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Developing a GeoGebra-Based Teaching Module on Quadrilateral Area and Perimeter to Enhance Seventh-Grade Students' Critical Thinking Skills

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ABSTRACT

Objective: Seventh-grade students often need help to grasp the concepts of area and perimeter, particularly when applied to real-world problems requiring critical thinking. This difficulty highlights a need for engaging and effective teaching resources beyond traditional methods. **Method:** This study employed a Research and Development (R&D) approach using the ADDIE model to design, develop, and evaluate a GeoGebra-based teaching module explicitly targeting the area and perimeter of quadrilaterals. The module, designed to foster critical thinking, underwent rigorous validation by media and material experts before being tested for practicality and effectiveness with seventh-grade students. **Result:** The GeoGebra-based teaching module was valid and practical, receiving high scores from expert evaluations and user feedback. More importantly, the module's implementation positively impacted students' critical thinking skills related to area and perimeter, as evidenced by significant improvement between their pre-intervention and post-intervention assessments. **Novelty:** This study provides valuable evidence for the efficacy of GeoGebra-based teaching modules in significantly improving critical thinking skills within a specific mathematical context. It addresses a critical gap in existing educational resources by offering a validated, practical, and effective tool that can be adapted to elevate mathematical understanding and cognitive skills in middle school education.

INTRODUCTION

Critical thinking is an indispensable skill for students navigating an increasingly complex world. This era demands individuals equipped with robust cognitive abilities and essential skills such as digital literacy, information management, and technological proficiency (Wahyunita & Subroto, 2021). Critical thinking, characterized by applying logical reasoning, enables individuals to effectively analyze information, solve problems, and make informed decisions (Munawaroh & Siswono, 2020). Fostering these skills in students is paramount, and educators play a crucial role in this endeavor. By employing diverse teaching methodologies, including problem-solving activities, discussions, and real-world applications, teachers can cultivate critical thinking within their classrooms (Barak & Shahab, 2023; Chen, 2021; Cruz & Dominguez, 2020; Gleason & Jaramillo Cherrez, 2021; Wang, 2021). This is particularly crucial in mathematics education, where critical thinking manifests in the ability to identify mathematical concepts, analyze relationships, solve problems, and evaluate solutions. Effective utilization of these skills can aid individuals in producing innovative ideas, assessing situations, and making decisions that align with their beliefs and actions. Teachers play a pivotal role in fostering students' critical thinking abilities.

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