

# FACTORS INFLUENCING THE LEARNING OF ENGINEERING MATHEMATICS 2 (DBM2013)

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## ABSTRACT

**Abstract:** Engineering Mathematics 2 (DBM2013) is a compulsory course for all engineering students in second semester at the Politeknik Sultan Salahuddin Abdul Aziz Shah (PSA), Selangor. There is a concern because the rate failure of this course is higher compared to Engineering Mathematics 1 and Engineering Mathematics 3 courses for the past two sessions (June 2018 and December 2018). Hence, the objectives of this study are to determine the factors that may have influenced the learning for this course. The study involved 43 respondents of Diploma in Electrical Engineering (Controlling), DJK. The method that is being used to gather the information is by using online questionnaire. The analysis of the factors include the students' background, understanding scale, mathematics learning in secondary school, attitude towards mathematics and other factors that influence mathematics learning at PSA. It was found that the students' background, understanding scale and mathematics learning in secondary school are the greatest factors that influenced their learning in this course. The students' attitude remained positive towards mathematics learning. The students' attitude comprised of their confidence, awareness of mathematics and engagement. The findings also show that the Curriculum Information Document Online System (CIDOS) developed by the Department of Polytechnic Education and mathematics learning in the form of games will encourage students and can increase their interest in mathematical learning.

### **Keywords:**

Factors influencing, Engineering mathematics, Students' attitude

## 1. INTRODUCTION

Mathematics is very important in our daily lives as many activities, directly or indirectly, deal with mathematics. A good understanding in mathematics is essential for obtaining good employment. Individuals with high mathematical competency are needed to ensure a continued production of highly-skilled people to fulfill the demand by the industry, science and technology. Having a strong background in mathematics is crucial as it is a basic requirement in polytechnic programmes at tertiary level study. Among the group of mathematics course in polytechnics, Engineering Mathematics 2 (DBM2013) is a compulsory course for all engineering diploma students' in second semester at Politeknik Sultan Salahuddin Abdul Aziz Shah (PSA). A preliminary research has found that many students perceived calculus as having a high level of difficulty among any other mathematics courses. The contents of this

course DBM2013 is more on calculus, differential and integration. An analysis of DBM2013 results over the past two sessions in PSA has shown an alarming rate of failure in the course. Therefore there is a need for some research on the factors that influence the learning of this course.

Students come to Polytechnic with various ethnic and culture backgrounds and also with differing mathematics skill especially in Additional Mathematics. This reflects their level of understanding skills on certain areas or topics. There are also other factors which contribute to difficulty in understanding Mathematics topics. This could be due to their study pattern during secondary schools and their attitude in studying mathematic itself. To overcome these kinds of problems, the lecturer must detect and investigate on the factors that contribute to the high failure rate in Mathematics.

The previous students' final exam achievement in two sessions which is June 2018 and December 2018, showed that among the three Engineering Mathematics Courses, DBM2013 is the highest rate of failure. This study will focus on the understanding of scale of the topics in DBM2013 which consists of Exponents and Logarithms, Differentiation and Integration, and also the causes of difficulty of understanding during their learning mathematics in secondary school. This research focused on respondents from Diploma in Electrical Engineering (Controlling), DJK.

The objectives of the research are to identify:

- the student background in mathematic
- the students understanding of the topics learning in DBM2013
- the factors which contribute to difficulty in understanding mathematic during secondary school

## **2. LITERATURE REVIEW**

Learning mathematics does not only involve thinking and reasoning, it is dependent on the attitudes of the learners towards learning and mathematics. Han and Carpenter (2014), *state that attitudes consists of cognitive, affective and behavioural reactions that individuals display towards an object or the surrounding based on their feelings or interest.* From the researchers' point of view, there has been not much research conducted in the polytechnics education level focusing on mathematics high failure rate. Therefore, the root causes of high student failures in mathematics in general have been extensively studied in literatures. Naidoo and Naidoo (2007) *used a computer laboratory to create a learning environment that promoted interactive learning together with traditional learning.*<sup>2</sup> The basic concept of teaching and learning mathematics must be understood by both students and lectures. Otherwise learning mathematics will be full of errors and misconceptions. When students see the importance of mathematics in real lives, they feel engaged, confident and connected to their learning. Mensah et al.(2013), *stated that as such the three components of attitude, confidence, importance of mathematics and engagement are interrelated.*<sup>3</sup> An important question that arises

here is how can an increased level of confidence, awareness of the importance of mathematics and engagement be achieved so that students' attitudes towards learning mathematics become more positive? Teaching mathematics in a meaningful context could be the solution. Afari, Aldridge, Fraser and Khine (2013), *investigated the impact of using one of mathematical games on college students' attitudes towards learning mathematics.*<sup>4</sup> It can be concluded that students that used games found their lessons more interactive, got involved and enjoyed learning mathematics.

### **3. METHODOLOGY**

The method that are being used to gather information regarding this study is online questionnaire. The online questionnaire comprise of:

- Section A : Respondent Background
- Section B : Understanding Scale DBM 2013
- Section C : Mathematics Learning in Secondary School
- Section D : Student Attitude on Mathematical Learning
- Section E : Factors Influencing Mathematics Learning at Polytechnic (PSA)

The online questionnaire were distribute to Diploma students of Electrical Engineering Controlling (DJK). The classes that are involve were DJK 2A, DJK 2B and DJK 2C. It is assumed that the passing rate is low in Engineering Mathematics DBM2013 which:

- Due to the student coming from different demographic area and learning background in mathematics
- The student are given a set of questionnaire regarding their background, understanding topics in DBM2013 and the factors influencing them during mathematic learning in secondary school
- It is assumed that the students and lecturers are able to identify how to improve their learning styles in studying mathematics

### **4. RESULTS AND DISCUSSIONS**

For the purpose of this research, we gathered a sample from Electrical Engineering Controlling (DJK) students from 3 classes. Only 43 of them took part on this online survey. They came from different races and background. These 43 respondents are a mixed from rural and city. Only 32 of them took Additional Mathematics during Sijil Pelajaran Malaysia examination. However, we found that only 19% (6 respondents out of 32 respondents) got a grade C and above while 26 of them gets grade D and above. Refer Figure 1.

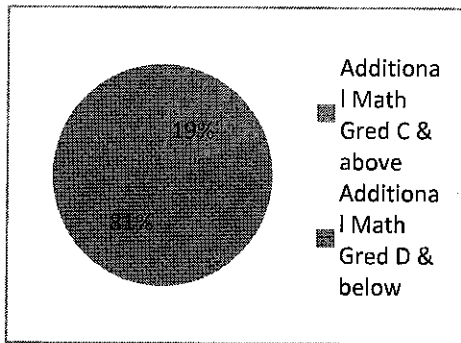


Figure 1: Respondents Grade in Additional Mathematics during SPM

One of the factor that we would like to investigate is their understanding of the topics in our DBM 2013 during their learning in mathematics at secondary school. Here is the result that may reflect their performance in learning engineering mathematic DBM 2013. Refer Figure 2.

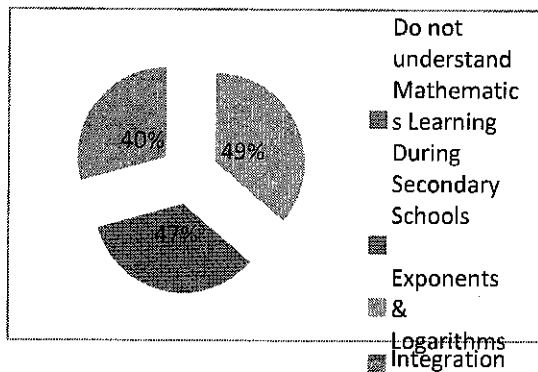


Figure 2: Students Understanding On Learning Mathematics during Secondary Schools

From the Figure 2 above, only 49% of the students understand the topics of Exponents and Logarithms, 47% understand of topic Differentiation and 40% understand of topic Integration. It shows that not even half of the students have a strong understanding in mathematic topics in DBM 2013. To investigate on how much their understanding during their learning the same topics in DBM 2013, we segregate into 3 parts, Very Poor (do not understand the topic), Poor (Understand the topic but not easy to apply) and Good (Understand the topic and can be applied). The result is shown in Figure 3.

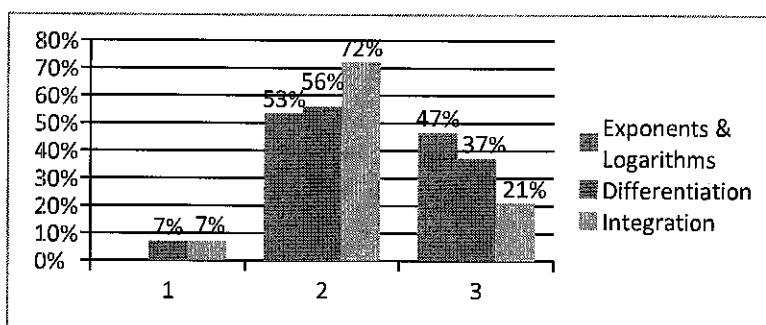


Figure 3: Understanding topic during learning DBM 2013

From Figure 3, clearly shows that mostly respondents understand the topic (50% and above) but they cannot apply it during examinations. Only 47% can apply the topic of Exponents & Logarithms, 37% can apply Differentiation while 21% can apply Integration. In addition, we want to know their attitude towards mathematic learning and the topic in DBM 2013. Majority of the respondents, 51% agree and 44% strongly agree when they were asked whether they like mathematic learning in general. But, when it comes to the topic itself, 26% and 33% dislike Exponent & Logarithms and Calculus. Refer to Figure 4.

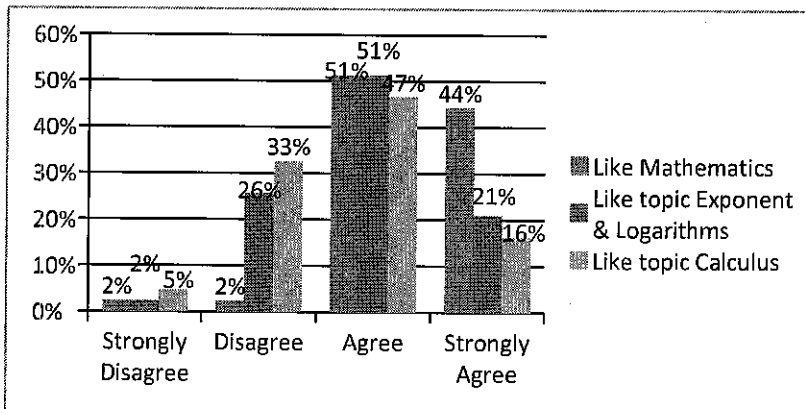


Figure 4: Students Attitude towards Mathematic Learning

When it comes to the current mathematics learning at Polytechnic, most of the respondents understand the lecturer's way of teaching, feel that the assessment given was sufficient and their response on completed the assessment were high (more than 80%). This information shows that they have the correct attitude towards learning engineering mathematic DBM 2013. Refer to Figure 5,6 and 7.

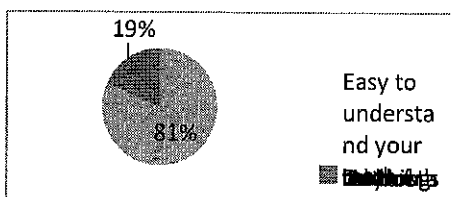


Figure 5: Easy to Understand the Lecturer Way of Teaching



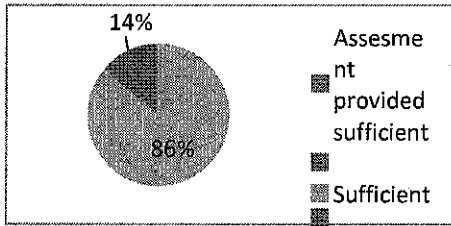


Figure 6: Sufficient Assessment Given

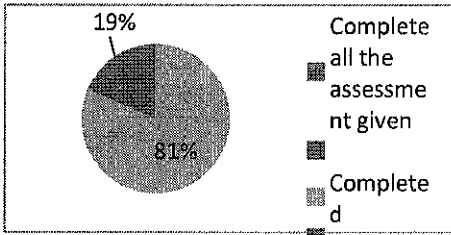


Figure 7: Complete All The Assessment Given

We already applied the CIDOS and learning mathematic in the form of games to attract students more active during classes and for them to improve their understanding in mathematics. In our survey, it shows 60% of the respondents agree that CIDOS help them to improve the mathematics learning. While, 88% of the respondents agree and wants the way of learning mathematics in the form games. Refer to Figure 8 and 9.

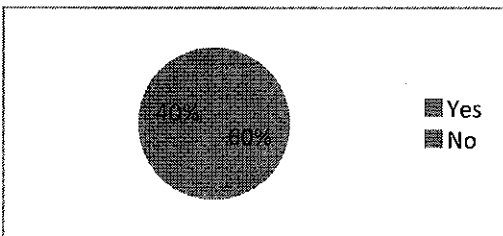


Figure 8: Does CIDOS Improve Mathematical Learning

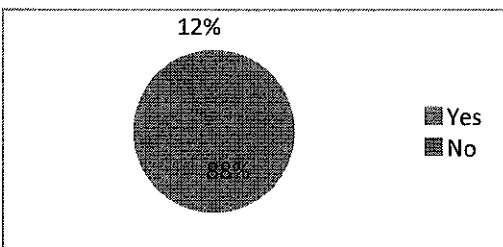


Figure 9: Does Learning in the form of games interactive and improve mathematical learning

## 5. CONCLUSIONS

It can be inferred that the major factor that affected the high failure rate of DBM 2013 was that the respondents did not have strong basic knowledge during learning mathematics at Secondary schools concerning Exponents & Logarithms and Calculus (Differentiation & Integration). Basically, they like mathematic in general but the lack the knowledge within the topics in DBM2013.

Another factor was that their understanding those topic learning during classes do not help them to apply their knowledge during examination. The exercise given was sufficient but they may need other methods of styles of learning to improve themselves in mathematics.. They have a good attitude towards learning mathematics. Therefore, they like mathematics learning in the form of games which can be more attractive and help them improve their understanding in mathematics. CIDOS can also help them to improve their knowledge in mathematic.

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