

## ANALYSIS OF CONCEPT UNDERSTANDING OF 2ND SEMESTER MATHEMATICS COURSES

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**Abstract:** This study aims to analyze the level of student concept understanding of Semester 2 Mathematics courses, identify the most difficult concepts to understand, and find forms of misconceptions and factors that influence them. The research used a qualitative descriptive approach with data collection techniques in the form of tests, in-depth interviews, classroom observations, and documentation. The research subjects were 2nd semester students of the Elementary School Teacher Education Study Program at PGRI Silampari University. The results showed that most students were in the moderate to low understanding category, with a tendency to memorize formulas without understanding their conceptual meaning. The most difficult materials to understand are function limits, mathematical logic, and linear function graphs. Common misconceptions include erroneous assumptions about the concept of limit and logical inference. Factors that influence understanding include initial ability, learning strategies, learning motivation, learning style, and learning environment. This study suggests the need for a learning approach that emphasizes conceptual understanding, the use of visual media, and the strengthening of contextual learning in order to create a more meaningful mathematics learning process.

**Keywords:** concept understanding, misconceptions, mathematics, students, qualitative learning

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### INTRODUCTION

Mathematics is a basic science that is an important foundation in almost all fields of science knowledge and technology. In higher education, especially in teacher and mathematics education study programs, mathematics courses are given since the early semesters to form a foundation for logical and systematic thinking for students. Mathematics courses in semester 2 often include material such as systems of linear equations, functions, mathematical logic, to limits and derivatives. This material not only demands the cognitive ability of students, but also a deep conceptual understanding so that it can be applied in problem solving. Concept

understanding is a very important cognitive component in learning mathematics. Without a good understanding of concepts, students will only be able to memorize formulas without really knowing their meaning and application. According to Wahyuni (2020: 78), concept understanding is the ability to connect one idea with another logically, so as to be able to solve new problems on the basis of concepts that have been owned. This is essential considering that mathematics does not only demand the final result, but also a structured and logical thinking process.

However, in reality, many students experience difficulties in understanding mathematical concepts, especially in semester 2. This difficulty is not only caused by the complexity of the material, but also influenced by the low readiness of student learning, the lack of interactive teaching methods, and the limited ability of students' abstract thinking. Rahayu and Lestari (2021: 102) in their research found that more than 60% of students tend to experience misconceptions in mathematical functions and logic material, which causes errors in answering applicative and problem solving questions.

## **METODOLOGI**

This research uses a qualitative descriptive approach, which is an approach that aims to understand and describe phenomena that occur naturally and deeply in accordance with the context experienced by the subject. According to Moleong (2021:6), qualitative research aims to understand the meaning behind the behavior, experiences, or interactions that occur in a particular setting. This type of research was chosen to analyze the level of understanding of students' concepts of Semester 2 Mathematics courses, including forms of misconceptions and factors that influence them.

This research was conducted at the Elementary School Education Study Program, PGRI Silampari University. This location was chosen because it has a Semester 2 Mathematics course which is taught regularly every academic year.

The research subjects were 2nd semester students who were taking the Mathematics Semester 2 course. The selection of subjects was carried out purposively, which was chosen deliberately based on the research objectives. The number of subjects studied was 20-30

students from one class who actively attended lectures. The object of the research is the level of students' conceptual understanding of mathematics materials taught in semester 2, such as the system of linear equations, mathematical logic, functions, and limits, as well as the forms of misconceptions that arise during the learning process.

Data collection was done through the following techniques:

1. Concept Understanding Test

Tests in the form of description questions designed to measure students' ability to understand mathematical concepts thoroughly and applicatively.

2. In-depth Interview

Used to further explore students' thoughts about material that is difficult to understand and the causes of misconceptions.

3. Class Observation

Observing student learning activities during mathematics lectures, including interactions with lecturers and the use of learning strategies.

4. Documentation

Includes data collection in the form of assignment scores, previous test results, teaching materials, and RPS as supporting data.

The instruments in this study include:

- a. Concept understanding test question sheet which is prepared based on indicators of conceptual ability according to Nugroho (2021: 65).
- b. Interview guide to explore the way students think and the difficulties they experience.
- c. Learning activity observation sheet to record learning behavior that reflects understanding or misconceptions.
- d. Documentation format to record grade data and materials used in lectures.

Data analysis was carried out qualitatively using the Miles and Huberman model (in Sugiyono, 2022: 143), which included:

1. Data Reduction

Filtering and summarizing raw data into important information according to the research focus.

2. Data Presentation

Organizing data in descriptive, graphic, or tabular form to facilitate understanding.

3. Drawing Conclusions and Verification

Conclude patterns and meanings from the data that has been analyzed, then verified through triangulation. To ensure the validity of the research results, source triangulation and technique triangulation techniques were used. Source triangulation was done by comparing data from students, lecturers, and documentation. Meanwhile, triangulation techniques were carried out by comparing data from tests, interviews, and observations.

According to Moleong (2021:330), triangulation is an important technique in qualitative research to test the credibility and reliability of data obtained from various approaches and sources of information.

## **RESULT**

This research was conducted at the PGRI Silampari University Primary School Education (PGSD) Study Program, which is located in Lubuklinggau City, South Sumatra. This study program aims to form competent and professional prospective elementary school teachers, including in mastering basic mathematics materials. Semester 2 Mathematics course is one of the compulsory courses that contains topics such as systems of linear equations, functions and graphs, mathematical logic, limits, and introduction to derivatives. Lectures are conducted face-to-face and online through the learning platform set by the institution.

The research data were obtained through three main techniques: concept understanding tests, in-depth interviews, and classroom observations. The test was given to 25 second semester students, then interviews were conducted with 6 students with the lowest and highest test results, and observations were made during three meetings in the Basic Mathematics II course.

### **1. Concept Understanding Test Results**

Based on the test results, the data obtained from 25 students:

- a. 6 students (24%) have high concept understanding
- b. 10 students (40%) are in the medium category
- c. 9 students (36%) showed low concept understanding

Examples of problems used include:

1) Explain the meaning of the limit of  $f(x)$

as  $x$  approaches  $a$  and give an example in a graph."

2) Many students simply answered the formula without being able to explain its meaning. This shows that their understanding is still procedural, not conceptual.

## 2. Interview Results

In-depth interviews showed that:

- a. Students with good results tend to learn through videos and discuss in small groups.
- b. Students with low results admitted that they only memorized formulas without understanding the meaning of the concept.
- c. Most of them had difficulties with limits and mathematical logic, especially in understanding mathematical symbols and language.

Example quote:

"I can memorize formulas, but when told to explain why the results are so, I am confused, especially story problems." (Respondent M4)

## 3. Observation Results

From class observations, it was found that students were more active in discussion sessions or when lecturers used visual media (graphs, animations), but passive when given abstract explanations without concrete examples. This shows that the learning style is very influential on the absorption of mathematical concepts.

## CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that the level of understanding of the concepts of 2nd semester students of the PGRI Silampari University Elementary School Education Study Program in Semester 2 Mathematics courses is still in the moderate to low category. Most students show a tendency to memorize formulas without understanding the meaning of the underlying concepts. The most difficult material for students to understand is limit functions, mathematical logic, and linear function graphs. This difficulty is caused by the abstract character of the material and the lack of concept reinforcement during learning. In addition, various forms of misconceptions were found, such as the assumption that the limit value is always equal to the function value at that point, as well as errors in understanding the logical symbol of implication. Factors that influence students' concept understanding include varying initial abilities, lecturer learning strategies that tend to be procedural, low motivation to learn, and lack of use of learning media that support understanding. Therefore, a learning approach that emphasizes conceptual understanding, the

use of visual media, and contextual learning is needed so that students can build their own conceptual understanding.

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