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Middle Grades Preservice Teachers' Experiences with Proof and Reasoning Focused Instruction

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Middle grades preservice teachers' experiences with proof and reasoning focused instruction

Jonathan Bostic
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Relevant Literature

- Reasoning and proof are fundamental to doing mathematics (NCTM, 2000).

- What makes a good proof?
  - “A good proof...helps one understand the meaning of what is being proved; to see not only that it is true but also why it is true” (Yackel & Hanna, 2003, p. 228).

- Reasoning with mathematical representations and precisely communicating one’s ideas to another are needed for a proof (Harel & Sowder, 2007).
Purpose of the Exploration

To provide an instructional context where PSTs learn about proof and ways to enact proof-related instruction, which may impact their teaching and sense making while engaging in mathematics proofs.
Method

O Goal of this exploration was to provide PSTs with opportunities to use manipulatives while proving topics typically found in the middle grades.
  O Language, tools, and representations were a focus of classroom discussions during instruction.

O 17 middle grades PSTs enrolled in a mathematics content and pedagogy (i.e., pre-methods) course at a Midwestern University.
  O They had prior experience with elementary proofs during prior mathematics coursework.
Method

O Students investigated six mathematical ideas such as “Every integer \( N > 1 \) is either prime or can be expressed as a product of prime numbers”.

O Think-Pair-Share (10 minutes, 45 minutes, and 20 minutes)

O Discussion about ways to translate the experience into future middle grades mathematics instruction.

O Completed a survey at the end-of-the course adapted from Knuth (2002) and were videotaped carrying out two proofs.

O Surveys were examined for themes across questions.
Use the materials to prove one of the following ideas.

- Every integer greater than one is either prime or can be expressed as a product of prime numbers.
- How can we prove the divisibility rule for two? (fourth grade)
Emergent Themes

Theme #1: proof in the middle grades involved the process of cognitively scaffolding students from proof-by-example towards generalizations for all cases.

Theme #2: there are perceived similarities between proof-related instruction and teaching through inquiry-based, student-centered approaches that promoted deep understanding of mathematics.

Theme #3: Developmentally appropriate struggle and building from one’s prior knowledge are critical to doing proofs and making sense of ideas shared by others.
Where do we go next?

Thank you for coming and enjoy the rest of the conference!

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