

TRAINING TEACHERS FOR NEW WAYS OF UNDERSTANDING THE TEACHING OF PHYSICS FROM ITS MATHEMATIZATION

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The use of mathematics in physics teaching often becomes an obstacle to learning. Within the framework of this problem, we set out to study the possibilities of training future teachers for new understandings of the relationship between physics and mathematics. Our main frame of reference is a research sequence developed in the Teaching and Learning of Physics research group in Castiblanco (2003), Vizcaíno (2013), Castiblanco and Nardi (2018), Vizcaíno and Terrazán (2020), Castiblanco and Vizcaíno (2022a, b). In this case, data arose from participant observation in a Physics Didactics course in an initial teacher training program at the District University Francisco José de Caldas, Bogotá. It was qualitative research of case study type, with 20 students finishing their training process. We focused on addressing the "mathematization of physics for teaching" in three phases by developing ways to enrich classroom interaction using experimental resources, technologies, and literature. The three phases were the criteria for planning and executing the course.

- 1) the phenomenological approach (awareness of the existence of the phenomenon);
- 2) the characterization of physical systems (identification of variables, parameters, constants, and initial conditions), and;
- 3) the conceptual modeling (synthesizing explanations and arguments in different types of language representations).

Results show innovative processes in teacher discourses. They substantially changed the way of creating explanations in physics to the point of being able to work on topics that they did not understand, such as Minkowski diagrams, quantum entanglement, and the concept of entropy. We found evidence of real possibilities to get out of the traditional way of presenting mathematics in physics, understanding mathematization as a mental process to see nature. Also, they believe that learning physics can be deeper and more impressive than simply memorizing and applying formulas, as well as having an awareness of the dynamic role of the teacher beyond a transmitter of content.

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