Chapter 2
Empowering Pre-Service Teachers:
Promoting Equity in Enhancing the Mathematical Potential of Gifted Elementary Students

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ABSTRACT

This study explores the feasibility of integrating problem-based learning (PBL) teaching strategy as a curriculum design model utilizing action research and analyzes its impact on pre-service teachers' curriculum design ability. The research found that the gradual presentation of the three examples can help students understand PBL's gifted mathematics curriculum model; the actual curriculum design review and practice can help students gain practical experience. After this course, the students significantly improved their understanding of the PBL teaching method, designed courses for gifted students in mathematics, taught confidence in gifted students, and showed interest in teaching them mathematics. However, students need to be strengthened and improved in learning sheet design and group teaching guidance for exploring problems.

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INTRODUCTION

Equal educational opportunities mean that all students, regardless of their social, economic, cultural background, gender, ethnicity, or physical condition, should have access to education. This does not imply providing identical education for every student but instead considering individual needs and offering appropriate resources and support to ensure each student can reach their full potential. Gifted students, in particular, often have educational needs that differ from those of general students. They require learning content that is more challenging, in-depth, and broad. Neglecting these needs may lead to the loss of interest in learning and even negatively affect their mental well-being. Therefore, to achieve equal educational opportunities, it is essential to provide gifted students with tailor-made curricula to help them fully realize their potential.

In Taiwan, elementary schools have established gifted classes or provided courses for students with advanced abilities. These classes or courses often extend and deepen the curriculum based on students' learning abilities and performance. However, in current practice, every teacher usually determines the curriculum content independently without following standardized curriculum guidelines. As a result, teachers may introduce challenging problems or concepts, sometimes covering foundational content from junior or senior high school mathematics. This approach can lead to gifted math education focusing excessively on test-taking skills, often neglecting the development of mathematical creativity and practical application. Gifted students may become overly focused on solving speed and competition scores, overlooking exploring the nature of mathematics and improving problem-solving skills. Teachers' instruction for mathematically gifted students should be improved, especially in terms of their ability to understand and implement effective learning strategies tailored to the needs of these students. Therefore, pre-service teacher education should provide more exploratory educational models and align with the professional development of in-service teachers (Bosica et al., 2021).

The mathematics learning objectives for gifted students should focus on three dimensions. First, the "transformation" in "mathematical concept connections" emphasizes the interconnections between different mathematical concepts. Gifted students should not perceive mathematical concepts as isolated ideas but instead focus on transforming and integrating these concepts. Second, the "open" in "problem-solving strategy exploration" highlights the diversity of problem-solving strategies. Gifted students should recognize that there is not just one way to solve a problem but multiple approaches. They should be encouraged to discover strategies and share them with their peers. Lastly, the "attainment" in "enhancing thinking skills" aims to develop higher-order thinking through well-designed gifted mathematics