

Exploring teachers' self-efficacy when implementing a curricular innovation in mathematics education in Uruguay

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What problem is addressed?

This paper addresses the global trend of implementing STEM and STEAM approaches in education, a movement to which Uruguay is no exception. Recently, Uruguay has introduced an educational reform known as “*transformación educativa*” (Administración Nacional de Educación Pública, 2022). As part of this recent educational reform, the mathematics curriculum, among others, now recommends the integration of the STE(A)M approach in the design and implementation of classroom activities.

In Uruguay, teacher education is organized by subject area, as well as the curriculum across different educational levels. As a result, teachers are trained to teach only one subject, with little or no emphasis on fostering connections between different disciplines.

Within this context, the implementation of STE(A)M activities seems to raise a few issues. On the one hand, teachers receive suggestions to integrate these approaches, but it is not always clear how or when this might happen in practice. The compartmentalized structure of subjects and curriculum may play a role in shaping what is possible, as well as how the teaching is organized and the available resources.

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Teacher education, which tends to focus on a single subject area, might also influence the extent to which collaboration across disciplines can emerge. In addition, time for coordination, whether between teachers of different subjects or even within the same subject, can be limited. All these aspects appear to influence how, and to what extent, STE(A)M approaches could be taken up in the Uruguayan educational context.

Our focus would be to study the factors that influence the implementation of STE(A)M approaches in mathematics classes as innovation enactments (Century & Cassata, 2016).

How is it addressed?

To explore how this suggestion is being implemented in practice, the study proposes the use of a questionnaire addressed to mathematics teachers. The questionnaire would provide an overview of teachers' perceptions, practices, and possible challenges related to the implementation of STE(A)M approaches, placing special emphasis on teachers' self-efficacy.

From a social cognitive perspective, Bandura (1997) described self-efficacy as "beliefs in one's capacities to organize and execute the courses of action required to produce given attainments" (p. 3). These self-efficacy beliefs are task-related and influenced by the context and purpose of the desired action, which in turn can influence how individuals behave (Bandura, 1997). Previous research indicates that teachers' willingness to adopt innovative practices—and the extent to which they modify their behaviors—is strongly affected by their self-efficacy (Chen et al., 2022; Sokha, 2024).

In addition to the questionnaire, follow-up interviews with a smaller group of teachers will be conducted to gain deeper insights into their experiences. Using these complementary methods would support both a broad overview of the current situation and a richer understanding of individual perspectives.

What is implemented?

What is being implemented are activities in mathematics classes that adopt a STE(A)M approach. Ideally, these activities would take the shape of interdisciplinary projects, where subject areas are intentionally integrated. In such projects, mathematics, science, technology, engineering, and the arts interact fluidly to address authentic problems or challenges, allowing students to experience concepts in a connected and holistic way. This type of integration encourages deeper learning, fosters creativity, and supports the development of valuable skills, as students must draw upon multiple disciplines to design solutions, interpret results, and communicate their findings.

In practice, however, it seems more likely that multidisciplinary activities emerge, where subjects are brought together around a common theme, but without deeper levels of integration, or where one subject, such as mathematics, is used primarily as a tool to support another. While still valuable, these multidisciplinary activities tend to maintain clearer boundaries between subjects and may offer fewer opportunities for students to perceive the interconnectedness of knowledge or engage in genuinely integrative problem-solving.

What is the potential importance and significance?

The potential importance of this study lies in exploring how mathematics teachers perceive and respond to the recommendation to implement a STE(A)M approach. Understanding their perspectives may provide valuable insight into the current state of implementation and help identify factors that support or hinder the integration of these approaches in classroom practice.

In addition, the study aims to highlight and value the voices of teachers, acknowledging their experiences as essential for informing improvements in educational contexts. By considering teachers' perspectives, it becomes possible to formulate recommendations that not only strengthen the adoption of STE(A)M approaches but also contribute to the ongoing development of more effective and responsive teaching practices.

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