

## **Educating Teachers towards Problem Solving and Problem Posing: Four potential paths**

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Abstract: Problem solving is a central part of mathematics education, and yet the training teachers receive on the subject is sorely lacking. Four of our recent studies have attempted to address this issue from both theoretical and practical perspectives.

In the first study, which was conducted with talented students aged 10-18, we examined the connection between students' formal mathematical knowledge and their ability to find creative and original solutions to non-routine problems. In the second, we developed and implemented an "explicit teaching" approach to instructing students in specific problem solving strategies, such as "working backwards," "proof by contradiction" etc., and examined the impact on students' non-routine problem solving skills. The third study was devoted to younger students' ability to develop mathematical models for everyday situations, focusing specifically on their applicability and creativity, and then we designed an efficient tool for assessing this ability. Finally, the fourth study was conducted with Bedouin students who live in the desert. We incorporated ethno-mathematical elements into their curriculum, posed problems related to their "real" daily life, and then examined the program's impact on the students' learning, on their teachers' knowledge, and on the attitudes of their fellow tribespeople.

All four of these studies indicate the steps that must be taken in teachers' professional development toward better problem solving: teachers must be taught to understand various problem solving processes, to adopt appropriate teaching approaches, and to develop methods for assessing both problem solving in general and non-routine problem solving in particular.