

The Art of Mathematical Modeling in College Physics: Strategies for Fostering Student Engagement

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Abstract: *This study investigates the integration of mathematical modeling strategies in college physics education to enhance student engagement, comprehension, and attitudes. Through a mixed-methods approach involving surveys, assessments, interviews, and observations, the study explores the impact of these strategies on student learning. The findings reveal a significant improvement in student engagement levels, increasing from 65% to 88% after implementation. Assessment scores demonstrated a parallel enhancement, rising from 62% to 90% across three rounds. Qualitative interviews highlighted students' initial lack of confidence in applying mathematical tools to physics scenarios, coupled with frustration due to the abstract nature of mathematics. However, the strategies' contextualization effectively addressed these challenges, leading to increased confidence and positive attitudes. The outcomes align with theoretical frameworks and previous research, underscoring the strategies' ability to bridge theoretical concepts with real-world applications. The study concludes that the integration of mathematical modeling in physics education promotes active learning, deepens understanding, and reshapes students' perceptions of mathematics and physics. It advocates for personalized support to overcome initial challenges and emphasizes collaborative coordination in curriculum planning. Ultimately, the study contributes to the evolving landscape of education by promoting interdisciplinary approaches that enhance student learning experiences.*

Keywords: Mathematical Modeling, College Physics, Student Engagement

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