

Analysis Across Geometry Textbooks to Link Content, Curriculum and Children's Reasoning

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Research showing that geometry textbooks for teacher candidates primarily focus on expanding the content knowledge in geometry by applying geometry to real-world problems (Litoldo & Amaral-Schio, 2021) and using technology to support problem-solving activities and create multiple representations (Jones et al., 2017). In this study, building on the previous research, we looked for how textbooks used in geometry content courses for elementary school teacher candidates might support their pedagogical content knowledge.

The conceptual framework of this study is Ball et al.'s (2008) practice-based theoretical model that refines pedagogical content knowledge which blends content knowledge, pedagogy and curriculum that highlights teacher's knowledge of standards, grade levels when particular topics are taught, and more. The framework guided the current study's data creation and analysis process to learn how textbooks support prospective teachers' pedagogical content knowledge in geometry teaching.

We collected the commonly used textbooks reported by U.S. mathematics courses instructors for elementary teachers (Max & Newton, 2017; Ozturk et al., 2023). Drawing from relational content analysis methodology (Elo et al., 2014), we first analyze the content of five geometry textbooks and identify the instances of pedagogical content knowledge elements while considering the conceptual framework and examine the differences and similarities across the textbooks. We engaged in a selective reduction process that entailed reading the book and reducing the text to categories, from which we could focus on developing codes for informing our research question. After creating the initial codes, we examined the books individually and then came together to compare and contrast the patterns found in each book. After six meetings (about 14 hours), we finalized five codes including *instancing children's written work*, *instancing children's ideas*, *instancing teacher's role and their activities in K-5 classrooms*, *using of learning standards and connection to K-5 curriculum*, and *using of standardized assessment questions*. Next, we created the final table containing the code frequencies within each textbook and across all codes to draw conclusions.

Analysis revealed that of 780 total codes, the highest percentages of codes focused on children's ideas which provides many examples of how children reason through geometric concepts. The second-highest code percentages focused on the teacher's role and classroom connections, such as discussing teachers' responses to children's ideas to advance the latter's geometric reasoning. The third-highest percentage of codes focused on the use of learning standards, which was often listed next to each relevant book session to show how standards could be linked with instructional activities in progressing through grades K–5. The fourth-highest percentages were related to the code for children's written work which would allow prospective teachers to see concrete examples of children's reasoning through geometric concepts. The code with the least frequency related to the use of assessment questions, providing sample questions from actual standardized tests for K–5 students to familiarize prospective teachers with the content for different grade levels. Depending on the instructor's purposes and practices, the coded instances of pedagogical content knowledge in the textbooks could be used to support prospective teachers' knowledge in geometry content courses (Ozturk et al., 2023).

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