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Pattern Generalization Based on APOS Theory

A Study on Middle School Students' Learning Styles

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Abstract

This study aims to describe the profile of pattern generalization among eighth-grade junior high school students, focusing on pictorial patterns using the APOS (action, process, object, and schema) theory as an analytical framework. Pattern generalization in this research refers to students' cognitive processes in recognizing, constructing, and developing pattern rules based on visual representations. The APOS theory is employed to understand how students construct mathematical understanding in generalizing pictorial patterns through the APOS stages. The research subjects consist of three students with different learning styles—visual, auditory, and kinesthetic—selected through purposive sampling. Data were collected through written tasks, semi-structured interviews, and observations during problem-solving activities. The analysis was conducted using a qualitative approach, encompassing data reduction, data

presentation, and conclusion drawing. The findings indicate that students with a visual learning style outperform those with auditory and kinesthetic learning styles in recognizing pattern regularities and converting them into numerical or algebraic forms. In contrast, auditory and kinesthetic learners face challenges in systematically constructing pattern abstractions. These findings provide valuable insights for educators in designing more adaptive learning strategies based on learning styles to enhance students' pattern generalization skills in mathematics education. Future research should explore multimodal approaches to accommodate diverse learning styles.

Keywords

Pattern GeneralizationAPOS TheoryLearning StylesMathematics EducationMiddle School Students