REASONING AND GEOMETRIC PROOF IN
MATHEMATICS EDUCATION: A REVIEW OF THE LITERATURE

by

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ABSTRACT

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The purpose of this literature review is to examine the role that reasoning and geometric proof play in the teaching and learning of mathematics. Specifically, I explore four questions: 1) What reasoning capabilities do students need to be ready for proof? 2) What evidence is there to show that high school students are not successful with proof and hold misconceptions about the nature of proof? 3) How can teachers’ beliefs and understandings contribute to students’ proof abilities? 4) What can be done to promote mathematical reasoning and improve students’ proof writing skills?

Through a comparison of the theories of Piaget and van Hiele, I discuss how students acquire mathematical and geometric reasoning skills and how this relates to their readiness to produce formal proofs. I then discuss research findings, which indicate that students are not typically at a high enough van Hiele level to be successful with proof by the time they get to high school. Further research is presented which examines common geometric and proof misconceptions among students, and how this relates to proof achievement. Teacher proof-conceptions and achievement are also discussed, citing studies with elementary, middle, and high school preservice and inservice teachers, and how this may affect students’ proof performance. Finally, I discuss ways in which preservice and inservice teachers can help their students improve their mathematical and geometric reasoning skills, thus furthering their proof comprehension and achievement.