



# Description of Factors Cause of Learning Difficulties in Mathematics Engineering Students in Civil Engineering Study Program

Tri Susilawati<sup>1</sup>(✉), Indra Darmawan<sup>2</sup>, and Gunawan<sup>3</sup>

<sup>1</sup> Department of Civil Engineering, Universitas Teknologi Sumbawa, Sumbawa Besar, Indonesia  
tri.susilawati@uts.ac.id

<sup>2</sup> Department of Electrical Engineering, Universitas Teknologi Sumbawa, Sumbawa Besar, Indonesia

<sup>3</sup> Department of Physics Education, University of Mataram, Mataram, Indonesia

**Abstract.** The impression of engineering mathematics courses that so far has been difficult for most civil engineering students to study, is certainly caused by learning difficulties faced by students. This research is a descriptive qualitative approach that aims to describe the factors that cause difficulties in learning mathematics techniques. Data collected by interview, observation and test techniques. There are two types of factors that cause difficulties in learning mathematics techniques, namely internal factors and external factors. Internal factors that are the main causes of learning difficulties in mathematics courses are difficult material, habits of students who do not study independently, organized activities that make students unable to manage time properly and correctly, and the habit of social media for more than 8 h per day. The external factors that cause difficulties in learning mathematics techniques are weather and hours of study, learning methods and media, social environment that tends not to support good study habits, and the conditions of the living environment.

**Keywords:** Learning Difficulties · Mathematics · Civil Engineering

## 1 Introduction

Learning difficulties are challenges experienced by students in the learning process that causes students to get suboptimal results in the learning process [1]. According to Ahmadi and Supriyono, some symptoms are a sign of learning difficulties namely: (1) shows low learning achievement below the average grade achieved by the class group; (2) learning outcomes achieved are not balanced with the work done. He tried hard but his value was always low; (3) slow in doing study tasks; (4) show a less reasonable attitude; (5) students exhibit different behaviours [2]. Factors underlying the cause of problems in students are sourced from internal factors and external factors. Internal factors can include intellectual aspects such as intelligence, talent, interests, motivation, physical conditions and circumstances. External factors include students' social conditions such as the environment, family economy, schools, and surrounding communities [3].

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Engineering mathematics is one of the advanced courses that are mandatory in civil engineering study programs. The requirements for programming this course are that students must pass a minimum grade of C for Calculus 2 and Calculus 1. This course requires students to understand several mathematical concepts that will be found in many other engineering calculations such as differential equation material, gamma functions, beta functions, and other materials. A good understanding of this course certainly makes it easier for students to understand the material in other courses in the civil engineering study program.

Engineering mathematics courses are often a scourge for most students. This can be seen from the graduation obtained by students which tends to be less each year, namely 65% in 2017 and 73% in 2018. The lecture process which tends to be passive without any feedback from students further strengthens student learning difficulties.

The assumption of most students that mathematical problems are difficult, do not know how to solve and do not like mathematics [4] already embedded in most students. This mindset and expressions often occur in Engineering Mathematics courses and their prerequisites. The difficulty of learning that often occurs in courses in the count of civil engineering study programs is lack of understanding of concepts. In line with what has been investigated by Muhammad Arie Firmansyah which concludes that one of the causes of the difficulty of learning mathematics is weak concepts [1]. Based on some of these problems with this research will describe the main problems that become factors of difficulty learning mathematics engineering in civil engineering study programs.

## 2 Methods

The research was conducted at a private university in Sumbawa Island. This type of research is a descriptive study with a qualitative approach. The descriptive approach does not aim to test certain hypotheses, but only describes what it is about a variable, symptom, or condition, that is, the condition according to what it is at the time the research took place [5]. The subjects of this study were 70 students divided into batch 2016, 2017 and 2018.

Data collected by interview, observation, and test. The data obtained were analyzed by finding the average value. Observations were made during the lecture process. The test results used are the results of daily assignment tests, quizzes, midterm exams, and final semester exams.

Some factors that are the focus of this study are divided into two, namely internal factors and external factors. Internal factors include reading/repeating material that has been delivered by the lecturer, independent study, time management, length of social media, difficult material, and personal problems. External factors include economic factors, learning media, social environment, weather and lecture hours, the environment around where you live, as well as learning methods. These six internal and external factors are used after interviews with 100 engineering faculty students regarding the causes of learning difficulties that they often experience.

### 3 Results and Discussion

Based on the test results, students in the no pass grades category were categorized as students experiencing learning difficulties. From the results of the study obtained data on the number of students who graduated as in Table 1.

Based on the data in Table 1 the number of students who were approved to pass in 2019 decreased compared to 2018 which was 12.72%. Students who pass in 2019, 75% consisted of students who had taken engineering mathematics courses in the previous year. Most of the students who have no pass are new students to take this course. The increase in the value of students who pass was not too significant which was an average of 63.25 compared to the previous year which was 60.12.

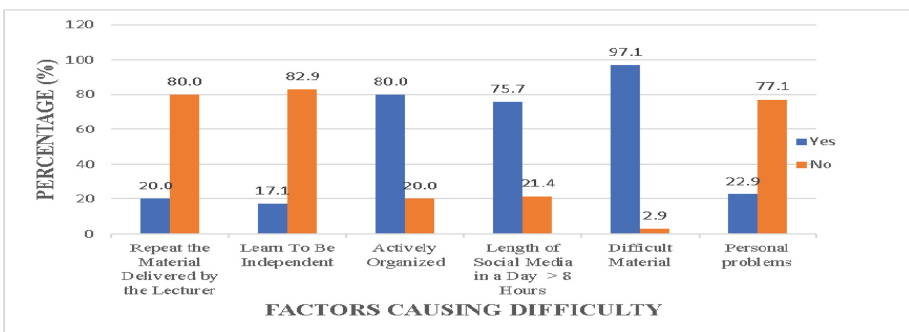
After a previous interview with 100 engineering students, several factors were found to cause learning difficulties that they often experienced. Some factors that are the main causes of learning difficulties are then taken each of the six for internal and external factors. Each of these six factors is the result of an average student's answer. The results obtained are then used as a basis as a reference for structured interviews for research subjects.

Structured interviews for categories of internal factors that cause difficulties in learning mathematics techniques are carried out to explore further what percentage of factors that influence. The results of the structured interviews were conducted to produce the data in Fig. 1.

Seen in Fig. 1 the most dominant internal factors considered by students are material that is considered difficult with a score of 97.1%. In line with research conducted by Nasrin Akhter and Nasreen Akhter [6] which concluded that most students believed that mathematics was difficult. Furthermore, it can be seen from the results of the test that

**Table 1.** Number of Student Graduations

Category	Total	Percentage (%)
Pass	10	14.28
Non Pass	60	85.72



**Fig. 1.** Internal Factors Data Causes Learning Difficulties in Engineering Mathematics

there is a low understanding of the concepts, it can be seen from the answers on the tests that are given tend to be confused with which concepts are suitable for a problem. The concept that should have been strong since in the prerequisite courses is largely not owned by students.

Internal factors that occupy the second position as the cause of difficulties in learning mathematics techniques are the habits of students who do not learn independently means that students are only centered on what is delivered by lecturers during lecture hours. The value which shows the number 82.9% is a high enough number. In this case, independent learning can be said to be a lack of student learning discipline. As has been studied by Rusmiyanti [7] that is, there is a positive and significant influence between learning independence and learning achievement. Another theory which supports that learning independence affects learning achievement is conveyed by Siregar [8] that learning independence affects student achievement, it is necessary to develop an independent attitude in students.

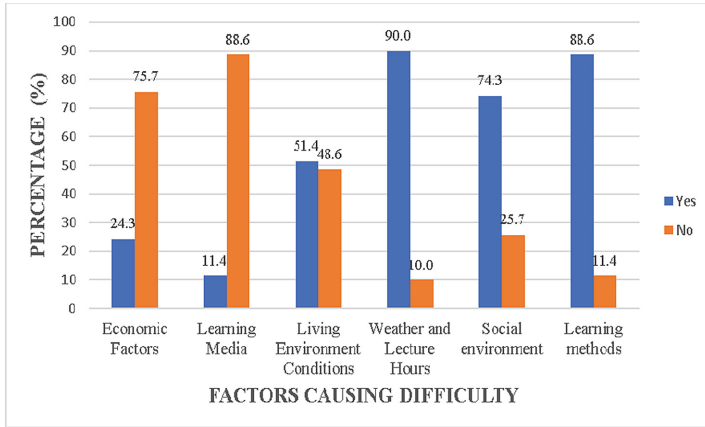
Another thing that is considered by students as one of the factors causing learning difficulties is the organizational activity with a percentage of 80%. Organizational activity can be categorized as bad time management meaning that the time discipline used does not follow the priority scale. Most students who are the subject of this research are active in several intra and extra-campus organizations. The activeness in various organizations that they do is not balanced with good time management and discipline. As a result of research conducted by Juliasarai and Kusmanto [9] that time management influences students' mathematics learning achievement.

In addition, students who tend to never repeat the material that has been delivered by lecturers also play an important role in causing students learning difficulties. Percentage that reaches 80% is a fairly high percentage. This means that learning habits and motivation are still low. Mathematics learning should tend to be an iterative process, not just memorization. The frequent repetition process will certainly strengthen the understanding of concepts in students. This is consistent with what has been studied by Gopalan et al. [10] that motivation is very important for the success of an education. This was further confirmed by the findings of Ridwan, Ardi, and Rahmansah [11] which concludes motivation and interest in learning significantly affect learning achievement.

Another effect that gives effect to the difficulty of learning engineering mathematics for 75.7% of students is the use of social media such as Facebook, YouTube and online games that are more than 8 h a day. Inversely proportional to those studied by Najamuddin et al. [12] that there is no significant relationship between the use of social media and learning achievement. The results of in-depth interviews, the use of social media by students is more widely used as entertainment media rather than used for learning media. The use of social media students tends to make motivation and interest in learning lower because time management is mostly used for social media. The use of social media should be very helpful in understanding and learning engineering mathematics.

Personal problems only affect 22.9% of students. Based on this tendency, personal problems do not affect the difficulty of learning mathematical techniques.

Besides the six internal factors, there are also factors that come from outside the student's personalities. The six factors are as shown in Fig. 2.



**Fig. 2.** External Factor Data Causes Learning Difficulties

Weather and lecture hours are factors that cause learning difficulties for 90% of students. Hot weather and lecture hours during the day are ineffective and reduce their concentration in understanding the material.

The next factor that caused learning difficulties 88.6% of students were learning methods and media. The learning method in question is the method of learning in class when studying and the learning methods that students apply themselves. The methods used when engineering mathematics courses tend to be monotonous methods.

Another factor that affects 74.3% of students' learning difficulties is the social environment. The social factor here means that associates do not support students independently. The results of in-depth interviews with 74.3% of students that their environment tends to be environment that is not accustomed to doing the learning process so that the learning climate is good and at all times not obtained by students. Parents who are less concerned about the daily activities of students plus a social environment that is not encouraging and can lead to motivation and student interest in learning.

Meanwhile, students who stated the condition of the living environment affected learning difficulties only 51.4%, meaning that it did not significantly influence. Furthermore, based on the results of interviews about the condition of their neighborhood, it was found that most students lived in boarding houses and contracts with several students who were still in the category of reasonable occupancy.

Meanwhile, economic factors for 75.7% of students did not affect learning difficulties. This is due to the fact that most students who take engineering mathematics courses are students with scholarships.

## 4 Conclusion

Based on the results of the study it can be concluded that two main factors that cause students learning difficulties are internal factors and external factors. These two factors should be minimized so that learning difficulties, especially mathematics engineering courses can be reduced. Need cooperation from all parties, namely students, lecturers,

learning facilities, and the environment in creating a good learning climate so that the results obtained are as expected.

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