

MODES OF THINKING WHILE IMAGINING TEACHING

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This paper presents results from a case study conducted during the initial phase of an ongoing project investigating the difficulties prospective mathematics teachers (PMTs) face in understanding school-level linear algebra concepts, with the aim of designing their training. The research question addressed in this phase was: What difficulties related to the concept of solution of a system of linear equations can be identified when writing an imaginary lesson (IL) for lower secondary education?

The theoretical framework is based on the perspective of Sierpinska (2000), who identifies three modes of thinking in linear algebra: synthetic-geometric (SG), analytic-arithmetic (AA), and analytic-structural (AS). In the SG mode, objects are presented to students through a geometric representation, such as a shape or a set of points. In the AA mode, mathematical objects are conceived through numerical relationships. In the AS mode, the focus is instead on the properties of the objects or their characterization through axioms. Each of these modes of thinking leads to different interpretations of the object, as each provides a distinct perspective on the algebraic entity in question.

This case study involved four PMTs. In this paper, we report only the findings related to one of the participants. Data collection was carried out through the writing of an IL to teach systems of linear equations with two variables to 14- to 15-year-old students. The starting point was an imaginary student's response: "Because there is no numerical equality". The PMT had to elaborate on what the student was responding to and how the lesson progressed.

The results indicate that the IL was influenced by the PMT's understanding of the solution concept, which was exclusively framed within the SG mode of thinking and limited to the case of parallel lines as the only graphical configuration of a system with no solution. This is consistent with Oktaç (2018); however, the findings show how these conceptions come into play not only in the context in which the PMT learns linear algebra but also in the context of teaching—that is, when the PMT assumes the role of a teacher, an aspect that this project aims to address.

References

- Sierpinska, A. (2000). On some aspects of students' thinking in linear algebra. In J. Dorier (Ed.), *On the Teaching of Linear Algebra* (pp. 209–246). Kluwer Academic Publishers.
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