

ARGUMENTATION AND PROOFS IN MATHEMATICS TEACHING¹

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In the last decades, the teaching of mathematics in Brazil at secondary school has been very superficial: students are not exposed to demonstrations, and are not asked to justify their answers, or the truth of an assertion. This happens in Geometry, when students are given ready definitions and are trained to apply formulas. In the Algebra classes it is even worse: the focus is on procedures – manipulation of algebraic expressions and solution of equations. As a consequence, students are getting to the University without being able to think or to discuss the solution to a problem.

Trying to change this framework, a group composed by two university teachers, five secondary school teachers in Rio de Janeiro and four university students from the Mathematics course carried on an investigation in order to:

- identify, at first, what kind of argumentation and justification students at various school levels, from 11 years on, are able to give;
- suggest trends and strategies to enhance the levels of argumentation of students, as well as of prospective and in-service mathematics teachers;
- develop activities based on these strategies to be tested by the teachers in the group;

This research has been motivated by the project developed by Professor Celia Hoyles, at the Institute of Education, University of London (Hoyles, 1997), and was based on well-known research about the teaching of proofs (Balacheff, Bell, Clements & Battista, De Villiers, Galbraith, Godino, Hanna, Hoyles, van Hiele).

As reported in Nasser and Tinoco (1999), the first trials of our investigation pointed that “the majority of Brazilian mathematics teachers do not require their students to justify their answers...”(p.303), which is the crucial point for the difficulties shown. Several questions asking for justifications have been developed and tested, based on the strategies adopted, in order to improve the ability of argumentation (Nasser and Tinoco, 1999). With these strategies, the teachers are getting great progress in the students’ ability to give justifications. Some of the activities used in the research, and samples of students’ justifications will be shown at the oral presentation.

The first conclusions show that there is a great relation between argumentation ability and content domain, as well as between that ability and good domain of the mother language; activities to develop the level of argumentation and logical reasoning must be included in the curricular planning since the first years of schooling, and at least two schoolyears of work are necessary to get students writing justifications.

References

- Hoyles, C. (1997): *The curricular shaping of students’ approaches to proof*. For the Learning of Mathematics, 17 (1), 7-16;
- Nasser, L. & Tinoco, L. (1999): *Helping to develop the ability of argumentation in mathematics*. Proceedings of PME-23, vol. 1, p. 303, Israel.

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