

SECONDARY TEACHERS' CONCEPTIONS OF GRAPH THEORY AND FUNCTIONS: IMPLICATIONS FOR TEACHING

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The primary purpose of this paper is to contribute to the discussion about the role of mathematical knowledge in secondary teaching. We focus on functions and discrete mathematics. Is it easier for teachers to adopt beliefs about the importance and meanings of relational understanding (Skemp, 1987) and student-centered instruction, in the context of their learning about new topics?

Our interpretations of participants' pedagogical conceptions are based on responses to a written survey, class work, and interviews with 14 of the 15 teachers and prospective teachers enrolled in a mathematics course for secondary teachers at Virginia Tech (Blacksburg, VA, USA) taught for the first time during the summer of 2002. The course emphasized innovative teaching strategies in the context of important secondary mathematics (discrete mathematics and algebra).

Partly because they spend so much time dealing with functions, many secondary teachers believe they possess deep understandings of this topic. Vinner and Dreyfus (1989) found that teachers' understandings are weak and often incorrect. In contrast, many secondary teachers do not feel their understandings of discrete mathematics are very strong, yet discrete mathematics is also an important secondary topic area. Jessica noted:

I have enjoyed working with the discrete math. It is something that I have not had the opportunity to do much of....These topics are terrific ways to interest students in math by giving real-world applications.

If teachers come to understand topics in ways that involve real-world applications, and encourage problem solving and student-centered activities, they might be more inclined to use these instructional strategies in their own teaching. Novel experiences in unfamiliar topics such as graph theory may provide a curricular opening that invites a shift in beliefs about teaching. Pajares (1992) indicated, "The earlier a belief is incorporated into the belief structure, the more difficult it is to alter" (p. 325). Based on our informal analysis we wonder if it might be the case that mathematical topics with which secondary teachers are unfamiliar, such as graph theory, provide better opportunities for teachers to apply innovative teaching strategies.

References

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