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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

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# Relevant Literature

- o Reasoning and proof are fundamental to doing mathematics (NCTM, 2000).
- o What makes a good proof?
  - o “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).
- o Reasoning with mathematical representations and precisely communicating one’s ideas to another are needed for a proof (Harel & Sowder, 2007).

# Purpose of the Exploration

- o 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

- Students investigated six mathematical ideas such as “Every integer  $N > 1$  is either prime or can be expressed as a product of prime numbers”.
- Think-Pair-Share (10 minutes, 45 minutes, and 20 minutes)
- Discussion about ways to translate the experience into future middle grades mathematics instruction.
- Completed a survey at the end-of-the course adapted from Knuth (2002) and were videotaped carrying out two proofs.
- Surveys were examined for themes across questions.

Use the materials to prove one of the following ideas.

o Every integer greater than one is either prime or can be expressed a product of prime numbers.

o How can we prove the divisibility rule for two? (fourth grade)

# Emergent Themes

- o Theme #1: proof in the middle grades involved the process of cognitively scaffolding students from proof-by-example towards generalizations for all cases.
- o Theme #2: there are perceived similarities between proof-related instruction and teaching through inquiry-based, student-centered approaches that promoted deep understanding of mathematics.
- o 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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