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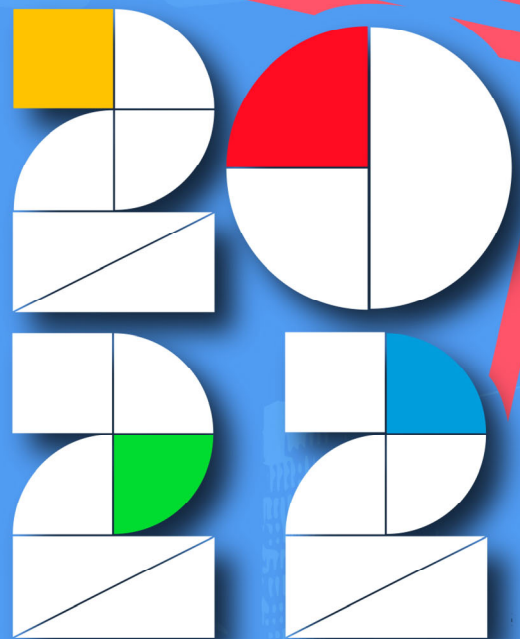
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Reengineering
Knowledge &
Creativity for
Global Excellence

30
June



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TECHNOLOGY, SCIENCE, SOCIAL SCIENCES AND
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TeSSH 2022***

**Reengineering Knowledge and Creativity
for Global Excellence**

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Foreword

The papers compiled in these e-proceedings are papers presented online at Technology, Science, Social Sciences and Humanities International Conference 2022 (TeSSH I 2022) held on 30 June 2022 at Universiti Teknologi MARA (UiTM) Cawangan Kedah, Kedah, Malaysia. With the theme, ***Reengineering Knowledge and Creativity for Global Excellence***, the conference has brought together presenters of diverse background who shared their conceptual and empirical papers in broad areas that are subsumed under the fields of Technology, Science, Social Sciences and Humanities. These e-proceedings comprise current researches that were undertaken with the rigorous endeavour of knowledge enhancement to ensure that the world of academia will continue to flourish. It is thus hoped that readers will significantly benefit from knowledge contained in these proceedings.

TeSSH I 2022 and these e-proceedings would not have been possible without the great efforts from the presenters, and the generous support from the TeSSH I 2022 committee members and the Rector of UiTM Cawangan Kedah, Prof. Dr. Mohamad Abdullah Hemdi. A heartfelt gratitude is extended to all involved. It is hoped that these e-proceedings will be an impetus to stimulate further studies and research that benefit the society at large.

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Basic of Differentiation using Three Alternative Approach in Seberang Perai Polytechnic

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ABSTRACT

Nowadays, Mathematics is a basic tool that is widely used in all disciplines. Basic mathematics education starts as early as pre school to expose students to topic of multiplication, addition and division. Students who do not have a strong mastery of mathematics will be confronted some learning problems especially at the tertiary level. Therefore, this study was conducted to identify the mathematical basis mistakes made by Engineering diploma students at Seberang Perai Polytechnic, Pulau Pinang. The basic differentiation module uses three alternative approaches (YouTube Video, Problem Generation and Games) or VPG. Basic differentiation is developed based on problem generation approach assisted by video description by integrating problem generation strategies and problem solving skills through basic topic of differentiation in Engineering Mathematics 2 and ends with a game in relation to the problem of differentiation. The objective of this study is to develop three alternative approaches for basic differentiation module, to apply VPG module requirement as best as possible to help students master in this topic more effectively and to identify the effectiveness of the basic differentiation module on students' knowledge of concepts and student achievement in the basic topic of differentiation, which indirectly enhances students' creative thinking. The results show the respond and performance evidence of weak differentiation student issue and know how to tackle the mathematics problem with the aids of video and games in mathematic learning of differentiation.

Key Words: Differentiation, Problem Posing, YouTube Videos, Digital Math Games

INTRODUCTION

The Malaysia Education Development Plan 2015-2025 (Higher Education) or PPPM (PT) was drafted in 2013 by the Ministry of Education, this plan was developed by Malaysians, for Malaysians and will drive Malaysia towards becoming a high-income developed country. PPPM (PT) is in line with the Fourth Industrial Revolution (Industry 4.0) which is happening globally. Higher education institutions (HEIs) in Malaysia need to change the teaching and learning process (PdP) to face the challenges of the Industrial Revolution 4.0.

The changes include aspects of learning space, teaching methods, a more organic curriculum, and the use of the latest technology. Problem generation (problem posing) refers to the construction of a new problem or the reconstruction of a given problem where the formation can occur before, during or after obtaining a solution to the problem. With problem generation activities, a student's

level of understanding of the mathematical concepts being tested will increase and understand the mathematical concepts more meaningfully. Math problem generating activities provide a fun experience for students and prevent from misunderstanding concepts as well as boredom of learning mathematics.

If a student can generate a problem, then the student understands the problem and knows how to solve it. In the world of mathematics education common mistakes that are often made cause students to feel that mathematics subjects are difficult and face a difficulty to obtain satisfactory results in exams. This is also a similar problem in the subject of Additional Mathematics especially in the topic of differentiation. Referring to the continuous assessment of Engineering Mathematics 2 (DBM20023) is a compulsory course taken by students pursuing an engineering program. From the results there is an explanation on this matter which shows the students are still weak in the topic of differentiation. With the emergence of such problems, we need to find the root causes that make the topic of differentiation for students quite difficult and cause them to often make common mistakes in solving problems related to differentiation.

To overcome the problem of learning the topic of differentiation, a study of alternative methods should be conducted to identify students' mastery of the topic of differentiation as well as to identify the types of mistakes that are often committed by students. In addition, this diagnostic study was conducted to ensure that students did not experience these learning difficulties indefinitely. From ancient times to the present students still experience similar weaknesses in the topic of differentiation. This is in response to the call of the National Education Philosophy (NEP) which wants Malaysians who are knowledgeable, skilled, responsible, and able to achieve personal wellbeing and contribute to society and the country.

The syllabus for this course is a mathematical foundation that contains the basic topic of differentiation which is the mainstay of the engineering syllabus. The level of student approval for this Engineering Mathematics 2 course was found to be inconsistent and declining as illustrated in figure 1 for Class DEE2B and figure 2 for Class DTK2A although it is a preliminary result for continuous assessment (PB). This decline is feared to affect the results KPIs of the Department of Mathematics, Science and Computer. To ensure final exam results, students need to get good passing results. This VPG requirement is implemented as best as possible to help students master this topic more effectively.

LITERATURE REVIEW

In a previous work reported by Sahin and Soylu, (2011) stated that Mathematics is a universal language formed from continuous scientific study, has unique methods, and is a communication tool for a person regardless of the fact whether a person is dealing with mathematics or not. Therefore, mathematics will always change from time to time both in terms of content and how to learn it. Whereas Shahril (1993) investigated the study classifying that, a person will find it difficult to learn mathematics if he does not fully understand or master mathematics at a lower level because mathematics is a structured and tiered field. Moreover, another study by Ozkan and Ozkan (2012) mentioned hierarchical knowledge lack of knowledge plays an important role against misconceptions or misunderstandings. This report is supported by Ng (1984) found that only 20% of mathematics students or educators in Malaysia associate mathematics with process. Students find it difficult to apply mathematics in their daily lives.

So many students succeed in mathematics but fail in solving real problems in everyday life (Costu et al. 2009). Nik Azis (1996) states that students need strategies to organize a situation into a meaningful form. The development of knowledge will be achieved through the formation of connections between various types of profound experiences.

A recent study conducted by (Ozkan, 2011; Ozkan and Ozkan, 2012; Scheja and Pettersson, 2010) identified a major problem faced in mathematics is the teaching of basic concepts to students. This difficulty is due to the weakness of the concept of students in previous schools. level even leads to misunderstanding or misunderstanding. Furthermore, several studies conducted by Tuan Salwani (2014) stated that drill methods without good planning is one of the causes of poor understanding of

students' concepts. Whereas Karagoz and Cakir (2011) asserted that conventional teaching cannot change students' misconceptions. More serious findings were found by Norizan (2000), difficulty understanding this concept will lead to errors. Recently, findings by Aygor and Ozdag, (2012) mentioned that errors are symptoms or signs to misunderstandings, prototype thinking, or persistent error instincts can affect students' understanding of concepts. According to Norizan (2000), educators are the most important people to determine the level of mastery of student learning. He found that 60.6% of students made mistakes in math problem-solving skills.

Students' errors in mathematical problem-solving skills are not only due to learning problems but there are other factors that influence them such as attitudes, environment, teaching methods and problem-solving methods. Errors can be attributed to an inability to answer problems correctly. Errors have a different meaning than misconceptions. Errors refer to errors in responding to questions, while misconceptions are part of a faulty cognitive structure. Hadjidemetriou and Williams (2002) also mentioned that errors in solving sentence problems can be caused by students not knowing the correct way to solve the problem. It is therefore desirable and necessary to investigate and identify the types of offenses committed by students while solving verse problems. According to him, the mistakes made by students can be used positively in learning mathematics.

METHODOLOGY

Department of Mathematics Science and Computer, Seberang Perai Polytechnic, Penang took the initiative to find the causes faced by students in learning problems of basic topics differentiation according to certain cohorts in preserving strengths and things that need to be identified so that treatment measures can be taken before students drop out more serious in the field of engineering taken. This is because differentiation is one of the important topics in Engineering Mathematics.

Significance of the Study

The final purpose of this study conducted was to identify the types of common errors that are often committed by students in the topic of fundamentals of differentiation. This study gives importance to several parties, namely to students, to the teaching staff and to the Polytechnic. fundamentals of differentiation are one of the difficult topics in the subject of Engineering Mathematics for polytechnic students. The results of the analysis of the findings of this study, can help students find out the mistakes made and in turn can find out the real cause that makes them feel difficult in this topic.

Knowing these mistakes can change students' perceptions of this topic and not consider the subject of Engineering Mathematics is not as difficult as expected if they know the mistakes that are often made and will try to avoid making those mistakes. Furthermore, this study can also help the instructor to overcome this problem if the instructor first understands the mistakes that are often made by students. Instructors play an important role in teaching and learning.

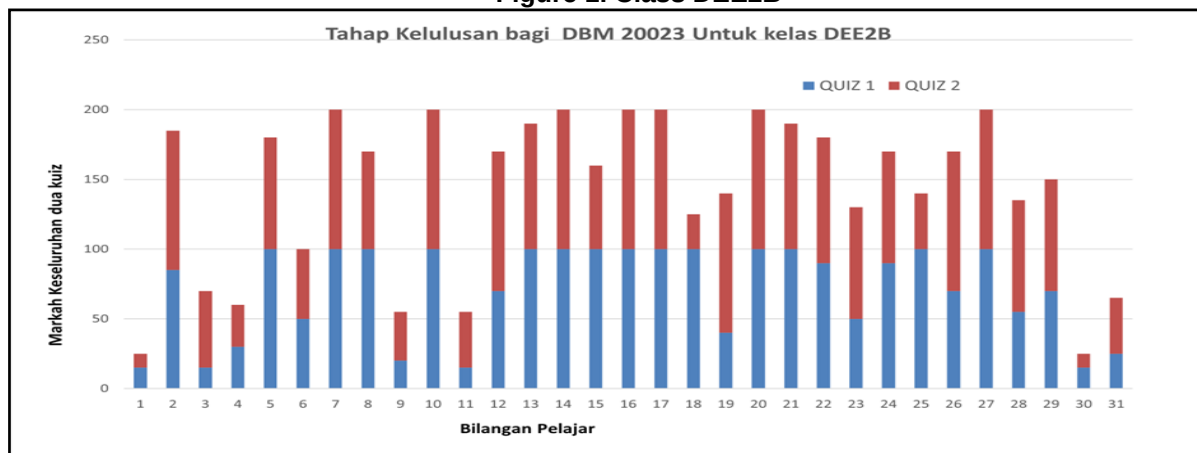
If the instructor knows the weaknesses of the students, the best teaching solutions, and methods to help the students avoid making mistakes or repeating the same mistakes in the topic of basics of differentiation. Moreover, by introducing You tube Videos, Problem Generation and Games will show their inclination about the understanding of Mathematics.

Pre-Assessment Scenario of Mathematic Student

The syllabus for this course is a mathematical foundation that contains the basic topic of differentiation which is the mainstay of the engineering syllabus. The level of student approval for this Engineering Mathematics 2 course was found to be inconsistent and declining as illustrated in figure 1 for Class DEE2B and figure 2 for Class DTK2A although it is a preliminary result for continuous assessment (PB) This decline is feared to affect the results KPIs of the Department of Mathematics, Science and Computer. To ensure final exam results, students need to get good

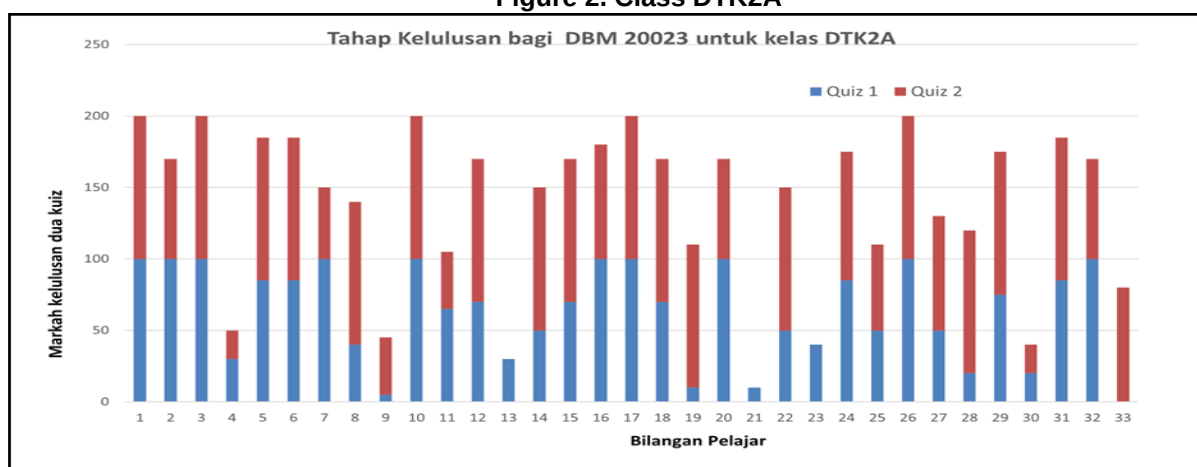
passing results. This VPG requirement is implemented as best as possible to help students master this topic more effectively.

Figure 1. Class DEE2B



Referring to Figure 1 for the DEE2B class, a total of 31 students sat for PB for the topic of differentiation but there were 8 students who obtained a total quiz score of less than 100 marks. Meanwhile, for Figure 2 for the DTK2A class, a total of 33 students sat for PB for the topic of differentiation but there were 7 students who obtained a total quiz score of less than 100 marks.

Figure 2. Class DTK2A



Among the causes of this decline is the achievement of CLO 1 (Identify mathematical methods in solving the mathematical problems) which is inconsistent and shows a decline in performance referring to the prerequisite results of engineering mathematics semester 1. Among the factors of decline in achievement for this topic are, students do not master the concept basic concepts though have been revealed from the school level again. This topic is among the early topics taught, where students may not be ready to accept learning in new situations and may even have forgotten for final exam preparation.

Table 1. Percentage of Students who passed and failed

Items	Basis Differentiation	DEE2B 31		DTK2A 33	
		Passed	Failed	Passed	Failed
1	Constant Rule	23	8	26	7
2	Power Rule				

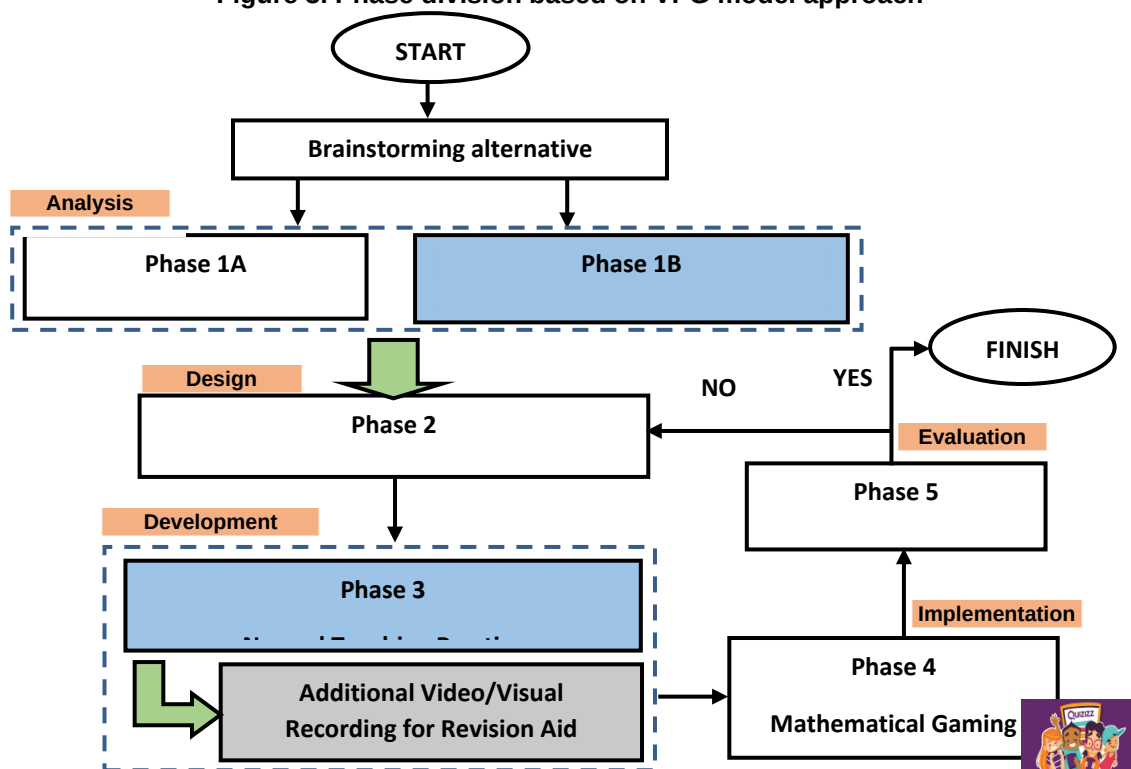
3	Sum Rule				
4	Composite Rule				
5	Product Rule				
6	Quotient Rule				
Percentage		74.1	25.9	78.8	21.2

From these data, it can be concluded that students lack mastery of the basics of differentiation for example the basics of constant rules, power rules, Total, composite, product, and quotient. The high differentiation score is around 78.8 percent, and the highest error is 25.9%, and indirectly affects problem solving for other topics related to applications that use the basis of differentiation. Table 1 are examples of student conceptual errors in the problem-solving process. When students unable to master these basic concepts, students will not be able to understand and follow learning smoothly through the pre -determined polytechnic syllabus, and ultimately affect the targets to be achieved at the departmental and polytechnic levels.

Continuous Improvement of Mathematic Student through VPG Approach

The method of implementing VPG Approach is divided into two main parts, namely the development and effectiveness of the problem generating module differentiation on student achievement in the topic. Analysis (Phase 1A and 1B), Design (Phase 2), Development (Phase 3), Implementation (Phase 4), and Evaluation (Phase 5). Figure 3 shows the phase division based on VPG model approach.

Figure 3. Phase division based on VPG model approach



RESULTS AND DISCUSSION

Quiz, PreQuiziz, Quiziz for basic topics of differentiation

Quiz 1, Quiz 2, PreQuiziz, and Quiziz were implemented to treatment class and control class, achievement scores were analyzed, and average scores are shown as in Figure below. To

understand in detail the weak students regarding assessment achievement following Figure 4 and Figure 5 can be seen about the initial process implemented. The full marks of Quiz 1, Quiz 2, PreQuiziz and Quiziz are evaluated per hundred.

Figure 4. DEE2B class for 8 weak students

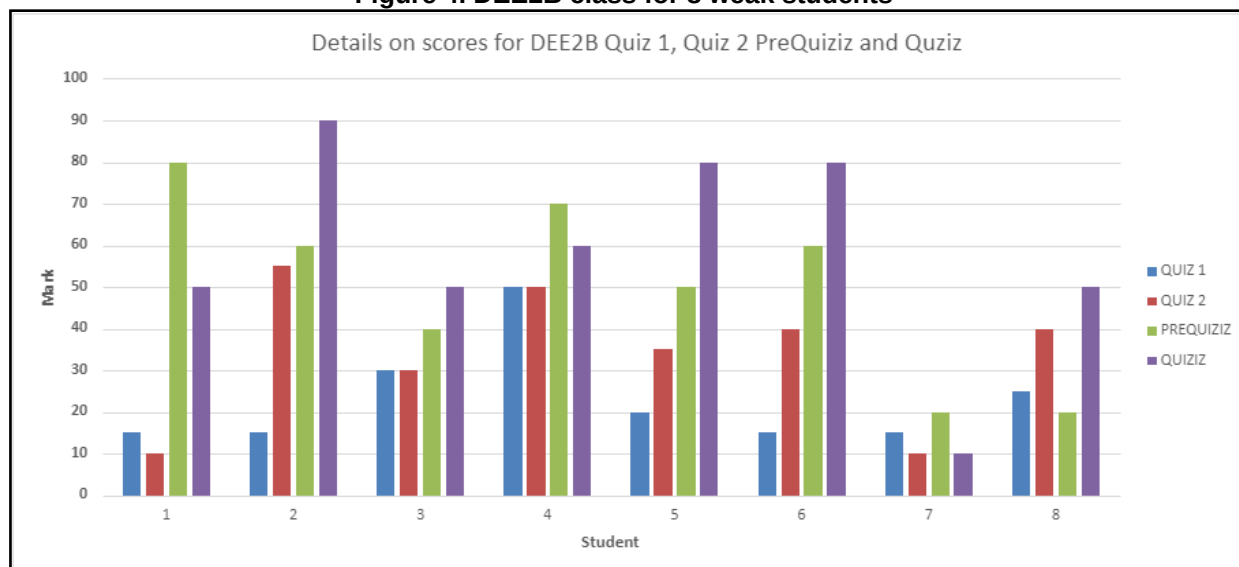
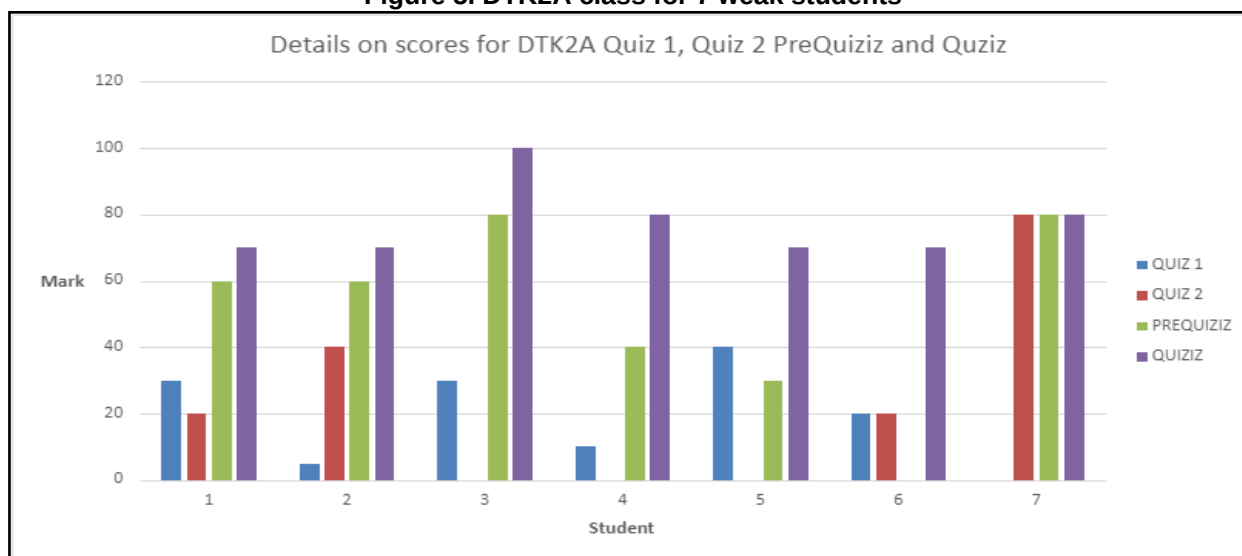


Figure 5. DTK2A class for 7 weak students



The results of the pre-test for weaker students are almost the same achievement where students only have existing knowledge on the basics of current differentiation at the secondary school level in Malaysia. The conclusion from the achievements before and after the implementation of the innovation there is a positive effect because of the implementation. This can be evidenced from the achievements of Quiz, PreQuiziz and Quiziz and involving the topic of Basics of Differentiation.

Student Questionnaire Findings

Questionnaires were given to weaker students to see their perceptions of the approach and use of the basic differentiation module using three alternative VPG methods that they went through throughout the learning. Overall, the findings show over 100 % agree that the basic differentiation

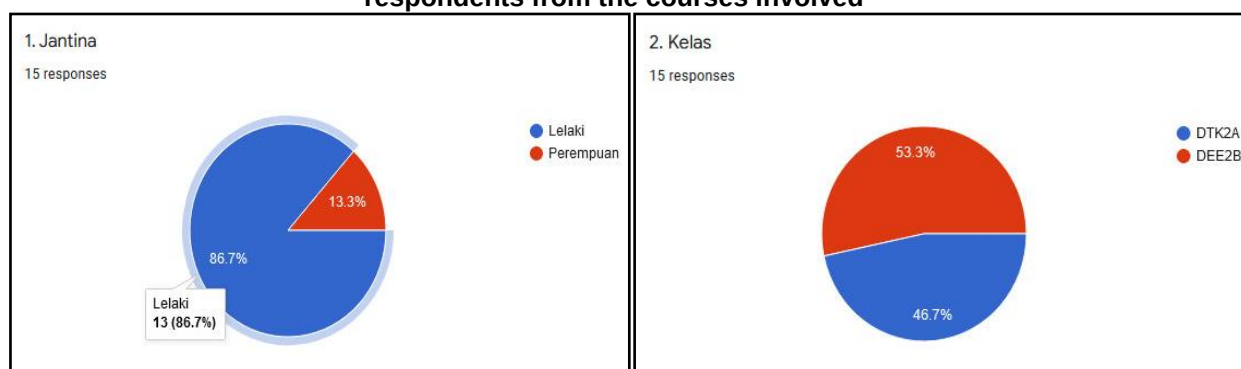
approach and module using three alternative VPG methods developed has a positive impact on their learning especially in terms of improving conceptual knowledge, creative thinking skills, problem solving skills. This approach also makes students more motivated, confident, and independent in generating problems according to their own abilities.

Here is the google form link for students' perceptions of the Basic of Differentiation Module (VPG Module).

<https://docs.google.com/forms/d/1zNakV2C85I6Fdd25qd0FzIJcAWK7hsM4KhtAIYrgavQ/edit?usp=sharing>

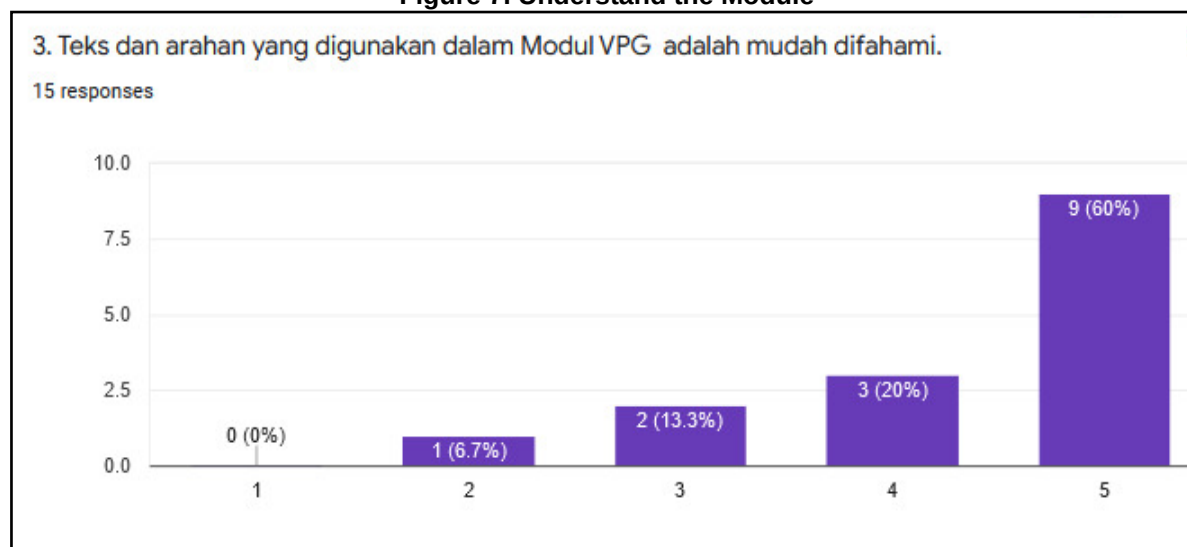
A. Respondent Demographic Question

Figure 6. Shows the number of students focused on differentiation according to gender and respondents from the courses involved



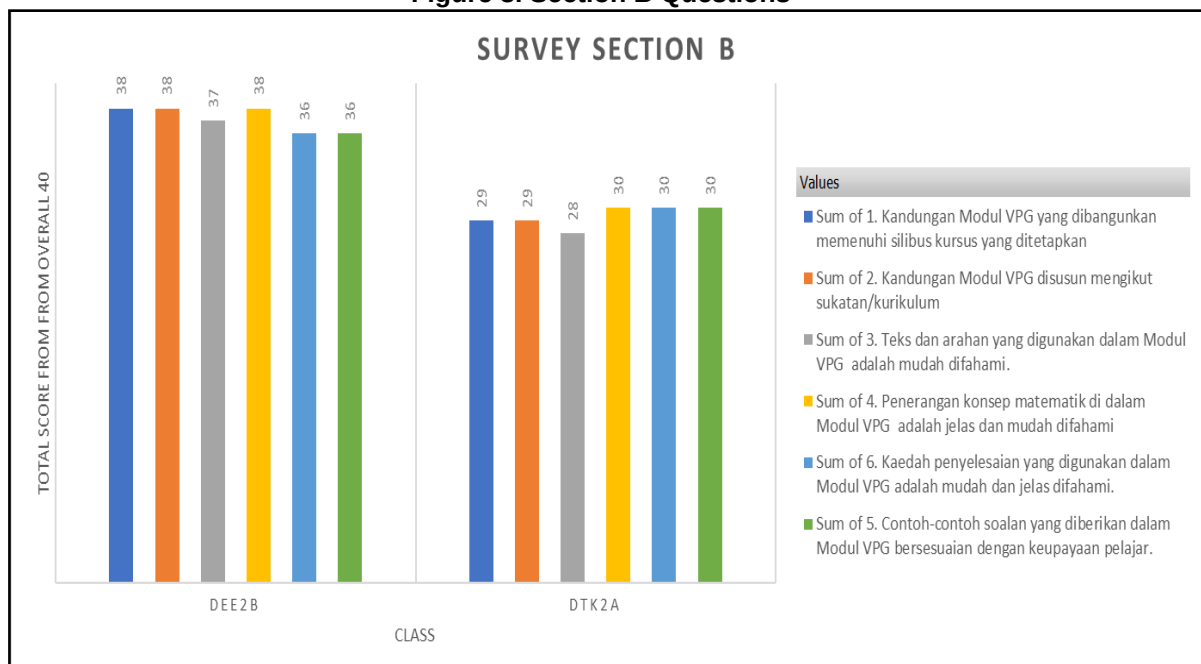
B. Module Usage content questions

Figure 7. Understand the Module



Referring to Figure 7 a total of 15 respondents agreed that the content of the technology used is easy to understand. The response varies based on their ability to understand.

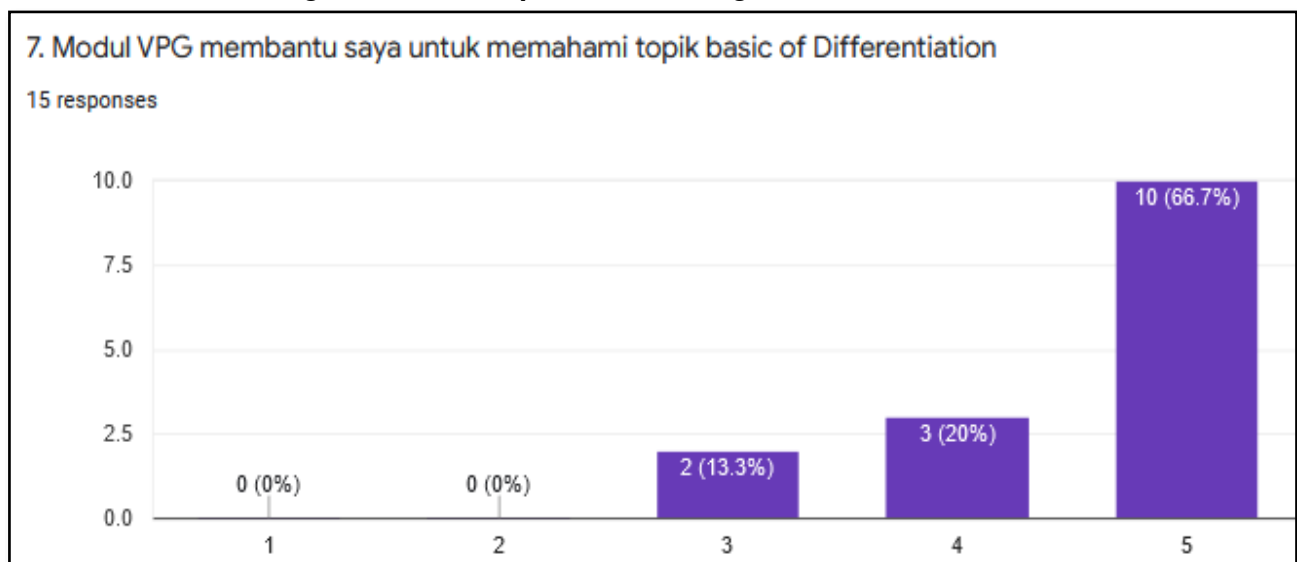
Figure 8. Section B Questions



Meanwhile, referring to Figure 8 for 6 questions has been of 15 respondents agreed on the question in accordance with the student's ability, DEE2B student score min 36 out of 40 marks for 8 students survey and DTK2A min 28 out of 40 marks for 7 students survey.

C. Question related to module benefits

Figure 9. VPG help understanding the differentiation



Referring to Figure 9 total of 15 respondents agreed that the VPG module is helpful for the basic topic of differentiation and agreed the VPG module makes the teaching and learning process more effective.

Figure 10. Section C Questions

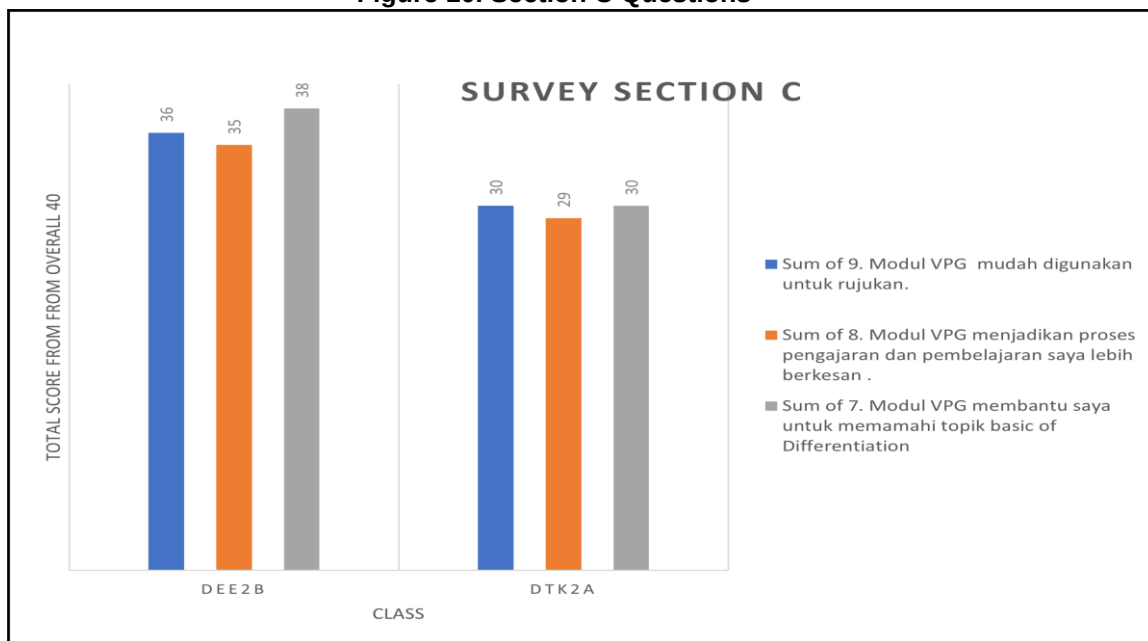


Figure 10. shows the result of 3 questions survey. The VPG module can be used as a reference especially the video/visual section which is specially designed for the description of each basic differentiation formula involved. Moreover, respondents agreed that the VPG module can be used as a reference to other students as well as for a description of each basic formula of differentiation involved.

CONCLUSION

In conclusion of introducing this Basic of differentiation using Three Alternative Approach in Seberang Perai Polytechnic. This study manages to identify the element to overcome the weak student level of for this Engineering Mathematics 2 course was found to be inconsistent and declining as illustrated in Figure 1 for Class DEE2B and Figure 2 for Class DTK2A although it is a preliminary result for continuous assessment (PB). From data, it can be concluded that students lack mastery of the basics of differentiation for example the basics of constant rules, power rules, Total, composite, product quotient. The high differentiation score is around 78.8 percent, and the highest error is 25.9%, and indirectly affects problem solving for other topics related to applications that use the basis of differentiation.

The construction of the Basic differentiation module using these three alternative methods of VPG can help the learning process of students in learn and understand the concepts and successfully solve problems in the topic of fundamentals of differentiation. Moreover, can be used as a planned learning material in addition to facilitating students to implement learning based on VPG approach. Therefore, this module can help develop students' knowledge, especially in improving students' level of thinking, problem solving skills and knowledge of students' concepts. The student be able to train creative thinking students with discipline while unearthing students' creativity and innovation during problem generation and mathematical games. More significant of this module can provide a variety of learning environment and is able to provide an environment that is fun, exciting, comfortable, and not boring because students will be actively involved in the classroom. Student can experience the process of self-learning in programs or courses that are structured to facilitate their learning process. Students are free to actively manage their learning based on this module according to their abilities and capabilities. Finally, students can find out their

level of understanding, mastery of problem-solving skills and creativity and innovation based on the assessments found in this module.

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