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# Identifying Topic Tendencies of Students Choices in The Final Semester Examination of Discrete Mathematics (DBM20083): Analysis of Final Examination Marks

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**ABSTRACT:** This action study was conducted to identify the tendency of students' choice of topics in the Discrete Mathematics DBM20083 final exam for Session 1 2023/2024. The respondents involved were a total of 32 second-semester students from the Department of Information & Communication Technology (JTMK). This study aims to identify the percentage of student achievement by gender in the final exam for the DBM20083 course. In addition, this study also wants to determine the percentage of student achievement by topic for the Discrete Mathematics course (DBM 20083). The study data is collected through the SPMP POLIMAS website for final exam marks and through a questionnaire given to students after the completion of the review program at the end of the session I 2023/2024. The results of the analysis show that there is a difference between the percentage of final exam marks for male and female students. In addition, the findings of the study also found that students are more likely to answer final exam questions from topic 1, topic 2, and topic 3. Therefore, it is hoped that the findings in this study can identify the tendency and difficulty level of students towards a topic to provide a better impact on the smoothness of the teaching and learning process in the DBM20083 course at POLIMAS.

**Keywords:** *Tendencies, choices, Final Examination, and Discrete Mathematics*

## 1.0 INTRODUCTION

The Discrete Mathematics course (DBM20083) is a compulsory course taken by Diploma Digital Technology (DDT) students at all polytechnics in Malaysia. The syllabus is in English and consists of 5 chapters. Among the branches of knowledge in this course are Basic logic and Proofs, Boolean Algebra, Graphs and Trees, Sets, Relations and Functions, and Basic Counting Rules.

In this course, students are exposed to the basic concepts of mathematics and their relationship with digital technology, which is the specialization of their field of study. Therefore, mastering and passing this course is crucial. Students must succeed in both the Continuous Assessment (CA) and the Final Examination (FE). Continuous assessment (CA) contributes as much as 60%, while the remaining 40% is through Final Exam. CA marks include Quiz (15%), End of Chapter (EOC) (20%), Test (15%) and Case Study (10%). Normally, students do not face problems in passing CA because even though students get lower marks on quizzes and tests, their PB score achievement is helped by assessment Case Studies and EOC.

According to Arahan-Arahan Peperiksaan dan Kaedah Penilaian (Edisi 6, Jun 2019), students in JTMK courses must score above 40% in both Continuous Assessment (CA) and the Final Examination (FE) to pass. This condition is also used for the Discrete Mathematics course (DBM 20083) for Diploma students.

Therefore, for the Discrete Mathematics course, when students are eligible to sit for the final exam, the condition for them to pass completely is to get an FE score of at least 40%. Hence, students can't be comfortable with high PB scores but instead need to work hard to revise to pass the final exam and even better by getting an A in the Discrete Mathematics course.

Since session II 2021/2022, the FE questions cover all five topics. Therefore, students must review all topics to ensure they score at least 40% and pass the FE. If they fail to get at least 40% on the final exam, they must repeat the entire course. This is what every student fears the most.

Analysis of FE questions in session I 2023/2024 shows the division of 4 questions covering 5 topics as follows; question 1 is from topic 1 (Basic Logic& Proofs), question 2 is from topic 2 (Boolean Algebra), and topic 5 (Basic Counting Rules), question 3 is from topic 3 (Graphs and Trees) and question 4 is from topic 4 (Set, Relations and Functions).

Based on a questionnaire distributed to 32 students of Discrete Mathematics at the end of semester session I 2023/2024, the findings show that out of 24 respondents, 41.7% of respondents stated that topic 5 was the most difficult topic to understand, followed by 37.5% for topic 4, 12.5% for topic 3, 8.3% for topic 1 and no students or 0% chose topic 2 as a difficult topic to understand. This shows that more than 70% of students choose topic 5 and topic 4 as the most difficult topics, while all students agree that topic 2 is the easiest.

This study aims to examine students' topic preferences and their FE scores to determine if there is a correlation between topic difficulty, as indicated by the questionnaire, and student performance. A previous study examines the mastery of DDT POLIMAS students in the Discrete Mathematics course by topic, but the course is an old code, and there are some changes in the curriculum. Besides, the old code does not test on topic 5 in the final exam. Therefore, this study can provide the latest findings and references for researchers and future studies.

Therefore, the objectives of this study that can be concluded are:

i. Identify student achievement percentage by gender for the Discrete Mathematics course (DBM 20083) for Session I 2023/2024.
ii. Identify student achievement percentage by topic for the Discrete Mathematics course (DBM 20083) for Session I 2023/2024.

## 2.0 LITERATURE REVIEWS

Since school, mathematics is often considered one of the most difficult subjects. This is followed by students achieving low scores in mathematics. This indirectly kills the interest and motivation of students. This situation continues to be carried by students until the higher education level. Mamat & Abdul Wahab's study (2022) proves that school students face the problem of lack of interest in Mathematics subjects. In addition, according to Sihombing et al., (2021), interest and motivation are among the factors that influence student achievement in mathematics. This statement is also supported by Silfitrah & Mailili (2020) and Simamora & Seragih (2021) whose studies emphasize that students' interests also influence the mathematics learning outcome.

The study of student interest that affects achievement in mathematics has been studied by many researchers worldwide. This includes Seah (2007), who stated that students' interests greatly affect their academic achievement, including mathematics. This statement is also supported by a study by Rismawati & Khairiati (2020), which states that students with low interest in mathematics will experience a lack of motivation, further leading to a low level of student achievement.

Besides interest, several studies prove the role of educators plays an important role in student achievement. Rokiah (2012), Nik Azis (2014), and Mohd Uzi and Lim (2008) stated that lecturers and teachers need to play the best role in improving students' achievement in mathematics. Therefore, educators should find a way to increase students' interest in mathematics, which can indirectly increase students' achievement in mathematics. There are some strategies that educators can use to enhance student achievements such as high-quality instruction, effective classroom management, use of technology, student-centered learning, and data-driven decision-making. Explaining in more detail about data-based decision-making, lecturers need to know which topics students find difficult and least favorite. Students

who are less interested in certain topics will not be interested in learning about the topic, and even worse, they choose not to answer questions from that topic in the exam. This will affect the students' marks. Therefore, if the lecturer can identify the topic of student difficulty, some methods may be implemented especially for those topics as an effort to attract students' interest and improve their understanding, thereby increasing student achievement in the exam.

According to a study by Robiah Sidin (1994), the marks obtained by a student affects his level of excellence. A student who obtains high marks will be closer to excellence. Therefore, student achievement in the final exam becomes an indicator for lecturers to check the degree of mastery and understanding of students in a course, especially Discrete Mathematics.

## 3.0 METHODOLOGY

This study was conducted at the Sultan Abdul Halim Mu'adzam Shah Polytechnic (POLIMAS), Jitra Kedah. The selection of respondents was guided by Othman Talib's (2013) principles, ensuring that the researcher had a clear purpose and target population. The respondents of this study were students from the Department of Information and Communication Technology (JTMK), POLIMAS who took the Discrete Mathematics course (DBM 20083) for session I 2023/2024. A total of 32 students were involved in this study.

The data analyzed in this study was obtained from the SPMP POLIMAS website, which is final exam marks, students' final exam answer scripts, and questionnaires given to the students after the revision program of Session I 2023/2024. The scripts consist of 4 questions, covering 5 topics. Marks for each topic of each script were converted into percentages. Then, the data was analyzed using descriptive statistics such as mean, percentage, and frequency using Microsoft Excel 2019.

## 4.0 DATA ANALYSIS AND FINDINGS

According to the guidelines in Arahan-Arahan Peperiksaan dan Kaedah Penilaian (Edisi 6, Jun 2019), student marks in the final examination are assigned points and grades as shown in Table 1:

**Table 1:** Grade System

| Mark | Point Value | Grade | Status |
|---|---|---|---|
| 90-100 | 4.00 | A+ | Very excellent |
| 80-89 | 4.00 | A | Excellent |
| 75-79 | 3.67 | A- | Honor |
| 70-74 | 3.33 | B+ | Honor |
| 65-69 | 3.00 | B | Honor |
| 60-64 | 2.67 | B- | Pass |
| 55-59 | 2.33 | C+ | Pass |
| 50-54 | 2.00 | C | Pass |
| 47-49 | 1.67 | C- | Pass |
| 44-46 | 1.33 | D+ | Pass |
| 40-43 | 1.00 | D | Pass |
| 30-39 | 0.67 | E | Fail |
| 20-29 | 0.33 | E- | Fail |
| 0-19 | 0.00 | F | Fail |

*Data was analyzed based on information from Table 1.*

### 4.1 Objective 1

Identify the percentage of student achievement by gender for the Discrete Mathematics course (DBM 20083) for Session I 2023/2024.

The data analysis from Table 2 shows that the percentage of students who passed the Final Semester Examination of Session I 2023/2024 for the Discrete Mathematics course was 100% with grades A to C. Specifically, 26% of students received an A, indicating excellent performance, while 55% achieved honors grades (A-, B+, B). While the rest (19%) passed with grades C+ and C. This proves that the tendency of students in the selection of questions in the final exam plays an important role in their achievement. The difficulty level of a topic is the cause of the tendency.

**Table 2:** Percentage of Student Achievement for the Discrete Mathematics Course (DBM 20083) Session I 2023/2024.

| Grade | Percentage (%) |
|---|---|
| **A+** | **0** |
| **A** | **26** |
| **A-** | **23** |
| **B+** | **13** |
| **B** | **19** |
| **B-** | **0** |
| **C+** | **13** |
| **C** | **6** |
| **C-** | **0** |
| **D+** | **0** |
| **D** | **0** |
| **E** | **0** |
| **E-** | **0** |
| **F** | **0** |

**Table 3:** Percentage of Student Achievement based on Gender for the Discrete Mathematics Course (DBM 20083) Session I 2023/2024.

| Grade | Percentage (%) | |
|---|---|---|
| | **Male** | **Female** |
| A+ | 0 | 0 |
| A | 38 | 0 |
| A- | 19 | 30 |
| B+ | 5 | 30 |
| B | 19 | 20 |
| B- | 0 | 0 |
| C+ | 14 | 10 |
| C | 5 | 10 |

| | | |
|---|---|---|
| C- | 0 | 0 |
| D+ | 0 | 0 |
| D | 0 | 0 |
| E | 0 | 0 |
| E- | 0 | 0 |
| F | 0 | 0 |

The findings of the study in Table 3 summarize that 38% of male students passed with honors with a grade of A. However, a higher percentage of female students (80%) received honors grades (A-, B+, B) compared to male students, with a total of 43% passing with honors. The percentage of students who pass with grades C+ and C are respectively 14% and 5% for male students, and 10% for female students.

### 4.2 Objective 2

Identify the student achievement percentage by topic for the Discrete Mathematics course (DBM 20083) for Session 1 2023/2024.

**Table 4:** Student Achievement Percentage by Topic for the Discrete Mathematics Course (DBM 20083) Session I 2023/2024.

| Topic | Percentage (%) |
|---|---|
| Topik 1: Basic Logic& Proofs | 80 |
| Topik 2: Boolean Algebra | 77 |
| Topik 3: Graphs and Trees | 64 |
| Topik 4: Set, Relations and Functions | 41 |
| Topik 5: Basic Counting Rules | 21 |

Based on Table 4 above, it was found that students are more likely to answer questions from topic 1 with an average achievement percentage of 80%. Meanwhile, topic 5 is a topic that is less preferred by students and has the lowest average percentage of achievement (21%) compared to other topics. This is in line with the findings of the survey from the Mock Final

Discrete Mathematics Program Session I 2023/2024, which was conducted before the end-of-semester exams. During the program, students were asked to answer a questionnaire in the form of a Google form related to the difficulty level of each topic in the Discrete Mathematics course. The findings are as in Figure 1.

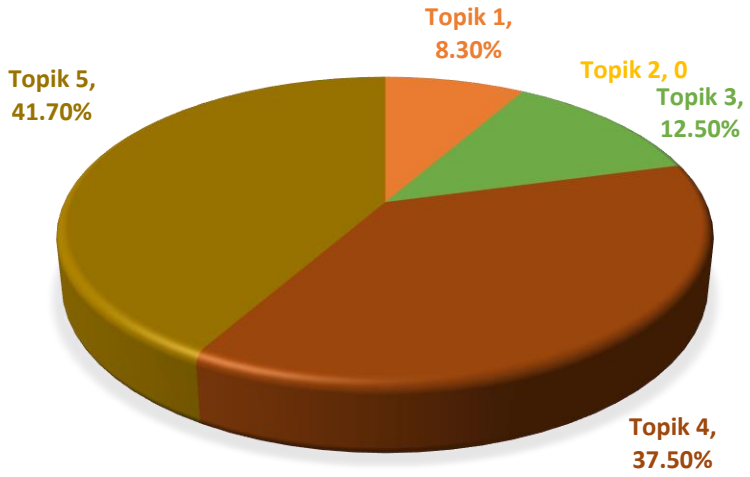


**Figure 1**: Level of Difficulty of Each Topic for the Discrete Mathematics Course (DBM 20083) Session I 2023/2024.

Data analysis, as shown in Figure 1, shows that 41.70% of students said topic 5 was the most difficult, and they were less likely to answer questions from that topic well. Then, followed by topic 4, topic 3, and topic 1. Findings also show that no student chose topic 2 as a difficult topic. This proves that students think topic 2 is easy for them, which is in line with the second-highest average achievement percentage in the final exam, which is 77%.

**Table 5:** Percentage of Student Achievement by Topic Based on Gender for the Discrete Mathematics Course (DBM 20083) Session I 2023/2024.

| Topic | Percentage (%) | |
|---|---|---|
| | **Male** | **Female** |
| Topik 1 : Basic Logic& Proofs | 84 | 82 |
| Topik 2 : Boolean Algebra | 79 | 81 |
| Topik 3 : Graphs and Trees | 69 | 60 |
| Topik 4 : Set, Relations and Functions | 43 | 39 |
| Topik 5 : Basic Counting Rules | 24 | 18 |

Table 5 shows that the average percentage of achievement by topic for male and female students is equivalent, where topic 1 is a favorite topic and easy to answer. In contrast, topic 5 is a difficult topic for them. This causes students to be less inclined to focus on the topic. Although students are required to answer all questions covering all topics in the final exam, their average achievement percentage for topic 5 is less than the other topics.

## 5.0 DISCUSSION AND CONCLUSIONS

This study shows the tendency of students to answer final semester exam questions according to topic. The findings showed that students are more likely to answer questions from topic 1, topic 2, and topic 3. On the other hand, topic 4 and topic 5 are difficult topics for them and less inclined to be answered. The data in Table 4 prove this. In addition, the level of difficulty of each topic can also be analyzed as in Figure 1.

Topic 4 and topic 5 were learned in additional mathematics subjects at secondary school. But, most of them had not taken and learned the subject before. As we all know, additional mathematics subject is one of the killer subjects for the students. So, that's why their marks for the topics were quite low plus their weakness in basic mathematics concepts. Therefore, as an initiative, the lecturers can give extra exercises and discuss with a small group.

This finding plays an important role for a lecturer in identifying the tendency and difficulty level of students towards a topic not only for the Discrete Mathematics course but

also for other courses as well. Indirectly, students can find difficult topics in advance. Lecturers and students can think together about the necessary actions to overcome the problem.

Therefore, it is important for course lecturers to know the students' views on the difficulty level of a topic in Discrete Mathematics. In addition, lecturers also need to analyze student scores based on topics so that students' tendencies to answer certain topics in the exam can be concluded. Lecturers need to think of appropriate improvement methods to increase students' interest in a topic so that the achievement of that topic can be increased for the next semester.

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