Mathematical Problem Solving: Its Effect on Achievement and Attitudes of Elementary School Students

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Summary and Reflections

In summarizing her findings, Devens-Seligman writes:

"As a result of the classroom exposure to mathematics problem solving, students who participated in this study appeared to have broadened their knowledge about problem-solving strategies. For the teachers and students who made up the comparison groups, there was recognition that problem solving emphasizes and develops a different type of thinking than most textbook lessons and follow-up problems. With increased exposure to problem solving, students who participated in the treatment group learned the value of knowing more than one way to approach a problem, they developed their own preferences for the way they liked to work on difficult problems, they learned ways to communicate their thinking to peers, and in many instances to evaluate what they did and didn't understand about the mathematics inherent to the problem. It was articulated in student survey responses that students recognized and valued the multiple solution methods demonstrated by classmates during small group discussion and post whole-class discussions. Student surveys also indicated that most students liked solving the non-routine problems." (Devens-Seligman 2007, 158–159)

"Perhaps of greatest importance to this study was the realization of teacher participants that additional time needed to be devoted to mathematics instruction across all levels of thinking. Observations of students attempting non-routine problems [sic. Exemplars] assisted teachers in accurately assessing the needs of their students that included: a deeper understanding of grade-level content, proficiency and accuracy in procedural knowledge, problem-solving skills, communication skills, and the interrelationship that exists among them. "(Devens-Seligman 2007, 165)

"Teachers learned the value of debriefing the problems, both for the purpose of assessing student understanding and also as a tool for teaching and molding the processes used by students. Asking teachers to become facilitators rather than directors of instruction was uncomfortable for many at the beginning of the year. Most teachers believe that their teaching is what facilitates student learning, and this premise is supported by the finding of this research project. What is new is the order in which this teaching and learning might occur within the classroom. In order to place students in the driver's seat and require them to do the majority of the work as advocated by George Polya, teachers must take their hands off the steering wheel, perhaps just a little at first, to allow students to test their abilities. Additional experiences result in the need for increased levels of decision making and risk-taking if the student is to continue to extend the learning.

Sitting in the back seat, however, might prove to be dangerous and is not at all what is advocated by these research findings. In fact, quite the opposite is what emerged from conversations with teachers and students. ” (Devens-Seligman 2007, 166)

“Many students currently develop a false sense of security about their proficiency levels in mathematics. In elementary school, problems can be quickly solved, often without effort. If students believe that this is how mathematics works, they are unprepared for the real-life application of their learning. Learning to persevere toward a solution is essential to understanding the process and remaining confident in one's ability to reach a solution. ”(Devens-Seligman 2007, 167)

“Finally, learning that other people’s point of view has value may be difficult initially to comprehend for elementary-age students. This learned understanding is an important lesson about problem solving and about life in general. We really can learn from others if we give ourselves the opportunity to do so. ” (Devens-Seligman 2007, 167)