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Fostering justification: a case study of preservice teachers, proof-related tasks, and manipulatives.

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Summary: Instruction promoting reasoning and proof should be a part of K–12 mathematics teaching. Preservice teachers (PSTs) need mathematics content instruction that helps them construct valid justifications for mathematical notions and develop positive perceptions of proof. This case study describes instruction with proof-related tasks and manipulatives for middle-grades PSTs that draws on developmentally appropriate modes of argument representation. The purpose of the instruction was for PSTs to explore mathematics content through a lens of how a middle-grades teacher might use manipulatives to engage students in justifying mathematical statements in proof-related tasks. Results indicate that this instruction supported PSTs to justify mathematical ideas and that PSTs characterized their experiences positively. PSTs perceived proof in ways echoed in past literature, saw connections between the PSTs' instruction and future middle-grades classroom instruction they might enact, and identified the role of struggle while engaging in proof-related tasks. This case study provides ideas for mathematics content instructors to develop PSTs' understanding of mathematics through instruction that prepares them to engage their future K–12 students in proof-related tasks.

Classification: E59 D39

Keywords: preservice teacher education; lower secondary; proving; justifying; argumentation; reasoning; proofs; modes of representation; educational media; teaching aids; manipulative materials; research; case studies