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Editorial



Implementation, Resistance and Change: the Latin American Connection

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1 Introduction

Over the past five years, *Implementation and Replication Studies in Mathematics Education* has worked to clarify implementation as a phenomenon worthy of

research. Much educational research focuses on the design of innovations or the outcomes of reforms, while the processes through which ideas travel into educational practice often remain less visible. In response, the journal has sought to articulate implementation as a specific field of inquiry. In the *ZDM — Mathematics Education* special issue on implementation research (Koichu et al., 2021), we proposed a working definition of implementation as a movement of agency from proponents of an innovation to its adopters and adapters. From this perspective, innovations do not simply diffuse through educational systems. Rather, they are interpreted, reshaped, and sometimes transformed by the actors who engage with them in practice.

Our encounters with educational communities in Latin America have recently prompted us to reflect further on this perspective. Two events have contributed to these reflections: our participation in the third *Latin American STEAM Education Research Conference + Summer School* and the first *Implementation and Replication in Mathematics Education Conference* (IRMEC). Both events brought together researchers and educators working across diverse contexts while sharing a strong interest in educational transformation. These encounters highlighted an aspect of implementation that has received less explicit attention in our field: the role of *resistance*, understood not as opposition to change, but as a form of critical engagement rooted in traditions of emancipatory pedagogy (Freire, 1970/2000).

At first glance, implementation and resistance may appear to stand in opposition. Implementation is often associated with promoting change, while resistance is commonly framed as an obstacle to reform. Resistance to innovation in mathematics education has been conceptualized as a multifaceted phenomenon encompassing opposition, adaptation, and agency, often co-existing within the same practice. Studies have documented both explicit and tacit forms of opposition to reform-oriented teaching, frequently grounded in teachers' prior experiences and beliefs. Achinstein and Ogawa (2006) were among the first scholars who challenged the view of teachers as resisting innovation because of some deficiencies and proposed instead that teachers are engaged in "principled resistance", that is, resistance informed by their professional principles. For example, they showed that teachers may actively resist innovations that do not align with their judgments of students' needs. The resistance, however, is not necessarily the opposition. As Achinstein and Ogawa (2006) showed in two case studies, and Talley and Huddleston (2024) confirmed in their review of more than 60 documented cases, teachers' resistance can often be enacted through strategic compliance, compromise, or redefinition rather than outright rejection. Furthermore, empirical analyses of curriculum implementation show that resistance often takes the form of selective appropriation

and transformation, whereby teachers engage with reform materials while reshaping them to fit established routines (Remillard & Bryans, 2004; Drake & Sherin, 2006). Taken together, the currently prevailing perspective is that resistance is not a negative phenomenon to be overcome but a to-be-endorsed form of professional agency. Accordingly, in the rest of this editorial, we refer to resistance as a set of context-dependent practices through which adapters of an innovation evaluate, negotiate, and ultimately reshape it in their everyday work.

A useful way to think about this relationship is as a productive tension between innovation and agency. Implementation processes introduce new ideas, practices, and technologies into educational systems. Resistance expresses educators' and institutions' responsibility to critically evaluate these ideas considering professional judgment, educational values, local realities, and ecology. Without such resistance, implementation risks becoming a technocratic diffusion of innovations that overflow educational practice without meaningful engagement. At the same time, resistance that disengages entirely from innovation risks becoming merely defensive, protecting existing practices without contributing to educational development.

Implementation and resistance therefore form a relationship that can be both oppositional and complementary. Innovations travel through educational systems, but they only become meaningful when they encounter actors capable of questioning, reshaping, and sometimes refusing them. Educational change emerges from this ongoing negotiation between the movement of new ideas and the integrity of educational practice. In this sense, resistance is not external to implementation but one of its constitutive forces. It ensures that implementation remains a process of deliberate educational judgment rather than passive adoption.

Educational traditions in Latin America offer a particularly strong articulation of this insight. Influenced by Freirean pedagogy, which puts forward "learning to perceive social, political and economic contradictions, and to take action against the oppressive elements of reality" (Freire, 1970/2000, p. 35), resistance is often understood as an ethical and political form of engagement and empowerment. In this perspective, resistance expresses a commitment to dignity, fairness, and responsibility in educational practice. Educators are not expected to adopt reforms uncritically. Instead, they are called upon to engage with new ideas in ways that remain accountable to their professional judgment and to the social purposes of education. Seen in this light, the tension between implementation and resistance is truly productive: implementation requires resistance in order to remain accountable to educational values and professional integrity.

Our participation in the *Latin American STEAM Education Research Conference + Summer School* provided a small but illustrative example of this dynamic.

2 STEAM Workshops in Santiago, Fray Bentos, and Buenos Aires: from Transdisciplinary Modelling to Implementation

In January and February 2026, three of the four editors of IRME were in Chile, Uruguay, and Argentina. We gave a workshop at Universidad Diego Portales in Santiago on January 29th, and on two occasions — at the *Latin American STEAM Education Research Conference + Summer School*, first at the Universidad Tecnológica, Southwest Regional Technological Institute in Fray Bentos, and second at Universidad Nacional de Avellaneda, Sede Piñeyro in Buenos Aires.

In a workshop focusing on transdisciplinary modelling, participants were invited to explore how modelling activities might support STEAM education across disciplinary boundaries. Rather than presenting a predefined route for implementation, the workshop began by framing mathematical modelling as a challenge shared across many educational systems. Participants were then invited to collaboratively develop ideas for innovative educational responses within their own contexts.

Then the discussion deliberately shifted toward implementation. Participants reflected on how the presented ideas might travel into practice, what institutional or pedagogical difficulties might arise, and how innovations might need to be reshaped in order to become meaningful in local contexts. In this way, the workshop combined collaborative innovation with collective reflection on implementation processes. Agency over the innovation process was distributed among the participants, who were invited both to generate ideas and to critically interrogate them in relation to implementation.

This process resonated with broader conversations throughout the Summer School, where the potential of technology to contribute to educational improvement and greater equality was a recurring theme. At the same time, discussions of critical data literacy and responsible uses of technology highlighted the need for careful and reflective engagement with technological innovation. In this context, resistance emerged not as opposition to change but as an integral part of educational responsibility. Innovations were welcomed as possibilities for transformation, but they were also subject to critical scrutiny regarding their purposes and implications.

These experiences suggest that implementation research may benefit from paying closer attention to the ethical and political dimensions of resistance.

While the field has long recognized that innovations are adapted as they travel through educational systems, we valued the opportunity to deeply engage with the ways by which Latin America educators exercise judgment about whether and how innovations should travel at all. We learn that resistance can function not only as a mechanism of adaptation but also as a filter and form of political agency within educational change processes.

3 **The First IRME Conference in Mexico City: Collective Engagement with Implementation and Replication Research**

The *Implementation and Replication Studies in Mathematics Education Conference* (IRMEC), held at CICATA Legaria, Instituto Politécnico Nacional, in Mexico City from November 3–7, 2025, offered a concrete instance in which the dynamics of implementation and resistance became visible in practice. The conference brought together 44 participants from Austria, Denmark, Israel, Sweden, and various regions of Mexico, creating a space for dialogue across diverse educational traditions and research cultures. The Editors of IRME served as the International Program Committee, working in close coordination with the Local Organizing Committee.

IRMEC was conceived as a forum to foster dialogue among researchers, practitioners, and policymakers, while also advancing implementation and replication research as fields of inquiry. The conference foregrounded the active use of research in classrooms and educational systems, while encouraging rigorous examination of how implementation and replication unfold in practice — how interventions are adapted, scaled, and sustained across contexts. To this end, the program combined two plenary lectures, five writing-oriented workshops focused on reporting implementation and replication studies, and 28 individual research presentations.

IRMEC revealed that communicating the meanings and scope of implementation and replication research is not always straightforward. As we noted in a previous editorial (Misfeldt et al., 2024), engaging with diverse educational communities highlights the situated nature of implementation and replication studies. What may appear as well-defined constructs within one research tradition can take on different meanings, priorities, or tensions in other contexts. This insight aligns with recent analyses of Latin American research, which emphasize that the region actively contributes to theorizing mathematics education and to the transformation of recognized international frameworks through locally grounded perspectives and epistemological diversity (Aguilar et al., 2025). In this sense, the interactions at IRMEC Mexico City illustrate that

international dialogue is not a process of simple dissemination but one of collective reinterpretation, in which ideas are expanded, challenged, and reconfigured in relation to specific educational realities, as illustrated below.

The questions, reinterpretations, and critical stances observed during the conference can be understood as part of an ongoing process of negotiating the international nature of the implementation and replication studies. This dynamic became evident in the plenary lecture by Ulises Xolocotzin (2025), titled “Exploring the potential benefits of replication-based learning for Mathematics Education graduate students.” Rather than presenting replication as a settled or fully defined practice, the lecturer raised fundamental questions: What should be replicated? For what purposes? How can replication-based learning be theorized within mathematics education? These questions invited participants not merely to adopt replication as a methodological stance, but to critically examine its epistemological and pedagogical implications. Such engagement exemplifies how resistance can take the form of incorporation through questioning — an effort to make new ideas accountable to existing theoretical traditions, educational values, and local concerns.

The plenary lecture by Ola Helenius (2025) titled “Implementing content-based mathematics teaching innovations at scale” focused attention on the design of implementation itself, particularly in relation to content-specific innovations. Drawing on large-scale implementation experiences in Sweden, such as the Algebra Monday project, Helenius highlighted that implementation cannot be reduced to the dissemination of ideas; it must be understood as a structured design problem involving interrelated components, including contact between developers and teachers, material resources, facilitation structures, collegial work, and organizational conditions. This perspective foregrounds the complexity of scaling educational innovations, especially when they require substantial changes in how specific mathematical content is taught. Rather than assuming that innovations can travel unchanged across contexts, the lecturer emphasized that implementation depends on carefully designed support structures that mediate between innovation and practice. Seen from the perspective developed in this editorial, IRMEC illustrates that implementation is inseparable from resistance. The conference did not produce a uniform understanding of implementation and replication research, nor did it aim to do so. Instead, it created conditions for a collective negotiation in which participants actively evaluated, adapted, and, at times, resisted the ideas presented, while also engaging with the structural and design-related conditions through which these ideas could be implemented in practice. This process reflects a broader insight: implementation gains meaning not through the uncritical diffusion of innovations, but through their encounter

with communities capable of exercising judgment. In this sense, the discussions at IRMEC exemplify how resistance operates as a constitutive force in implementation — ensuring that new research agendas are not simply adopted but thoughtfully integrated into the practices of the mathematics education communities.

4 In This Issue

The present issue of IRME contains two implementation-related studies and two replication studies.

The first paper in this issue is by Andreas Lindenskov Tamborg and Peter Wied Stenkilde. It is entitled “Designing for Implementability: Authentic and Techno-Critical Mathematics Education Innovations.” This paper addresses how mathematics education can support students in critically engaging with the role of mathematics in digital technologies, while remaining feasible for classroom implementation. The authors develop techno-critical teaching innovations based on issues of algorithmic bias in contexts such as language models, recommender systems, and machine learning. A central contribution of the study is its focus on implementability, understood as the extent to which such innovations can realistically be taken up by teachers. The authors redesign complex research into classroom-ready formats, including structured teaching sequences, adaptable materials, and clear guidance for teachers. These innovations are tested in a small-scale implementation, where teachers highlight both the innovation feasibility — particularly in terms of alignment with curriculum and manageable preparation — and emerging tensions related to technology use and the meaning of critical engagement. The study thus demonstrates how designing for implementability requires careful adaptation across pedagogical, technical, and institutional dimensions. From the perspective of this editorial, the paper offers a clear example of how implementation unfolds through processes of negotiation rather than straightforward adoption. The adaptations required to make the innovations workable illustrate how ideas are reshaped as they move into practice. At the same time, teachers’ responses point to forms of productive resistance, for instance in their reinterpretations of criticality or their caution towards unfamiliar technologies. These responses do not simply hinder implementation but reflect efforts to align new approaches with professional judgment and classroom realities. In this sense, the study illustrates how resistance is not external to implementation but part of the work through which innovations become meaningful in practice.

The issue's second paper, by Hanna Palmér, Jessica Elofsson, Maria Walla, and Camilla Björklund, is entitled "From Design to Practice: Preschool Teachers' Implementation of a Research-Based Mathematics Innovation." The authors examine how preschool teachers enact a research-based mathematics innovation for very young children, focusing on how they balance fidelity to the design with adaptations in practice. Drawing on video data from many teacher-designed and enacted activities, the study analyses how core components of the innovation — such as mathematizing, representations, and cardinality — are taken up in classroom situations. A central finding is that maintaining the pedagogical intention of making mathematics meaningful consistently requires adaptation, while fidelity to specific mathematical structures varies across activities. The study thus highlights different patterns through which innovations are translated into practice, showing that fidelity and adaptation can coexist in both productive and less productive ways. From the point of view of this editorial, the paper offers a particularly clear articulation of how implementation unfolds as a dynamic negotiation between innovation and practice. Teachers do not simply reproduce the designed activities; they reshape them in response to children, contexts, and pedagogical priorities. These adaptations can be understood as forms of productive resistance, where educators exercise professional judgment to ensure that the innovation becomes meaningful in their specific setting. At the same time, the variation in how core components are preserved or transformed illustrates that such resistance is not uniformly productive, but part of the ongoing tension between maintaining the integrity of the innovation and responding to local realities. Hence, the study demonstrates that implementation depends on teachers' capacity to interpret and reconfigure innovations, and that resistance is integral to how educational ideas are enacted and made meaningful in practice.

In the third paper by Tuğrul Kar and Mehmet Fatih Öçal, "An Investigation of Mathematics Teachers' Perceptions of 'I Pose My Own Problems' in the Context of Turkey: A Close Replication Study", the authors revisit and extend the study by Klinshtern et al. (2015) on Israeli teachers conceptualize problem posing. Kar and Öçal conducted a close replication of Klinshtern et al. (2015) in the Turkish context. Following the Klinshtern et al.'s method, they drew on survey data from 182 Türkiye teachers complemented by interviews. In line with the findings of the Klinshtern et al. study, the new study revealed that while many teachers report engagement in problem posing, their conceptualizations are predominantly oriented toward practical outcomes, particularly the adaptation of tasks to meet instructional needs. Problem posing is thus primarily understood as an instructional tool, whereas its roles as a learning

goal or as a means of assessing students' mathematical thinking receive considerably less attention. At the same time, the replication both extends the original findings by identifying additional nuances in how teachers describe their practices, including distinctions between routine, in-the-moment problem posing, and more systematic or innovative approaches. From this editorial's perspective, the paper illustrates that replication studies do not merely reproduce prior results but also reveal how educational ideas are interpreted in new contexts. Teachers' emphasis on adaptation can be seen as a form of productive resistance, where problem posing is reshaped to align with local curricular demands and classroom realities. In this sense, the study demonstrates that the implementation of pedagogical ideas, such as problem posing, is inseparable from how teachers reinterpret their purposes and possibilities in practice.

Finally, the fourth paper of this issue by Haoyi Wang, Qiuyu Chen, and Jon R. Star, entitled "Comparing and Discussing Multiple Strategies: An Instructional Approach to Promote Algebra Learning", reports a replication with extension of the Comparing and Discussing Multiple Strategies (CDMS) approach originally examined by Durkin et al. (2021). Implemented in Grade 10 classrooms in China through a quasi-experimental design, the study investigates the effects of structured comparison and discussion of solution strategies on multiple dimensions of algebra learning, including conceptual knowledge, procedural knowledge, and different forms of flexibility. The findings indicate positive effects on students' potential flexibility, suggesting that the intervention supports the expansion of students' repertoire of strategies, while effects on other dimensions — particularly spontaneous flexibility — remain more limited. In addition, the study highlights that variations in instructional quality continue to play a significant role in shaping outcomes, even when core features of the intervention are maintained. From the perspective developed in this editorial, the paper provides a nuanced account of how instructional innovations travel across cultural and curricular contexts. The partial alignment and divergence from prior findings point to the importance of local instructional traditions and classroom practices in shaping how innovations are enacted. Rather than being implemented as fixed designs, approaches such as CDMS are mediated by teachers' practices and students' prior experiences, giving rise to adaptations that can be understood as expressions of resistance. These findings underscore that the effectiveness of instructional approaches depends not only on their design but also on how they are interpreted, negotiated, and enacted within specific educational contexts.

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