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# Development of Differentiated Learning Module with Undo Procedure to Improve Learning Outcomes Students on Function Inversion Material

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**ABSTRACT**

**Objective:** This study aims to develop a teaching module focusing on differentiated learning by applying the undo procedure to improve student learning outcomes and understanding of inverse functions. **Method:** This study is the development of a differentiated learning teaching module on the inverse function material using the four-D (4-D) model from Thiagarajan (Define, Design, Develop, and Disseminate). Meanwhile, to determine the effectiveness of the teaching module, the research subjects were students of class XI SMAIQu (Qurani Islamic High School) Al Bahjah Cirebon. **Results:** The teaching module based on the Undo procedure was considered valid by experts, with an average validation score reaching the very valid category. This module is very practical, as evidenced by its ease of use by teachers and students' high level of readability (80–90%). The module effectively improves student learning outcomes, with an average N-Gain Score of 0.65 (moderate to high category). The module supports differentiated learning, allowing students to learn according to their abilities. **Novelty:** This module uses the Undo procedure as a learning strategy, which has not been widely applied in developing mathematics teaching materials, especially for inverse function material. The module integrates the principle of differentiated learning, providing solutions to the diversity of student abilities in the classroom. The module is designed to help students understand concepts through a procedural approach, which is rarely focused on in conventional teaching modules.

## INTRODUCTION

The ability to understand and apply inverse functions helps solve a variety of practical mathematical problems, such as personal financial planning, where an understanding of inverse functions allows for the estimation of investment growth or the calculation of loan payments (Charpentier et al., 2020). In data analysis, the concept of inverse functions helps reverse mathematical transformations applied to data, helping to return data to its original state or identify inverse relationships between variables. In addition, in computer science and technology, understanding inverse functions is important in developing algorithms and software, including digital image processing, where inverse functions are used to obtain the original image from a modified image. Thus, understanding the concept of inverse functions not only provides benefits in the academic sphere but also has broad and relevant applications in various aspects of daily life and various professional fields (Biza et al., 2022; Dreyfus et al., 2021; Liang et al., 2023; Meyer & Lima, 2023; Shurygin et al., 2024). However, the learning that has occurred so far has not been optimal because the classroom conditions are not conducive, students are less active, and learning has not accommodated students' diverse abilities, the impact of which is that student learning outcomes are less than optimal. For this reason, efforts are needed to improve learning.

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