements which are; 1)Reduction that allow to skips certain process tailor to user prescribe; 2)Tunnelling that has predetermine direction helps user to narrow down to right steps of choice; 3)Suggestion based on user favour or interest; 4)Self-monitoring allow user to check for progress, surveillance helps user to not only check progress but double cross information with another similar user to inspired actions; and 5) Kairos for opportune moment to perform persuasive action.

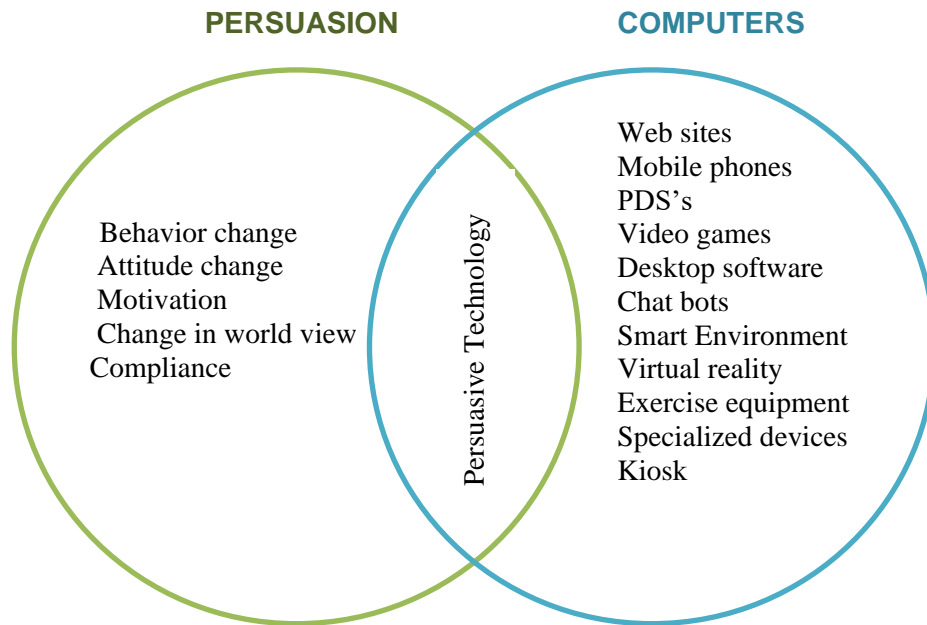


Figure 1: Persuasive technology as intersection of persuasive concept and computers applications (Fogg,2003; Behringer et al.,2013)

Oinas-Kukkonen et al. (2009) has proposed persuasive system design that consist 28 design principles for designing and evaluating intended system. As illustrated in Figure 2, the suggested framework is divided into several phases. The key issues, the process model, and the design principles to be employed for the development and evaluation of persuasive systems are all specified in this model. The primary focus is on primary task, dialogue, system credibility, and social support, which are all categories in designing of persuasive system principles.



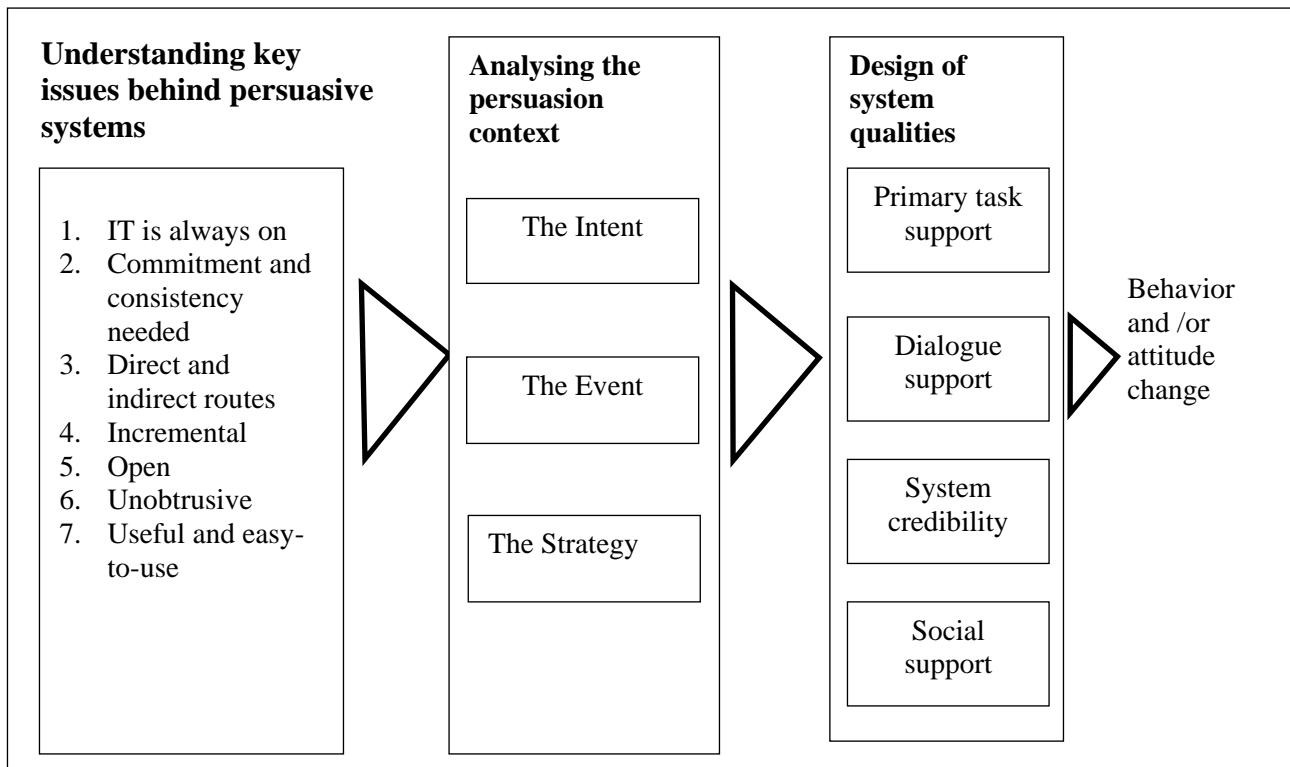


Figure 2: Phases in Persuasive System Development (Oinas-Kukkonen et al. ,2009)

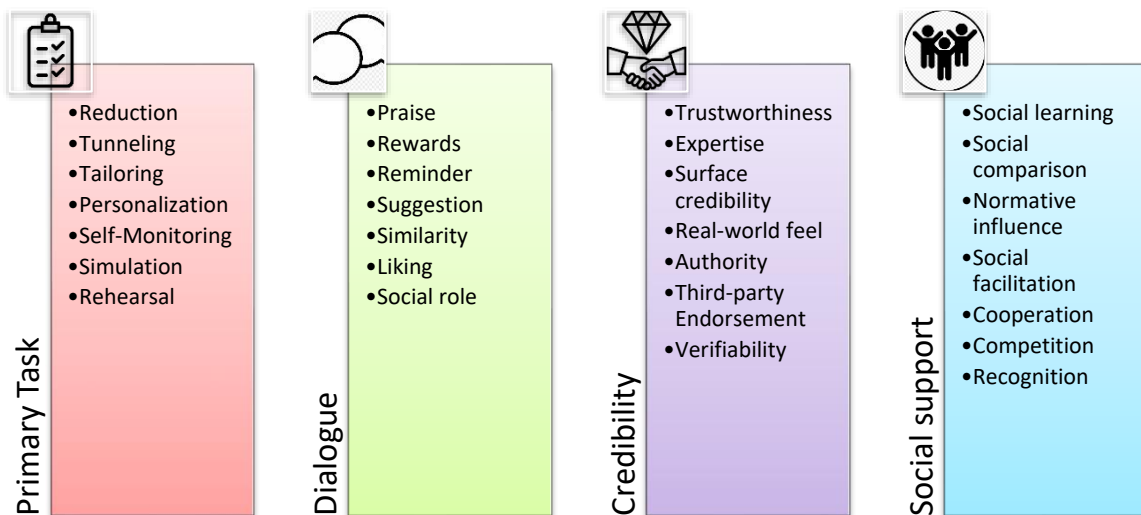


Figure 3: Description of Persuasive Design principles (Oinas-Kukkonen et al. ,2009)

**Methodology**

The goal of this research is to create a portal that will help students learn important concepts in each chapter that demand long-term memorization. The portal is based on persuasive technology, which will connect online learning with a persuasion approach, assisting students in changing their attitudes and behaviours toward self-learning online for the Interactive Multimedia course among Hotel Management students. As a result, in constructing this online learning portal, this study closely maps the notion of persuasive technology proposed by Behringer et al (2013) and Oinas-Kukkonen et al. (2009). Table 1 depicts the mapping strategies of persuasive technologies in order to develop the learning portal.

Table 1: The design principle implemented from Oinas-Kukkonen et al. (2009) into FuPla portal

Strategy	Example Requirement	Our Implementation
<b>Primary Task Support</b>		
Personalization	The system should offer personalized content and services for its user	The contents are organised into topics allow user to choose based on their preference knowledge
Simulation	System should provide means for observing the link between the cause and effect with regard to user behaviour.	User able to compare the result of performance for specific exercises with colleagues
Self-Monitoring	System should provide means for users to track their performance or status.	Each exercise allow user to re-sit the exercise to improve the performance.
<b>Dialogue Support</b>		
Rewards	System should provide virtual rewards for users in order to give credit for performing the target behaviour.	Tokens of appreciation will be given for each finished exercise as complement for extra effort in studies.
<b>Credibility Support</b>		
Real-world feel	System should provide information of the organization and/or actual people behind its content and services.	The instructor assigned to the portal are the one will teach the lesson online.

<b>Social Support</b>		
Social Comparison	System should provide means for comparing performance with the performance of other users.	Comparison of knowledge enable the comparison via Kahoot gaming questions.
Social Learning	System should provide means to observe other users who are performing their target behaviors and to see the outcomes of their behavior	Combination of personalised and collaborative gaming allow them to evaluate themselves.
Cooperation	System should provide means for co-operation.	Cooperation stands on collaborative learning.
Normative influence	System should provide means for gathering together people who have the same goal and make them feel norms.	Collaborative games via Kahoot allow them to communicate and learn with each other
Competition	System should provide means for competing with other users.	Students compete among colleagues on same questions and compete for highest marks

**Result and Discussion**

The development of learning portal is named as FuPla which is known for fun and play portal based on interactive gaming for learning theoretical concept across 10 topics in Interactive Multimedia course. Based on the proposed methodology of persuasive technology, the outcome of the portal will be discussed in this section. In this study, cooperation, fun and rewards are key elements of persuasion in designing the persuasive technology. Hence, the portal has been divided into 2 sections of gaming which are: 1) Kahoot that promote competition, social comparison, real-world feel and simulation. This active n fun activities usually end up with them laughing with each other online because of the given answer and questions. Figure 4 shows the Kahoot competition questions for 10 different topics. Each topic consists of several questions regarding the important concept that they must know in order to master each topic. And 2) Wordwall that promote self-monitoring, personalization, rewards and social learning as elements of persuasive design. In this design several gaming methods have been cooperated in order to polish their standard of learning the fundamental concept and idea in each topic. The maze chase, match up, world search, game show quiz, true and false, missing word and anagram are collections of multiway gaming from worldwall tool has been implemented to support the persuasion design proposed in this portal. Figure 5 shows example of implementation using maze chase that have being applied for leaning concept of topics1.



Figure 4: Kahoot tool in implementing important concept for 10 topics in FuPLA learning portal

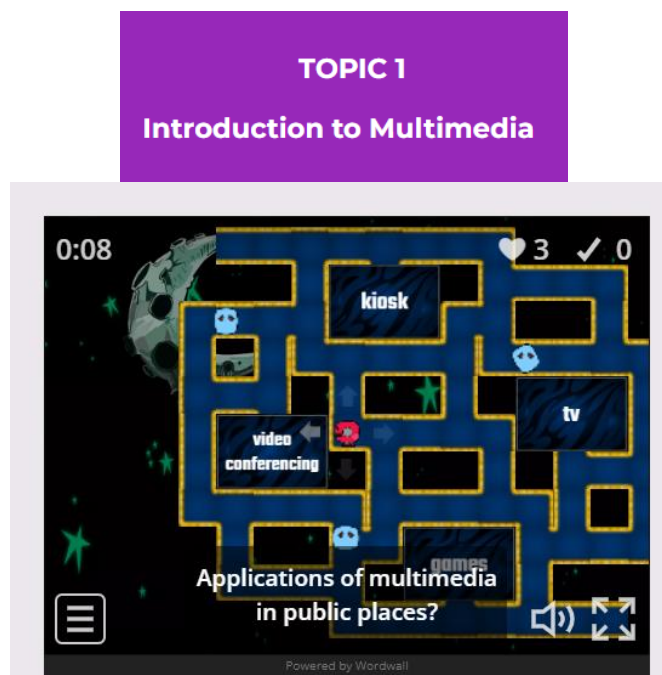


Figure 5: Implementation of Maze Chase game for topic1

Further, 10 set of personalised gaming learning tools has been developed based on the multiway gaming provided by Worldwall tool. These game has been implemented into 10 different topics that consist of collection of fundamental questions. The implementation illustrates in Figure 6. Students that has completed all the topics will send their progress to the instructor personally to consult and gain the rewards.

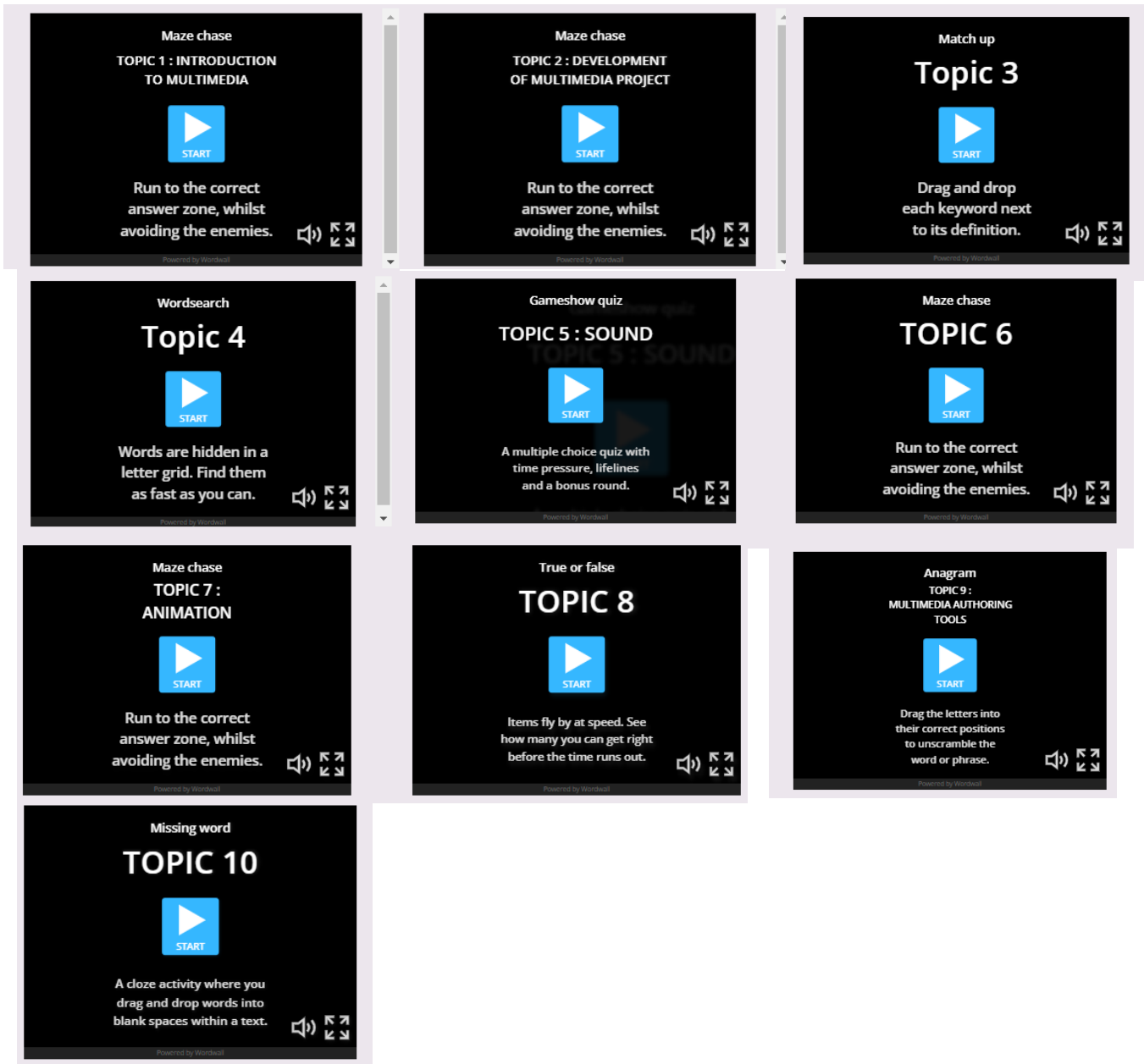


Figure 6: Implementation of various gaming elements applied for personalize persuasion design.

## Conclusion

Implementing persuasive technology into ODL is difficult owing of the variability of students' emotional levels, which changes throughout courses, age, and maturity. The development of FuPal is one of steppingstone for incorporating persuasive technology as one of crucial elements in ODL tools of teaching and learning. In future, students' performance, feedback and more improvement will be reported in this portal.

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## INDUSTRIAL REVOLUTION (IR) 4.0 INNOVATIONS

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### ABSTRACT

*The introduction of Industrial Revolution (IR) 4.0 has brought the creation of innovation either in industries or people's daily life. The implementation of IoT, cloud computing, grid computing, big data and other new fields of IT applications has benefited the manufacturing industries, services in government and corporate agencies as well as the whole human life. As the manufacturing sectors focus to increase productivity by utilising the existing technology or assets, it is believed that IR 4.0 is capable to achieve the goals, vision and mission of the organisations. This paper aims to introduce and explain in detail nine (9) elements of IR 4.0. Furthermore, examples of application for each element are further discussed in terms of industrial, government and human being practices. Implementation of IR 4.0 in education is believed to increase the teaching and learning pedagogies effectiveness, especially in the e-learning area. Nevertheless, to ensure that the dreams can come true, the infrastructures and info structures should be established into Industrial Revolution (IR) so that they can be implemented effectively and able to benefit the organisations and people.*

**Keywords:** *Industrial Revolution (IR), Internet of Things, Big Data, Augmented Reality, Cloud Computing*

### Introduction

Advances in technology change the way humans producing things and delivering services to people. The steps of production in the manufacturing sectors are different from the past due to the enhancement and improvisation of the processes. The advancement of technologies has changed the working conditions and lifestyles of people. These changes of technological advancement over the years are called the industrial revolution.

The industrial revolution started with the first revolution in the 18<sup>th</sup> century. The use of steam power and mechanisation production was popular in the manufacturing industries. The development of steam power for ships and locomotives brought massive changes to the local economy as humans and goods could move great distances in a few hours and days (Desoutter Industrial Tools, 2021). The use of machinery was 8 times better compared to the volume using the labour energy.

The second industrial revolution began in the 19<sup>th</sup> century whereby the electricity component and the production line were the main concern. For example, Henry Ford took the idea of adopting mass production from the slaughterhouse in Chicago and transforming it into automobile production. Previously, the process of assembling an automobile took place at one station until complete, which took

a long time and required a lot of human power. Today, vehicles can be assembled by part on the conveyer belt. Furthermore, they can be completely assembled at the end of the production line, which is significantly faster, low-cost and requires less human power. The third revolution started in the ‘70s in the 20<sup>th</sup> century with the implementation of computing technologies such as memory-programmable controls and computers. The technology automates the entire process without human assistance. Robots are the example of technology that perform the tasks that have been programmed without human intervention.

The 4<sup>th</sup> industrial revolution was characterised by the application of information and communication technologies to industry, which was built with the existence of infrastructures from the 3<sup>rd</sup> revolution and expanded by a network connection. The networking capabilities led to communication with other applications and encouraged the automation of all processes through system integration. Therefore, the smart factories will create an environment where production systems, components and people communicate via a network and production that is nearly autonomous.

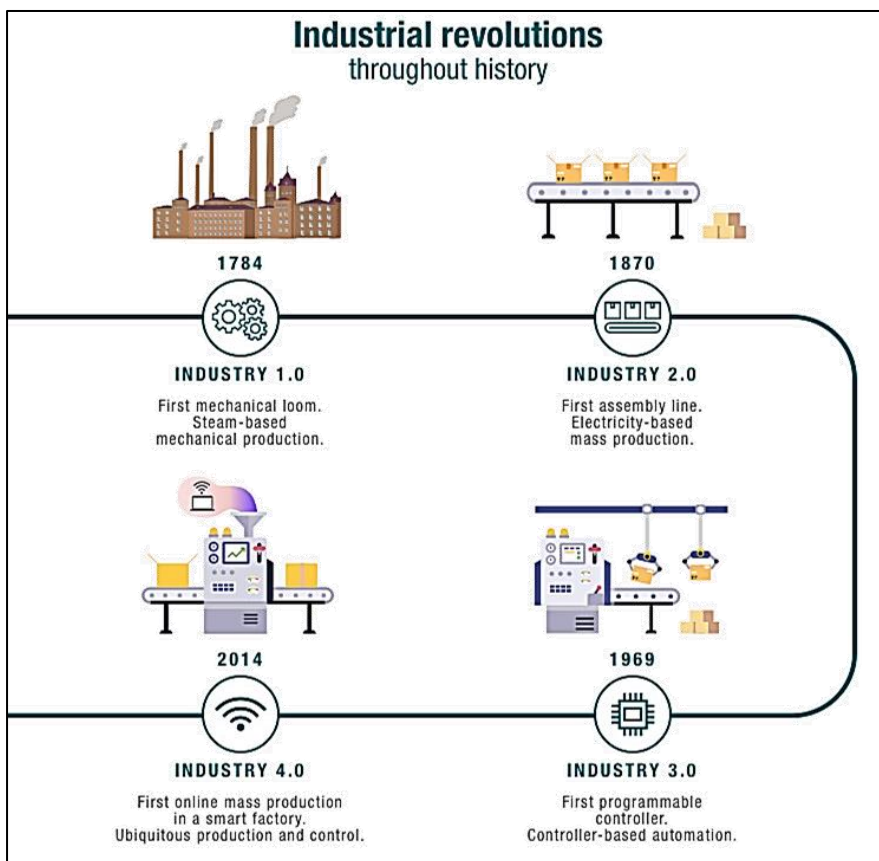


Figure 1: Industrial Revolutions (Adapted from Iberdrola, <https://www.iberdrola.com/innovation/fourth-industrial-revolution>)

### **Industrial Revolution (IR) 4.0 Elements**

Generally, Industry 4.0 concentrates on the growing trends of process automation and data exchanged within the manufacturing industry. Industrial Revolution (IR 4.0) elements include: (i) Internet of Things (IoT), (ii) Cloud Computing, (iii) Augmented Reality (AR), (iv) Simulation, (v) Robotic Automation, (vi) System Integration, (vii) Additive Manufacturing, (viii) Big Data and (ix) Cybersecurity (Erboz, 2017).

#### *i. Internet of Things (IoT)*

IoT allows data transfer between objects and humans. It consists of three (3) main relationships in a digital network; between humans and humans, humans with objects and objects with objects. IoT architecture consists of three (3) layers; perceptions, networks and applications (Yang et al., 2011). The perception layer is referring to the peripherals that collect data from the environment such as barcode, camera digital or RFID. The network layer provides a platform for data transmission and the application layer is the interface between the users and IoT devices. The IoT is made based on the development of technologies, real-time analytics, sensors, wireless systems, automation, control systems and machine learning.

IoT platforms are designed to determine the actions based on the pattern of data detected and performed the required action, make recommendations and find the best solution. For example, when you are driving, the dashboard of your car suddenly displays a red signal indicating that the engine is having a problem. Through IoT technology, the sensor from your car will transmit the data to the car manufacturer. The manufacturer will then analyse the car faults and automatically make an appointment with the owner of the car to fix the fault at the nearest car dealer. Furthermore, the IoT ensures that the replacement parts are ready in stock whenever you arrive at the centre (TWI, 2021).

Many smart homes embedded IoT technology to save energy by automatically turning off the devices whenever the device is unused. Lighting, heating, air conditioning, security systems and other smart devices and peripherals are controlled through smartphones or tablets. Besides, IoT is also applied for healthcare purposes to monitor the sugar level, pulse rate and blood pressure of the patients to avoid serious malfunctions or injuries (TWI, 2021).



Figure 2: Smart home



Figure 3: Propeller sensor in an inhaler to trigger asthmatic attacks

ii. *Cloud Computing*

Cloud computing is on-demand access via the Internet facility, allowing the resources such as application systems, database systems, data storage, development tools, servers, mobiles and networking infrastructures to be used for sharing purposes to reduce capital expenses (Vennam, 2020). Cloud computing helps to lower IT costs by reducing the purchasing, installation and configuration costs as well as managing the resources available at a premise. In addition, cloud computing encourages the use of real-time enterprise applications instead of waiting for a couple of weeks or months for the supplier to install and configure the application at a premise after the purchase.

Generally, cloud computing consists of three common models, namely Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS). IaaS enables the end-users to scale and shrink resources such as the servers, networking and storage based on the needed basis, utilisation, optimisation and overbuying the resources. PaaS provides software developers with on-demand platforms such as the hardware, complete stack of software, infrastructures, development tools for development, running, testing and managing the applications without cost, complexity and inflexibility of maintaining the platform at their premise. Meanwhile, SaaS is also known as a hosted cloud application that needs to be accessed via a web browser. The SaaS users must pay the monthly or annual subscription fee. SaaS offers automatic upgrading and protection from data loss.

The type of cloud computing consists of (1) public cloud, (2) private cloud, (3) hybrid cloud and (4) multi-cloud. The public cloud is a cloud in which the service provider might be making the computing resources accessible for free. Amazon Web Services (AWS), Google Cloud and IBM Cloud are examples of public cloud. Private cloud is only dedicated and accessible by only one customer, hosted at on-premises in the customer’s data centre, highly secure and customised based on the premise infrastructures. Hybrid cloud combines public and private cloud services. The goal of the hybrid cloud is to establish a mixture of public and private resources for flexibility to choose the most optimal cloud for each application. The multi-cloud is the use of two or more types of clouds for two or more different cloud providers. Almost 85% of organisations have been reported using multi-cloud environments.

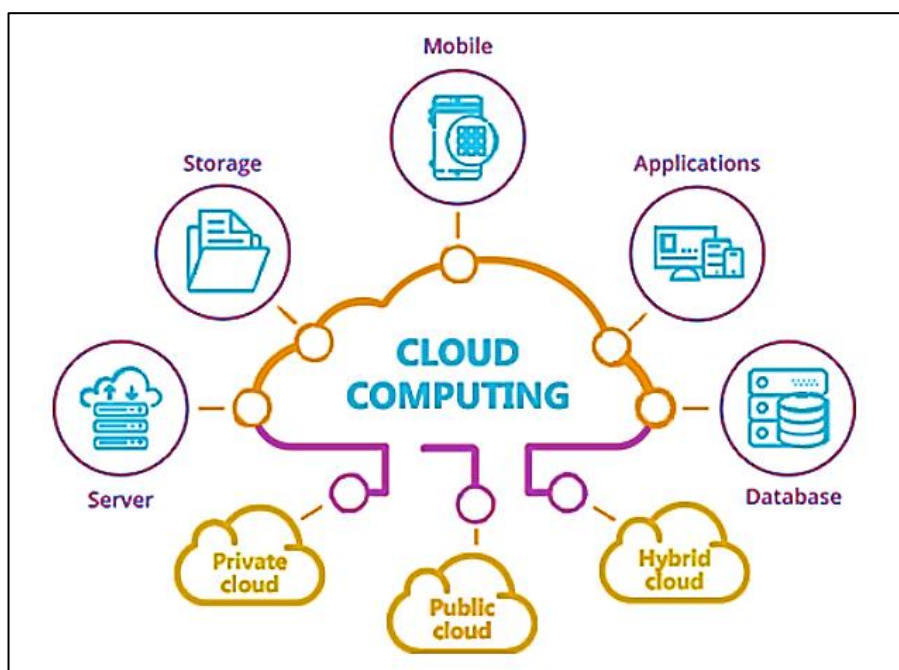


Figure 4: Cloud Computing Frameworks (Adapted from <https://www.networksunlimited.com/cloud-computing-trends-for-2019/>)

iii. *Augmented Reality (AR)*

Augmented Reality (AR) is an enhancement or improvisation of the real physical image upgraded through the use of digital visualisation, sound engineering and other sensory stimulus delivered through the technology. Among the popular AR applications are AcrossAir, Google Sky Map, Layar, Lookator, SpotCrime and PokemonGo.

Augmented Reality (AR) can be categorised into (1) Augmented Reality in 3D viewers, (2) Augmented Reality in Browsers, (3) Augmented Reality Games and (4) Augmented Reality GPS (Anurag, 2017). Augmented Reality in 3D viewers allows the users to put life-size 3D models in their environment with or without the use of trackers. Trackers are the simple images of 3D models that can be linked to Augmented Reality. Examples include AUGMENT and Sun Seeker. The AR browsers can enhance users' camera display with contextual information. For example, when someone points his or her smartphone at a building, its history or estimated value will be displayed. Examples for AR browsers are Argon4 and AR Browser SDK.

AR Gaming software creates mesmerizing gaming experiences that use your actual surroundings. For instance, Pokémon Go, Parallel Kingdom, Temple Treasure Hunt, Real Strike and Zombie Go. AR GPS is generally an application in smartphones that include Global Positioning System (GPS) to spot the users' location and a compass to detect device orientation. Examples for this category are AR GPS Compass Map 3D and AR GPS Drive/Walk Navigation



Figure 5: Augmented Reality in Aircraft Inspection and Maintenance (Adapted from <https://www.ptc.com/en/technologies/augmented-reality>)

#### iv. Simulation

Simulation is a model or representative of a process using computer technology to develop the users' understanding. For example, the operation of an aircraft simulation for the training purposes of new pilots before handling the real aircraft. The computer model mimics the operation of any real application system. The best simulation can help the organisations to estimate better Return of Investment (ROI) before it can be initiated. Besides, simulation also provides a free risk environment to avoid risk on product standards, cost, time and people's life

(Restart 4.0, 2021). Practically, the correct simulation model with the right data would enable organisations to predict future outcomes.

Today, many industrial facilities that concern with reducing the risk and optimising the scheduling processes have implemented industrial 4.0 technologies to improve overall productivity. This will leverage the digital twins and simulation modelling to accomplish the whole process to produce outstanding throughput.



Figure 5: Simulation allows manufacturers to develop the perfect design before the new parts are finalised and invested

v. *Robotic Automation*

Innovations of robotics, automation and artificial intelligence (AI) are the main concern for Industrial Revolution (IR) 4.0 in the manufacturing industry. Robots are generally taking place the repetitive tasks, which encouraged the workers to focus on more exclusive and intensive tasks. The number of new robots created is increasing by approximately 14% throughout the years (Polly, 2022). Factories prefer futuristic robots and humans working side-by-side to meet the global productivity demands. This is the new paradigm of manufacturing that should be prepared by all industries. AI is expected to increase the productivity of the labour by up to 40% by the year 2035.

According to research, 57% of workers indicated that they have shown interest to increase productivity by implementing automation and robots in the working environment. Furthermore, the implementation of robots will create new job opportunities and allowing employers to hire more staff in future (Polly, 2022).

For example, robot technology is currently applied at restaurants to make and send orders to the customers. The business could save its cost by employing many workers and

spaces in the restaurants. In addition, it could reduce human error whenever taking orders from the customers.

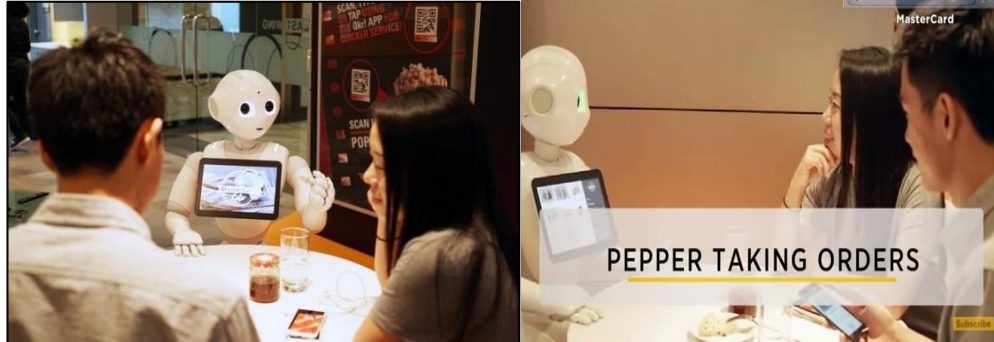


Figure 6: Pizza Hut introduces the robots to greet and take orders from the customers

vi. *System Integration*

System integration is involved in system engineering and information technology fields. It combines various application systems and software packages to create larger and comprehensive systems. The system integration works cohesively in a coordinated and unified manner at optimum operation and occupies all requirements at the strategic management. The systems that have been integrated should be up to date and working properly is one of the main challenges in the system integration process for IR 4.0 (Automation.com, 2015). Another concern is to ensure that the database is secure from cyber threats and attacks besides avoiding any malicious activity.

The following Figure 7 shows a system named MyATP that integrates the systems from Research Management Systems, Publication Management Systems, Consultation Management Systems and Training Information Systems in a single integrated platform for appraisal or staff promotion. The system helps the panel to decide those who deserve a good appraisal or are suggested for the promotion.



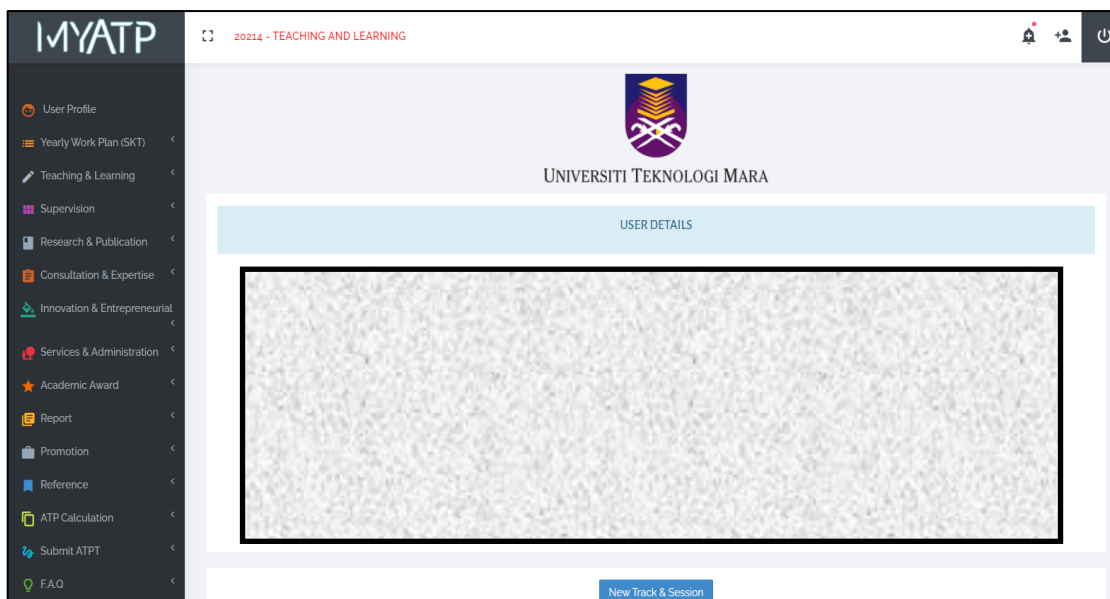


Figure 7: The MyATP system that integrates various existing systems on a platform for appraisal and staff promotion

vii. *Additive Manufacturing (AM)*

Additive manufacturing (AM) technology offers the ability to produce products with lower cost, shorter time of production, less energy and material waste needed during the manufacturing process. The AM promotes the integration of smart technologies and production systems. The manufacturers can innovate complex parts and hence reduce the inventory spaces and transport distances. Furthermore, additive manufacturing encourages making products based on users' demand and even reduces the supply chains (Zimmerman, 2018). AM requires continuous and effective communication between the devices, machines and robots with the existence of adequate digitisation and smooth manufacturing activities.

Additive manufacturing (AM) is commonly applied in the healthcare and aerospace sectors. For example, in the healthcare sector, bioprinting is understood as the production of customising human organs and transplants. Bioprinters artificially construct living tissues by outputting living cells layer upon layer in 3-D structures. Bio-printed tissues are already used in drug toxication tests nowadays, saving money and the health of test subjects during clinical trials. The second sector is the space whereby the AM is feasible for component replacement. Most of the failures at ISS (International Space Station) involve plastics and composites that could be replaced onsite by AM. Besides, AM could make the plastics and other wastes or scraps to be recycled at ISS.



Figure 8: Simplification of the production process will reduce the material and labour costs and the time required to assemble the different parts.

viii. *Big Data*

Big data is an area of integrating data from isolated systems to obtain a complete visualisation. It collects the data, analyses it and facilitates the output in proper representation. Organisations in today's eras seek to achieve business intelligence through the compilation, analysis and sharing of data across all related entities to attain business excellence (nexusintegra, 2021). Big data classifies the huge information that has been collected and organised into relevant conclusion that helps the organisations to improve the operation of the production. The improvement involves the warehousing processes, elimination of bottlenecks in the production, prediction ability on customers' demand through the internal and external analysis beyond the historical data and forecasting on the future maintenance or possible machinery failure or breakdown that affects the production.

Education institutions especially at the tertiary level have introduced the Python programming language to expose the students to the concepts of Big Data. Python has been acknowledged as the fastest-growing programming language. Since Big Data involves a lot of data analysis and scientific computing, Python provides libraries comprising packages such as numerical computing, data analysis, statistical analysis, visualisation and machine learning (nexusintegra, 2021). Nowadays, Python is considered the most popular language for software development owing to its high speed and performance.

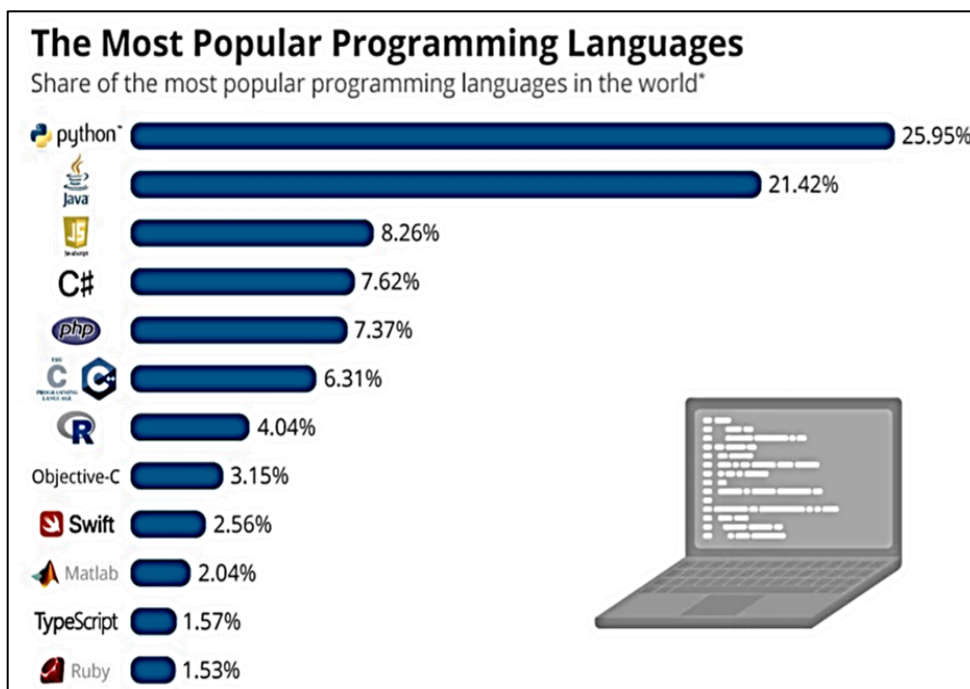


Figure 9: Python was ranked as the most popular programming language, source by PYPL, [http://infographic.statista.com/normal/chartoftheday\\_16567\\_popular\\_programming\\_languages\\_n.jpg](http://infographic.statista.com/normal/chartoftheday_16567_popular_programming_languages_n.jpg)

ix. *Cybersecurity*

Cybersecurity is the most important element in any business to secure data and ultimately human safety. Manufacturing sector is the second most attacked and yet requires a powerful security system to secure the data (Balbix, 2021). Industries are exposed to vulnerability exploitation, malware, denial of service (DoS), device hacking and other common attack methods. There are few challenges facing the industries in the age of IR 4.0; for instance, every connected device represents the potential risks, the isolated systems are exposed to cyber-attack and visibility is very poor across the isolated environment and different systems.

The manufacturing industry is currently emphasising digital transformation, in which Cyber-Physical Systems (CPS) combine physical components and digital networks to revolutionise the way companies automate processes and share information. Besides, the smart factory’s combination of virtual and physical systems makes interoperability and real-time capability possible. Digital transformation ensures the implementation of a proper security system as the key success factor for Industrial Revolution (IR) 4.0.

## Conclusion

Industrial Revolution (IR) 4.0 is the main concern of the Malaysian government to move at par with other world-class countries. The government has spent a lot of money, especially in the education and manufacturing sectors to make sure that the people and industries are ready with these new trends and technologies.

Hopefully, the explanation on IR 4.0 elements will give an overview and sprouting of ideas to instructors for new applications, pedagogy and teaching style innovations of e-learning to improve the teaching skills and effective teaching delivery to learners.

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## REVISITING NOTE-TAKING STRATEGIES FOR MATHEMATICS DURING ONLINE CLASSES

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### ABSTRACT

*Teaching and learning have been done entirely online for the past two years because of the Covid-19 pandemic. Therefore, students should be aware of the good methods for taking notes in class as the ability in doing so will help them grasp important content well. In turn, reading and revising will be made much easier when they need to only refer to their notes which are simple yet complete with important details. The ability to take notes and write them in a way that corresponds with each lecturer's presentation is an art that should be learnt by all students. However, taking notes is sometimes overlooked by many, especially in mathematics. Thus, students should be informed of note-taking strategies and what to address in and review the materials that they need to read. This article aims to share with students some note-taking strategies that may serve as a guide in helping students improve their performance especially in mathematics.*

**Keywords:** *Online classes, note-taking strategies, improve, mathematics*

### Introduction

Taking good notes may help you remember what you learn in class and can be a useful study tool while studying for tests or examinations. It's critical to select the note-taking approach that best suits your study habits and thinking style. While your method of perfect math note taking may differ from that of others, several components are common. Pay attention in class and ask questions if you don't understand something, then experiment with different note-taking strategies until you discover one that works for you. (Cam, 2021). A good note-taking strategy can lead to more efficient study habits, better course results, and better retention of material after a course has ended (Friedman, 2014).

There are several methods for taking notes in school or at university. Some people prefer an organised approach and use an outline technique to take notes, while others prefer a visual approach and construct mind maps, while yet others employ no structure at all. However, there is one note-taking approach that is better than others in many instances, and research has proved that it is not only more efficient, but also makes it much simpler to review notes, such as while studying for an exam. As part of taking good notes, make sure you understand the information as early as possible, so that it can become more consolidated in your memory with repeated exposure to the material. Get ahead at this point by checking up new terms and topics if your professor posts pre-lecture slides for your upcoming class. Although the lecturer has provided lecture notes in the form of PowerPoint slides, OneNote, PDF files, live notes, and other formats, students must also take lecture notes before, during, and after the

presentation. Students should not depend entirely on lecturer-provided notes. They should integrate the notes in the form of their own understanding and creativity.

Research from iversity.org found out that we forget 47% of what we learn after 20 minutes. Or that we only remember 10% of what was said during an audio lecture. In the online learning world, this can make it hard for you to hold on to new information and material. But worry not, you can recall nearly 80% of a lecture by taking and refreshing yourself on your notes. Notes also help you get a clear of idea of the instructor's main points and keep you concentrated.

### **Notes-taking tips for mathematics.**

Taking notes while attending a lecture online might be difficult, especially if you are used to doing so on your computer. Toggling between your online course screen and a separate note-taking screen is challenging. Taking notes, on the other hand, should not be a difficult activity; rather, it should be a straightforward action that assists pupils in remembering what they've just learned. Here are a few tips to make taking notes for online classes a snap.

#### **1) Take notes by hand**

Taking handwritten notes throughout your online course may seem 'old fashioned,' but it may save you time and remove a lot of unnecessary computer processes. You won't have to go back and forth between your class and your typing document, for example. You won't have to pause any of the videos or courses you're watching. Simply take out a pen and paper and begin writing.

#### **2) Don't Write Everything Down**

According to Friedman (2014), while taking notes during an online course, students tend to write everything down. This is mostly due to the lack of textbooks, handouts, and other resources that would typically be supplied in a regular classroom. Writing down as much as possible, on the other hand, might harm a student's ability to study. Too many notes might result in information overload, reducing the amount of content a student can recall later.

#### **3) Option for diagrams or pictures**

When looking back over your notes, diagrams can also help you capture concepts in a form that you can comprehend and absorb fast. If the information available includes a diagram or picture, save it to your computer so you may print it out and add it to your notes later.

#### 4) Review the notes

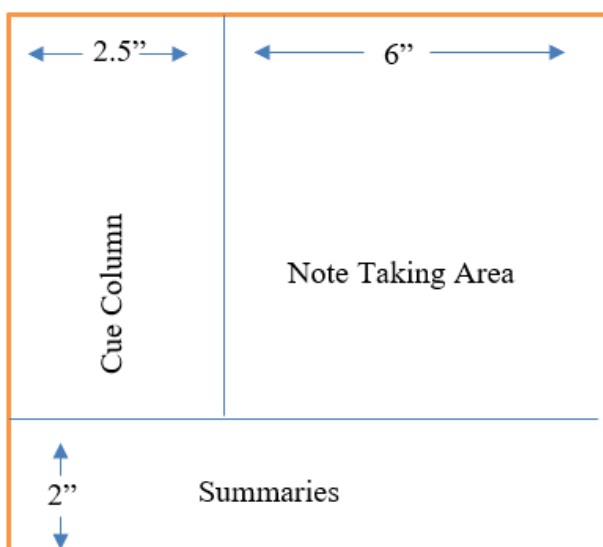
Regardless of whether you take notes by paper, on a computer, or using a phone app, it's a good idea to review your content soon after the online course is over. This is a great time to take notes since the material you've just absorbed is still fresh in your mind.

#### Some suggestion for option of picture and diagram

Draw pictures or diagrams if you're having trouble finding the appropriate words to describe what you're trying to say. They also make it easier to understand and remember information when you're looking back at your notes. Here are some options using this technique.

#### 1) The Cornell Methods

The Cornell technique allows you to condense and organise your notes in a methodical manner without having to recopy them. After you've written your notes in the main area, identify each idea and detail with a key phrase or "cue" in the left-hand space. Rule your paper with a 2-inch margin on the left and a 6-inch margin on the right for notes. During class, jot down notes in the six-inch space. Skip a few lines as the lecturer goes on to a different topic. Complete as many phrases and sentences as you can after class. Create a cue in the left margin for each key piece of information. To review, put a card over your notes, leaving the cues exposed. Say the cue aloud, then say as much of the information below the card as you can. When you've stated everything, you can, move the card and check to see if what you said matches what's written. You know it if you can say it.



**Note Taking Area** - Record the lecture as completely and effectively as possible.

**Cue Column** – Keep the cue column empty while you're taking notes. Immediately after the lecture, reduce your notes to just few short scribbles as hints.

**Summaries** – Sum up each page of your notes in a sentence or two.



2) **Three Column Method**

Students can use the three column notes method to write a question, an answer, and an example. As a result, students will have the opportunity to go deeper into the meaning of the term or phrase by putting it into question form, finding an answer to the question they have written, and presenting an example of the word/phrase in context that they may come across.

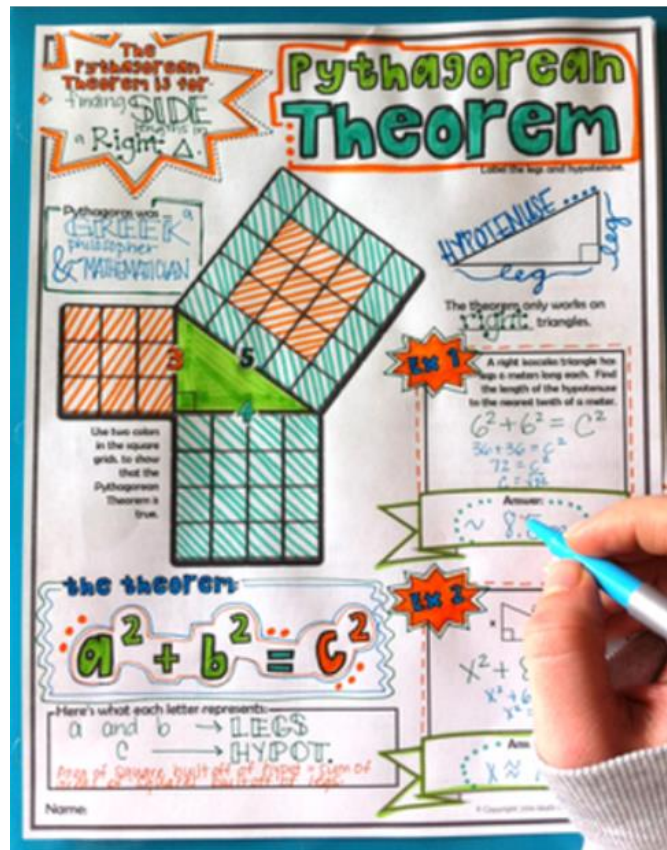
Make three equal columns on your pages. The three-column method, unlike the Cornell Method, is developed particularly for use in math lectures. To better organise your notes, you'll use each column for various types of material. With a ruler, divide the page into three pieces by drawing two lines from the top of the lined portion to the bottom. You may want to draw your separating lines using a marker or different coloured ink to make them stand out.

Problem	Solution	Explanation
Find an equation of the line with slope 4 that contains the point (2, =1).	Step 1: $y = 4x + b$	Substitute 4 for the "m" in $y = mx + b$ ; "m" is the slope.
	Step 2: $-1 = 4(2) + b$	Replace x with 2 and y with =1 in the equation.
	Step 3: $-1 = 8 + b$	In ordered pairs, the first value is for x, the second is for y.
	Step 4: $-9 = b$	Multiply to simplify.
	Step 5: Equation: $y = 4x - 9$	Solve for b by subtracting 8 from both sides.
	Step 6: $-1 = 4(2) - 9$ Is this true?	Replace the "b" with -9 in the equation $y = 4x + b$ .
	Step 7: $-1 = 8 - 9$ YES	Check the answer by substituting the x and y values in the answer.

Key Words	Examples	Explanations/Rules
Distributive Property	$2(3x - 1) = 10$	Distribute to clear ( ).
Add the opposite of Term FIRST.	$6x - 2 = 10$ $\frac{-2 \quad +2}{6x \quad = \quad 12}$	Add the opposite of the term, -2, to eliminate the term & compensate on other side by doing the same.
Divide by factor LAST.	$\frac{6x}{6} = \frac{12}{6}$ $x = 2$	Divide by the factor, 6, to eliminate the factor & compensate by doing the same to the other side.
		When x is all alone on one side, the equation is <u>solved</u> .

- Step 1 : Record each problem step in the ‘Examples’ section.
- Step 2 : Record the reason for each step in ‘Explanations/Rules’ section by using abbreviations, short phrase (not sentence) or key words, formulas and properties.
- Step 3 : Record key words and concepts in left hand side section either during or immediately after lecture by reworking the notes.

3) Doodle Notes Strategy



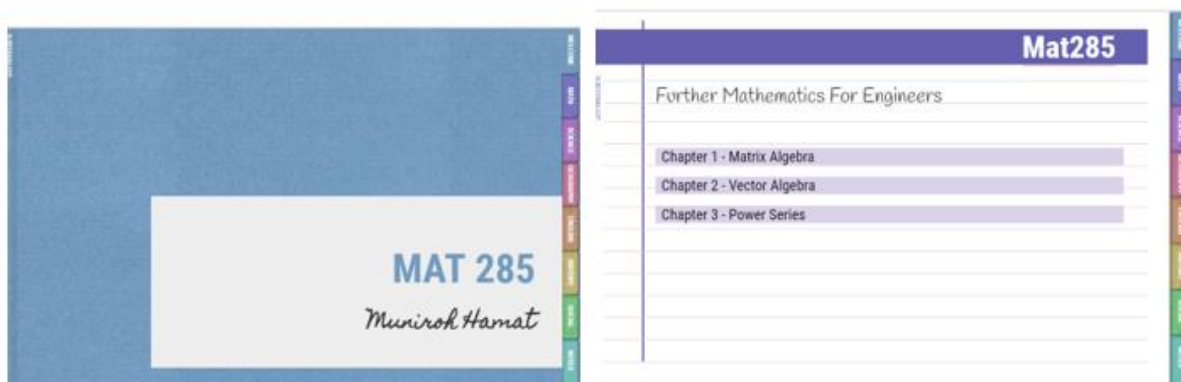
Doodling and colouring in a left-brain oriented subject like mathematics increases communication across the corpus callosum, the bundle of nerve fibres that divides the brain's two hemispheres. Relaxation is an extra benefit. These doodle notes, like the new adult colouring book therapy trend, can assist to reduce mathematics anxiety.

A recent study found that doodling really increases focus and recall of new knowledge. Students may utilise coloured pencils and the right side of their brains to recall important terminology, mathematical examples, and new ideas more easily with these colour-it-in, doodle-friendly note techniques.

4) Digital Notebook with section



Digital notebooks for distance learning and 1:1 classroom. Landscape and Portrait versions. Students can use it as is in Google Slides or PowerPoint or they can duplicate as many pages as they want or need, then save the file as PDF and use it with apps such as Good Notes, Notability or any PDF reader that supports handwriting with a stylus.



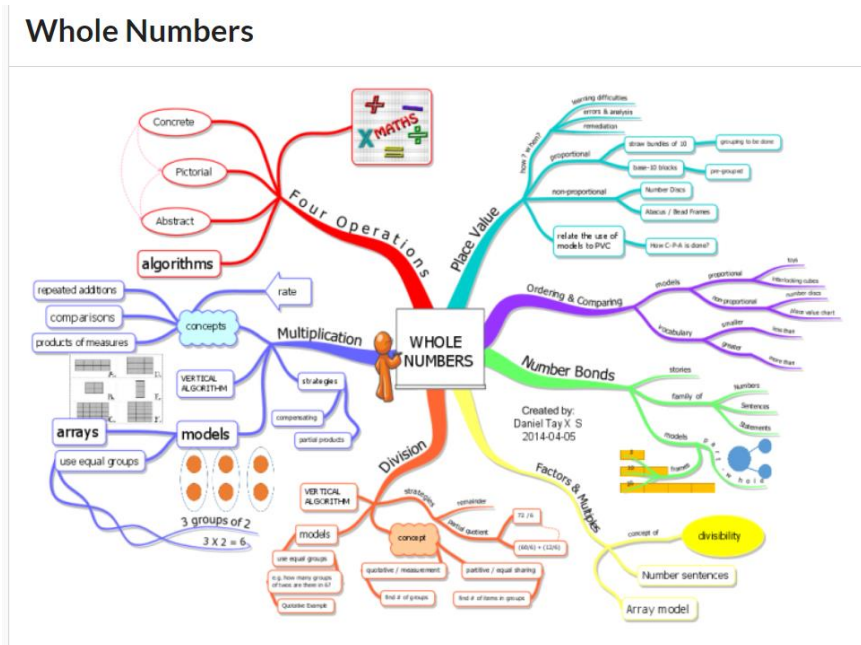
### 5) The Boxing Method



To begin, students should study and read mathematical notes twice: once while writing them and again when placing them in boxes. It's easier for me as a visual thinker to keep notes on different topics separated. It makes it easier for students to remember and recall them at the appropriate moments. It's easy to focus on one box at a time when studying. Because we don't want the boxes to be very long or wide, the notes are significantly shorter. When students use ruled/quad ruled paper, they can use the space much more efficiently. It's simple to move notes around using it.

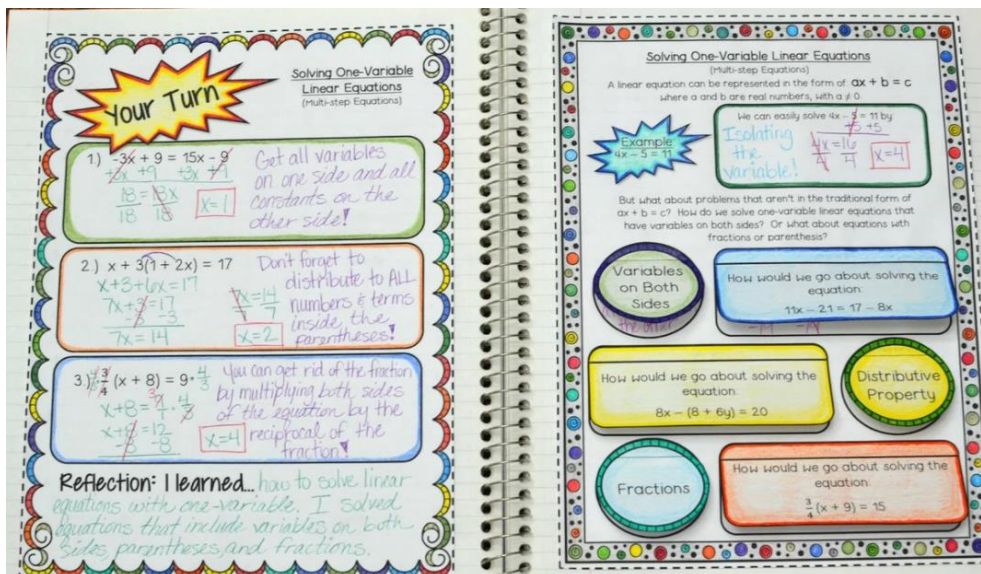
### 6) The Mapping Method

Mind mapping is a process where all the brainstorming, such as designing a business strategy, investigating an error, defining an approach to achieve a specified target, learning a complex concept or subject, etc. It is done via graphical illustrations, typically using a well-labelled diagram. A mind map comprises a box that represents the main topic of the plan or strategy. This box can then be further extended with the help of several small boxes that represent categories or parts, and with even smaller boxes to denote subcategories, and so on.



7) **Foldable**

A foldable graphic organizer is one that folds in some way. In the last few years, foldables have been used to help engage students in the classroom. There has been a large push in recent years to move towards a classroom with more hands-on learning and student-centered classrooms. Foldables were created to help present material that would otherwise be given in direct instruction or notes in order to engage students and get them to do the thinking.



## Conclusion

However, the best note-taking strategy for you will depend on your learning needs as well as the type of learner you are. Logical learners such as students in mathematics classes the methods that better to use are involved with logic, reasoning, patterns, and other systems to understand new information. The best note-taking method for logical learners is those that involve associations or connecting seemingly unrelated ideas together, such as the Boxing Method, Charting, or Mapping.

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## GEOGRAM: DIGITAL GAME-BASED LEARNING TOOL FOR IMPROVING BASIC GEOMETRIC KNOWLEDGE

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### ABSTRACT

*Geometry refers to the mathematical study of shapes and space. Students should be able to memories the formulas for the basic shapes and spaces in order to solve geometry problems. Calculation problems will arise due to a lack of knowledge and skills in identifying basic geometry's formula. The goal of the development of GeoGram is to provide students with an edutainment experience in which they can review and improve their knowledge of basic geometry formulas. We designed a game to teach students simple and quick self-learning techniques that they can use at any time. As a game platform, we used a PowerPoint spinning-wheel created by tekhnologic and a tangram created by mathigon. We modify the spinning wheel by adding a task for the player to complete. After spinning the wheel, the player must complete the goal of creating a diagram using the tangram platform by using the provided formula. GeoGram, which includes an edutainment component, will assist students in improving their understanding of geometry formulas. Based on the results of a pre-test and a post-test, students are better able to solve basic geometry applications after being introduced to the GeoGram.*

**Keywords:** *geometry, game-based learning, spinning-wheel, tangram, self-learning*

### Introduction

Students have a number of misconceptions, a lack of prior knowledge and basic operation errors in the topic of geometry (Özerem, 2012). Geometry has become one of the most difficult subjects for students to learn because it requires students to have strong cognitive abilities as well as spatial skills (Buchori et al., 2017). They also lack understanding and application of geometric concepts (Carroll, 1998). As a result, we created a digital game-based learning tool called GeoGram to assist students in resolving this issue. The purpose of this GeoGram is to provide students with an edutainment experience in which they can refresh and improve their basic geometry formula knowledge. Geogram is a digital game that teaches students quick and simple self-learning strategies that they can use at any time.

GeoGram is created using the PowerPoint software. It combines the use of spinning-wheels in PowerPoint developed by tekhnologic's (2018) and tangram on mathigon's website (2022). A spinning wheel is commonly used as a teaching tool. Botelho et al. (2019) and Beck & Gong (2013) used the spinning wheel as a teaching aid in their research. Deddiliawan et al. (2019) discovered that the used of spinning wheel as an educational tool, was beneficial. They discovered that using spinning-wheel element could help students become more interested in the learning process, resulting in better conceptual understanding. Students' visualisation and analytical thinking skills may enhance.

Tangram was used in the development of GeoGram because it contains a STEM learning tool. The use of tangram helps preschool-aged children develop a variety of important STEM skills (Brewer, 2020). Tangram can also be used by teenagers. Tangram is a simple concept with profound brain-growth implications. Tangrams aid in the development of problem-solving abilities as well as geometrical concepts (Shofan, 2014).

## Methodology

### Development Process

A tangram created by mathigon and a PowerPoint’s spinning wheel created by tekhnologic were used to create a game platform. We change the spinning-wheel by displaying the basic geometry formula on it. Figure 1 depicts the GeoGram development process. The basic geometry formula, the PowerPoint’s spinning-wheel and the tangram are all combined.

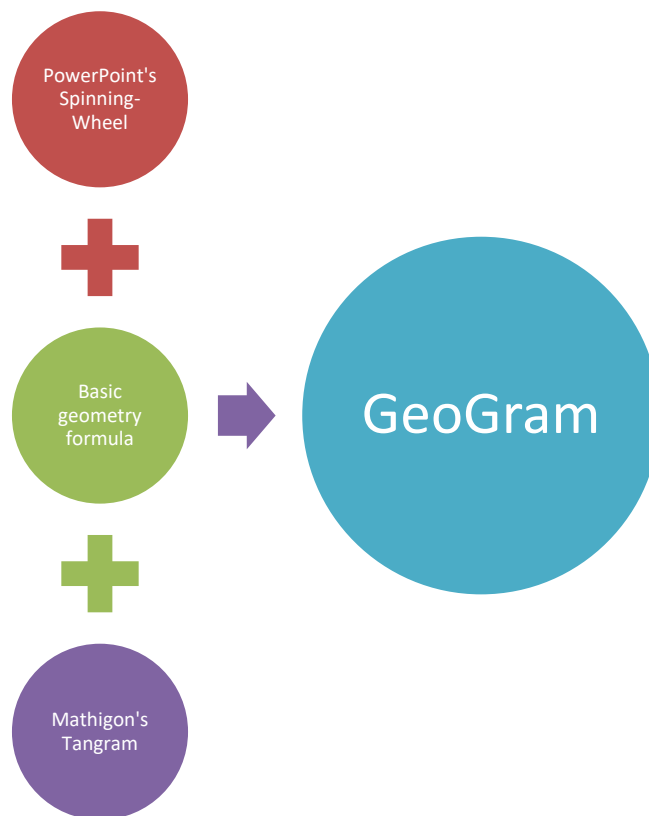


Figure 1: Development process of the GeoGram

### GeoGram Elements

An instruction manual or user manual can be displayed on the first page of GeoGram. It will assist players in understanding the method to play quickly or when they become stuck. Figure 2 shows the user manual of the GeoGram.



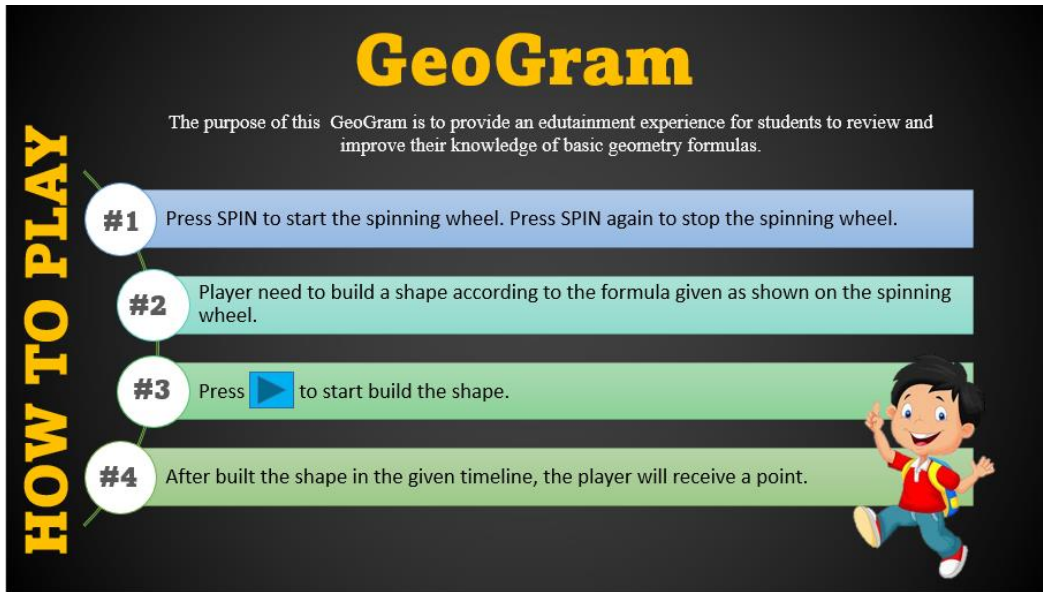


Figure 2: User manual of the GeoGram

The basic geometry formula can be seen near the spinning wheel, as shown in Figure 3. It will aid the player in recalling the basic geometry formula. The player must construct a shape after spinning the spinning-wheel using the number of shapes and formulas specified on the spinning-wheel. If players are unable to identify the formulas, they can refer the formulas in a list displayed on the same screen.

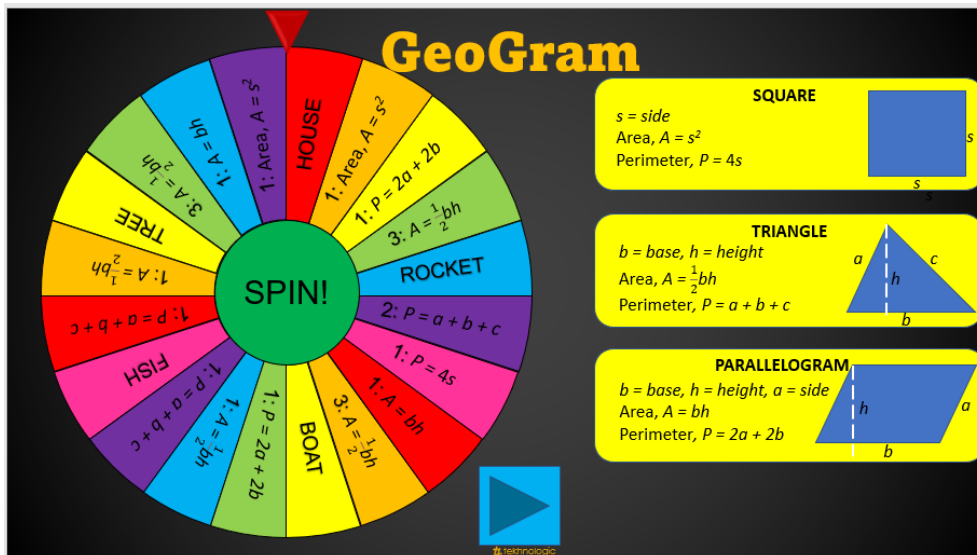


Figure 3: GeoGram interface

Players must press the play button to get to the tangram website. Figure 4 shows the Mathigon website, the platform to play the tangram in online mode.

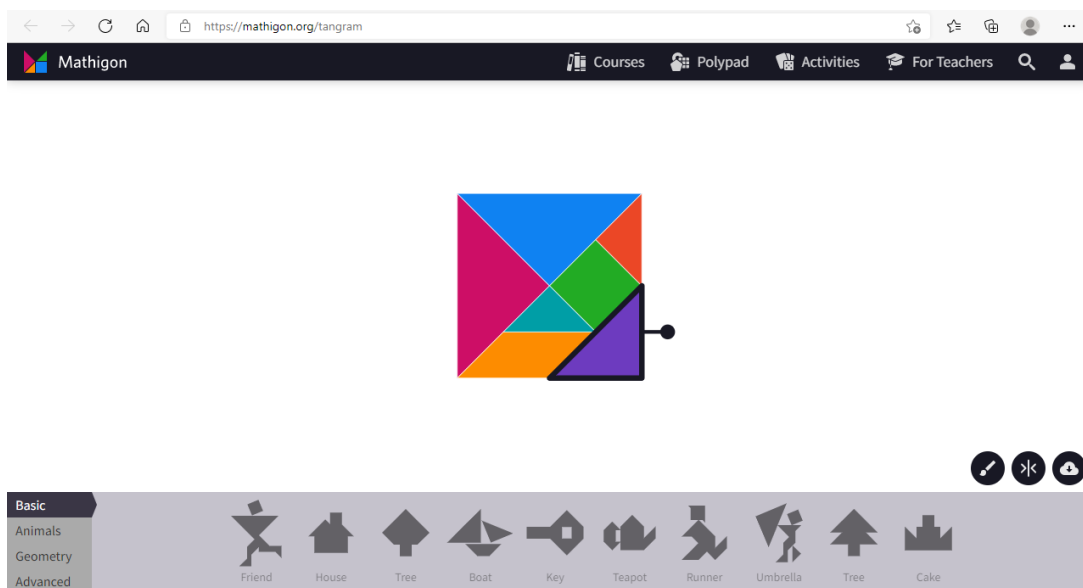


Figure 4: Mathigon website

### Playing GeoGram

For example, if the spinning-wheel lands on a house plot, the player is suspected of building the house with one square, three triangular and one parallelogram, as shown in Figure 5.

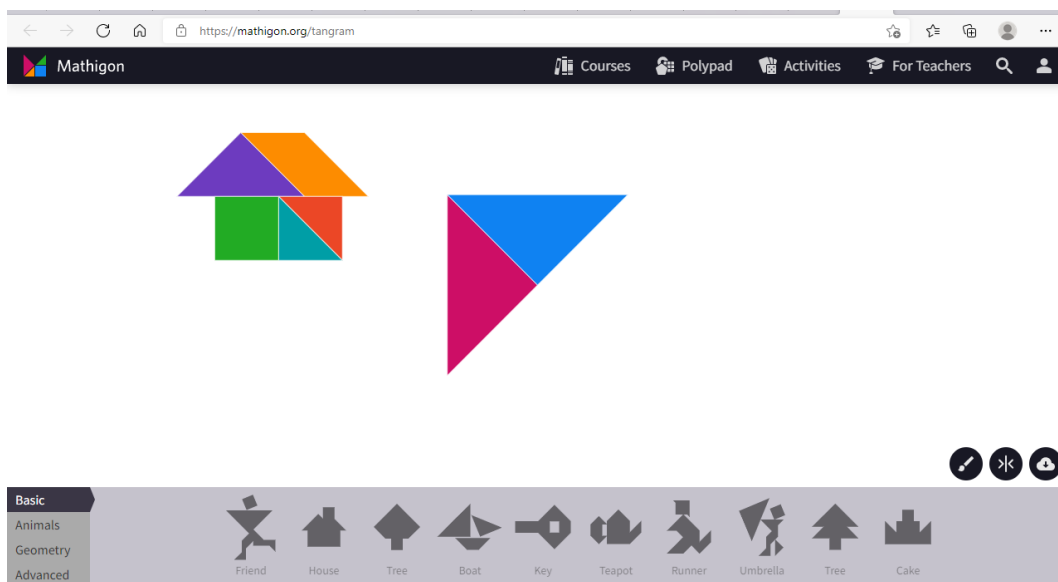


Figure 5: Sample of building a house

## Result and Discussion

A total of 25 Pra Pendidikan Tinggi’s students from UiTM Cawangan Pulau Pinang who is taking Intensive Mathematics 1 (MAT037) course for the semester, October 2021-February 2022 were participated in this study. Pre-test questions about basic geometry are assigned to students. The students are then instructed to play GeoGram. The deadline for them to play GeoGram is in two days. After two days of playing the GeoGram game, students are asked to complete a post-test. Figure 6 shows the pre-test and post-test questions that were distributed to students via Google Form.

1. Find the area of a square clipboard whose side measures 12 cm. * 1 point	4. Find the perimeter of a triangle whose sides are 5 cm, 4 cm and 2 cm. * 1 point
<input type="radio"/> a. 24 cm <sup>2</sup>	<input type="radio"/> a. 9 cm
<input type="radio"/> b. 48 cm <sup>2</sup>	<input type="radio"/> b. 11 cm
<input type="radio"/> c. 96 cm <sup>2</sup>	<input type="radio"/> c. 8 cm
<input type="radio"/> d. 144 cm <sup>2</sup>	<input type="radio"/> d. 10 cm
2. If length of side of square is 3cm, then find its perimeter. * 1 point	5. If the base of a parallelogram is equal to 5 cm and the height is 3 cm, then find its area. * 1 point
<input type="radio"/> a. 6 cm	<input type="radio"/> a. 25 cm <sup>2</sup>
<input type="radio"/> b. 12 cm	<input type="radio"/> b. 9 cm <sup>2</sup>
<input type="radio"/> c. 9 cm	<input type="radio"/> c. 15 cm <sup>2</sup>
<input type="radio"/> d. 3 cm	<input type="radio"/> d. 7.5 cm <sup>2</sup>
3. What is the area of a triangle with base b = 3 cm and height h = 4 cm? * 1 point	6. If a = 10 cm and b = 5 cm, then the perimeter of a parallelogram is * 1 point
<input type="radio"/> a. 6 cm <sup>2</sup>	<input type="radio"/> a. 15 cm
<input type="radio"/> b. 12 cm <sup>2</sup>	<input type="radio"/> b. 50 cm
<input type="radio"/> c. 9 cm <sup>2</sup>	<input type="radio"/> c. 20 cm
<input type="radio"/> d. 16 cm <sup>2</sup>	<input type="radio"/> d. 30 cm

Figure 6: Pre-test and post-test’s questions

According to the results of the pre-test and post-test as shown in Figure 7, students are better able to solve basic geometry applications after being introduced to the GeoGram.

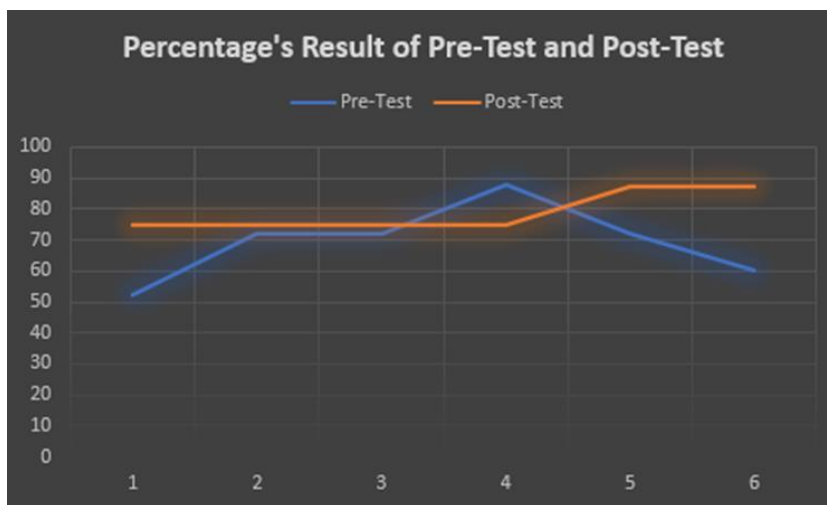


Figure 7: Percentage's result of pre-test and post-test

Learning through play helps students improve their performance and makes learning more enjoyable. They also enjoy completing the task because it allows them to develop their creativity. GeoGram will help students remember the basic geometry formula. This finding is consistent with the findings of Seher & Kendir, 2013. They discovered that students in the experimental group had developed a more positive attitude toward geometry.

**Conclusion**

GeoGram includes an element of edutainment or learning through play. GeoGram combines students' knowledge of basic geometry formulas with their creativity in building a two-dimensional shape. The game combination encourages students to complete the overcoming challenge in order to improve their performance in the activities, making learning more enjoyable. Students enjoy completing the game because it allows them to express their creativity.

GeoGram can be used in STEM programmes involving secondary and higher education students. STEM education is important because it fosters an interest in innovation and teaches critical thinking skills. STEM education teaches students how to think critically in order to solve problems. Participating in STEM learning experiences teaches students how to examine problems and then devise solutions (Lynch, 2019).

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## HUBUNGAN ANTARA GRED MATEMATIK SPM DENGAN TAHAP PENCAPAIAN DALAM PEMBELAJARAN STATISTIK

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### ABSTRAK

*Sejak akhir-akhir ini, pencapaian pelajar dalam subjek Matematik dan Statistik di peringkat pengajian tinggi didapati semakin menurun. Terdapat kajian yang dilakukan oleh penyelidik menyatakan ianya berpunca dari kelemahan asas Matematik semasa di peringkat sekolah menengah. Dengan ini, kajian kuantitatif ini bertujuan untuk mengenalpasti hubungkait di antara gred Matematik Moden dan Matematik Tambahan Sijil Pelajaran Malaysia (SPM) dengan tahap pencapaian dalam subjek Statistik di peringkat lebih tinggi iaitu di institusi pengajian tinggi. Kajian kes dijalankan kepada 31 pelajar yang mengambil subjek Statistik. Gred markah bagi Matematik Moden dan Matematik Tambahan SPM diambil melalui borang soalselidik. Keputusan markah peperiksaan akhir semester bagi subjek Statistik diambilkira untuk dijadikan ukuran sebagai pembolehubah bersandar. Analisis deskriptif dan ujian korelasi digunakan dalam kajian ini. Dapatan kajian berdasarkan deskriptif mendapati bahawa pelajar yang mendapat gred Matematik Moden SPM yang baik juga mempunyai markah yang agak baik dalam subjek Statistik. Walaubagaimanapun, ujian korelasi menunjukkan bahawa ianya tidak signifikan. Dengan ini, tidak terdapat bukti yang kukuh menyatakan wujudnya perkaitan di antara gred Matematik Moden SPM dengan pencapaian subjek Statistik. Seterusnya, perbandingan deskriptif data di antara gred Matematik Tambahan SPM dengan subjek Statistik pula mendapati terdapat hubungkait yang positif. Berdasarkan nilai Ujian Korelasi menunjukkan bahawa nilai p adalah signifikan dengan nilai korelasi  $r = 0.378$  yang agak rendah iaitu hubungan linear positif yang lemah di antara gred Matematik Tambahan SPM dengan pencapaian markah subjek Statistik. Secara keseluruhannya dalam kajian ini, pencapaian subjek Statistik di peringkat ijazah kurang dipengaruhi oleh pencapaian Matematik Moden dan Matematik Tambahan SPM.*

**Katakunci:** Matematik Moden, Matematik Tambahan, Sijil Pelajaran Malaysia (SPM), Statistik, Ujian Korelasi

### Pengenalan

Statistik merupakan suatu proses untuk mendapatkan data dan seterusnya data tersebut diorganisasi, dianalisis, dan juga ditafsir untuk dibuat kesimpulan. Statistik bukan sahaja penting dalam aspek pembelajaran dan pengajaran, namun ianya juga penting dalam bidang kerjaya. Pembelajaran berkaitan statistik telah diperkenalkan sejak dari sekolah rendah lagi dan diteruskan sehingga ke sekolah menengah. Di peringkat pengajian yang lebih tinggi, subjek statistik juga perlu diambil oleh para pelajar memandangkan ianya banyak digunakan dalam keperluan pembelajaran misalnya dalam penghasilan projek penyelidikan tahun akhir, tesis dan kertas kerja. Namun sejak kebelakangan ini, terdapat kemerosotan pencapaian markah dalam subjek statistik ini.

Berdasarkan tinjauan literatur oleh penyelidik lain, kebanyakannya mengkaji hubungan gred Matematik SPM dengan subjek Matematik lanjutan di peringkat lebih tinggi misalnya bagi pelajar tingkatan 6, pra-universiti, diploma dan juga ijazah. Pelbagai dapatan yang ditemui berdasarkan sampel

kajian masing-masing.

Berdasarkan Siti, Noor'Aina, Maisurah dan Fadzilawani (2017) mendapati bahawa pelajar pra diploma mendapat skor yang agak rendah sekiranya gred Matematik Moden SPM kurang cemerlang dan sebaliknya. Namun, kajian ini hanyalah memberi penekanan kepada asas matematik sahaja. Terdapat perbezaan pula dengan kajian yang dijalankan oleh Maisurah, Noor 'Aina, Siti dan Fadzilawani (2017) yang menemui dapatan bahawa pelajar yang cemerlang dalam Matematik Moden SPM tidak semestinya mempunyai tahap asas matematik yang baik.

Asiahwati (2017) mendapati bahawa pelajar yang mendapat gred Matematik SPM yang cemerlang berada dalam tahap numerasi yang tinggi. Dapatan juga menunjukkan wujudnya hubungan linear positif yang sederhana kuat antara gred Matematik SPM dengan tahap numerasi pelajar lepasan menengah (Tingkatan 6) dalam bidang Nombor.

Nor, Nurul, dan Amran (2019) mendapati bahawa terdapat kesinambungan pengetahuan dan kemahiran matematik bagi Matematik SPM, Matematik Kejuruteraan 1, 2 dan 3. Sehubungan itu, pelajar-pelajar perlu menguasai kesemua kemahiran matematik yang asas bagi membolehkan mereka mendapat skor yang cemerlang bagi matematik di peringkat seterusnya.

Hasil dapatan Husnira, Marina dan Rohayu (20118) dari analisis regresi menunjukkan bahawa terdapat hubungan positif yang signifikan antara pencapaian Matematik SPM dengan pencapaian Matematik Kejuruteraan 2 di politeknik dan ini juga membuktikan bahawa Matematik Tambahan SPM adalah salah satu medium untuk kecemerlangan pelajar dalam bidang Kejuruteraan Matematik 2 di politeknik.

Mat, Noor dan Ashari (2001) pula mendapati terdapat hubungkait yang rapat pencapaian akademik bagi pelajar kejuruteraan elektrik di UTM dengan pencapaian matematik dan sains di peringkat SPM dan PMR. Kajian ini juga menemui dapatan bahawa pelajar yang berasal dari Sekolah Menengah Harian mempunyai hubungan korelasi yang positif dengan prestasi pelajar elektrik berbanding Sekolah Menengah Sains.

Kajian ini pula mengkaji hubungan Matematik Moden SPM dan Matematik Tambahan SPM dengan pencapaian markah bagi subjek Statistik di peringkat ijazah. Namun, kajian ini hanyalah merangkumi kajian kes bagi sebilangan kecil pelajar sahaja iaitu hanya melibatkan pelajar kejuruteraan awam sahaja.

## Metodologi

Kajian yang dijalankan melibatkan pengumpulan data daripada 31 orang pelajar bagi peringkat ijazah yang mengambil subjek Statistik. Gred Matematik Moden dan Matematik Tambahan semasa SPM diambil bagi tujuan analisa deskriptif. Ianya diklasifikasikan mengikut prestasi gred. Jadual 1 berikut merupakan gred yang digunakan semasa SPM.

Jadual 1: Gred Markah SPM

Klasifikasi	Gred Matematik Moden/ Matematik Tambahan SPM
1	A+, A, A-
2	B+, B
3	C+, C
4	D, E
5	G

Markah bagi subjek statistik juga diklasifikasikan mengikut prestasi gred. Jadual 2 berikut merupakan gred markah yang digunakan bagi subjek statistik di peringkat ijazah.

Jadual 2: Gred Markah Subjek Statitik (Ijazah)

Klasifikasi	Gred Markah Subjek Statistik
1	A+, A, A-
2	B+, B, B-
3	C+, C
4	D+, D
5	E, F

Analisis deskriptif digunakan untuk melihat perbandingan pencapaian bagi dua peringkat yang berbeza iaitu di antara peringkat SPM dan peringkat ijazah. Seterusnya, Ujian Korelasi dijalankan untuk menguji dengan lebih signifikan hubungan linear di antara Matematik SPM dengan subjek Statistik di peringkat ijazah.

## Analisis dan Perbincangan

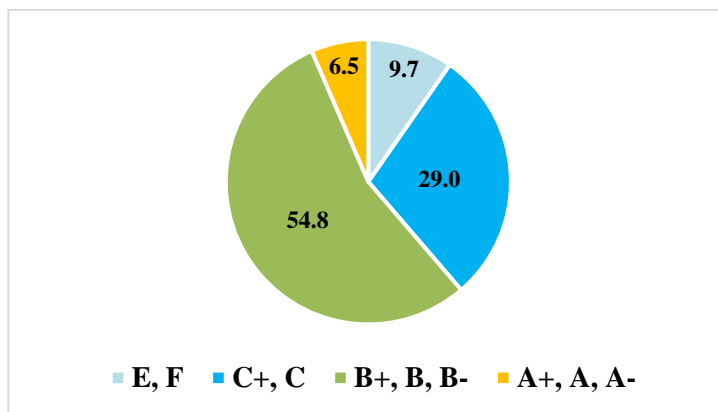
Jadual 3 dan Rajah 1 berikut menunjukkan bilangan pelajar dan peratus min markah mengikut gred bagi



subjek Statistik. Didapati majoriti pelajar mendapat keputusan B+, B dan B- iaitu sebanyak 54.8%. Ini diikuti dengan peratus sebanyak 29% bagi pelajar yang mendapat gred C+ dan C. Peratus pelajar yang mendapat gred A+, A dan A- adalah dengan minoriti iaitu kurang dari 10%. Ini menandakan tidak ramai yang mendapat keputusan yang cemerlang.

Jadual 3: Keputusan Markah Statistik (Ijazah) Mengikut Gred

	Jumlah Pelajar	Peratus (%)
Gred	E, F	3
	C+, C	9
	B+, B, B-	17
	A+, A, A-	2



Rajah 1: Peratus Markah Subjek Statistik (Ijazah) mengikut gred

Jadual 4 menunjukkan bilangan dan peratus pelajar mengikut gred bagi subjek Statistik (Ijazah) dan Matematik Moden SPM. Dapat diperhatikan bahawa terdapat juga pelajar yang tidak lulus dan mendapat gred C+ dan C dalam subjek Statistik (Ijazah) walaupun gred Matematik Moden SPM adalah cemerlang. Kebanyakan pelajar yang cemerlang semasa SPM mendapat B+, B dan B- dalam subjek Statistik (Ijazah) iaitu sebanyak 54.8% dan sebanyak 25.8% yang mendapat C+ dan C. Dapat diperhatikan sekiranya pelajar tersebut mendapat gred B+, B dan B- bagi Matematik Moden SPM, pelajar ini hanya mendapat gred di antara C+, C, E dan F bagi subjek Statistik (Ijazah) dengan peratus yang agak rendah.

Jadual 4: Keputusan Gred Statistik Mengikut Gred Matematik Moden SPM

		Matematik Moden			
		B+, B, B-		A+, A, A-	
		Bilangan	Peratus	Bilangan	Peratus
Statistik (Ijazah)	E, F	1	3.2%	2	6.5%
	D+, D	0	0%	0	0%
	C+, C	1	3.2%	8	25.8%
	B+, B, B-	0	0%	17	54.8%
	A+, A, A-	0	0%	2	6.5%

Jadual 5 di bawah menunjukkan min markah bagi subjek Statistik (Ijazah) mengikut gred Matematik Moden SPM. Didapati min markah Statistik (Ijazah) bagi pelajar yang cemerlang semasa Matematik Moden SPM adalah lebih tinggi iaitu sebanyak 60.79.

Jadual 5: Min Markah Statistik (Ijazah) Mengikut Gred Matematik Moden SPM

Matematik Moden	Min Markah Subjek Statistik (Ijazah)	Jumlah Pelajar
B+, B, B-	47.50	2
A+, A, A-	60.79	29

Seterusnya Ujian Korelasi dijalankan untuk mengetahui secara statistiknya kesignifikanan hubungan di antara markah Statistik (Ijazah) dengan gred Matematik Moden SPM.

Jadual 6: Ujian Korelasi di antara Matematik Moden SPM dan Statistik (Ijazah)

Matematik Moden SPM		
	Korelasi Spearman, r	.253
Statistik (Ijazah)	Sig. (2-hujung), p	.169
	N	31

Berdasarkan Jadual 6, nilai  $p = .169$  adalah tidak signifikan ( $p > 0.05$ ). Dengan ini tidak ada bukti kukuh yang dapat mengatakan terdapat hubungan linear positif di antara markah Statistik (Ijazah) dengan gred Matematik Moden SPM.

Seterusnya, analisis deskriptif dijalankan untuk mengetahui hubungan di antara pencapaian Statistik (Ijazah) dengan Matematik Tambahan SPM. Jadual 7 berikut menunjukkan bilangan dan peratus pelajar

mengikut gred bagi subjek Statistik (Ijazah) dan Matematik Tambahan SPM. Secara keseluruhannya, dapat diringkaskan bahawa keputusan Matematik Tambahan SPM yang agak baik juga mempengaruhi markah Statistik (Ijazah). Namun dapat juga diperhatikan walaupun pelajar mendapat prestasi Matematik Tambahan SPM sekitar C+, C dan C-, pelajar ini juga berupaya mendapat markah yang agak baik di dalam subjek Statistik (Ijazah). Berdasarkan analisa didapati bahawa peratus kegagalan dalam subjek Statistik (Ijazah) adalah dari kelompok pelajar yang mendapat gred yang rendah dalam Matematik Tambahan SPM.

Jadual 7: Keputusan Gred Statistik (Ijazah) Mengikut Gred Matematik Tambahan SPM

		Matematik Tambahan					
		C+, C, C-		B+, B, B-		A+, A, A-	
		Bilangan	Peratus	Bilangan	Peratus	Bilangan	Peratus
E, F		3	9.7%	0	0%	0	0%
Statistik	C+, C, C-	7	22.6%	1	3.2%	1	3.2%
(Ijazah)	B+, B, B-	8	25.8%	9	29.1%	0	0%
	A+, A, A-	1	3.2%	1	3.2%	0	0%

Jadual 8 berikut pula menunjukkan min markah bagi subjek Statistik (Ijazah) mengikut gred Matematik Tambahan SPM. Hanya seorang pelajar sahaja yang mendapat gred cemerlang dalam Matematik Tambahan SPM jika dibandingkan dengan Matematik Moden SPM iaitu seramai 29 orang yang mendapat gred cemerlang. Dapat diperhatikan wujudnya hubungan positif jika dibandingkan dengan dua kumpulan pelajar yang mendapat gred di antara C+, C, C- dengan B+, B, B- bagi Matematik Tambahan SPM. Min markah pelajar bagi subjek Statistik (Ijazah) adalah lebih tinggi bagi pelajar yang mendapat B+, B dan B- jika dibandingkan dengan pelajar yang mendapat C+, C dan C- iaitu sebanyak 67.91 dan 55.42.

Jadual 8: Min Markah Statistik (Ijazah) Mengikut Gred Matematik Tambahan SPM

Matematik Tambahan	Min Markah	
	Subjek Statistik (Ijazah)	Jumlah Pelajar
C+, C, C-	55.42	19
B+, B, B-	67.91	11
A+, A, A-	58.00	1

Seterusnya, Ujian Korelasi dilakukan untuk mengetahui hubungan di antara markah Statistik (Ijazah) dengan gred Matematik Tambahan SPM. Kekuatan hubungan ditunjukkan oleh pekali korelasi. Pekali korelasi,  $r$  mempunyai nilai bermula 0 dan sehingga 1. Nilai  $r = 0$  menunjukkan tiada korelasi dan  $r = 1$  menunjukkan korelasi yang tinggi. Nilai  $r$  adalah sangat lemah bagi  $0.01 \leq r \leq 0.30$ , lemah sekiranya terletak dalam selang  $0.31 \leq r \leq 0.50$ , sederhana sekiranya terletak dalam selang  $0.51 \leq r \leq 0.70$ , kuat sekiranya terletak dalam selang  $0.71 \leq r \leq 0.90$  dan sangat kuat apabila  $r$  terletak dalam selang  $0.91 \leq r \leq 1.00$  (Chua, 2008).

Jadual 9: Ujian Korelasi di antara Matematik Tambahan SPM dan Statistik (Ijazah)

Matematik Tambahan SPM		
	Korelasi Spearman, $r$	.378*
Statistik (Ijazah)	Sig. (2-hujung), $p$	.036
	N	31

Berdasarkan hasil keputusan dalam Jadual 9 di atas, didapati bahawa nilai  $p = .036$  ( $p < 0.05$ ) adalah signifikan. Namun pekali korelasi,  $r = 0.378$  menunjukkan bahawa terdapat hubungan linear positif yang lemah di antara pencapaian markah Statistik (Ijazah) dengan gred Matematik Tambahan SPM. Ini mungkin disebabkan hanya seorang pelajar sahaja yang mendapat gred yang cemerlang bagi Matematik Tambahan SPM dan nilai ini mungkin memberi kesan kepada keputusan analisis.

## Kesimpulan

Berdasarkan kajian ini, didapati bahawa hubungan Gred Matematik Moden dan Matematik Tambahan dengan pencapaian markah subjek Statistik (Ijazah) adalah tidak begitu ketara di mana hubungannya adalah agak lemah. Ini berkemungkinan besar sampel kajian adalah tidak begitu meluas iaitu hanya terhad kepada 31 orang pelajar sahaja dan hanya mengambil subjek Statistik. Namun, dapat juga diperhatikan bahawa hubungkait ini hanya berkait dengan segelintir pelajar sahaja yang mempunyai hubungan markah Statistik dengan gred semasa SPM. Tidak dinafikan terdapat pelajar yang sentiasa berusaha memperbaiki ilmu asas pemahaman matematik sehingga berjaya memperbaiki kelemahan dari semasa ke semasa. Terdapat juga pelajar yang cemerlang semasa SPM namun mendapat prestasi yang kurang memuaskan apabila memasuki ke peringkat yang lebih tinggi. Semua ini terjadi mungkin disebabkan oleh persekitaran pembelajaran yang kurang sesuai ataupun terdapat faktor-faktor lain contohnya seperti faktor minat, sikap pelajar, kaedah pengajaran tenaga pengajar dan dorongan ibu bapa. Penyelidik seterusnya disarankan untuk menggunakan bilangan sampel yang lebih meluas agar kajian seperti ini dapat menghasilkan output yang lebih signifikan.

Justeru itu, peranan tenaga pengajar adalah perlu untuk mengatasi masalah ini. Tenaga pengajar mungkin boleh mengubah sedikit teknik pengajaran misalnya dengan menjalankan pembelajaran statistik secara interaktif dengan menggunakan aplikasi atau sistem yang bersesuaian bagi sesetengah topik untuk menarik minat pelajar dalam pembelajaran statistik ini. Tenaga pengajar juga boleh mengadakan bengkel yang berkaitan untuk menaikkan motivasi pelajar dan seterusnya berkongsi ilmu berkaitan penguasaan konsep dan kemahiran dalam pembelajaran statistik yang boleh dimanfaatkan oleh para pelajar.

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## MatVec: A ONE-STOP PLATFORM FOR IMPROVING STUDENT SKILLS IN MATRICE AND VECTOR CALCULATION

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### ABSTRACT

*Students who are lack of knowledge and awareness of skills in calculating matrices and vectors will struggle to solve mathematical problems involving vector calculus. To overcome the problem, thus 'MatVec' was developed as a one-stop platform consists of a video and a flipbook. These items provide students with simple and quick self-learning strategies available at any time and from any location. MatVec was created using digital technologies, highlighting the instructor's short video that covers a manual approach of determinant, dot product and cross product calculation so that students can polish their knowledge and understanding. MatVec centralizes its information in Google Classroom as the main platform and it has assisted students in improving their grades in their examination results. This can be clearly shown in the passing rate of the MAT455 final exam results for mechanical students at Universiti Teknologi MARA Cawangan Pulau Pinang for two consecutive semesters, the increment from 85.7% in semester March 2021-July 2021 to 96.6% in October 2021-February 2022. The improvement in students' grades suggests that the methodology of incorporating digital technologies as additional learning tools is significant and beneficial.*

**Keywords:** one-stop platform, matrices, vectors, self-learning, digital technologies

### Introduction

Mastery of matrices and vectors was required for calculus students in order to solve mathematical problems relating to vector calculus topics. Vector calculus is an important branch of mathematics and it relates two important branches of mathematics, namely vector and calculus. In mathematics, calculus inclusive of the study of changes, while vector represents a physical quantity that has a magnitude as well as a fixed direction. Before starting vector calculus, students need to recall some principles of vector algebra, such as representation, addition of vectors, determinant, dot product, and cross product. Calculus students who are lack of knowledge and awareness of skills in calculating matrices and vectors will struggle to solve mathematical problems involving vector calculus. Students need to have a solid base of appropriate mathematical content coupled with an equivalently strong set of mathematical process skills, allowing them to apply their knowledge successfully. Insufficient levels in basic mathematics will cause students to have trouble in solving the mathematical problem (Steve, 2019).

There are two principle reasons that contributed to the difficulties students face with vector calculus topics. First is the lack of knowledge and awareness of skills in calculating matrices and vectors. The second issue is the lack of basic skills in using a calculator or any software to calculate

matrices and vectors. In addition, the facts that this group of students have left calculus for more than two years and were not offered certain calculus courses during their diploma level are among the main reason of the poor performance. Thus, how successfully calculus students master matrices and vectors and how skillfully they apply both topics in their calculation of mathematical problems are crucial concerns. Therefore, it is important to develop a learning platform that aims to assist students in their preparation for the topic of vector calculus by recognising the problems in matrices and vectors.

Nowadays, there is a common focus on raising student achievement while integrating platform technology as a tool. Msomi (2018) found that when modern technology is used as a supplement to the traditional methods of teaching such as an e-learning platform, it could have a positive impact on the first-year mathematics students. According to Walker and Keeffe (2010), there may be changes in students' performance in mathematics if technology can be embedded in teaching and learning. Furthermore, Lin et al. (2017) confirmed that the application of blended learning by combining the Moodle online teaching platform with traditional instruction showed a significant effect on academic achievement. This method can assist them to learn mathematics at their own pace, while expressing their opinions and concerns on the topics. Overall, their research result indicated that the interaction of students in mathematics using an e-learning platform in the classroom creates prospects for gaining access and understanding various demonstrations of mathematical concepts (Forster, 2006; Swan, 2010). They concluded that the technology integration has the following benefits inclusive of the increment of the students' motivation, engagement, collaboration, as well as their hands-on learning opportunities. These allow them to increase the students' confidence, and technology skills at all level (Kevin, 2014).

In this study, we develop a one-stop platform for education and learning. The learning platform is called MatVec. MatVec is derived from the words "matrix" and "vector". The goals of MatVec are to assist students in enhancing their knowledge and understanding skills in the calculation of matrices and vectors. It also provides learners and educators with an interactive and comprehensive environment. In this innovation, we use digital technologies to make short videos highlighting the instructor's video that covers a manual approach, a short video showing how to use a scientific calculator and a Symbolab Calculator, also a flipbook that includes short notes, systematic examples. Not only that, we also provide live activities and exercises which contain gaming feature, allowing activities to be auto-marked and also a video and flipbook to provide students with simple and quick self-learning strategies that they can use anytime and anywhere. The utilisation of MatVec in Google Classroom is essential to streamline and organise these learning platforms.

The aim of developing MatVec is to explore effective platform in digital technology in order to

improve the cognitive performance of calculus students, promote life-long learning and also to support self-learning strategies that are simple and efficient in measuring the academic performance on the students' final exam scores and enhancing their grades in matrices and vectors subjects. Thus, we applied the MatVet to students in e-Fundamental Engineering Seminar (eFES) for two consecutive semesters and monitor the students' performance and feedbacks from this platform.

## **Methodology**

### ***Product Development***

MatVec is made up of four components, as illustrated in Figure 1: Google Meet, live activities, YouTube and flipbook. The Google Meet includes an engaging live stream, managed by a facilitator who has experience in teaching calculus courses. Students are divided into groups and assigned a task. They must present the solutions. The facilitator will make comments and provide feedbacks. This two-way communication will improve students' understanding and calculation skills.

Students were then given notes and handouts in the form of pdf files and a flipbook. This pdf file and flipbook are available for download from Google Classroom. While short videos were created using digital technologies, emphasizing on the instructor's video that covers a steps-by-steps calculation. This will help students to improve their knowledge and understanding of the determinant, dot product and cross product topics. MatVec also includes a short video that shows how to calculate determinant, dot product, and cross product with a scientific calculator and a symbolab calculator. These brief videos are available on YouTube and students can watch the videos at any time and from any location. It can also be downloaded from the YouTube video and watch it later.

Moreover, live activities contain games created with Liveworksheets, Canva, and Genially. Liveworksheets can transform traditional printable worksheets into self-correcting interactive exercises that students can complete online and send to the facilitator. Canva and Genially both offer interactive learning tools. These live activities include auto-marked elements that allow students to repeat the exercise until they understand the topics.





Figure 1: The components of MatVec Model

### Data Collection

MatVec have been initially used in the e-Fundamental Engineering Seminar (eFES) in October 2021. This seminar is conducted for the third semester (*penerapan*) Mechanical Engineering students at Universiti Teknologi MARA, Cawangan Pulau Pinang, involving sixty-five students who were taking the Calculus for Engineer (MAT455) courses for that semester. The online five-point Likert-scale questionnaires were created using Google Form and for the data collection process. The link was share at the end of the Google Meet session. The obtained data were then analysed using Google Form - responses. Table 1 shows the research question for analysing student satisfaction of FES and using MatVec. This questionnaire was adapted from Student Satisfaction Survey developed by Nemanja (2019) and Pool of Questions for Seminar Evaluation developed by Friedrich-Alexander-Universität (2015).

Table 1: Research Question of Student’s Satisfaction

RQ	Item
1	FES is beneficial to ' <i>Penerapan</i> ' students and should be continued
2	The applications in the modules are very interesting and help to improve my skills in graphing, using e-calculator and solving matrix-vector problems
3	The Google Meet Session improves my basic understanding of MAT455, and all the lecturers are very helpful

The results of MAT455 final exams for mechanical students will also be analysed for three semesters: October 2019 - February 2020, March 2021-July 2021 and October 2021-February 2022. The seminars were handled solely through Google Meet during the semester of October 2019-February 2020. Students were not given any additional materials, such as videos, flipbooks or interactive exercises. Students were introduced to one-stop platform called eFES during the semesters of March 2021–July 2021 and October 2021–February 2021. MatVec was also used during this seminar.

### Result and Discussion

Figure 2 shows the student’s satisfaction with joining FES. 52.3% of students strongly believe that FES is beneficial to *Penerapan* students and should be continued. Overall, 96.9% supports that FES is beneficial and contains elements that can help them recall their understanding and skills in calculating some calculus and algebra topics, such as matrices and vectors. Only 3.1% stays in natural or indecisive zone.

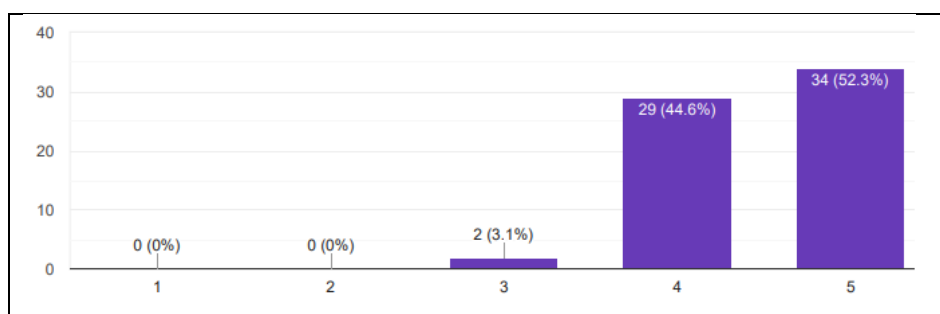


Figure 2: Student’s satisfaction joining FES

Figure 3 shows that 56.9% of students are well-satisfied with the material provided in FES. They believe that the modules' applications are very interesting and that they will help them improve their skills in graphing, using an e-calculator and solving matrix-vector problems. MatVec, for example, includes an interactive element that can stimulate their interest during their revision.

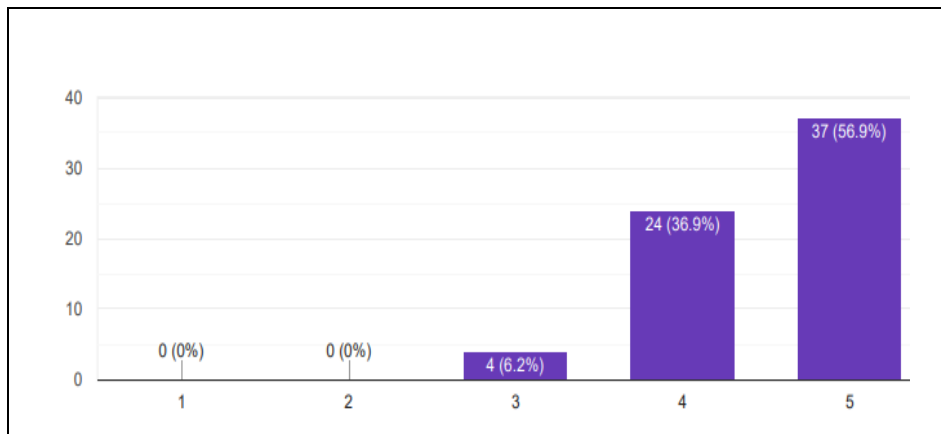


Figure 3: Student’s satisfaction with material provided in FES

Figure 4 shows the student’s satisfaction with Google Meet session. 58.8% of students agree that the Google Meet Session improves their fundamental understanding of MAT455. This expected outcome is due to the two-way communication and active interactions between students and facilitators during the Google Meet session.

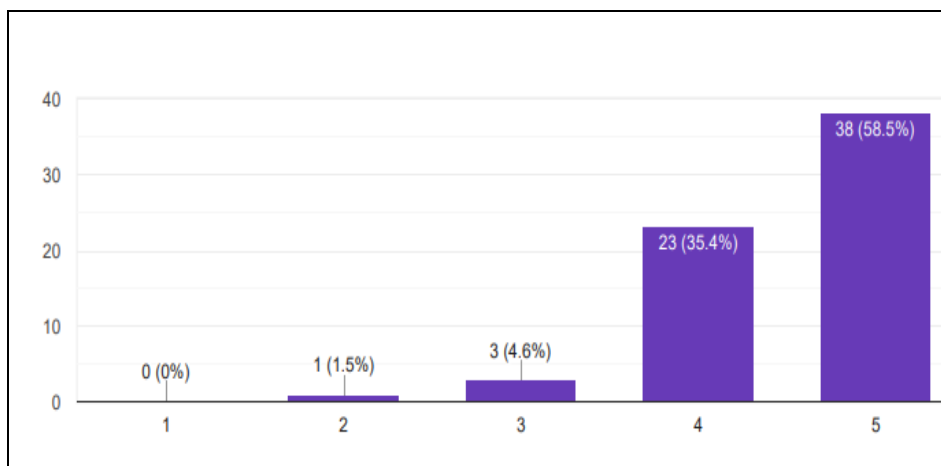


Figure 4: Student’s satisfaction with Google Meet session

Figure 5 depicts the MAT455 final exam results for mechanical students over three semesters. The chart shows that the passed results are consistent for the first two semesters, which were during the implementation of FES and eFES. Following the second eFES, the passing rate increased from 85.7% to

96.6%. The strong students' acceptance rate on the the internet-based learning style where they can revise borderlessly using the one-stop platform that eFES provides, made the outcomes possible.

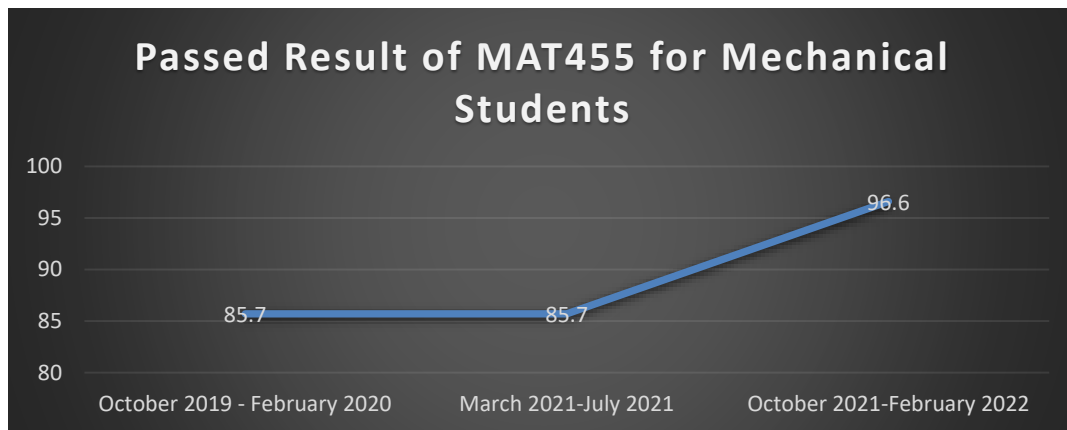


Figure 5: Final exam results for mechanical students over three semesters

### Conclusions

This study investigates the effectiveness of MatVec learning platform adoption and implementation in enhancing the students' learning skills and performance of students' grades. The use of MatVec contributed to the success of their examination results, as evidenced by the passing rate of the MAT455 final exam results for mechanical students at Universiti Teknologi MARA, Cawangan Pulau Pinang, which increased from 85.7% in semester March 2021-July 2021 to 96.6% in October 2021-February 2022. The fact that the improvements in the students' grades suggest that the applications of hybridizing and integrating digital technologies as additional learning tools is significant and beneficial. This is because of the development of MatVec were designed by considering the theories of learning and the understanding of the students' psychological needs and interests in comprehending the problems. Thus, MatVet fulfilled as one of the solutions as a one-stop platform model. It provides students with simple and quick self-learning strategies by using digital technologies, assist students in repeating exercises because live activities can be auto-marked and presents the correct answer, systematically directs and assists students' attention to the content as the flipbook was designed to be short, straightforward and appealing. Thus, it provides engaging experience between students and educators.

Furthermore, MatVec can be considered as an effective learning platform for students, as it allows them an opportunity to construct knowledge, and also allows possible collaboration with peers and learning groups within and beyond the classroom environment. Different learning strategies can

also be provided to students with different learning backgrounds, to create successful learning experiences.

Finally, students positive feedbacks on the use of the MatVec learning platform after experiencing it during the eFES seminar supports the effectiveness of this platform. Most students successfully demonstrated their ability to overcome the difficulties in solving matrices and vector problems that were given to them in the seminar. Therefore, it can be suggested that one way to improve the performance of calculus students is through embedded technologies such as MatVec, which can be used as a monitoring tool in measuring the students' performance. This platform can help to reduce the failure rate among calculus students and provide instructional practises that enhance the maximum effects on instruction and student outcomes. According to Msomi (2018), due to the large use of technology in the world we are living in, there is no doubt that the use of technology in teaching and learning has great impacts on how students perceive and absorb knowledge. Thus, it is very essential and unavoidable to use integrated tool such as MatVet if we are to make a lasting impact on how students learn and comprehend knowledge.

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## **MOLP: AN EASY AND INTERACTIVE WAY TO LEARN MATHEMATICS USING ONLINE LEARNING PORTAL**

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### **ABSTRACT**

*Learning mathematics can be done in many ways. However, during this Covid-19 pandemic, the most effective way of learning is through online learning where students can get all the information about the lesson quickly on the internet. Online learning portals can be a useful way to gather all the information and can be accessed easily by the students. Therefore, MOLP was developed as a one-stop center to combine all the interactive materials together. It can be an easy and interactive way to learn mathematics using online learning portal. MOLP was specifically developed for Pre-Commerce students who is learning Intensive Mathematics 1. A survey has been conducted to understand the student's limitations with the distribution of the current learning materials and their satisfaction in using MOLP. All the respondents agree that MOLP can help them in their studies, and they fully recommend MOLP to their friends.*

**Keywords:** *MOLP, one-stop center, interactive*

### **Introduction**

The rise of different forms of online learning platforms allows users to access all the information needed easily. Learning portals are special informatic tools which can provide effective usage of information learning on the internet. It is an online learning tools which provide a set of learning materials that are combine and stored in one place and can be accessed over the Internet.

Learning portals provide many advantages to categories of users. Student use portals for creative expression, interactive communication and for adopting new knowledge to speed up the learning process while educators use portals for interactive communication among themselves, information, cooperation, and specialization in their field. Besides that, parents can get latest information about their children study place and activities, while the education institution itself can provide information on anything related to the institution to the outside users (Anton & Nadia, 2007).

Learning Management Systems (LMS) are online learning portals where it provides a two-way communication between the educators and students. Besides accessing the learning materials, students can also communicate with their lecturers through the forums provided in the LMS (Chiang, Ahmad Fauzi & Wong, 2010). Most of the education institutions nowadays provide their own LMS for the ease of educators and students. Though, this LMS depends on the lecturer to upload all the materials whether in document or slide and student need to download the materials for them to read the content. Some

other lecturers will use different platform such as Google Classroom and Ms Teams to deliver the materials to the students. However, like other LMS, this platform needs the students to download all the shared materials and store it in their storage devices.

MOLP was being developed to overcome this problem as it can be a one stop center for students to get all the materials easily. Besides that, the content in MOLP is interesting and interactive as it is created using latest online tools such as TikTok and Wordwall. The contents are also being presented using animated videos. Hence, MOLP do not only provide interactive online materials to students but also will help the students to understand during their revision.

### **Literature Review**

The main platform to develop MOLP is by using Google Sites. Google Sites is a straightforward and user-friendly platform. It is a tool that can be done to create a webpage using plain text and webpage creator do not need to have knowledge on HTML. Besides, Google Sites provide template-based system which can be customized easily. It is the easiest way to make information accessible to people who need quick and up-to-date access (Kalyan, 2020).

MOLP features includes notes which are developed using MS PowerPoint. Animations are applied to the slides and are converted into videos to make it more interactives. PowerPoint can be a very easy and useful tools for all the students to create notes after they have learnt each lesson in class. In order to prepare a good and easy presentation, PowerPoint is the most chosen platform to be used (Undrill & McMaster, 2013). It has also been widely used by students and academicians as it enables them to quickly make better, neat, and professional presentations (Amadi & Origi, 2017).

Furthermore, MOLP also contain video features which are being developed using TikTok applications. TikTok is a video-sharing social networking apps which is rapidly growing. Besides sharing other contents, TikTok can be a very useful tools for sharing knowledge (Fiallos, Fiallos & Figueroa, 2021). Ichsan and Ulya (2021) in their studies agree that most students prefer using TikTok video as a learning tool as it is more interesting and enjoyable. Throughout 2018, the TikTok application has dominated the App Store with more than 500 million downloads where most of TikTok users are known to be young generations.

Lastly, exercises feature in MOLP consists of Mathematics examples and solutions which are also created using PowerPoint. On the other hand, to make MOLP more interesting, students can test their knowledge after learning each chapter by playing games provided in MOLP. These games were



created using Wordwall. Wordwall is a gaming platform which contains a collection of related work and can be converted to interesting activities or games (Jasmine & Schiesl, 2009). Wordwall activities can be very useful to get students understanding after they have learnt each topic (Callella, 2001).

## **Methodology**

This online learning portal was developed using the 7 steps in developing web-based system (digitalsilk.com, 2022). The first step is to define the project that we have chosen which is MOLP. MOLP is an online learning portal which is aimed to provide interactive materials to pre-commerce students who is taking basic mathematics course.

The second step is to plan the portal by creating a storyboard. A storyboard is an effective way to visually present information, explaining a process, and showing the passage of time. The main purpose of storyboard is to create a story by using a set of sequential drawings. By breaking a story into linear, bite-sized chunks, it allows the developer to focus on each cell separately, without distraction (Sherman, 2022).

The next step is designing the website by looking at the user interface. It is very important to choose the suitable color palette, logo, and images in your portal. These elements should remain consistent across all the pages. After that, start planning and creating your web content. Contents are created based on the target of audience. In MOLP, content consists of the landing or starting page which consists of all the features in MOLP, and other pages consists online and interactive learning materials for the users to view and use such as notes, videos, and exercises.

Start to develop the portal by choosing a suitable tool. Developers need to have some knowledge and experience in developing website using certain tools. Many web development tools are available in the market such as Microsoft Front Page and Adobe Dreamweaver. For expert developers, they can use HTML (Hypertext Markup Language), ASP (Active Server Page) or PHP (Hypertext Preprocessor). However, by using Google Site, it is more user friendly, and less knowledge is needed when developing a website using this tool. However, each web development tools provide different features and functionalities, and should be built with the ability to scale and match the website functionality and growth potential.

Once the portal is fully developed, test the functionality of each feature provided in the portal. The aim is to detect any issues such as broken links and compatibility with different devices to ensure everything works properly. In the end, the portal should be maintained from time to time. Depending on

the current situation, update should be done by increasing the number of pages, add more functionalities and features and more. Below are MOLP interfaces:

*MOLP Interfaces*



Figure 1: MOLP main page

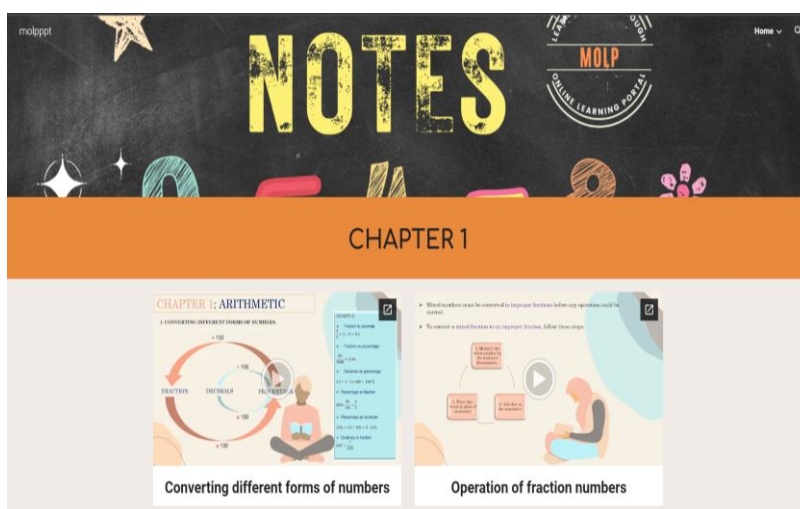


Figure 2: NOTES page

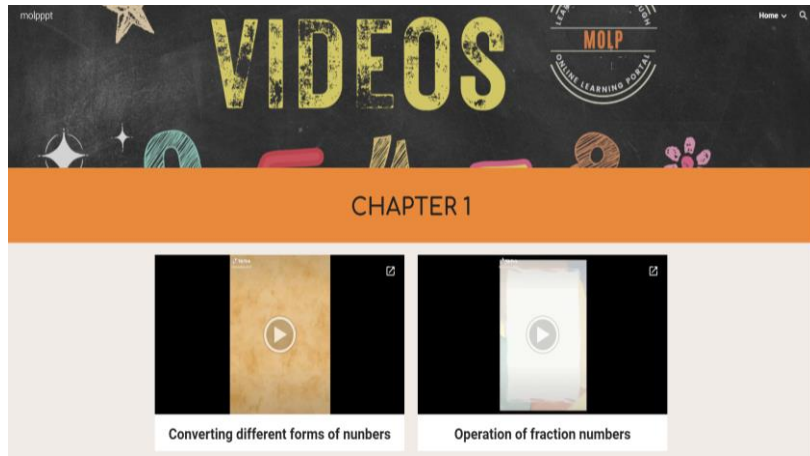


Figure 3: VIDEOS page

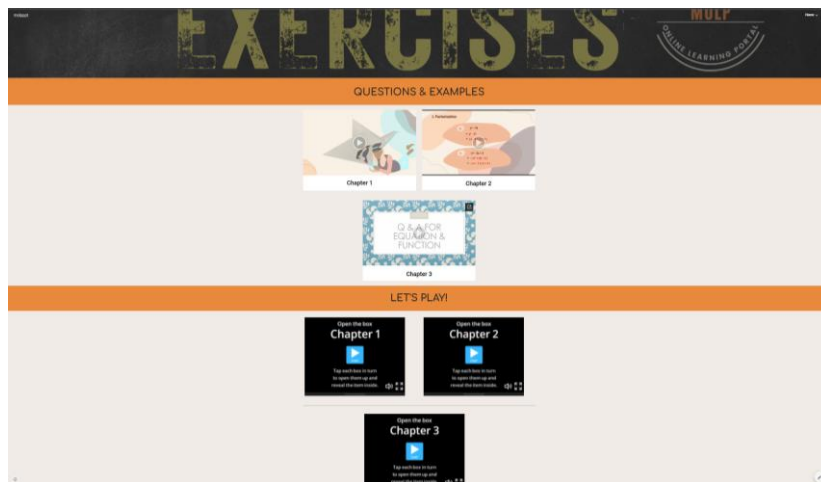


Figure 4: EXERCISES page

## Results and Discussion

This paper is to identify students' revision method and MOLP satisfaction in learning MAT037 among Pra Pendidikan Tinggi (PPT) students. A survey has been conducted to 50 Pre-Commerce (PBA002) students from UiTM Cawangan Pulau Pinang who is taking Intensive Mathematics 1 (MAT037) course in semester October 2021-February 2022. The questions are divided into three parts which are:

- Demographic
- Revision method
- MOLP satisfaction

The findings are represented in the graph below. Figure 5 shows the respondents difficulties in accessing the learning materials. The result shows that 40% off the students still have difficulty when accessing online learning materials.

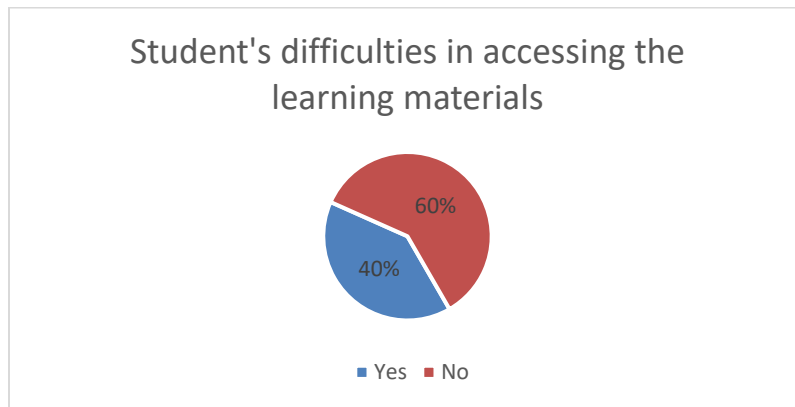


Figure 5: Student's difficulties in accessing the learning materials

Figure 6 illustrates the student's satisfaction in using MOLP. Most of the students are satisfied with MOLP as they found that MOLP is interesting and can help them to do revision easily.

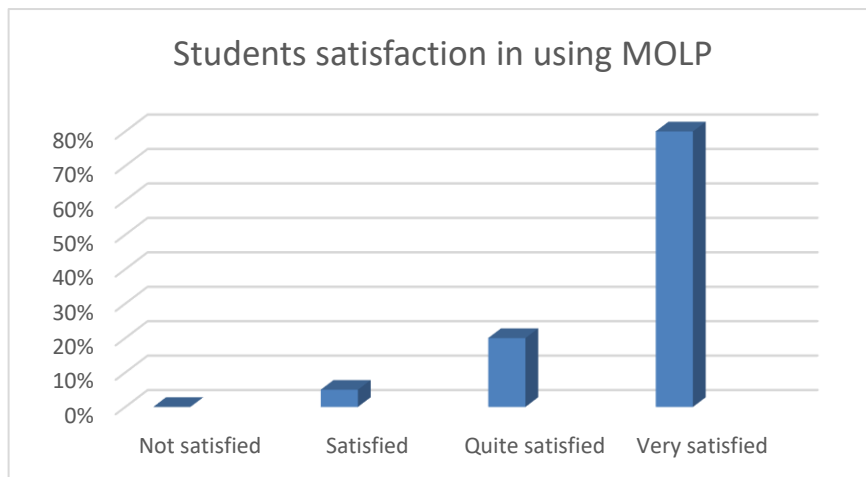


Figure 6: Student's satisfaction in using MOLP

Figure 7 shows the students recommendation of using MOLP to their friends. All the students recommend their friends to use MOLP in learning MAT037 course as most of them like the interface of MOLP and they prefer to use MOLP as one of the revision tools.

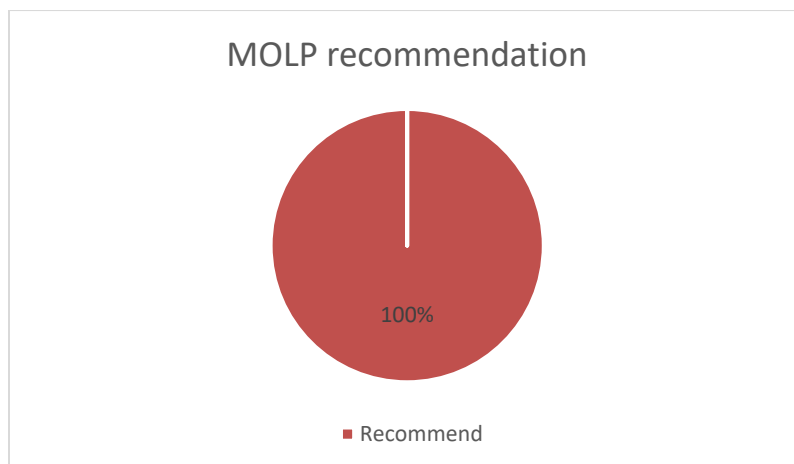


Figure 7: MOLP recommendation

## Conclusion

MOLP is an easy and interactive online learning portal which was developed as a one-stop center to combine all the interactive learning materials together. MOLP was specifically developed for Pre-Commerce students who is learning Intensive Mathematics 1 course. Its features consist of interactive notes and videos, and exercises which contains examples and solutions and games to test the user's knowledge on what they have learnt. Most of the students who used MOLP are satisfied with MOLP as it provides an easy way for them to access all learning materials. They also fully recommended MOLP to their friends so that everyone can learn mathematics in an easy, interesting and interactive way.

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## ONLINE LEARNING MODES: SYNCHRONOUS AND ASYNCHRONOUS

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### ABSTRACT

*The implementation of online learning in the Malaysian higher education landscape has become vital since the outbreak of the COVID-19 pandemic beginning from March 2020 in Malaysia. In line with the Standard Operating Procedure (SOP) set by the government in all sectors including education and maintaining social distancing to prevent the spread of COVID-19, higher education institutions in Malaysia has converted the traditional face-to-face education system to online learning modes which consist of synchronous and asynchronous mode. This article looks into the definition of synchronous and asynchronous e-learning modes, the technologies used and key issues for each mode, the best practices as well as strengths and also weaknesses of synchronous and asynchronous online learning gathered from previous studies. The aim of this article is for the educators to comprehend more clearly about these two modes of online learning and selecting preferable teaching methods, online tools as well as digital educational resources in improving the quality of the educational process. By blending synchronous and asynchronous modes, educators can create an effective online distance learning experience that are favorable by instructors, but most importantly, ideal to the learners.*

**Keywords:** *online learning, synchronous, asynchronous*

### Introduction

In maintaining social distancing, the Covid-19 pandemic has caused the global closure of several activities, including education, and has transformed the traditional face-to-face education system to an online version via two online learning modes: synchronous and asynchronous settings. Not all educational institutions are prepared to face this transformation, which presented educators and students facing a variety of unexpected new teaching and learning obstacles.

In traditional classroom learning mode, the instructor is the focus and the learning process is implemented face to face, but in online learning modes, the educator still acts as an instructor, but both the educator and the students depend on different online sources and there is more collaboration involves between both parties as mentioned by Amiti (2020). There are three online learning modes namely synchronous, asynchronous and hybrid online learning. According to the study by Hadullo et. al. (2018), synchronous learning provides real-time interaction by combining features such as video conferencing and group chat with the simultaneous presence of instructors and students. Asynchronous settings, in contrast, are not time or space restricted, meaning that learning can take place in multiple places at different times, with students using resources like discussion boards, blogs and e-mail at their own

leisure as stated by Hadullo et. al. (2018). Alternatively, a hybrid online environment combines synchronous sessions and asynchronous activities as a method of learning delivery.

### Synchronous Online Learning

A synchronous learning environment is a learning mode where the instructors and the students meet online using specific online platforms to deliver lessons. A synchronous learning can consist of various forms of interaction between instructors and students. Instructors can deliver lessons using videoconferencing with a camera, where instructors and students are present simultaneously on the selected online platform. Through this mode, the instructors have the ability to assess the reaction of students, understand their needs, respond to their questions and choose a pace that is convenient for the group as well as monitor the student's involvement in the process as stated by Berestok (2021). Table 1 explains about the synchronous e-Learning technologies and their key issues.

Table 1: Synchronous e-Learning Technology and Key Issues (Adapted: Dada, 2019, p.56)

Technology	Key Issues
Video Conferencing	<ul style="list-style-type: none"> <li>• Allows real-time interaction among students just as in the traditional classroom environment.</li> <li>• Costly and successful implementation depends on the availability of bandwidth.</li> </ul>
Web Conferencing	<ul style="list-style-type: none"> <li>• Allows sharing of documents, PowerPoint presentations and demonstration of application programs.</li> <li>• Costly and successful implementation depends on the availability of bandwidth.</li> </ul>
White Boarding	<ul style="list-style-type: none"> <li>• Demonstration and co-development of ideas.</li> <li>• Costly, its implementation depends on the availability of bandwidth. It is sometimes better used with audio conferencing.</li> </ul>
Audio Conferencing	<ul style="list-style-type: none"> <li>• Allows students to engage in collaborative discussion.</li> <li>• It is likely to be costly when it involves international participants.</li> </ul>
Chat	<ul style="list-style-type: none"> <li>• Allows the sharing of textual and graphical information that is not too complex.</li> <li>• Communication rate is slowed down since it is majorly text-based.</li> </ul>
Instant Messaging	<ul style="list-style-type: none"> <li>• Allows messages to be delivered promptly.</li> <li>• The use of devices such as headset is required. It also allows one to one or one to many interactions.</li> </ul>

A study by Amity (2020) added, a synchronous class should be student-centered environment, with the educator providing instructions first, then giving the students complete attention and students respond based on the activities. Table 2 discusses the benefits and drawbacks of the synchronous online learning mode attained from prior researches.



Table 2: Benefits and Drawbacks of Synchronous Online Learning Mode

Author	Benefits	Drawbacks
Amiti (2020)	<ul style="list-style-type: none"> <li>• Offers real-time learning and knowledge sharing platform with direct access to the instructor for question and answer session to avoid miscommunication.</li> <li>• Live lessons can be recorded and saved automatically on the Learning Management System (LMS) or any collaborative learning platform chosen by the instructor. Students can view and replay instructor’s lectures as many times as they need to comprehend the content at their own pace and time.</li> <li>• Synchronous learning brings students together regardless of their physical location. As a result, introvert learners that are struggling in regular classrooms; feel more comfortable and less worried as they attended online lessons from their home environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Synchronous learning requires a prearranged meeting date and time.</li> <li>• For learners’ lacking in auditory skills, the instructor may need to talk more slowly during the video conferencing lecture session. Yet for the more advanced students, they may not feel happy with the following situation. Therefore, the slower learners may require some extra assistance outside of the online class sessions.</li> </ul>
Perveen (2016)	<ul style="list-style-type: none"> <li>• Through collaborative learning, synchronous mode fosters a sense of community. Instructors and students can connect and collaborate in real time in a synchronous virtual classroom. It mimics a traditional classroom setting, with web camera and class discussion elements, except that all participants view it remotely over the Internet. Due to the presence of the instructor and classmates, synchronous sessions might result in high levels of motivation to stay engaged in e-activities. Facial expressions and voice tones can help them have a more human feel across a broader spectrum, resulting in low-cost global communication.</li> </ul>	<ul style="list-style-type: none"> <li>• The requirement for a high-bandwidth Internet connection. Due to technical difficulties, students may feel disappointed and less motivated.</li> </ul>
Beresto (2021)	<ul style="list-style-type: none"> <li>• Educators frequently offer online lessons using webinars and video conferencing. Among the advantages of using these features are the flexibility to have remote lessons, recorded lectures, have an unlimited number of students, and the use of supplementary instructional resources. Presentation, demonstration, video viewing, group discussion with students having microphones, and online boards or whiteboards can be used through video conferencing feature. It is also a one-stop platform for all learners' comments, photos, text chat (both shared and private messages) and can be remotely accessed. It also allows us to display the speaker's screen.</li> </ul>	<ul style="list-style-type: none"> <li>• The availability of students and educator at the scheduled time as well as the dependence on unanticipated technical events.</li> </ul>

In a study by Moser and Smith (2015), they suggested best practices in implementing synchronous online courses. Table 3 displays all of the 12 steps that should be taken from the beginning until the finish of a lesson revised from Moser and Smith (2015) article from page 46 to 48. They added that for students to have a better online learning experience, educators must establish a guideline and a curriculum for their classes, as well as integrate software to incorporate all of the abilities.

Table 3: Best Practices for Implementing Synchronous Online Courses

Step	Action
1	Provide a welcome message that is displayed approximately 15 minutes before class.
2	Notify class of your presence and encourage equipment checks.
3	Provide easily accessed methods to connect/enter the virtual classroom
4	Record class meetings.
5	Discourage unnecessary use of video sharing.
6	Maintain virtual office hours.
7	Pre-load software that will be used during class presentation.
8	If possible have more than one monitor/display
9	Equip your teaching/production facility with various video options.
10	Use electronic Textbooks and other reference materials.
11	Encourage (require?) students to participate in virtual study sessions/group meetings.
12	Integrate additional software systems to augment the virtual classroom experience.

Berestok (2021) discussed that the similarities and differences between synchronous learning and traditional classroom learning. Obviously, both teaching formats bring students and instructors together at the same time and in the same place. In addition, the teaching staff will use various teaching aids to deliver teaching materials. On the contrary, both the classroom and synchronous formats require various collaboration tools: the synchronous format emphasizes mobile learning tools such as mobile applications and online chats. Other than that, with synchronous teaching, the teacher usually does not have the opportunity to evaluate whether the pupils are paying attention, therefore the learning's success is heavily dependent on the students' awareness.

### **Asynchronous Online Learning**

Asynchronous learning is self-paced and allows educators as well as learners to deliver ideas or

exchange information without relying on other participants' simultaneous involvement. Perveen (2016) described that students in asynchronous environments have access to information such as audio and video lectures, lectures note and handouts, articles, assignment questions and power point presentations through a Learning Management System (LMS) or other similar channels at any time and from any place. These online learning platforms either using the education institution developed LMS or online collaborative platform such as Microsoft Teams and Google Classrooms houses course content and provides a framework for communication between students and educators.

Materials, lectures, quizzes, and assignments are provided by instructors and can be accessed at any time. Students may be assigned a timeline to connect at least once or twice in a week and they work in their own pace in asynchronous learning. Ogbonna (2019) said that, if they need to re-listen to a lecture repeatedly or reflect over a subject for a while, they can do so without causing the rest of the class to fall behind. Table 4 describes on the asynchronous e-Learning technologies and their key issues.

According to Amiti (2020), when the instructor does not need an immediate reply, students engage in more critical thought, and the more they think about a topic, the more they develop thoughtful answer rather than responding spontaneously. Instead, when there is a space between the teacher and the student, shyness is lessened, and nervousness is moderated, thus there is less pressure. Students, on the other hand, appreciate the freedom and work-at-your-own-pace nature of asynchronous classrooms.

Individual participant interactions in asynchronous courses are incapable of imparting a feeling of shared social presence or involvement in online education, as stated by Friska (2021). Participants in asynchronous online learning are looking for content provided by their instructor or trying to engage themselves in relevant learning tasks. This may be due to many learners who have taken asynchronous online courses are totally unfamiliar with the experience of learning how to comprehend and become active learners. The majority of students will need to change their roles as online learners and their perceptions of educators.

Table 4: Asynchronous e-Learning Technology and Key Issues (Adapted: Dada, 2019, p.57)

Technology	Key Issues
Email Messages	<ul style="list-style-type: none"> <li>• Allows the distribution of course materials to registered students.</li> <li>• Getting instant reply can be difficult especially in a large class.</li> </ul>
E-books	<ul style="list-style-type: none"> <li>• Serves as an additional teaching and learning materials.</li> <li>• It does not encourage an interactive mode of learning.</li> <li>• It is not dynamic.</li> </ul>
Web Blogs	<ul style="list-style-type: none"> <li>• Allows the exchange of ideas through educative posts and comments.</li> <li>• Decisions and conclusions are not easily arrived at.</li> </ul>
Discussion Forums	<ul style="list-style-type: none"> <li>• Encourage collaboration and exchange of ideas over some period of time.</li> <li>• It usually takes time to arrive at decisions and conclusions.</li> </ul>
Website Links	<ul style="list-style-type: none"> <li>• It is usually to redirect users to supplementary materials and references.</li> <li>• Maintenance activities on the web server can make the resources the users are trying to locate not to be available.</li> </ul>
Databases	<ul style="list-style-type: none"> <li>• Serve as the warehouse of teaching and learning materials, and also help in managing them.</li> <li>• Personnel with good managerial skills are needed to make it function optimally.</li> </ul>
Streaming Video	<ul style="list-style-type: none"> <li>• Lectures are delivered through playback of video for students to watch.</li> <li>• It is not dynamic and interactive learning is not supported.</li> </ul>
Streaming Audio	<ul style="list-style-type: none"> <li>• Lectures are done through playback of audio for students to listen to.</li> <li>• It is not dynamic and interactive learning is not supported.</li> </ul>
Narrated Slideshow	<ul style="list-style-type: none"> <li>• Lectures are delivered through playback for students to watch.</li> <li>• It is not dynamic and interactive learning is not supported.</li> </ul>
Online Bulletin Boards	<ul style="list-style-type: none"> <li>• Allow teachers to take advantage of functional wall space. It can save time, keep students informed and serve various purposes.</li> <li>• They are costly and complex to implement. High Maintenance cost is involved. Not the best option in an environment where there is an inadequate power supply.</li> <li>• They can also lead to clutter and confusion in class.</li> </ul>

Online learning is a highly adapted process, but in order to be active and effective online learners, students must first understand how to use the technology in the course and be able to search for course materials in order to learn how to communicate with other students. Fortunately, recent online learning platforms designers have been able to comprehend and incorporate the basic nature of social interaction, as well as various factors such as physical, social, emotional, and psychological aspects, and their relationship to learners' participation in online courses. Table 5 explains the benefits and drawbacks of asynchronous learning gathered from previous studies.

Table 5: Benefits and Drawbacks of Asynchronous Online Learning Mode

Author	Benefits	Drawbacks
Perveen (2016)	<ul style="list-style-type: none"> <li>• Students can employ their higher order learning skills since they can think about the question for a long time and develop divergent thinking when they have the option of delayed response. A prepared answer replaces the prompt reply. As a result, learning in an asynchronous setting is self-paced, independent and student-centred. It also builds on students' prior knowledge by introducing new concepts as well as supporting critical thinking and deep learning. This is due to greater opportunities for peer group conversations in discussion boards and less reliance on lecture notes and materials.</li> <li>• Due to the remote setting, anxiety and shyness is decreased. This allow learners to respond more innovatively and creatively since there have adequate time to try e-activities and less frustrated by technological problem such as low speed and non-connectivity as compared to live lecture sessions.</li> </ul>	<ul style="list-style-type: none"> <li>• Students might encounter difficulties to comprehend a complex subject matter on their own remotely without the assistance of instructors and classmates as compared to face-to-face or synchronous learning mode.</li> <li>• Asynchronous e-learning can be difficult to keep students engaged and attracted unless the instructor developed teaching approaches that support motivation, interest, involvement and critical thinking skills in this learning environment. Furthermore, it is a self-paced system in which students must possess high self-disciplined in order to stay engaged and interactive during the online lessons and activities.</li> <li>• Delayed feedback from instructors can lead to frustration and decrease students' interest to learn the subject.</li> <li>• Asynchronous e-learning causes insufficient possibilities for socialising, so students must find ways to network with their peers on their own.</li> </ul>
Beresto (2021)	<ul style="list-style-type: none"> <li>• The ability to find important learning materials easily at any time and more freedom to communicate thoughts than in face-to-face classroom settings.</li> </ul>	-
Dada (2019)	<ul style="list-style-type: none"> <li>• When discussing difficult subjects that require time to think, it is preferable to use asynchronous e-learning and media such as e-mail and discussion boards. Learners in an asynchronous communication environment can participate in a discussion that allows them to access the recorded lecture or pre-recorded videos at different times. Thus, learners can work at their own time, whenever and whenever they want, at remote location, giving them ample time to reflect on their own ideas and encouraging them to engage in more critical thinking in completing given assignments.</li> </ul>	-

## **Discussion and Conclusion**

Synchronous learning is a mode of teaching that involves the delivery of information instantaneously. The learning materials can consist of lectures, webinars, live social media broadcasts and discussions. These are the tools that enable the learners to receive information immediately and to ask a question as well as getting the response promptly from the instructor.

On the other hand, the concept of asynchronous learning is based on the assumption of a delay in obtaining information. Reading textbooks, articles, blogs, websites, interactive presentations, e-courses, online quizzes, assignments, and exercises, viewing a recorded video, and listening to audio recordings are among the examples of asynchronous learning resources.

Educators should be given the latest guidelines and skilled for interactive, innovative teaching techniques and tools that allow them to teach and make assessments in an online teaching mode. This is because regardless of the teaching approach they employ, students frequently request a combination of synchronous and asynchronous techniques as indicated by Amiti (2020). Based on previous studies, each learning mode has its own set of advantages and disadvantages. In this instance, the educator can select how to integrate synchronous and asynchronous learning and create a beneficial impact on the learner's education process based on the setting and conditions.

Furthermore, the use of the suitable teaching mode often depends on the educational objectives of an institution, but in reality, it is only in principle. In practice, the instructors of online learning are most often guided by their experience and habits, rather than by objectives or scientific understanding. As a result, the synchronous mode is more favored by X generation since they are born before the digital age and are not proficient in ICT. In contrast, the digital generation that are less attentive to social contact prefers asynchronous teaching and learning. They find it simpler to write than speak, to read or listen to a recording, to watch a video than to attend a lecture. They have their unique rate of information reception and transmission.

Learners who prefer to study at their own pace such as the digital generation or those who are in the X generation who require live conversation to absorb knowledge, for example, will view the same learning content in relatively different ways. Thus, the ideal solution is to combine or employ both learning modes at the same time. In traditional academic classroom setting, there is frequently a synchronous lecture as well as an asynchronous option.

In addition to clarifying challenging issues, synchronous learning should increase motivation and involvement in the learning process. We can build up online distance learning in synchronous and asynchronous mode and make it flexible, meeting the demands of all learners in the educational process, by using both the learning management system and the video conferencing capability at the same time. Educators' experience has shown that by creating a favorable online learning environment of mutual support from all participants and by choosing convenient online tools, innovative methods as well as digital educational resources will improve the quality of the educational process and provide effective online distance learning experience to learners.

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## **PROGRAMMING RELATED FACTORS INFLUENCING IN LEARNING A PROGRAMMING: A STUDY ON ENGINEERING STUDENTS IN UITM PULAU PINANG**

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### **ABSTRACT**

*In response to a current need, higher education institutions have begun to provide programming courses not only to computer science students, but also to non-computer science students. This is because, in recent years, understanding of computer technology and programming in a variety of areas has become necessary to meet the industry's demand for information and communication competency. The issue is that teaching and learning computer programming languages, particularly for non-computer science students, can be difficult. Educators face challenges in getting students to comprehend programming principles and develop outstanding programming abilities in order to tackle real-world problems. Students' lack of logical, creative, and critical thinking leads to inadequacies in problem-based learning implementation. Several factors have been identified as contributing to programming language problems, including educators, students' abilities, and programming nature, and this study investigates a programming-related factor that contributes to computer programming learning challenges, as well as the students' background knowledge. A study was conducted on engineering students in Universiti Teknologi MARA in a total of 241 students involves in this study. According to the results of a mean and standard deviation study, it is found that programming-related factor were particularly effective in learning a programming. With these findings, it can be a guideline for educators in dealing with problems in learning a programming.*

**Keywords:** *Programming Problem, Programming Nature, Program Structure, Engineering Student.*

### **Introduction**

Nowadays, having a good understanding of computer technology, as well as programming skills, is required to satisfy industrial demands (Siti Rosminah & Ahmad Zamzuri, 2012). For many students, particularly those with a non-computer science background, the current demand causes challenges and presents a considerable obstacle. According to (Moström, 2011), novice students must understand the problem, develop a solution using normal problem-solving methodologies, and then write down the solution in a programming language in such a way that a computer can understand the instructions.

According to the existing study, traditional teaching practices, as well as students' study methods and attitudes, must be improved. Instructional methods such as hands-on programming practise and cutting-edge teaching and learning tactics must be utilised to increase students' interest in computer education. Educators are faced with new challenges, demanding the creation of new



instructional tools. Students' background knowledge and attitudes, teaching and learning methods, and social context are all aspects that contribute to learning obstacles in computer programming, according to (Gomes et al., 2012). Educators must also address gaps in students' knowledge backgrounds, making large-scale student management more difficult (Ahmad & Ghazali, 2020).

Therefore, the purpose of this study is to identify the challenges that students have when learning a programming language by investigating the programming-related factors that influence students' programming language learning and proposing ways to overcome these concerns. This research is intended to help computer science educators improve their teaching methods for basic programming courses, as well as improve students' interest in and performance in programming courses.

### **Programming Nature in Learning a Program**

Learning any programming languages is far more complicated, as it necessitates other abilities such as algorithm design, programming writing, and syntax understanding (Baist & Pamungkas, 2017). It is not easy to write a program code, according to (Moström, 2011), novice students must comprehend the problem, design a solution using standard problem-solving approaches, then write down the solution in a programming language in a way that a computer can follow the instructions.

The problem arise among students starting at the beginning is related to the understanding of programming environment, which causes students to see programming as something difficult (Ahmad & Ghazali, 2020). Also, the inability of students to reason logically and their lack of problem-solving skills are two major factors that contribute to programming inefficiency. Although different programming methods and approaches have been developed to assist students in learning programming, not all of them focus on the programming stages of problem resolution (Yusoff et al., 2020). Similarly, despite the existence of a variety of learning aids and teaching strategies, such as teaching by doing, using relevant examples, demonstrations, direct examples, and trail-guided teaching approaches, teaching issues and programming learning remain unresolved (Cheah, 2020).

One of the issues discussed regarding the effectiveness of students mastering a programming language is the nature of programming, which plays an important role in determining the effectiveness of students' ability to master a programming language. Pears et al. (2007) reported that most institutions use an object-oriented language, but many use Java, C and C ++, languages to teach procedural programming, whereas less than 10% of institutions teach functional programming.

Despite the popularity of such languages, there has been much debate about the suitability of these languages for education, especially when introducing programming to novices. These languages are not designed specifically for educational purposes, in contrast to others designed with this specific purpose (such as Python, Logo, Eiffel, and Pascal).

There are interrelated types of programming's' nature of difficulties while learning to program as stated in the previous studies. (Siti Rosminah & Ahmad Zamzuri, 2012) identified three issues that should be addressed by educators, which are: the lack of understanding of the basic concepts of programming structure; problem in designing a program to complete a specific task and; inability to identify the syntax of programming languages. This is in contrast to (Bosse & Gerosa, 2017), which is more focused on the ability of students in using computers and performing system development tasks. The present discussion focuses more on the opinions outlined by (Xinogalos, 2016), which has outlined five problems faced by students related to programming nature, namely: developing an algorithm, transferring an algorithm to a programming language, programming structures, modularisation, and; testing and debugging. Guided by (Xinogalos, 2016), these five issues were discussed based on the study on previous work as well as observations of more than 10 years in the world of programming education. The findings of the present observation are stated in the summary as shown in Table 1.

The following section will discuss the survey conducted on non-computer science students that focuses on the factors that effect on learning a program. This focused factor is related to the nature of the program which will show the environment of a programming language in giving effect in the programming learning process.

Table 1 Programming-Related Factors

<b>Problem</b>	<b>Author(s)</b>	<b>Descriptions</b>
Basic knowledge of Programming	(Chan Mow, 2008; Costa et al., 2012; Lahtinen et al., 2005; M, 2014; Xinogalos, 2016)	<ul style="list-style-type: none"> <li>• Unable to transform the problem into a programming instruction. Most students may understand the syntax and semantics of individual statements, but they have no idea how to put them together into legitimate programmes.</li> <li>• Difficulties with language libraries, such as looking through them, finding the right function, and correctly using it in a programme.</li> <li>• Inability to combine syntax, logic, and concepts. Insufficient ability to translate problems into a charitable action plan.</li> <li>• A lack of understanding of effective instructional methods.</li> <li>• Difficulties in representing a program using notation. The symbols of a programming language, as well as the grammatical rules for assembling them into a programme, are referred to as notation.</li> </ul>
Understanding the Structure of Programming	(Bosse & Gerosa, 2017; Chan Mow, 2008; Lahtinen et al., 2005; Qian & Lehman, 2017; Swidan et al., 2018; Wittie et al., 2017; Xinogalos, 2016)	<ul style="list-style-type: none"> <li>• Failure to recognise that each command is carried out in the state generated by the preceding ones.</li> <li>• The complexity of comprehending the order of statements, the value of a variable, and the interactivity of an input action.</li> <li>• The most challenging programming concepts are pointers, arrays, and data structures.</li> </ul>
Module Structure of Programming	(Bosse & Gerosa, 2017; Xinogalos, 2016)	<ul style="list-style-type: none"> <li>• Students' difficulties in working with functions.</li> <li>• A lack of understanding of the scope of variables and why passing and returning arguments is required.</li> </ul>
Testing and debugging	(Bosse & Gerosa, 2017; Chan Mow, 2008; Pears et al., 2007; Qian & Lehman, 2017; Siti Rosminah & Ahmad Zamzuri, 2012)	<ul style="list-style-type: none"> <li>• Incapable of mastering the compiler, as well as error and warning messages</li> <li>• One of the difficulties is dealing with syntax mistakes, with the most typical issue being a lack of ability to discover faults.</li> <li>• Inability to visualise the status of the program during code execution.</li> <li>• Missing semicolons, mismatched parentheses, brackets, or quotation marks, and employing the illegal start of expressions.</li> </ul>

### Methodology

This study involved a total of 241 students who took programming courses at UiTM Cawangan Pulau Pinang. It consists of diploma and degree students from the Faculty of Mechanical Engineering (FKM) and the Faculty of Civil Engineering (FKA) as shows in Figure 1. Students are required to answer all questionnaires related to this course after they have completed the 14-week lecture.

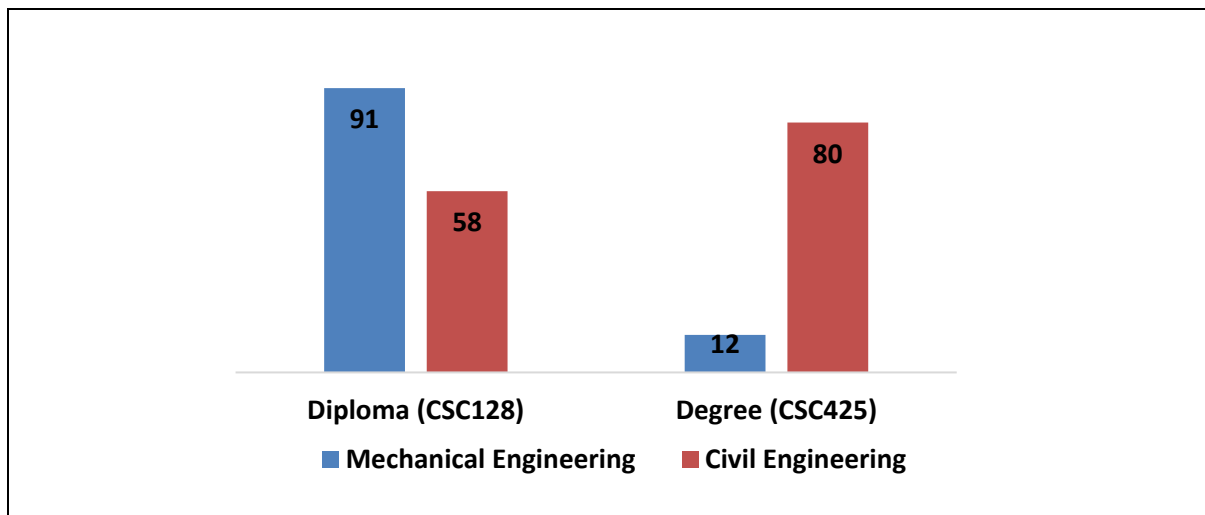


Figure 1. Number of Students in the Study

The questionnaire for the study consists of 2 parts as shows in Table 2 and Table 3. The first part is about the course information taken by students and the second part focuses on the factors related to the students on the programming course. All questions contain 15 items that focused more on Basic Element of Programming (4 items), Control Structure of Programming (5 items) and the Module Structure of Programming (4 items). These questionnaires use the five-point Likert scale. the programming ability-related factors used range from 5-Strongly Agree, 4-Agree, 3-Natural, 2-Disagree, and 1-Strongly disagree that values greater than 3 are positive and values less than 3 are negative statements.

Table 2 Construct Questions in Course Information

Construct	Options
Program Code	1. Mechanical Engineering 2. Civil Engineering
Study Level	1. Diploma 2. Degree
Semester	1/2/3/4/5/6/7/8
Programming Code Taken	1. CSC128 2. CSC425
Status Taken	1. First Timer 2. Not First Timer

Table 3 Construct Questions in Programming-Related Factor

Construct	Statements
A. Basic Element of Programming	1. Has the ability to define identifier. 2. Has the ability to write declaration statement. 3. Has the ability to assign value into variable. 4. Has the ability to evaluate/trace the mathematical expression based on certain input.
B. Control Structure of Programming	1. Has the ability to write a selection control structure. 2. Has the ability to write a repetition control structure. 3. Has the ability to trace a selection control structure program segment and show the output based on the given input. 4. Has the ability to trace a repetition control structure program segment and show the output based on the given input. 5. Has the ability to write a complete program that includes the combination of selection & repetition control structure.
C. Module Structure of Programming	1. Has the ability to apply the predefined function in a program. 2. Has the ability to apply the user-defined function in a program. 3. Has the ability to apply the local and global variables. 4. Has the ability to determine appropriate function either function with passing/return value or without passing/return values.

Reliability Test or Cronbach's Alpha was performed first before analyzed the questionnaire. Reliability describes how reliable and consistent a research instrument's measurement of a variable is. The better the instrument's reliability, the less errors it generates (Kumar, 2018). Cronbach's Alpha values are based on (Choi et al., 2001).

Cronbach's Alpha is used in this analysis to measure the internal consistency of the items tested. According to Table 4, the Cronbach's Alpha values for all 15 questionnaires tested was 0.935. This value is greater than 0.8, which is considered reliable.

Table 4. Reliability Test

Cronbach's Alpha	N of items
.935	15

### Analysis and Result

In this paper, the mean and standard deviation was applied. The analysis by using mean and standard deviation values can be used to identify in general about programming ability-related factor that influence students in learning a programming language. The findings in Table 5 for programming abilities indicate that the mean for all items is near to or higher than 4. The ability of students to construct a declaration statement has the greatest mean of 4.11, while the ability to determine an appropriate function, either function with return or without return values, has the lowest mean of 3.55. The standard deviation is also not very high. This indicates that all students agreed to have the ability to understand the basic elements, control structure, and structure of programming modules.

Table 5. The Mean and Standard Deviation for Programming Ability- Related Factors

Item no.	Statement	Mean	SD
C1	Has the ability to define identifier.	4.04	0.679
C2	Has the ability to write declaration statement.	4.11	0.665
C3	Has the ability to assign value into variable.	4.06	0.677
C4	Has the ability to evaluate/trace the mathematical expression based on certain input.	3.94	0.725
C5	Has the ability to write a selection control structure.	3.82	0.689
C6	Has the ability to write a repetition control structure.	3.69	0.711
C7	Has the ability to trace a selection control structure program segment and show the output based on the given input.	3.71	0.746
C8	Has the ability to trace a repetition control structure program segment and show the output based on the given input.	3.66	0.731
C9	Has the ability to write a complete program that includes the combination of selection & repetition control structure.	3.64	0.784
C10	Has the ability to apply the predefined function in a program.	3.68	0.703
C11	Has the ability to apply the user-defined function in a program.	3.66	0.689
C12	Has the ability to apply the local and global variables.	3.62	0.721
C13	Has the ability to determine appropriate function either function with passing/return value or without passing/return values.	3.55	0.763

Overall, it was found that programming related factors were very helpful in programming learning. This is because the mean is 3 and above means that students agreed with all statement.

## Conclusion

Reading program source code is not same as reviewing ordinary documents and using textual representation as the major source of information causes several challenges in program comprehension. Although many methods and tools have been proposed to represent source code, experience have shown that textual presentation is the most suitable to represent a program. However, the problems still exist if the source code is used in a form of text-based due to the source code. Therefore, the challenges that have emerged in learning a program due to the nature of the programming language are discussed in this work. The goal of this study is to identify the challenges that students have when learning a programming language by investigating the elements that influence students' programming language learning and offering techniques for dealing with these concerns. This research is intended to help computer science educators improve their teaching methods for basic programming courses, as well as raise students' interest in and performance in programming disciplines.

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## TEKNIK MENGAMBIL NOTA MENGGUNAKAN KAEDAH CORNELL DALAM MATAPELAJARAN MATEMATIK

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### ABSTRAK

*Nota ialah perkara yang dicatat oleh seseorang pelajar semasa proses pengajaran dan pembelajaran. Nota menjadi bahan rujukan, apabila kita terlupa sesuatu maklumat atau fakta. Mencatat nota juga merupakan suatu seni. Hasil kajian yang dilakukan oleh Swenson (2018) menunjukkan strategi dalam mencatat nota ini telah meningkatkan prestasi pelajar dalam pentaksiran. Mengambil nota adalah cara yang baik untuk membantu pelajar mengenal pasti kepentingan konsep yang dipelajari di dalam kelas. Walaupun dengan mempunyai ingatan yang hebat, itu tidak akan dapat membantu mengingat semua yang dikatakan oleh pensyarah. Mencatat nota perlu kerana pelajar tidak perlu mengingat semua yang dipelajari. Nota yang sistematik, tersusun dan dalam bentuk yang menarik dapat meningkatkan daya ingatan pelajar dan keberkesannya dalam proses pembelajaran. Dalam kajian ini, penekanan diberikan dalam teknik mengambil nota menggunakan kaedah Cornell terutamanya dalam mata pelajaran matematik. Pelajar boleh menggunakannya untuk menyusun dan menstruktur nota matematik, formula dan persamaan matematik. Pelajar boleh mengambil nota Cornell semasa pensyarah sedang memberi syarahan atau semasa mereka menyelesaikan masalah atau soalan secara bebas dalam buku mereka.*

**Katakunci:** *Cornell, Nota, Sistematik, Matematik, Konsep*

### ABSTRACT

*Notes are things that a student takes down during the teaching and learning process. Notes become reference material when we forget something information or fact. Taking notes is also an art. The results of a study conducted by Swenson (2018) show that strategies in taking these notes have improved student performance in assessment. Taking notes is a great way to help students identify the importance of concepts learned in class. Even with having a great memory, it won't be able to help remembering everything the lecturer says. Taking notes is necessary because students do not have to remember everything they have learned. Notes that are systematic, organized and in an interesting form can improve students' memory and its effectiveness in the learning process. In this study, emphasis is given in note-taking techniques using Cornell's method especially in mathematics subjects. Students can use it to organize and structure mathematical notes, formulas and mathematical equations. Students can take Cornell notes while the lecturer is giving a lecture or while they are solving problems or questions independently in their book.*

**Keywords:** *Cornell, Note, Systematic, Mathematics, Concept*

### Pengenalan

Mencatat nota adalah penting. Ada yang lebih suka mengambil pendekatan berstruktur dan menggunakan kaedah garis besar untuk mencatat nota. Orang lain mungkin lebih suka pendekatan cara visual dan melukis peta minda. Ada juga yang mungkin tidak menggunakan struktur sama sekali. Kajian yang menarik mendapati bahawa pelajar yang menyemak nota mereka sendiri mengatasi pelajar yang menyemak nota yang diberikan oleh pensyarah mereka. Kajian lepas mendapati bahawa pelajar yang menulis nota mereka belajar lebih banyak daripada mereka yang menaipnya.

Walau bagaimanapun, terdapat satu teknik mencatat nota yang telah membuktikan dirinya jauh lebih baik daripada yang lain. Penyelidikan telah membuktikan bahawa kaedah ini bukan sahaja lebih cekap, tetapi juga menjadikannya lebih mudah untuk menyemak & mengingat nota. Teknik ini dipanggil teknik mengambil Nota Cornell. Oleh itu, nota terbaik adalah buatan tangan, buatan sendiri dan Gaya Cornell. Mencerap nota kuliah dengan usaha mahasiswa sendiri antara kaedah yang berkesan daripada pembelajaran sendiri di peringkat pengajian tinggi. Hal ini kerana, ketika mencatat nota, para pelajar dapat menghubungkan apa yang didengar dengan apa yang dicatat untuk proses ingatan yang lebih lama dalam otak kekal mereka. Oleh sebab itu, di IPT para pensyarah tidak digalakkan untuk memberikan nota dalam bentuk powerpoint dan teks lengkap berbanding pelajar mencatat nota itu dengan usaha mereka sendiri. Kajian di peringkat pengajian tinggi mendapati bahawa salah satu elemen penting pembelajaran mahasiswa ialah kemahiran membuat nota daripada kuliah yang dihadiri oleh mereka dan penggunaan nota kuliah. Metode Cornell dan 5R merupakan antara beberapa teknik kemahiran mengambil dan menyusun nota kuliah.

Menurut (Sharpe, 2010) mencatat ialah menulis maklumat semasa anda mendengar atau membaca. Mengambil nota adalah penting kerana ia membantu pelajar menumpukan perhatian dan memahami maklumat yang mereka baca di mana ia membantu mereka merumuskan idea dan hujah dalam teks. Dari kajian yang dijalankan oleh Howe (1970) mendapati bahawa jika maklumat penting terkandung dalam nota, ia mempunyai 34 peratus peluang untuk diingati. Maklumat yang tidak ditemui dalam nota hanya mempunyai peluang lima peratus sedang diingati. Berdasarkan idea itu, pastinya pengambilan nota memainkan peranan penting dalam membantu pelajar untuk mendapatkan perkara utama yang disediakan dalam teks bacaan.

### **Kajian Keberkesanan Nota Cornell**

Satu kajian yang diterbitkan pada tahun 2010 oleh Wichita State University membandingkan dua kaedah pengambilan nota di kelas menengah Inggeris, dan mendapati bahawa pengambilan Catatan Cornell mungkin memberi manfaat tambahan dalam kes di mana pelajar dikehendaki mensintesis dan menerapkan pengetahuan yang dipelajari, sementara kaedah nota berpandu nampaknya lebih baik untuk penarikan semula asas.(Jacobs, 2008)

Satu lagi kajian yang diterbitkan pada musim panas 2013 mendapati bahawa pelajar yang diajar mengambil nota menggunakan Nota Cornell mendapat nota yang lebih baik daripada mereka yang tidak, tetapi mereka tidak memperoleh hasil pencapaian yang lebih tinggi. Kajian itu juga

menyatakan bahawa melalui analisis skor penilaian, tiada perbezaan yang signifikan antara intervensi dan kelas asas pencapaian.(Broe, 2013).

Pengambilan nota Cornell dapat memberi keberkesanan kepada pelajar dalam mengatur pemikiran yang telah mereka ajarkan dan memberikan ulasan yang lebih baik dalam mengingat semua maklumat yang telah mereka pelajari.(Quintus et al., 2012). Sistem pengambilan nota Cornell bukan hanya merupakan kaedah penulisan nota yang cepat, tetapi seseorang dapat menyerap maklumat yang diberikan pada kadar yang lebih cepat.(Mulder, 2012). Faber et al. (2000) menjalankan kajian ke atas 115 pelajar, enam puluh satu yang diajar cara mengambil nota Cornell. Kajian ini menunjukkan bahawa pelajar yang diajar kaedah ini mendapat markah yang lebih baik secara signifikan pada ujian objektif yang dibuat oleh guru berbanding mereka yang tidak diajar nota Cornell. Pelajar yang menggunakan sistem pengambilan nota Cornell dalam bilik darjah sains gred kesembilan dan kesepuluh mereka mendapat markah 10%-12% lebih tinggi daripada pelajar semester sebelumnya (Donohoo, 2010). AVID (Advancement Via Individual Determination), sebuah organisasi global yang prihatin dengan menutup jurang pencapaian dan menyediakan pelajar ke kolej, memasukkan kaedah pengambilan nota Cornell sebagai sebahagian daripada kurikulum yang berjaya (AVID, 2012).

Kajian juga dijalankan oleh Akintunde (2013) dalam membandingkan keberkesanan tiga kaedah pengambilan nota yang berbeza iaitu Cornell, Verbatim dan Outline. Cornell Note Taking, menggariskan pengambilan nota (idea utama dan sub-titik dikenal pasti dan ditulis) dan pengambilan nota verbatim (menulis apa yang guru katakan. perkataan demi perkataan). Para penyelidik mendapati Cornell Note Taking sebagai strategi yang paling berkesan, manakala pengambilan nota verbatim adalah yang paling miskin.

Perbezaan dalam kejayaan Cornell dan kaedah mengambil nota verbatim boleh dikaitkan dengan yang pertama sebagai kaedah pembelajaran yang aktif, manakala yang kedua adalah pasif. Apabila pelajar menulis perkataan demi perkataan apa yang guru katakan, mereka menjadi terpacu dengan perkara ini dan tidak memberi perhatian yang secukupnya kepada perkara utama pelajaran, menjejaskan pengekodan, manakala kaedah Cornell Note Taking memaksa pelajar untuk mempertimbangkan maklumat yang diajar.

Dalam kajian oleh Rhaudyatun (2016) mendapati secara keseluruhan kemampuan berfikir reflektif pelajar yang diajarkan dengan kaedah Cornell Note Taking adalah lebih tinggi daripada kemampuan berfikir reflektif pelajar yang diajarkan dengan pembelajaran konvensional.

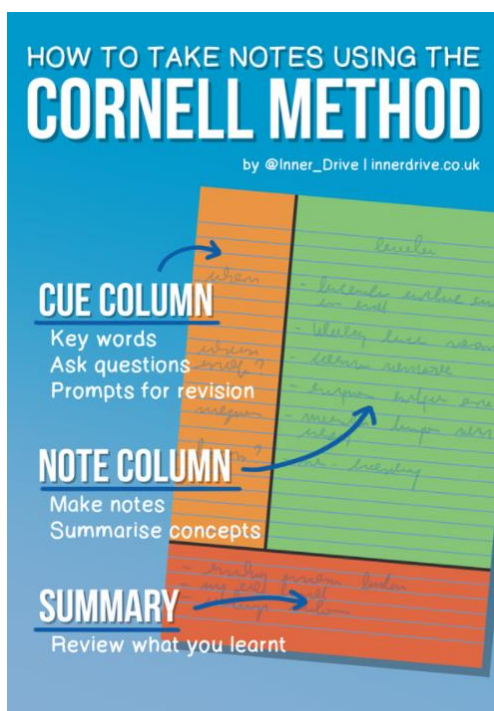
### **Apa itu Kaedah Cornell**

Sistem mencatat nota ini dibangunkan oleh profesor Walter Pauk pada tahun 1950-an dan telah dibincangkan dalam bukunya *How to Study in College*. Kaedah Cornell terkenal dengan sistem dua lajur dengan lajur kiri mengambil satu pertiga daripada halaman dan lajur kanan mengambil dua pertiga halaman. Lajur kanan ialah lajur mencatat nota dan digunakan untuk "menangkap idea dan fakta pensyarah" (Pauk, 2005, hlm. 207), di mana pelajar mencatat nota semasa pelajaran. Lajur kiri dipanggil lajur isyarat dan tidak diisi semasa kuliah (Pauk, 2005).

Selepas sesi mengambil nota, pelajar menyemak nota mereka dan mencipta soalan yang akan mewujudkan makna, menyerlahkan idea utama, dan mengembangkan hubungan antara konsep. Menulis soalan dalam lajur kiu, menurut (Pauk, 2005), membantu pelajar menjelaskan maksud pelajar, membawa hubungan antara idea menjadi terang, dan menguatkan ingatan pelajar. Lajur ini juga boleh digunakan untuk membuat refleksi selepas pelajaran. Pusat strategi pembelajaran di Universiti Cornell mengesyorkan bahawa pelajar mengambil sekurang-kurangnya sepuluh minit setiap minggu untuk mengkaji nota ini. Kawasan ringkasan bawah digunakan untuk meringkaskan perkara utama yang dibincangkan pada halaman tersebut dalam beberapa ayat.

Kaedah Cornell menyediakan format sistematik untuk penjanaan dan penyusunan nota. Sistem mencatat ini direka untuk pelajar peringkat sekolah menengah atau kolej. Terdapat beberapa cara untuk mencatat, tetapi salah satu yang paling biasa adalah nota dua lajur. Pelajar membahagi kertas menjadi dua lajur: lajur mengambil nota (biasanya di sebelah kanan) dua kali lebih besar dari ukuran soalan / kata kunci (di sebelah kiri). Pelajar meninggalkan lima hingga tujuh baris, atau kira-kira dua inci (5 cm), di bahagian bawah halaman seperti Rajah 1 di bawah.

Bahagian kanan dan merupakan bahagian yang lebih besar daripada dua lajur hendaklah digunakan untuk mengambil nota semasa pengkuliahan. Pelajar harus memastikan bahawa nota ini ringkas dan mereka tidak hanya menulis dengan tepat apa yang pengajar mereka katakan tetapi sebaliknya meringkaskan konsep yang paling penting dalam perkataan mereka sendiri. Ini membantu memastikan mereka berfikir secara mendalam tentang topik tersebut.



Rajah 1: Nota Cornell

Untuk bahagian ringkasan, selepas setiap sesi kuliah, pelajar harus meringkaskan perkara penting yang diambil daripada setiap kuliah dalam baris di bahagian bawah halaman. Ini membolehkan mereka melihat semula bahan sebelum mereka melupakannya, dan melibatkannya dengan lebih mendalam dengan memikirkan maklumat yang paling penting. Sebaik sahaja pelajaran tamat, pelajar hendaklah menulis soalan mengenai perkara itu di lajur sebelah kiri. Menulis soalan adalah bahagian penting dalam strategi ini, kerana ia memaksa pelajar untuk benar-benar mempertimbangkan maklumat yang telah mereka pelajari. Pelajar juga harus menggunakan lajur ini untuk merekodkan sebarang kata kunci atau persamaan penting.

### **Kelebihan Teknik Cornell dalam mata pelajaran matematik**

Menarik mengenai kaedah ini adalah ia tidak menggunakan ayat dan huraian yang panjang. Untuk setiap isi kandungan, anda boleh menulis menggunakan singkatan (abbreviation) atau simbol yang mudah difahami. Untuk rajah dan formula matematik, pelajar boleh meletakkannya di bahagian kanan halaman. Dengan ini, nota akan lebih kemas selain lebih mudah mencari isi penting untuk topik tertentu. Bukan itu sahaja, aturan seperti adalah lebih konsisten selain membantu pelajar mengasingkan perkara dan maklumat penting dengan kandungan topik yang lain.

Penyusunan isi dan idea menerusi kaedah ini adalah lebih jelas dan teratur. Hal ini kerana, kaedah ini telah mempunyai tiga bahagian yang berlainan untuk penulisan fakta. Bukan itu sahaja, ia menggunakan kata kunci mengenai aspek penting sesuatu topik yang dipelajari di kuliah. Selain itu, di bahagian bawah halaman juga anda menulis rumusan ringkas berdasarkan pandangan dan pemahaman anda. Bagi mata pelajaran matematik, di mana ianya adalah subjek dan topik yang rumit, pelajar dinasihatkan untuk menyelesaikan semua nota sejurus selepas kuliah selesai kerana anda boleh terus merujuk kepada pensyarah untuk bahagian yang mungkin tidak difahami.

FINITE MATH PAGE 1																											
LINEAR PROGRAMMING																											
Linear Function	* Maximum or Minimum of some																										
- Objective Function	linear function subject to linear inequalities.																										
Linear Inequalities																											
- Constraints (Subject to:)	* In Linear Programming problems X and Y are generally NOT negative!																										
STEPS FOR SOLVING LP PROBLEMS	EXAMPLES p.302 # 42																										
① DETERMINE YOUR VARIABLES	Let X = # of ounces per food M Let Y = # of ounces per food N																										
② WRITE RELEVANT INFO ABOUT X + Y IN A TABLE	<table border="1"> <thead> <tr> <th></th> <th colspan="2">LIMITS PER OUNCE</th> <th>MINIMUM REQUIREMENT</th> </tr> <tr> <th></th> <th>M</th> <th>N</th> <th></th> </tr> </thead> <tbody> <tr> <td>CALCIUM</td> <td>30</td> <td>10</td> <td>360</td> </tr> <tr> <td>IRON</td> <td>10</td> <td>10</td> <td>160</td> </tr> <tr> <td>VITAMIN A</td> <td>10</td> <td>30</td> <td>240</td> </tr> <tr> <td>CHOLESTEROL</td> <td>9</td> <td>4</td> <td>?</td> </tr> </tbody> </table>				LIMITS PER OUNCE		MINIMUM REQUIREMENT		M	N		CALCIUM	30	10	360	IRON	10	10	160	VITAMIN A	10	30	240	CHOLESTEROL	9	4	?
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CALCIUM	30	10	360																								
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VITAMIN A	10	30	240																								
CHOLESTEROL	9	4	?																								
③ DETERMINE THE OBJECTIVE FUNCTION	Objective Function Minimize C = 8x + 4y																										
④ WRITE CONSTRAINTS USING LINEAR INEQUALITIES OR EQUATIONS	Subject to: $30x + 10y \geq 360$ $10x + 10y \geq 160$ $10x + 30y \geq 240$ $x \geq 0, y \geq 0$																										

FINITE MATH PAGE 2																							
AFTER YOU'VE SET-UP AN LP PROBLEM, YOU CAN SOLVE IT -	Maximize $P = 3x + 5y$ Subject to $2x + y \leq 10$ $x + 2y \leq 8$ $x, y \geq 0$																						
① SKETCH AND SHADE REGION																							
② LABEL CORNER POINTS	(0,0) (0,4) (4,2) (8,0) FIND THIS POINT BY SOLVING THE SYSTEM																						
FIND POINTS FOR GRAPH BY PLUGGING D IN EACH EQUATION FOR BOTH X + Y	<table border="1"> <thead> <tr> <th colspan="2"><math>2x + y = 10</math></th> <th colspan="2"><math>x + 2y = 8</math></th> </tr> <tr> <th>x</th> <th>y</th> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>0</td> <td>8</td> <td>0</td> </tr> <tr> <td>0</td> <td>10</td> <td>0</td> <td>4</td> </tr> </tbody> </table>			$2x + y = 10$		$x + 2y = 8$		x	y	x	y	5	0	8	0	0	10	0	4				
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③ MAXIMIZE	$P = 3x + 5y$																						
* MAKE TABLE OF CORNER POINTS	<table border="1"> <thead> <tr> <th>X</th> <th>Y</th> <th>P</th> <th>Maximum Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>is 22 ct</td> </tr> <tr> <td>4</td> <td>2</td> <td>22</td> <td>(4, 2)</td> </tr> <tr> <td>0</td> <td>4</td> <td>20</td> <td></td> </tr> <tr> <td>8</td> <td>0</td> <td>15</td> <td></td> </tr> </tbody> </table>			X	Y	P	Maximum Value	0	0	0	is 22 ct	4	2	22	(4, 2)	0	4	20		8	0	15	
X	Y	P	Maximum Value																				
0	0	0	is 22 ct																				
4	2	22	(4, 2)																				
0	4	20																					
8	0	15																					
* PLUG X + Y INTO $3x + 5y$																							

Topic: <u>Graphing Linear Equations</u>	Name: _____ Class: <u>Algebra</u> Period: <u>4</u> Date: _____
Questions/Main Ideas	Notes
Standard form - Slope intercept form - slope -	$Ax + By = C$ ex. $4x + 3y = 9$ $y = mx + b$ ex $y = 2x + 1$ rise = change in y value = $y_2 - y_1$ run change x value $x_2 - x_1$
$2x + 4y = 20$ find the slope: subtract $2x$ divide by 4	$2x + 4y = 20$ $-2x \quad -2x$ $4y = -2x + 20$ slope = $-\frac{1}{2}$ $4 \quad 4 \quad 4$ y-intercept = 5 $y = \frac{1}{2} - \frac{1}{2}x + 5$
How do you graph a slope?	# Graphing 1. Plot y-intercept 2. follow slope 3. connect line.
Find the slope: find slope	$(1, 4), (3, 2)$ $y_2 - y_1 = 2 - 4 = -2 = 2$ $x_2 - x_1 = 3 - 1 = 2$ $y = \frac{2}{2}x + b$ slope-intercept = 0 $y = \frac{2}{2}x + 0$ y-intercept = 0
substitute	$4 = 2 + b$ $b = 0$
Summary: Today in class we learned the standard form ( $ax + by = c$ ) the slope intercept form ( $y = mx + b$ ) and what a slope is (rise over run) we also learned that when graphing, you plot the y first then follow the slope.	

## Cornell Notes for Math

Process	Problem
Use distributive property $a(b + c) = ab + ac$ on left side to remove parentheses.	$2(x + 3) - x = 2x + 8$
Combine two like 'x' terms on left side.	$2x + 6 - x = 2x + 8$
Subtract 'x' from both sides to isolate 'x'.	$x + 6 = 2x + 8$
Subtract 8 from both sides to isolate 'x'.	$6 = x + 8$
	$-2 = x$
<b>Summary of Process</b>	
1. Combine like terms.	3. Isolate variable.
2. Isolate terms w variable.	

Rajah 2 : Contoh dari pelajar

## Kesimpulan

Mengambil nota adalah kemahiran yang diperlukan untuk semua pelajar semasa sesi pengkuliah. Menyediakan pelajar dengan strategi pengambilan nota yang berbeza boleh memberi manfaat kepada mereka dalam kerjaya pendidikan masa depan mereka. Hasil kajian mendapati teknik mengambil nota yang berkesan terutamanya untuk subjek matematik adalah dengan menggunakan kaedah Cornell. Ianya mudah dan bukan sahaja membantu pelajar terutama dalam mempelajari mata pelajaran matematik untuk memilih kaedah di mana mereka boleh menyusun nota mereka tetapi juga cara untuk meningkatkan pembelajaran mereka.

Secara keseluruhan, teknik ini merupakan jalan mudah bagi pelajar dalam membantu meningkatkan pencapaian akademik mereka. Selain penyediaan nota yang kemas dan teratur, kaedah Cornell juga didapati mengambil masa yang singkat untuk menyerap fakta sebagai hasil pembelajaran yang berkesan sekaligus memudahkan pelajar untuk ulangkaji semula subjek yang telah dipelajari menerusi penyediaan nota yang sempurna beserta formula-formula dan teknik dalam menyelesaikan soalan matematik.

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## CABARAN PELAJAR PRA SAINS BELAJAR MATEMATIK SECARA ATAS TALIAN

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### ABSTRAK

*Pembelajaran secara atas talian merupakan kaedah pembelajaran baru yang telah dilaksanakan di Malaysia sejak PKP dilaksanakan dan masih lagi diteruskan di beberapa peringkat pengajian termasuklah di institusi pengajian tinggi. Walaupun pembelajaran norma baru ini telah berlangsung selama beberapa semester namun masih ramai lagi pelajar yang baru pertama kali belajar secara atas talian ini terutamanya bagi pelajar semester pertama lepasan SPM. Oleh yang demikian kajian ini dijalankan kepada pelajar Pra Sains yang rata-rata nya datangnya dari keluarga dengan kumpulan pendapatan B40. Kajian ini bertujuan untuk mengkaji cabaran pelajar Pra Sains terhadap pembelajaran matematik secara atas talian. Seramai 35 pelajar telah terlibat dalam kajian ini yang terdiri dari 15 pelajar lelaki dan 20 pelajar perempuan. Kajian ini adalah kajian kuantitatif berbentuk deskriptif yang menggunakan soal selidik sebagai instrumen kajian. Soal selidik dibangunkan menggunakan Google Form dan diisi oleh pelajar Pra Sains yang mengambil subjek Matematik bagi sesi Oktober-Februari 2022. Data yang diperolehi adalah dari soal selidik dan tinjauan yang telah dijalankan. Kajian ini juga dapat membantu pensyarah mengurangkan tekanan dan beban kerja pelajar sepanjang pembelajaran atas talian berlangsung. Antara cabaran utama dari pelajar adalah masalah capaian internet, tekanan, faktor persekitaran dan juga faktor sendiri pelajar. Statistik dari peratus bilangan pelajar dari cabaran-cabaran yang di dihadapi oleh pelajar diperolehi dari soal selidik tersebut. Hasil kajian ini mendapati peratus pelajar yang mempunyai masalah capaian internet yang lemah adalah tinggi. Oleh yang demikian, pensyarah perlu lebih peka terhadap masalah pelajar agar pelajar dapat menerima ilmu yang disampaikan dengan baik dan dalam masa yang sama mutu pengajaran pensyarah juga dapat ditambah baik.*

**Keywords:** *Matematik, cabaran, soal selidik, pembelajaran atas talian.*

### Pengenalan

Wabak Covid 19 di Malaysia telah memberi kesan yang sangat besar dalam pelbagai sektor antaranya adalah sektor pendidikan. Pergerakan setiap individu terbatas, tidak boleh bersentuhan dan perlu sentiasa menjaga penjarakan bagi mengelakkan diri dari dijangkiti. Justeru itu, alternatif yang telah dirancang ialah dengan menjalankan pembelajaran secara atas talian bagi memastikan sesi perkuliahan tetap berjalan. Walaupun sektor pendidikan telah dibuka sedikit demi sedikit untuk pembelajaran secara bersemuka namun di institusi pendidikan tinggi masih lagi dijalankan secara atas talian. Ini mungkin setelah diambil kira kesan yang akan dihadapi sekiranya terus dibuka secara bersemuka kerana rata-rata pelajar di institusi pengajian tinggi berada di serata daerah dan negeri.

Matematik adalah antara subjek yang sangat penting bagi pelajar Pra Sains. Mereka tidak dapat melanjutkan pengajian di peringkat Diploma sekiranya gagal dalam subjek Matematik. Justeru itu ia menjadi subjek teras dalam kebanyakan program pengajian di institusi pengajian tinggi di Malaysia. Oleh yang demikian, pelajar Pra Sains perlu lulus untuk subjek Matematik ini. Walaupun kebanyakan pelajar mengatakan yang subjek ini agak susah namun sekiranya pelajar memahami konsep asas matematik dan rajin membuat latihan, ia pasti akan menjadi mudah.

Secara amnya, pembelajaran atas talian di peringkat institusi pengajian tinggi belum lagi mencapai tahap yang optimum kerana kaedah secara bersemuka masih menjadi pilihan utama pelajar. Pelajar baru mungkin menghadapi masalah di peringkat awal pembelajaran. Begitu juga yang dihadapi untuk pelajar Pra Sains ini. Tambahan pula mereka merupakan pelajar semester pertama yang baru hendak membiasakan diri dengan teknik pembelajaran di universiti dan masih belum dapat menyesuaikan diri memasuki kelas atas talian ini. Tambahan lagi, subjek matematik yang memerlukan banyak pengiraan dan pemahaman konsep asas.

Masalah capaian internet sering menjadi cabaran dalam pembelajaran atas talian (Nor Shela & Mohd Shafie, 2020). Namun begitu, usaha giat yang dilakukan oleh syarikat telekomunikasi di Malaysia dalam meningkatkan rangkaian internet di Malaysia harus dipuji (Aziz, 2015). Oleh itu, seharusnya pelajar tidak perlu panik dalam menghadapi pembelajaran secara atas talian ini. Apa yang penting adalah pelajar itu sendiri perlu mendisiplinkan diri.

Menurut Bao (2020) pula, masalah lain yang sering dihadapi pelajar bukan sahaja kurang disiplin diri tetapi masalah seperti bahan pembelajaran yang tidak sesuai, kemudahan capaian internet dan keadaan persekitaran pembelajaran yang tidak selesa.

Taeho & Richardson (2015) pula menyatakan pelajar yang baru pertama kali mengikuti pembelajaran atas talian lebih merasa keseorangan kerana mereka baru ingin menyesuaikan diri dengan rakan-rakan sekelas dan persekitaran pembelajaran atas talian ini. Ditambah pula dengan pandemik yang melanda negara kini, sesi pengajaran dan pembelajaran (PnP) secara atas talian perlu diteruskan. Sudah tentu, pensyarah dan pelajar akan menghadapi cabaran ketika menjalankan PnP ini (Quah, 2020). Walau apa jua cabaran dan rintangan, semua pihak harus mempunyai tanggungjawab dalam membuatkan sesi dua hala ini berjalan dengan jayanya.

Menurut Mazidah & Aidawati (2021), hasil kajian mereka menunjukkan bahawa Google Meet mudah dicapai dan dikendalikan di samping mempunyai rekabentuk paparan yang mudah dan menarik. Google Meet mempunyai tahap mesra pengguna yang baik dan menyenangkan. Oleh itu Google Meet merupakan satu platform pengajaran dan pembelajaran yang baik untuk digunakan. Namun disamping semua kelebihan yang ditawarkan oleh aplilasi Google Meeet/ Zoom, ternyata terdapat beberapa kelemahan yang perlu dilihat, antaranya ialah ia memerlukan capaian internet yang baik. Sekiranya capaian internet kurang baik, proses pengajaran dan pembelajaran akan menjadi tidak lancar (Dara, 2020).

Kajian Faizatul & Nor (2017) mendapati cabaran utama dalam pembelajaran atas talian ialah pelajar tidak mempunyai komputer dan capaian internet. Ini akan menjadi alasan pelajar dalam menghantar tugas dan sebagainya. Justeru itu, ia akan menyukarkan pensyarah dalam memberi penilaian kepada pelajar tersebut. Oleh yang demikian, pensyarah perlu memikirkan kaedah lain sekiranya pelajar menjadikan isu tiada komputer dan capaian internet sebagai alasan.

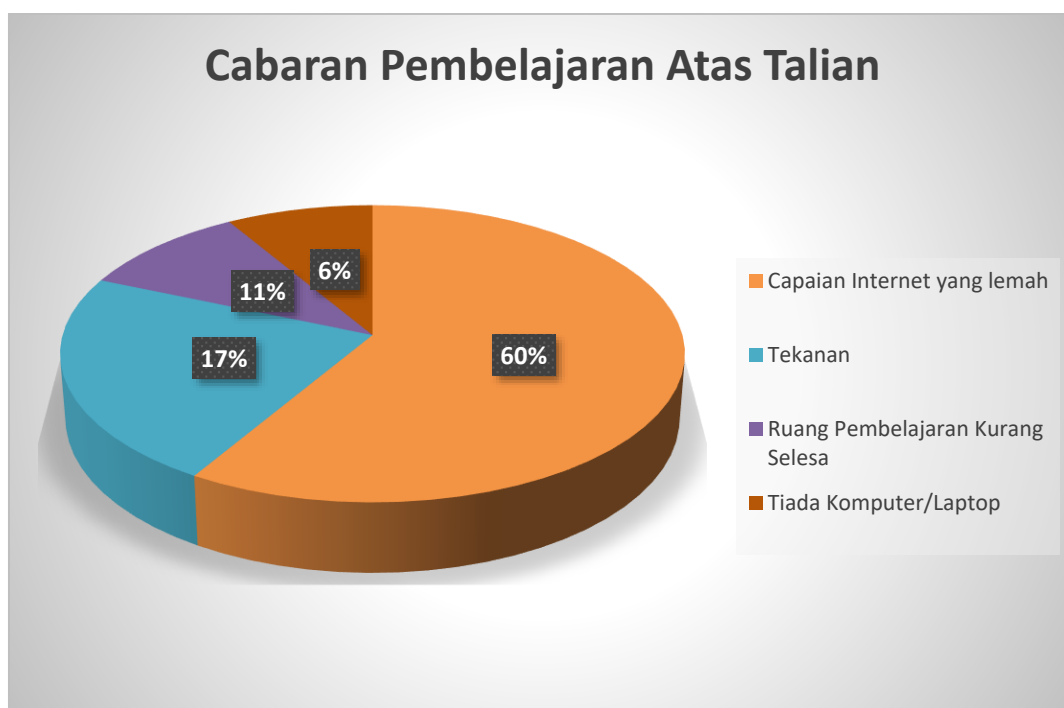
Oleh yang demikian, kajian ini akan mengenalpasti cabaran yang dihadapi pelajar Pra Sains sepanjang pembelajaran atas talian disamping meningkatkan teknik pengajaran dari pensyarah agar pelajar dapat menjalani sesi pembelajaran dengan berkesan.

## **Metodologi**

Kajian ini telah dijalankan terhadap pelajar Pra Sains yang mengambil subjek matematik ketika pelaksanaan pembelajaran secara atas talian di musim pandemik Covid-19. Data diperolehi daripada soal selidik yang telah dijalankan melalui borang soal selidik kepada 35 pelajar Pra Sains dari tiga kumpulan kelas untuk mengetahui cabaran yang mereka lalui sepanjang pembelajaran atas talian ini. Dari jumlah keseluruhan pelajar, didapati 15 pelajar lelaki dan 20 pelajar perempuan telah menjawab soal selidik berkenaan. Jawapan pelajar dari soal selidik tersebut telah dianalisa dan peratus bilangan pelajar dengan pilihan jawapan dari cabaran yang mereka hadapi sepanjang pembelajaran atas talian dikaji. Secara amnya, kajian ini adalah sangat berguna kepada pensyarah dalam menambah baik mutu pengajaran dan pembelajaran atas talian dalam memastikan semua pelajar tidak ketinggalan dalam mendapatkan ilmu seiring dalam perkembangan teknologi terkini.

### Analisa dan Perbincangan

Carta pie dalam Rajah 1 di bawah menunjukkan peratus bilangan pelajar yang menghadapi cabaran dalam pembelajaran secara atas talian sepanjang semester Oktober-Februari 2022. Empat cabaran semasa pembelajaran atas talian telah dikenalpasti iaitu capaian internet yang lemah, tekanan, ruang pembelajaran yang kurang selesa dan faktor sendiri pelajar.



Rajah 1: Carta Pie Cabaran Pembelajaran Secara Atas Talian.

Dari kajian yang telah dijalankan didapati 60% cabaran utama mereka ialah mereka berhadapan masalah capaian internet yang lemah. Walaupun pelajar diberi pilihan untuk berada di kampus atau berada di rumah namun masalah capaian internet ini adalah cabaran utama yang perlu diberi perhatian setiap kali semester pembelajaran secara atas talian ini dijalankan. Tambahan pula, kebanyakan pelajar Pra Sains ini adalah dari keluarga kumpulan pendapatan B40. Ini sedikit sebanyak menyumbang kepada cabaran dalam menimba ilmu yang disampaikan dari para pensyarah kepada pelajar. Malah rata-rata pelajar yang tidak tinggal di kampus, 30% dari mereka tinggal di kawasan luar bandar. Malah seramai 12 pelajar menggunakan telefon pintar sebagai alat komunikasi utama dalam pembelajaran atas talian ini. Oleh yang demikian cabaran utama ini bukan sahaja menyukarkan pelajar dalam pembelajaran malah membataskan mereka dalam menyelesaikan sesuatu tugas yang diberikan oleh pensyarah.

Cabaran yang kedua ialah tekanan. Sebanyak 17% cabaran sepanjang pembelajaran atas talian ini datangnya dari tekanan. Tekanan boleh dihadapi oleh pelajar dari pelbagai faktor. Antaranya dari kelemahan internet itu sendiri boleh membawa kepada tekanan kepada pelajar dimana apabila maklumat yang disampaikan pensyarah tidak dapat diterima dengan baik oleh pelajar, pelajar tidak dapat faham topik yang disampaikan pensyarah dan seterusnya pelajar tidak dapat menyelesaikan tugas yang diberikan dengan baik. Selain itu, pembelajaran maya ini juga sudah pastinya memenatkan pelajar kerana jadual yang padat untuk pelajar menamatkan pengajian asasi selama satu semester sebelum melanjutkan pengajian ke peringkat Diploma. Keletihan ini juga mendorong kepada tekanan kepada pelajar. Oleh yang demikian tugas yang diberikan kepada pelajar perlu diambil kira supaya pelajar tidak terlalu letih dalam menyiapkan tugas yang diberikan oleh pensyarah di samping mengurangkan tekanan kepada pelajar.

Cabaran yang ketiga pula ialah ruang pembelajaran yang kurang selesa. Sebanyak 11% pelajar mengatakan ruang pembelajaran yang kurang selesa menyebabkan mereka kurang fokus semasa sesi pembelajaran. Ini adalah antara cabaran yang biasa dihadapi bukan sahaja kepada pelajar tetapi juga kepada pensyarah yang mengajar. Cabaran ini juga boleh dilihat dari segi faktor persekitaran pelajar. Ini kerana setiap pelajar datang dari latar belakang yang berbeza. Corak kehidupan, adik beradik yang ramai dan masalah keluarga adalah antara gangguan yang sering menjadi cabaran kepada pelajar semasa pembelajaran secara atas talian. Atas faktor ini juga sebanyak 31% pelajar memilih untuk tinggal di kampus supaya lebih fokus semasa sesi pembelajaran. Pelajar boleh berbincang dengan rakan-rakan yang lain atau terus rujuk kepada pensyarah jika ada sesuatu topik yang mereka tidak faham.

Cabaran yang ketiga pula ialah dari faktor sendiri pelajar. Sebanyak 6% pelajar mengatakan yang mereka kurang keyakinan diri untuk belajar sendiri dan tidak mempunyai motivasi belajar secara atas talian. Mereka perlu untuk mendisiplinkan diri dalam membahagikan masa untuk sesuatu kelas, tambahan pula bagi pelajar yang berada di rumah. Mereka bukan sahaja perlu menyiapkan tugas dari pensyarah, tetapi perlu membantu ibu bapa menguruskan adik beradik, membuat kerja rumah, ada yang mempunyai masalah kesihatan, ada yang mungkin dijangkiti virus Covid 19 malah ada juga yang terpaksa bekerja untuk menyara kehidupan keluarga.

Selain itu, cabaran yang keempat pula ialah pelajar tiada peralatan komunikasi yang baik sepanjang pembelajaran. Sebanyak 6% pelajar menggunakan hanya telefon pintar sebagai alat utama sepanjang pembelajaran atas talian berlangsung. Mereka tidak mempunyai komputer riba atau

komputer di rumah. Ini antara cabaran pelajar dalam menerima ilmu yang disampaikan pensyarah dan menjadi kekangan untuk mereka dalam menyelesaikan tugas yang diberi pensyarah. Ramai dalam kalangan pelajar berasal daripada keluarga B40 yang mana mereka tidak mempunyai komputer riba atau komputer di rumah. Jadi mereka hanya menggunakan telefon pintar 100% dalam pembelajaran atas talian ini.

Berikut adalah antara respon yang diterima dari pelajar Pra Sains sepanjang pembelajaran secara atas talian:

*“Saya berharap pembelajaran dibuat secara online dan offline”* -Respondan 1

*“Video recording sangat membantu pelajar terutamanya pelajar yang mempunyai gangguan teknikal semasa kelas”* -Respondan

2

*“Bagi saya ianya sangat menyeronokkan walaupun secara online dan saya dapat fahami kesemua ilmu yang di curahkan walaupun secara online. Bagi saya tiada sebarang penambahbaikan kerana semua yang telah madam lakukan sudah cukup terbaik dan memadai”* -

Respondan 3

*“Saya rasa mungkin agak sedikit sukar untuk bertanya soalan untuk online class berbanding bersemuka”* -

-Respondan 4

*“Saya mempunyai masalah internet pelajar”* -Respondan 5

*“Stress belajar online..”* -Respondan 6

Oleh yang demikian, didapati dari cabaran yang dikenal pasti ini apa yang perlu adalah pelajar perlu lebih bersikap positif untuk mengatasi cabaran pembelajaran atas talian ini walaupun ia sukar dilaksanakan. Pelajar perlu yakin dan percaya ia sangat penting untuk memperolehi manfaat dari pembelajaran yang dilaksanakan meskipun ia sekadar pembelajaran atas talian kerana setiap pelajar pasti akan memperolehi kejayaan atas usaha mereka sendiri.

## Kesimpulan

Kajian ini mendapati capaian internet yang lemah masih menjadi cabaran utama pelajar dalam pembelajaran secara atas talian ini. Apa yang pelajar harus faham adalah menuntut ilmu itu tiada batasan kerana ilmu itu sangat luas. Dalam pelaksanaan pembelajaran atas talian, meskipun terdapat banyak cabaran pelajar tidak seharusnya menjadikannya sebagai beban atau batu penghalang untuk mereka terus belajar mencari ilmu. Justeru, cabaran inilah yang sepatutnya dijadikan sebagai semangat untuk mereka terus melangkah mencapai kejayaan dalam apa jua bidang yang mereka pelajari. Walaupun pelajar datangnya dari latar belakang yang berbeza, dengan usaha dan cabaran yang mereka tempuhi itu sudah pasti kejayaan yang mereka perolehi akan menjadi kebanggaan kepada ibu bapa masing-masing malah kepada tenaga pensyarah yang mengajar tanpa penat dan lelah.

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## **PARTISIPASI PELAJAR DALAM PROSES PENGAJARAN DAN PEMBELAJARAN PENGATURCARAAN DALAM TALIAN BERMEDIUMKAN APLIKASI CLASSPOINT**

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### **ABSTRAK**

*Kaedah pembelajaran dan pengaturcaraan secara semuka yang telah sekian lama dipraktiskan mempunyai permasalahan besar untuk ditangani, apatah lagi cabaran pengajaran pengaturcaraan dalam talian. Kaedah pengajaran dan pembelajaran dalam talian seakan menjadi satu keperluan mendesak seiring dengan perubahan masa dan kemajuan teknologi walaupun dunia telah bebas daripada pandemik COVID-19 kelak. Cabaran terbesar dalam proses pengajaran dan pembelajaran dalam talian adalah berkaitan dengan partisipasi pelajar. Era digital memperlihatkan kepelbagaian perisian komputer dibangunkan untuk memenuhi keperluan norma masyarakat terkini yang menyokong proses pengajaran dan pembelajaran secara dalam talian. Setiap perisian mempunyai kelebihan tersendiri, bergantung kepada tujuan dan bagaimana ia digunakan untuk menghubungkan pengguna secara maya. Dalam kajian ini, aplikasi ClassPoint digunakan untuk menggalakkan partisipasi pelajar dalam proses pengajaran dan pembelajaran pengaturcaraan secara dalam talian.*

***Kata kunci: partisipasi pelajar, pembelajaran dan pengaturcaraan dalam talian, ClassPoint***

### **Pengenalan**

Pengumuman Perintah Kawalan Pergerakan (PKP) akibat penularan virus COVID-19 pada 18 Mac 2020 yang telah membawa kepada penutupan semua sekolah dan institusi pendidikan di Malaysia (Kementerian Pendidikan Malaysia, 2020; Pejabat Perdana Menteri Malaysia, 2020). Natijah daripada situasi ini, seluruh institusi pendidikan di Malaysia beralih kepada mod pendidikan dalam talian demi kemaslahatan semua pihak dalam menentang virus COVID-19 yang kian mengganas pada ketika itu. Landskap pendidikan telah berubah secara total, bukan sahaja di Malaysia tetapi di seluruh dunia dan University of Washington menjadi universiti pertama di dunia yang membatalkan kelas secara bersemuka berkuat kuasa pada 6 Mac 2020 (Thomason, 2020). Pada asasnya, pembelajaran atas talian digambarkan sebagai ruang alam maya untuk proses pengajaran dan pembelajaran secara tatap muka yang menggunakan perantaraan peralatan komputer di mana murid dapat melihat dan mendengar murid lain dari jarak jauh dengan tetapan tertentu tanpa memerlukan

pelajar berada di tempat yang sama dan dihubungkan melalui talian internet (Hrastinski, 2019).

Kursus pengenalan pengaturcaraan menjadi elemen penting untuk pelajar jurusan teknologi (Chen et al., 2017; Combefis et al., 2016). Konsep pengaturcaraan asas merujuk kepada konsep asas yang berkaitan dengan pengaturcaraan berstruktur dan algoritma yang digunakan dalam pengaturcaraan (Ouahbi et al., 2015). Proses pengajaran dan pembelajaran pengaturcaraan dianggap salah satu daripada tujuh cabaran besar dalam pendidikan pengkomputeran (McGettrick et al., 2005) dan ini dikuatkan lagi dengan kajian oleh beberapa orang penyelidik lain (Elly Johana, 2021; Mason, 2012; Soloway & Spohrer, 2013) yang mengutarakan isu yang sama. Menurut Renumol et al. (2012) faktor ketara yang menyumbang kepada kesukaran mempelajari kursus pengaturcaraan adalah berkait dengan kesukaran untuk mula menulis atur cara, memahami logik atur cara, menangani sintaks bahasa pengaturcaraan, menyahpejatkan, kekurangan pengetahuan mengenai sistem operasi dan persekitaran aplikasi yang digunakan serta masalah yang melibatkan aspek psikologi dan juga fisiologi. Permasalahan pengajaran dan pembelajaran pengaturcaraan peringkat asas telah menjadi isu sejagat dalam pendidikan pengkomputeran. Kaedah pembelajaran dan pengaturcaraan secara semuka yang telah sekian lama dipraktiskan mempunyai permasalahan besar untuk ditangani, apatah lagi cabaran pengajaran pengaturcaraan dalam talian (Zin et al., 2006). Secara suka atau terpaksa dengan norma baru yang sudah mencecah usia hampir dua tahun, pelajar perlu menyiapkan diri dan perlu bersedia untuk mengadaptasi kaedah pembelajaran dalam talian (Ghebreyesus, 2020). Ala-Mutka (2005) merumuskan sifat peribadi pelajar akan mempengaruhi prestasi mereka.

Era digital memperlihatkan kepelbagaian perisian komputer dibangunkan untuk memenuhi keperluan norma masyarakat terkini. Telah diakui secara meluas bahawa Maklumat dan Teknologi Komunikasi (ICT) boleh digunakan untuk memberi impak positif dalam pengajaran dan pembelajaran secara umum (Ghavifekr et al., 2015) dan dalam bidang pengkomputeran kejuruteraan secara khusus. Antara perisian yang sering kali diguna pakai untuk menjadikan proses pengajaran dan pembelajaran atas talian menjadi lebih realistik adalah seperti *Google Meet*, *Google Classroom*, *Google Docs*, *Google Forms*, *Zooms*, *Microsoft Forms*, *Microsoft Sway*, *Microsoft Teams*, *Kahoot*, *Padlet*, *Quizizz*, dan *ClassPoint*. Perisian berbeza mempunyai ciri yang berbeza dan seterusnya akan memberikan kepuasan yang berbeza kepada pengguna (Rofizah 2020). Setiap perisian mempunyai kelebihan tersendiri, bergantung kepada tujuan dan bagaimana ia digunakan untuk menghubungkan pengguna secara maya. Dalam kajian ini, aplikasi *ClassPoint* digunakan untuk menggalakkan partisipasi pelajar dalam proses pengajaran dan pembelajaran pengaturcaraan secara dalam talian.

### **Partisipasi Pelajar Dalam Proses Pengajaran dan Pembelajaran Pengaturcaraan Dalam Talian**

Permasalahan pengajaran dan pembelajaran pengaturcaraan peringkat asas telah menjadi isu sejagat dalam pendidikan pengkomputeran. Masalah pengajaran dan pembelajaran pengaturcaraan menjadi lebih serius dan mencabar pada peringkat lanjutan. Dalam kepelbagaian paradigma pengaturcaraan, bahasa, kaedah, persekitaran, dan konsep pengaturcaraan, proses penaakulan logik sangat mencabar bagi pelajar. Bransford et al. (2000) dan Allert (2004) bersetuju bahawa kemahiran ini merupakan proses kritikal dalam menyokong pembelajaran dan penyelesaian masalah dalam kursus pengaturcaraan. Gomes dan Mendes (2007) merumuskan tiga faktor yang melibatkan strategi pengajaran, sikap pelajar dan kaedah pembelajaran sebagai faktor penyumbang kepada kesukaran pengajaran dan pembelajaran pengaturcaraan. Du et al. (2016) menyatakan bahawa pembelajaran pengaturcaraan tidak menunjukkan perkembangan yang baik dan menjadi isu sejagat dalam dunia pendidikan pengkomputeran.

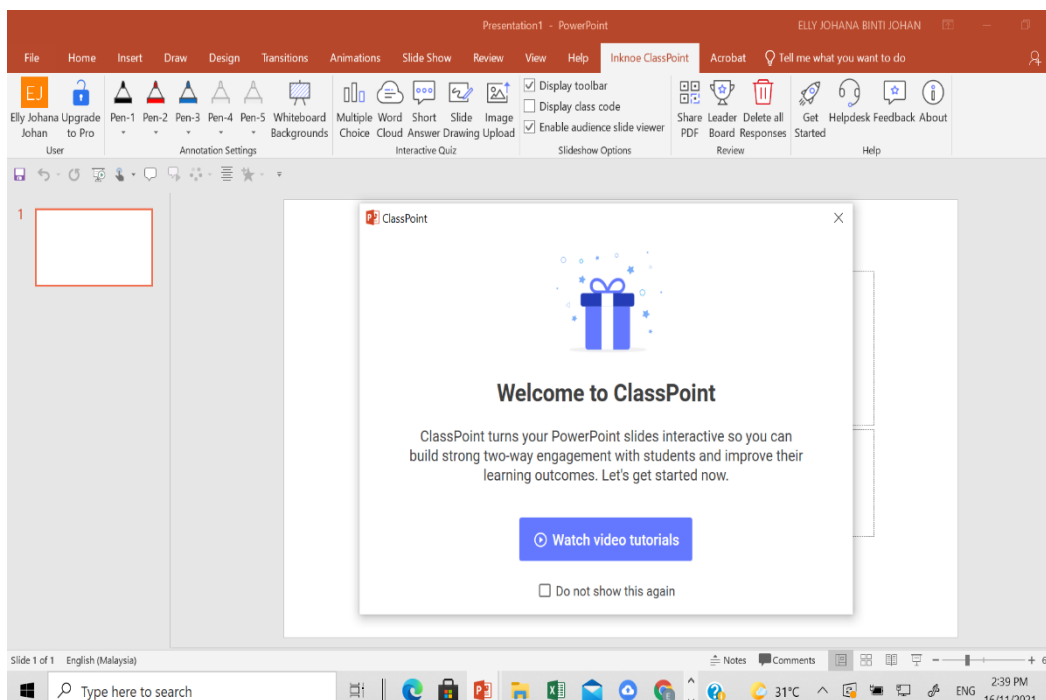
Cabaran terbesar dalam proses pengajaran dan pembelajaran dalam talian adalah berkaitan dengan partisipasi pelajar, apatah lagi yang melibat kursus pengaturcaraan. *Glossary of Education Reform* (2016) mentakrifkan partisipasi pelajar sebagai tahap perhatian, rasa ingin tahu, minat, keyakinan dan semangat yang ditunjukkan oleh pelajar semasa proses pengajaran dan pembelajaran sedang berlangsung. Apabila idea ini dikaitkan dengan kaedah pembelajaran dalam talian, ini bermakna persekitaran maya tersebut berupaya mewujudkan senario untuk pelajar mengambil bahagian dalam sesi pengajaran dan pembelajaran yang sedang berjalan dan secara tidak langsung menyumbang kepada pencapaian objektif pembelajaran dengan lebih efektif.

Melalui kajian yang dilakukan oleh Maltby & Whittle (2020) didapati majoriti pelajar lebih menggemari kaedah pembelajaran dan pengajaran pengaturcaraan secara bersemuka berbanding kaedah dalam talian walaupun ia tidak memberi kesan pada pencapaian gred peperiksaan pelajar. Dalam kaedah pengajaran dan pembelajaran pengaturcaraan secara bersemuka, partisipasi pelajar lazimnya dinilai berdasarkan pemerhatian semasa kuliah atau semasa sesi makmal yang melibatkan aspek kekerapan bertanya soalan, menjawab soalan yang diberi, mengutarakan pendapat dan membantu penyelesaian masalah rakan sekelas. Tahap interaksi antara pelajar dan tenaga pengajar dalam kaedah pengajaran dan pembelajaran atas talian yang melibatkan aspek tersebut dilihat sangat merosot. Melalui pembelajaran atas talian, komunikasi lebih berat kepada komunikasi sehalu yang memperlihatkan tenaga pengajar menyampaikan kandungan pembelajaran dan pelajar mendengar. Pelajar didapati kurang berinteraksi dan tidak mahu memberi maklum balas yang baik walaupun

semasa sesi soal jawab dibuka. Menurut Hassan (2007), kejayaan pembelajaran dalam talian bergantung kepada hubungan dua hala antara pelajar dan pengajar, juga hubungan dalam kalangan pelajar itu sendiri. Permasalahan yang dihadapi pelajar ini mencabar keupayaan pensyarah untuk mewujudkan satu persekitaran yang mendorong pelajar untuk berinteraksi dan memberi maklum balas dengan lebih baik demi melancarkan proses pengajaran dan pembelajaran tanpa memberi tekanan kepada pelajar. Keadaan persekitaran seharusnya mendorong partisipasi pelajar secara langsung melalui satu set aktiviti realistik yang mempunyai dorongan atau motivasi intrinsik untuk pelajar terus bersemangat dalam meneruskan sesi pengajaran dan pembelajaran.

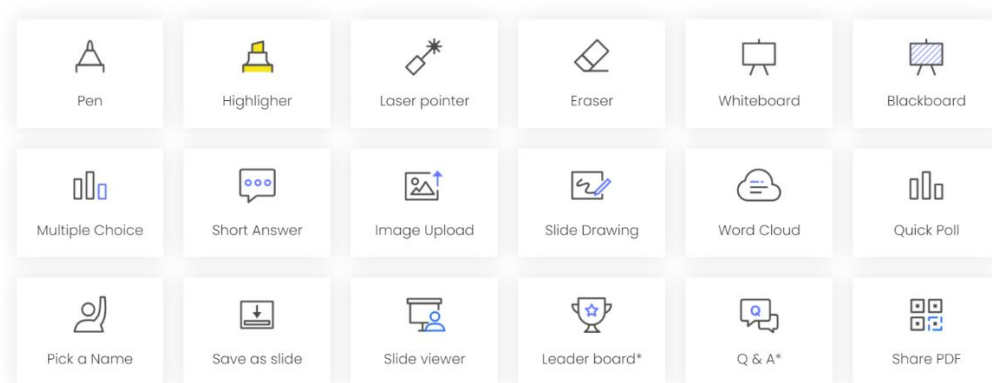
### Aplikasi *ClassPoint*

*ClassPoint* adalah aplikasi yang ditambah dalam perisian *PowerPoint* sedia ada seperti yang ditunjukkan dalam Rajah 1 untuk menjadikan *PowerPoint* bersifat interaktif dan boleh digunakan secara dua hala oleh tenaga pengajar dan pelajar secara serentak. *ClassPoint* adalah alatan kuiz interaktif yang berupaya yang membantu partisipasi pelajar secara langsung untuk meningkatkan hasil pembelajaran dengan lebih efektif.



Rajah 1: Aplikasi *ClassPoint*

Fitur menarik yang terdapat dalam aplikasi *ClassPoint* adalah seperti *pen*, *eraser*, *laser point*, *highlighter*, *whiteboard*, *quick poll* dan lain-lain seperti yang ditunjuk dalam Rajah 2. Selain itu, *ClassPoint* boleh digunakan secara interaktif bersama pelajar melalui penyediaan soalan *multiple choice*, *word cloud*, *short answer*, *slide drawing* atau *image upload* untuk menjadikan proses pengajaran dan pembelajaran menjadi lebih berkesan dengan partisipasi pelajar secara menyeluruh.



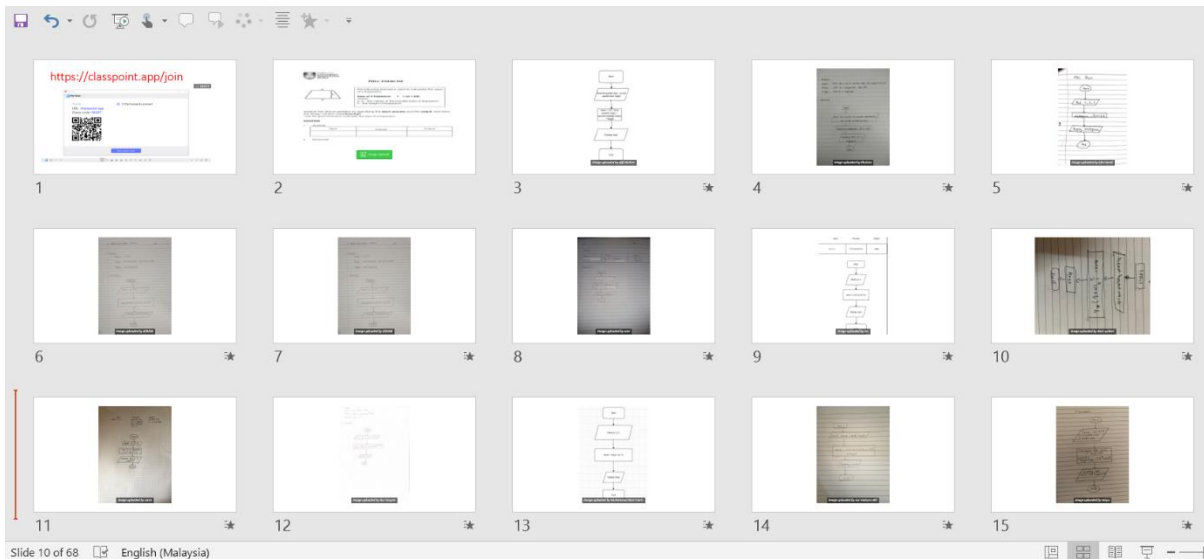
Rajah 2: Fitur *ClassPoint*

*ClassPoint* mudah disepadukan dengan aplikasi persidangan video seperti *Microsoft Teams*, *Google Meet* dan *Zoom* yang memberi ruang kepada tenaga pengajar dan pelajar untuk berada di halaman skrin yang dan pelajar tidak perlu memasang aplikasi *ClassPoint* pada peralatan yang mereka gunakan. Cara penggunaan yang mudah dengan partisipasi pelajar secara menyeluruh dan interaktif, keupayaan pelajar untuk memahami proses pembelajaran dan pengajaran menjadi lebih efektif.

### **Proses Pengajaran dan Pembelajaran Pengaturcaraan Dalam Talian Bermediumkan Aplikasi *ClassPoint***

Lazimnya, proses pengajaran dan pembelajaran pengaturcaraan dalam talian mengambil masa yang lebih lama berbanding kaedah bersemuka yang boleh disebabkan oleh masalah teknikal seperti penetapan aplikasi dan sambungan internet yang kurang stabil. Semasa sesi makmal kursus pengaturcaraan yang memerlukan pelajar menyelesaikan permasalahan pengaturcaraan, maklum balas segera tidak dapat diberikan akibat keterbatasan waktu untuk menyelami dan menyemak satu persatu jawapan yang dihantar oleh pelajar. Permasalahan ini dapat diatasi menggunakan fitur *upload image* yang terdapat pada aplikasi *ClassPoint* yang membolehkan semua penyerahan jawapan pelajar disimpan secara automatik oleh *ClassPoint* dalam bentuk slaid. Dalam kajian ini, pelajar diberi tugas yang memerlukan mereka mengenal pasti input, proses dan output serta menghasilkan carta

alir (*flow chart*) bagi permasalahan tersebut dalam masa yang ditetapkan. Pelajar akan memuat naik jawapan mereka melalui kod kelas yang diberikan dan Rajah 3 menunjukkan paparan slaid jawapan yang dihantar oleh pelajar.



Rajah 3: Fitur *upload image* pada *ClassPoint*

Partisipasi pelajar dilihat amat memberangsangkan dengan mereka memberi tindak balas dalam jeda masa yang ditetapkan. Mereka memberi perhatian penuh dan menunjukkan rasa ingin tahu, minat, keyakinan dan semangat semasa proses pengajaran dan pembelajaran sedang berlangsung. Maklum balas terhadap jawapan pelajar boleh diberi secara langsung sebaik masa menjawab tamat. Tenaga pengajar dan pelajar berkongsi paparan skrin yang sama dan ini secara tidak langsung menimbulkan kemahiran pembelajaran sosial dalam talian. Pelajar bukan sahaja berinteraksi dengan tenaga pengajar tetapi dengan rakan sekelas lain secara maya, sebagai contoh mereka bertanyakan pada rakan lain mengenai aplikasi mudah untuk menghasilkan carta alir yang kemas. Pelajar juga mempelajari dan bertanya kemusykilan yang timbul dari hasil jawapan pelajar lain yang dapat dilihat pada paparan skrin. Melalui kaedah ini, idea yang jelas tentang partisipasi pelajar dan tahap kefahaman mereka dapat dikenal pasti dan penambahbaikan proses pengajaran dan pembelajaran dapat dilakukan dengan kadar segera.

## Rumusan

Pandemik COVID-19 yang melanda dunia memberi impak yang besar kepada rutin pengajaran dan pembelajaran ahli akademik seluruh dunia. Namun, di sebalik cabaran yang dihadapi, telah terbuka pintu untuk mendorong ahli akademik berinovasi dan kreatif dalam mencari penyelesaian demi

kelangsungan proses pengajaran dan pembelajaran dalam talian. Proses pengajaran dan pembelajaran pengaturcaraan dianggap salah satu daripada tujuh cabaran besar dalam pendidikan pengkomputeran dan cabarannya pasti lebih besar jika dijalankan secara dalam talian. Kajian ini menunjukkan bahawa pemilihan dan penggunaan aplikasi *ClassPoint* menggalakkan partisipasi pelajar secara menyeluruh semasa pelaksanaan pengajaran dan pembelajaran pengaturcaraan secara dalam talian. Hal ini dapat dilihat daripada pemerhatian yang dilakukan semasa proses pengajaran dan pembelajaran pengaturcaraan dalam talian berlangsung. Data kajian menunjukkan responden sangat positif terhadap penggunaan dan penerimaan aplikasi *ClassPoint*, khususnya ketika melaksanakan tugas pengaturcaraan. Aplikasi *ClassPoint* boleh digunakan sebagai salah satu alternatif alatan digital dalam kaedah pembelajaran dan pengajaran pengaturcaraan dalam talian yang secara tidak langsung dapat memenuhi tuntutan pembelajaran abad ke-21 yang menekankan aspek kreativiti, komunikasi serta literasi teknologi, maklumat dan komunikasi.

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## **EASY AND INTERESTING REVISION STYLE USING SMART INTERACTIVE REVISION TOOL (SIRT 2.0)**

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### **ABSTRACT**

*Smart Interactive Revision Tool (SIRT 2.0) is a new tactic to do revision in an interesting way that up current online distance learning (ODL) system. Usually, student faces problems while performing revision. Student will feel bored to do revision in traditional way beside that, nowadays all the notes are in softcopy form that forces them to do online revision. They also felt bored to read non interesting notes that been provided. So, to make them enjoy their revision period, SIRT 2.0 are introduce. SIRT 2.0 allows the student to develop their own revision notes interestingly in video form using TikTok. This approach grants the student from all levels of education either from school or university student to enjoy their revision period. This SIRT 2.0 is the upgrade version from the 1st edition with additional features. SIRT 2.0 is design especially for Pre-Comm student for subject MAT 037. A survey involving 60 of students has been done to identify the satisfaction about SIRT 2.0 among the Pre-Comm student from UiTM Cawangan Pulau Pinang. From the survey, almost everyone satisfied and enjoy doing revision using SIRT 2.0. SIRT 2.0 will be the best approach to perform revision an easy and interesting way.*

**Keywords:** *interesting, online education, Tik Tok, education videos, style of study*

### **Introduction**

Since COVID-19 start to spread to all over the world, the education system has changed their traditional face to face (f2f) system to online education system. All level of education from preschool until university are started to be conducted thru online education system. Smartphone, laptop, tab and desktop will be the main medium for this education style. To make the revision process align to the education style, SIRT is introduce. Students usually faces problem and feel bored with doing the traditional way of revision. Besides that, students also have problem to share revision notes to their friends.

SIRT is a new approach that allow student from all levels to do revision in easy and interesting way. The main purpose of the SIRT ides comes because to enc create simple, interesting, attractive, and easy-to-understand content. SIRT 2.0 also provide animated and attractive content which can be accessed easily, anywhere at any time thru medium TikTok, WhatsApp or Telegram. Initially, SIRT was develop for secondary student so that they can do short notes video for reading subject like science. SIRT get a good respond from the secondary school student. Therefore, SIRT 2.0 are introduce to Pre-Comm students in subject Mathematics (MAT 037). There are new features and

style introduce added to SIRT 2.0. The uniqueness of SIRT 2.0 are the videos in it are easy to understand, attractive, and fast learning up to trend of online learning. SIRT 2.0 also have interesting and easy to understand with creative video notes.

In the previous study stated that video has become an important part of higher education during online classes. Several analyses have shown that technology can enhance learning and multiple studies showed that video, specifically, can be a highly effective educational tool (Stockwell, et al, 2015), (Kay, ,2012) and (Allen & Smith, 2012).

The effective use of video as an educational tool can be enhanced once instructors consider three elements. The first element is how to manage cognitive load of the video, secondly how to maximize student engagement with the video and third element is how to promote active learning from the video (Cynthia & Kathryn, 2021) and (Means et al, 2010). A survey has been done to TikTok users, and the findings discovered that content quality, task technology fit, and vividness have a significant influence on overall effectiveness learning (Bashar, 2021). There are positive and negative implications to the use of TikTok based on the educational environments. It is crucial to harness the positive aspects and adapt them to the modern approaches in teaching this can be achieved by establishing TikTok clubs on local and national levels at schools and other institutions (Yang, 2020).

## **Methodology**

In the process of developing SIRT 2.0 there two (2) main method applied. First method is for developing the video then the second method are to study the satisfaction of SIRT 2.0. In this part the 1<sup>st</sup> method will be elaborate while the 2<sup>nd</sup> method will be discussed further in part result and discussion.

SIRT 2.0 has been develop based on Program Development Life Cycle (PDLC) steps as shown in Figure 1. There are five main steps in PDLC that start with analysis, design, implementation, testing and documentation.



Figure 1: PDLC design

In the SIRT 2.0, the problem statement was identified. The main problem is student felt bored to perform revision in traditional way. Besides that, the notes are bored and not attractive. So, once students once clearly understand the requirements to solve the problem, they plan to design the revision notes in interesting form. Next in the design level, interface design was developed for video style and content that can be delivered interestingly. Few styles are design. Then, the video was created using TikTok. After developing the video, the video was shared among few students to test the satisfaction.

### Product Description

The videos in SIRT 2.0 are developed using TikTok application. TikTok application are selected to create revision video because, nowadays TikTok has been one of the easiest applications that can be used and share in social media. Everyone interested to view the TikTok video. Besides that, everyone can have smartphone that have TikTok application. TikTok video also can be share in WhatsApp or Telegram group The social media application TikTok is very potential as an educational tool since it enables the delivery of small learning units in a short time duration [2]. Below in Figure 2 to Figure 4 show the variety of interface video style that used in SIRT 2.0.

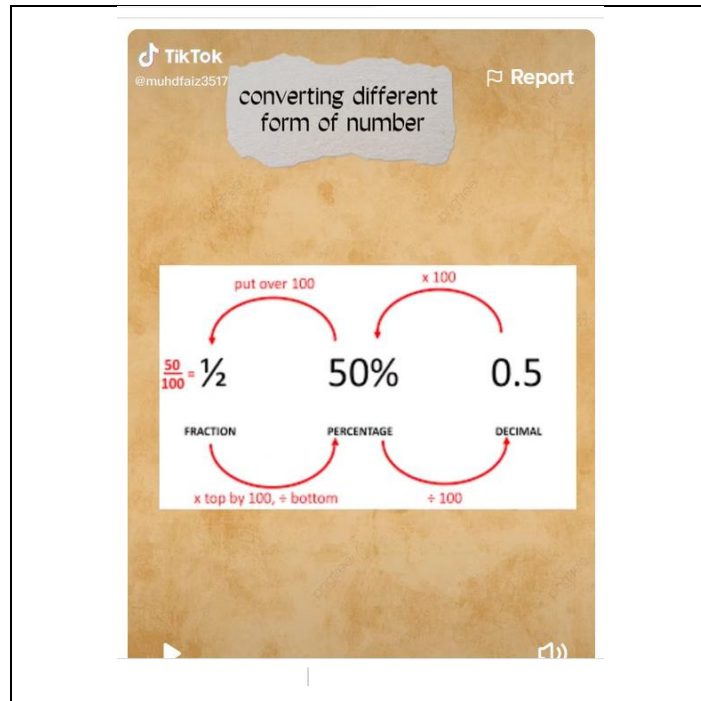


Figure 2: Sample of SIRT 2.0 video notes interface

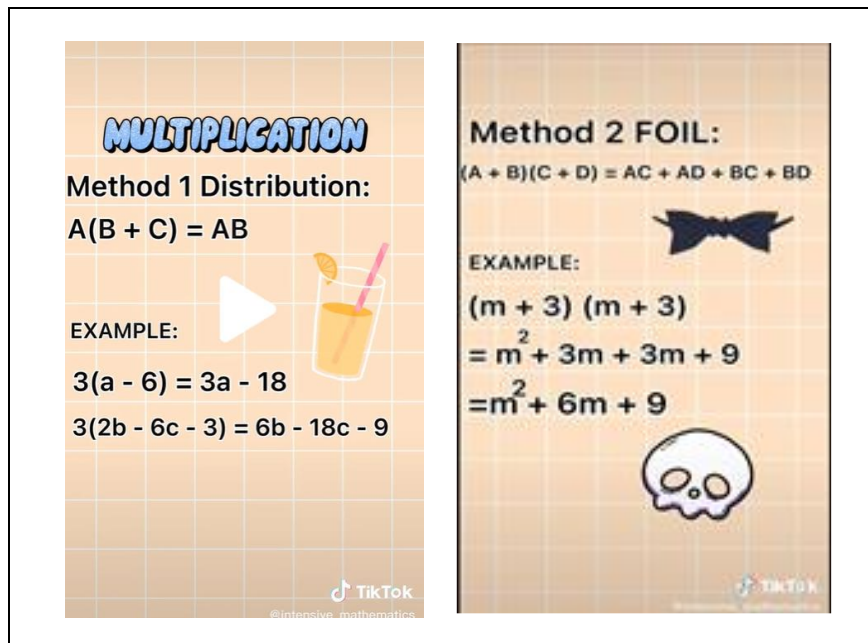


Figure 3: Sample of SIRT 2.0 video example interface

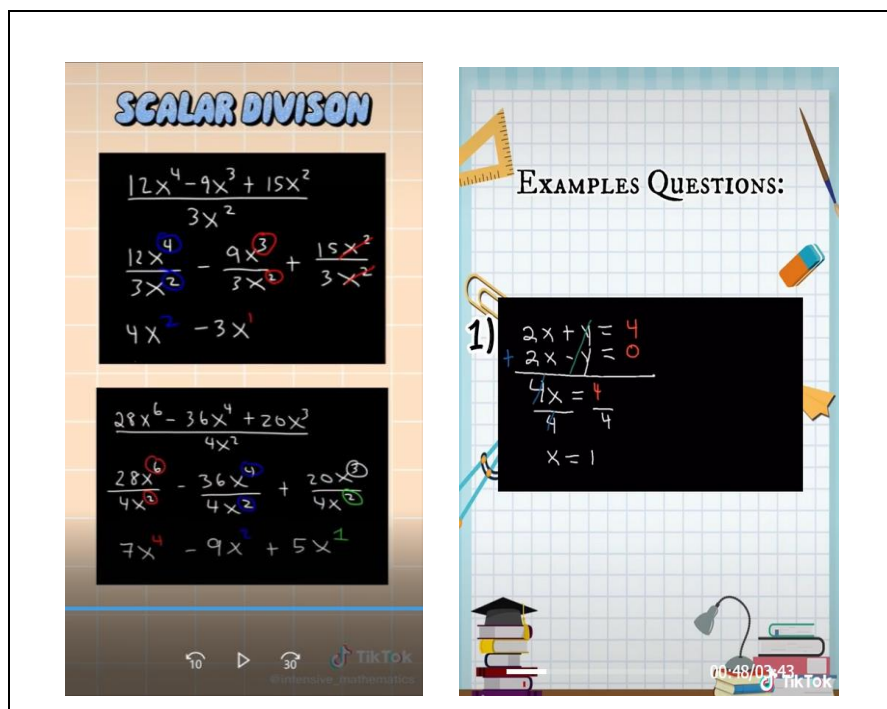


Figure 4: Sample of SIRT 2.0 video example question interface

## Results and Discussion

A survey has been conducted among Pre-Commerce (PBA002/PBA003) students from UiTM Cawangan Pulau Pinang who is taking Intensive Mathematics 1 (MAT037) course for the current semester, October 2021-February 2022. The main objective of the questionnaire is to identify the student's opinion and satisfaction using SIRT 2.0 as their revision tool in learning MAT037. The questions are divided in two parts which are:

- a) Demographic
  - Gender
  - Where they stay
- b) SIRT 2.0 satisfaction

Below are the results and findings from the questionnaire distributed among the students. The table above shows the demographic information about the respondent. From the 60 students involved in this study, 32 of them are female student while 28 of the are male student as shown in Table 1. Table 2 shows, total of 33 of them staying in campus and remaining 27 are staying in their own

hometown. This is because not all the students are allowed to stay at campus due to the SOP in the Covid-19 situation.

Table 1: Respondent Demographic based on gender

Gender	Male	Female
Number of students	32	28

Table 2: Respondent Demographic based on place staying

Place of staying	Stay In Campus	Stay in Hometown
Number of students	33	27

Figure 5 illustrates the respondent’s satisfaction in using SIRT 2.0. The result shows, 83% of the respondent are satisfied with SIRT 2.0 as it can help and make them enjoy during their revision time especially for subject MAT 037. They are felt very happy that they do not have to carry the textbook around for their revision. Besides that, the respondent also realized that with SIRT 2.0, they are able communicate and share their video notes easily with their friends thru What’s App or Telegram especially during group studies.

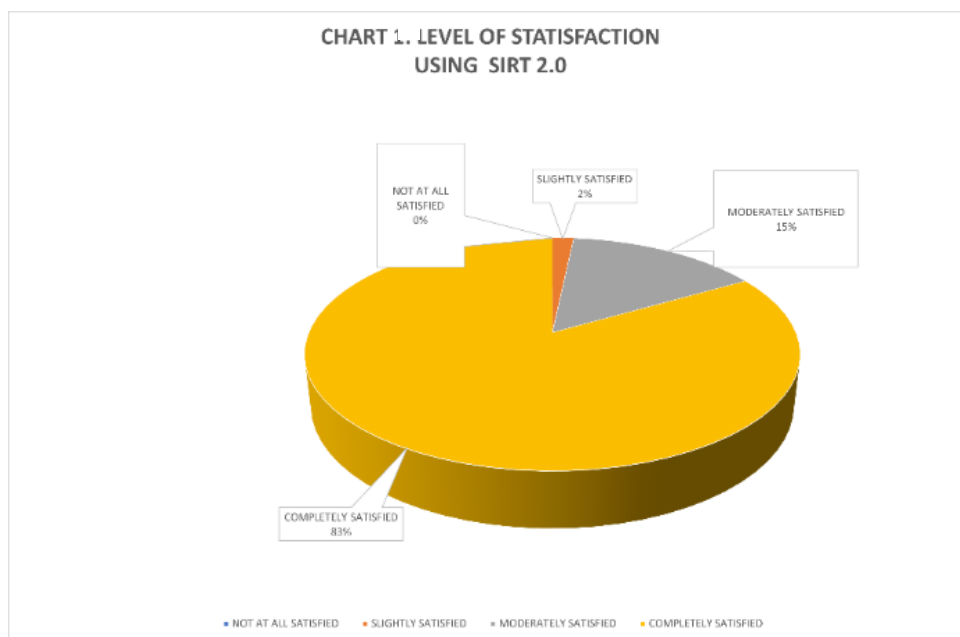


Figure 5: Student’s level of satisfaction using SIRT 2.0

Figure 6 below shows that 96.67% respondent likes the video style in SIRT 2.0. The video in

SIRT 2.0 have the notes with the explanation given. Only 5% of the respondent dislike the style of SIRT 2.0 video. It is maybe because colorful effect was applied in the video.

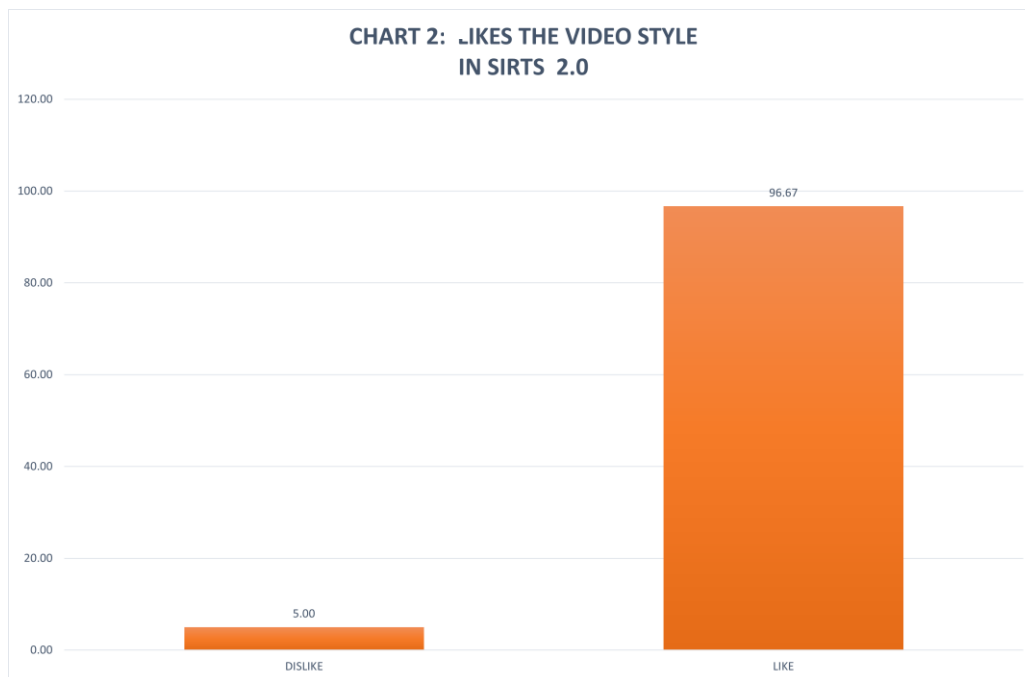


Figure 6: Student’s likes on the SIRT 2.0 video style

**Conclusion**

SIRT 2.0 is an approach in trend tour current online educational system. With this SIRT 2.0 approach, it will allow the students from all levels of education to enjoy their revision time. SIRT 2.0 will allow student to foster self-regulated learning and enjoy their revision time in an easy and interesting way. Besides that, SIRT 2.0 also allow student to share their video revision notes easily with friends thru What’s App. The existing of SIRT 2.0 hope the student enjoy and love their revision duration.

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TikTok

## THE EFFECTIVENESS OF SOCIAL MEDIA USE AMONG UNIVERSITY STUDENTS IN MALAYSIA

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### ABSTRACT

*Social media has now become an integral part of a student's life. It may harm their productivity, especially their time management. On the positive side, social media provides students with learning opportunities and the chance to interact with others during online distance learning. This study focuses on determining whether the students' average time spent on social media is related to their CGPA results. In addition, this study highlighted either gender effects of social media use by students. In this study, a questionnaire designed by QuestionPro was adopted and revised. It was distributed through social media platforms and gathered 50 respondents. The relationship between average time spent on social media with CGPA results was analysed using the Chi-Square test of independence. In contrast, the independent sample t-test was used to analyse the effectiveness of social media use by students' gender. Based on the results, the Chi-Square test ( $p < 0.001$ ) shows that social media usage impacts students' performance, where students who get high CGPA results spend minimum average time daily on social media. The independent sample t-test shows that the effectiveness of social media used between males ( $M=3.526$ ,  $SD=0.697$ ) and females ( $M=3.645$ ,  $SD=0.985$ ) are not statistically significant  $t(48)=-0.459$ ,  $p=0.648$ .  $SD=0.697$ .*

**Keywords:** *social media, online learning, academic performance, gender effectiveness*

### Introduction

Nowadays, social media is regarded as a necessity in life for many, particularly the younger generations. People can now be seen using laptops, mobile phones, or other smart gadgets to browse and surf social networking sites, read blogs, or communicate anywhere and at any time. Some people are even addicted to certain apps, such as online gaming. Undoubtedly, social media is one of the fastest-growing segments on the web (Parra-López et al., 2011).

Frequently used social media applications are weblogs or blogs (i.e. Blogger and WordPress), social networking sites (i.e. Facebook, Twitter and MySpace), photos and videos (i.e. Flickr and YouTube), online encyclopaedia (i.e. Wikipedia), online bookmarking (i.e. Delicious), virtual social worlds (i.e. Second Life) and virtual game worlds (i.e. World of Craft). These social media platforms

allow users to search, create, share, collaborate and organise content among them. They also provide virtual self-presentation and self-disclosure for their users.

Cheng & Cho (2021) studied social media use by concentrating on job needs and revealed why employees believe social media is crucial for them at work. According to their findings, employees use social media during work breaks to unwind from stressful work and job expectations. This study examines the influence of social media on students' performance by determining whether their CGPA results are affected by the average time they spend on social media. Next is to investigate the difference in the effectiveness of social media use among Malaysian students by gender.

### **Methodology**

The questionnaire for this study was created using Google Form and disseminated through social media platforms, namely Twitter, Telegram, and WhatsApp online messenger applications. Altogether, 50 respondents participated in this survey.

The questionnaire was adopted from the questionnaire designed by QuestionPro. The questions in the questionnaire were adapted and modified to meet this study's needs. It was divided into two sections where respondents were asked about their gender, age, education level, and institution in the first section. The following section covers the social media used by the respondents, their average time spent on social media and their previous semester CGPA results. They also have to rate their level of agreement on social media effectiveness from 0 (not agreed) to 100 (most agreed). In addition, they need to determine their social media performance based on a five Likert Scale. Table 1 below describes each data from the survey analysed using SPSS.

The methods used to analyse the data obtained from the survey differ according to the objectives. The Chi-Square Test of Independence was used to determine whether the CGPA performance results in the online distance learning related to their average time spent on social media. This method was chosen because it meets the criteria to explore the association of two categorical variables. Next, to investigate the difference in the effectiveness of social media use by Malaysian students according to their gender, the independent sample t-test was used. We analysed the respondent demographic profile using descriptive analysis, where the data were combined into one chart.

Table 1: Data Description

Variable	Type of variable	Scale of measurement
Gender	Qualitative	Nominal
Age	Qualitative	Nominal
Education level	Qualitative	Nominal
Institution of study	Qualitative	Nominal
Social media used	Qualitative	Nominal
Average time spends	Qualitative	Ordinal
Previous CGPA result	Qualitative	Ordinal
Rate of social media effectiveness	Quantitative	Ratio
Social media performance	Qualitative	Ordinal

**Finding**

Figure 1 below illustrates the respondents' demographic profile consisting of four items which are gender, age, education level and institution of study. The result shows that most of the respondents who participated in this study are female, bachelor students, and public universities. About 40% (20 respondents) are students from certification, diploma, master and doctorate levels of education. Students between the ages of 21 and 22 less participated in this study, with most respondents being between the ages of 23 and 24.

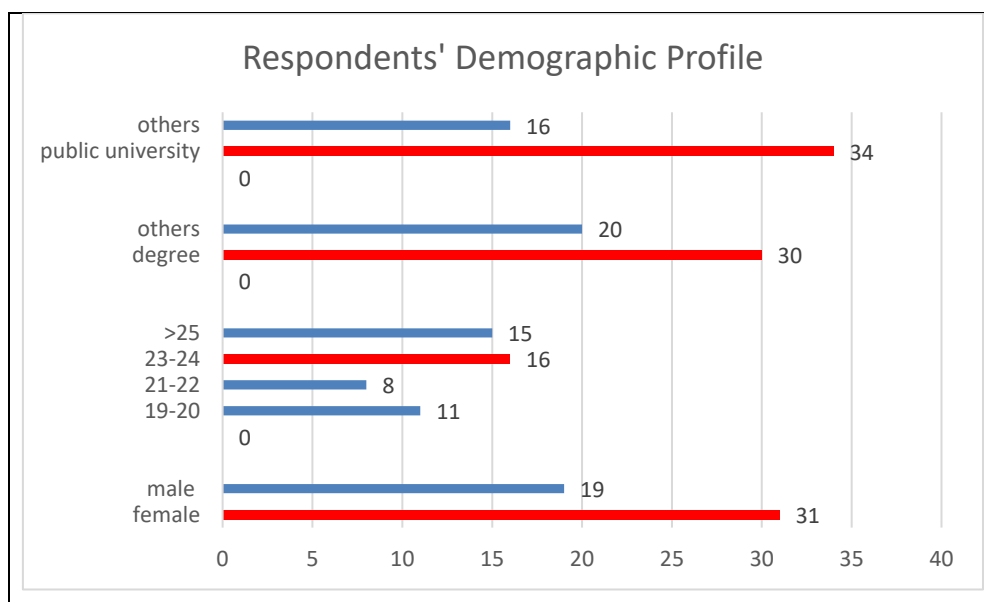


Figure 1: Chart of Demographic Profile

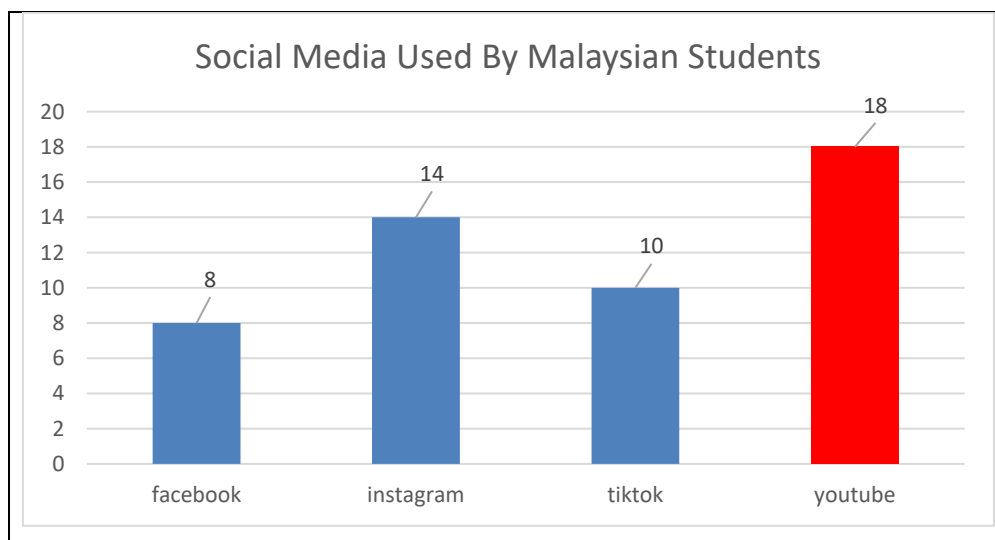


Figure 2: The social media used by Malaysian students.

Figure 2 above shows the types of social media Malaysian students utilise regularly. Four popular social media platforms were shortlisted in this study. The study found that YouTube was the most social media chosen by the respondents. This finding supported the article written by Aliyah (2019) in [slamxhype.com](http://slamxhype.com), where the author listed out five reasons why YouTube is the best social media platform. In other words, this platform has evolved into one of the most effective ways for people to engage, whether it is for watching shows or sharing information.

The Chi-Square test was conducted to investigate the relationship between average time spent on social media and CGPA results during online distance learning. Average time spent on online learning consists of a choice of '1-3 hours', '4-6 hours', '7-9 hours', and '10 hours and above'. Meanwhile, CGPA result ranges from '2.00-2.19', '2.20-2.99', '3.00-3.49' to '3.50-4.00'. The hypothesis statements are as follows:

$H_0$ : There is no relationship between university students' average time spent on social media and CGPA results.

$H_1$ : There is a relationship between university students' average time spent on social media and CGPA results.

The Chi-Square test indicates a relationship between average time spent on social media and CGPA results among university students where the test value  $p$  is less than 0.001. It reveals that the

number of time students frequently spend on social media impacts their academic performance. Furthermore, most students who scored high CGPA results spent minimum average time on social media daily.

The independent sample t-test was performed to examine whether there is any difference in the effectiveness of social media use by Malaysian students according to their gender. An independent sample t-test indicates that the difference in the effectiveness of social media use by Malaysian students between males (M=3.526, SD=0.697) and females (M=3.645, SD=0.985) is not statistically significant resulted  $t(48)=-0.459$ ,  $p=0.648$ . It shows no difference in the effectiveness of social media uses by Malaysian students between gender.

### **Conclusion**

From the findings, clearly, there is a correlation between the average amount of time students spend on social media and their CGPA results. Hence, it is a reciprocal relationship because students with better CGPA results use fewer social media daily. Furthermore, there is no gender difference in the effectiveness of using social media among Malaysian students. Male and female students spend similar average hours on social media, and their CGPA results' efficacy is also identical.

Undoubtedly, today's social networking sites are frequently utilised by students to connect with others and keep up with current news and hype. According to a study by Rahman M.S.A. et al. (2021), many students experienced high-stress levels during current online distance learning. It can be assumed that the students are likely trying to release their stress by spending hours on social media. However, the effects of spending too much time on social media on their CGPA results should not be overlooked. Students need to manage their time wisely and study diligently to obtain a good CGPA.

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## SURVEY ON THE ABILITY OF SECONDARY SCHOOL STUDENTS IN USING SCIENTIFIC CALCULATOR

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### ABSTRACT

*Scientific calculator, as one of the education technologies known to many students across countries, is said to give assistances in solving mathematical computation. As a user, the student should have known most of the instructions and functions in the scientific calculator for them to be able to benefit from the device. Data was collected from 56 secondary school students in Pulau Pinang who involved in mathematical seminar. In the seminar, some functions in scientific calculator related to their mathematics syllabus is integrated in solving mathematics questions. 30.4 percent of the students admitted that they did not have proficiency in using scientific calculator and 23 percent of them did not get direct teaching on most calculator functions from their teacher. The students agreed that by using the calculator it helped them in solving the computation quicker and they were more confident in their answer. There was 71.4 percent of students assured that they had improved their ability in using scientific calculator. This study suggests similar calculator seminar being trained to students occasionally as an initiative to support and maximise the use of scientific calculator in mathematics education.*

**Keywords:** *Calculator scientific, mathematics education, school students*

### Introduction

The scientific calculator is implemented in mathematics education as a learning aid used by teachers and students (Kamarulhaili & Sim, 2005; Leng, 2011). It is a valuable tool for gaining direct and stimulated experiences in learning mathematics. Incorporating such technology in mathematics education requires them to have the knowledge and ability to fully utilise it (Nabie & Yidana, 2001; Ebal et al., 2019). Students, as a generation that are growing up in a technologically environment, should feel comfortable exploring the functions of scientific calculator.

In Malaysia, most secondary school students especially form four and five students, should take at least one of two-mathematics subject called Modern Mathematics and Additional Mathematics. Both of these subjects consist of a handful topics the students have to master within two years. Excel in these subjects open opportunities for them to science and technology courses in their future university studies (Olson & Riordan, 2012; Sole, 2019). Consequently, it contributes to great pressure and loss of interest in learning mathematics when they face with difficulties in solving the questions. Proficiency in using scientific calculator surely come handy for the students to lift the burden in learning mathematics.



This paper, therefore, attempts to assess secondary school students on their knowledge and ability to use related functions in their scientific calculator. This is to prove that having the ability to use most of scientific calculator functions can save time in solving mathematical problems and improve students understanding.

### Methodology

In this study, data was taken from the participants of Seminar of Scientific Calculator organized by Department of Computer and Mathematical Sciences, University Teknologi MARA Cawangan Pulau Pinang. A total of 56 students from secondary schools (Form four students) throughout the state of Pulau Pinang participated in the seminar. The students came from four districts in Pulau Pinang, namely Seberang Perai Utara (SPU), Seberang Perai Tengah (SPT), Seberang Perai Selatan (SPS), and Barat Daya, where they attended public secondary schools. However, only 44 students completed the survey and the assessment. The survey consists of respondent's demographic and questions regarding their proficiency in using scientific calculator.

### Results and Discussion

Result from the survey and assessment are displayed and presented in tabulation and graphical presentation. Table 1 summarizes the demographics of the students. 34% of students attended schools in SPU, 32% attended SPT schools, 25% attended SPS schools and the remaining 9% attended Barat Daya schools. The majority of the students who participated in the seminar (84%) were female, with only 16% being male.

Table 1: The Summary of Students' Demographic

	SPU	SPT	SPS	Barat Daya	Total
Male	5	1	0	1	7
Female	9	14	11	3	37
Total	14	15	11	4	44

According to the results of a survey on students' experience with scientific calculators, as displayed in Figure 1, about 76.7% of students agreed and strongly agreed that their Mathematics teachers taught them how to use most of the basic functions in scientific calculators to solve mathematical problems. However, a small percentage of them, approximately 23%, disagreed.

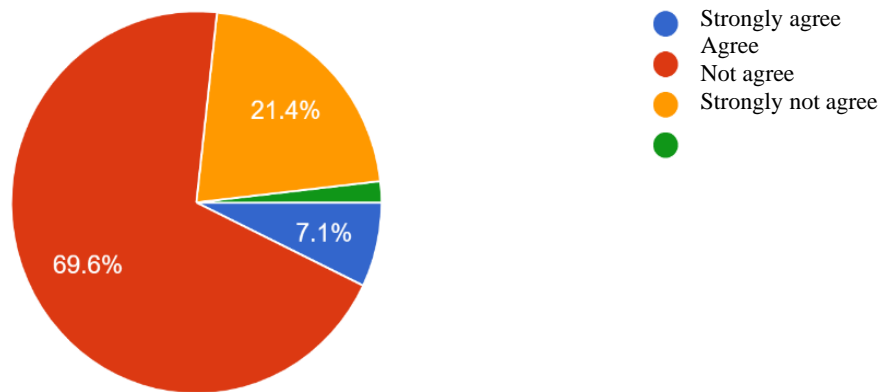


Figure 1: Teacher taught basic functions in scientific calculator

Following their teachers' lessons on using the scientific calculator (Figure 2), 69.6% of the students knew how to perform or use most of the basic functions in the scientific calculator when solving mathematical problems. Despite this, 30.4% of students responded that they were still not proficient in performing basic scientific calculator functions after receiving a lesson from their teachers at school.

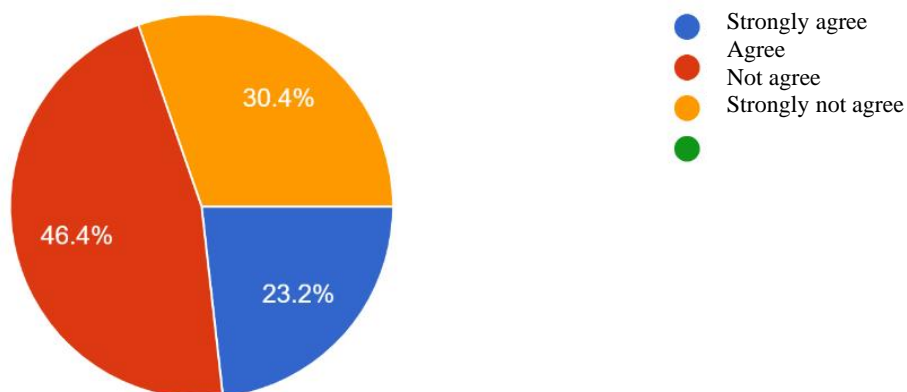


Figure 2: Students' knowledge in using scientific calculators

Figure 3 shows the survey results for the benefits of using a scientific calculator. All students with majority of them (71.4%) strongly agreed that a scientific calculator is an effective learning tool that

can assist them solve most mathematical problems in a short amount of time. With the aid of scientific calculator (Figure 4), all of them with 69.6% strongly agreed they felt more confident in their answers than when they solved the mathematical problems without using a scientific calculator.

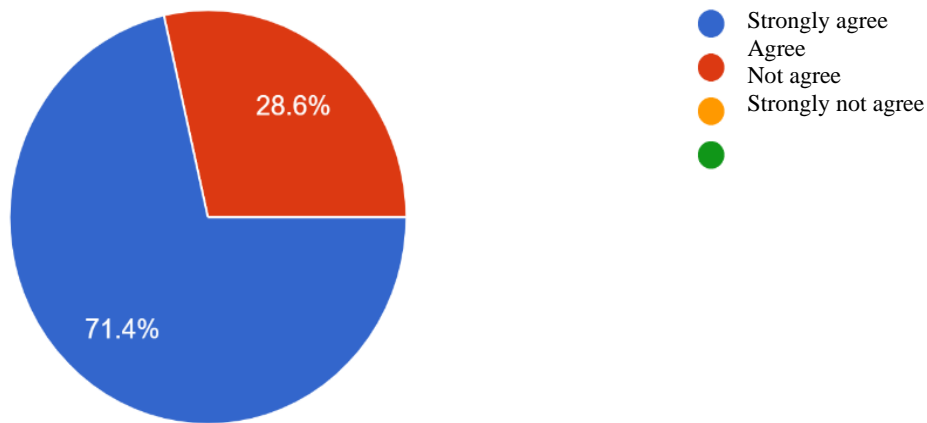


Figure 3: Scientific calculators save time in solving mathematical problems

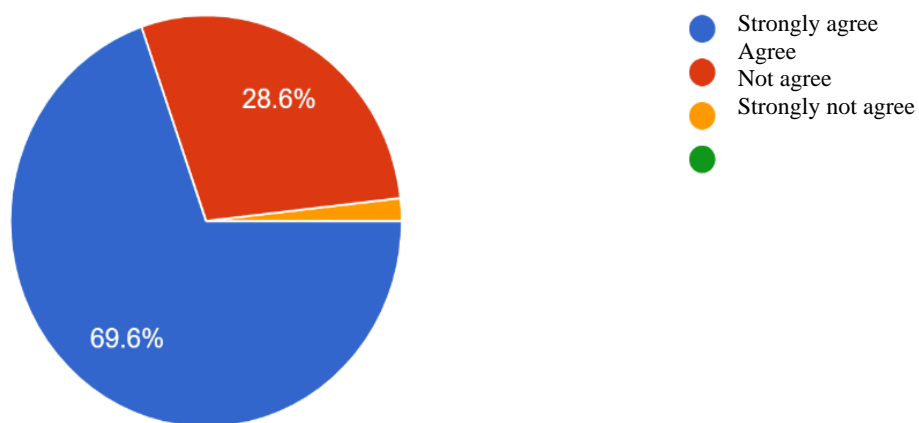


Figure 4: Students have confidence in their answer when using scientific calculators

### Conclusion

According to the findings, all students agreed that it improved their understanding of how to use a scientific calculator and that it is an effective learning tool that can help them solve most mathematical problems in a short amount of time. They also emphasised the importance of scientific calculator knowledge and competency for mathematics education. They felt more secure in their

responses when they used a scientific calculator to solve the mathematical problems than when they did not use a scientific calculator. As a result, the seminar's success has been recognised, and it is requested that it be held on a regular basis during their school years.

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