



## Analysis of Students' Learning Obstacles in The Differential Equations Course Reviewed from Their Problem-Solving Ability

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### ABSTRACT

**Objective:** This study examines the obstacles students may encounter when learning to solve differential equations with mathematical problem-solving. **Method:** A qualitative study with observation and interviews was conducted on the 5<sup>th</sup>-semester students of the Mathematics Education Study Program, Khairun University, Ternate, who took the Differential Equations course to explore students' mathematical problem-solving abilities. Samples were selected by purposive sampling by selecting two students each from the low, medium, and high problem-solving ability categories. **Results:** Based on the results of this study, the obstacles that students faced in studying differential equations were ontogeny obstacles, didactic constraints, and epistemological constraints. Several efforts can be made to help students overcome these barriers, such as improving students' collaborative skills, providing constructive feedback, strengthening students' learning motivation through contextual learning, and reflecting on students' learning processes. **Novelty:** The result of this research contributes to helping lecturers design learning that makes it easy to learn differential equation courses.

### INTRODUCTION

Before beginning a lesson, teachers should note any obstacles students may encounter in their learning. This is because students' low learning achievement is most likely attributed to internal factors, such as their cognitive abilities, attitudes toward learning, affective behavior, and physical behavior, compared to other factors. According to Geary (2012), students with low mathematics achievement are typically those experiencing obstacles in their learning. Compared to other factors, psychological factors such as low intelligence, interest, learning motivation, and learning concentration cause students to experience 35% greater obstacles. Furthermore, Fauziah & Habibah (2017) examined obstacles in learning mathematics and found that the causes of these obstacles are students' interest (26.26%), motivation (30%), concentration (46.67%), study habits (30%), and intelligence (20%). Meanwhile, the self-confidence factor that may contribute to students' difficulties in learning mathematics has only been discussed in a prior study by Akbari and Sahibzada (2020).

Barriers experienced by students in their learning are better known as learning obstacles. Brousseau (2002) revealed that learning obstacles are caused by three factors, namely: 1) Ontogenic barriers (student's mental readiness to learn); 2) Didactical barriers (teacher's strategies or materials); and 3) Epistemological barriers (knowledge of students who have limited application contexts). Ontogenic barriers occur because the learning process is not by student readiness. To overcome these barriers, training is needed to make students more mentally prepared to solve problems gradually (Prabowo et al., 2022). Ontogenic barriers can be divided into psychological,

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