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To figure out more than a solution to a geometric problem: What do prospective teachers?

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This poster focuses on the development of prospective elementary teachers' problem-solving capacity and, particularly, on geometric problem solving. More specifically, we present some preliminary results of a research project that is being developed, in a Portuguese School of Education focusing prospective elementary teachers' preparation in geometry and measure, one of the disciplines of their bachelor's degree.

Theoretical framework

Recent recommendations for mathematics teaching highlight that effective teaching of mathematics should involve students in “solving and discussing tasks that promote mathematical reasoning and problem solving and that allow multiple entry points and varied solution strategies” (NCTM, 2014, p.10). In the context of the development of “mathematical proficiency” (Kilpatrick, Swafford & Findell, 2001) of students, it is essential that the teacher develops “the ability to see the mathematics possibilities in a task” (idem, p. 370) as well as the capacity to propose tasks that promote reasoning and problem solving. The teacher must also be able to interpret what students do and say, to analyze their reasoning and to answer to the different approaches they use to solve a mathematical problem (Kilpatrick, Swafford & Findell, 2001). However, this is a challenging task, even by experienced teachers since often it is very difficult to interpret some students' solutions, either because they are not expected or because they do not look at them through the students' eyes. In this sense, we believe that to offer prospective teachers the opportunity to produce more than one solution to the same problem, can help them to develop a ‘lens’ to interpret their future students' problem-solving solutions and to use this understanding to help these students to develop their mathematical proficiency.

Research question and method

This poster reports part of a research that aims to investigate prospective teachers' capacity to produce and analyse different solutions to solve mathematical problems. This research has an exploratory design framed by a qualitative methodology (Patton, 2012). The participants are 39 prospective elementary teachers organized within two classes, that were inscribed in a Geometry and Measurement course (first semester, second year of the bachelor's degree).

The study had three main phases. At the beginning of the GM course, the prospective teachers were asked to solve a diagnosis test, composed by six problems, using, if possible, more than one strategy to solve each one. To solve the problems, they had to mobilize only geometrical contents of the mathematics curriculum of primary, upper primary and middle school. Throughout the GM course, pre-service teachers were challenged to solve problems that could be solved using different strategies and the teacher, the first author of this poster, promoted and supported collective discussions of these strategies. At the end of semester, the preservice teachers were asked to solve a second test with five problems, and, in some of them, to use more than one strategy.

Data includes pre-service teachers' solutions of the problems, field notes focused on the development of the GM course and transcriptions of excerpts of video recorded collective discussions. In this poster we present only the analysis of the data related to the prospective teachers' solutions of the problems.

Results

The results revealed that (i) initially prospective teachers expressed many difficulties in solving geometric problems and even more in to use more than one strategy to solve the same problem; (ii) there has been some progress, although incipient, concerning the production, by the future teachers, of more than one strategy to solve the same problem; (iii) the opportunity to solve problems and to analyze different strategies that can be used to solve each problem, helped the participants to improve their mathematical proficiency in the domain of Geometry and Measurement.

References

- Kilpatrick, J., Swafford, J., & Findell, B. (Eds). (2001). *Adding It Up: Helping Children Learning Mathematics*. Washington: National Academy Press.
- NCTM (2014). *Principles to action: Ensuring mathematical success for all*. Reston, VA.: NCTM.
- Patton, M. Q. (2012). *Qualitative research & evaluation methods* (3rd ed.). Thousands Oak: SAGE Publications.