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Developing preservice elementary teachers' specialized content knowledge: the case of associative property.

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Summary: Background: Specialized content knowledge (SCK) is a type of mathematical content knowledge specifically needed for teaching. This type of knowledge, although serving as a critical component for preservice teacher education, is often challenging to develop with preservice elementary teachers (PTs). The purpose of this study is to investigate PTs' development of SCK for teaching fundamental mathematical ideas in a university methods course. Focusing on the case of the associative property (AP) of multiplication, the author as the course instructor identified three instructional opportunities (a formal introduction and two delayed revisits) to stress two SCK components, representations, and explanations. PTs' learning progresses were assessed through three diagnostic tests (a pretest, a mid-term exam, and a final exam) and two prompts, which informed the upcoming lesson design. Meanwhile, the course instructor conducted on-going reflections on PTs' learning, which also informed the corresponding lessons. Results: It was found that PTs initially generated abstract number sentences without reasoning about the contexts of word problems. This representational sequence indicates a symbol precedence view. When prompted for explanations, PTs focused on individual numbers rather than quantitative relationships, and they could not consistently apply the basic meaning of multiplication for reasoning. The methods course, when designed to address these issues, promoted PTs' SCK development. At the end of the course, the majority of PTs were able to generate number sentences based on the word problem structures and provided reasonable explanations; however, the methods course also faced dilemmas due to PTs' robust symbol precedence view and the tension between PTs' learning and children's learning. Conclusions: Very few studies have explored ways to support PTs' knowledge growth in SCK, especially for teaching fundamental mathematical ideas. This study, by carefully documenting the successes and challenges in developing PTs' SCK, contributes to the existing literature. Based on our findings, this study highlights the importance of stressing basic meanings so as to develop PTs' explanation skills. Meanwhile, to develop PTs' representation skills, university instructors should be aware of the tension between PTs' and children's learning as manifested by PTs' symbol precedence view. Finally, to support PTs' SCK growth, it is also important to emphasize the role of elementary textbooks.

Classification: D39 C39

Keywords: preservice elementary teachers; specialized content knowledge; fundamental mathematical ideas; associative property of multiplication; methods course

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