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Teaching Mathematics for Sustainable Development in Official Educational Institutions: Theoretical and Argumentative Contributions Based on the Key Competence of Problem Solving

La enseñanza de las matemáticas para el desarrollo sostenible en las instituciones educativas oficiales: aportaciones teóricas y argumentativas basadas en la competencia clave de la resolución de problemas

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Resumen

Este artículo tuvo como objetivo formular un constructo teórico que articule la enseñanza de las matemáticas, el desarrollo sostenible y la competencia clave de resolución de problemas, en el marco de un proyecto de investigación doctoral llevado a cabo en instituciones educativas públicas del municipio de Soledad, Atlántico (Colombia). La investigación se estructuró utilizando un enfoque cualitativo y un método hermenéutico-dialéctico basado en los principios de la teoría fundamentada, lo que permitió la integración de los hallazgos empíricos con referencias teóricas y normativas. Se utilizaron entrevistas semiestructuradas, grupos focales y análisis documental para la triangulación de datos. Los resultados revelaron tensiones entre las regulaciones educativas, la práctica docente y las condiciones contextuales, lo que requiere el desarrollo de un marco teórico que reconozca la enseñanza de las matemáticas como un proceso contextualizado, ético y sostenible. El constructo resultante se compone de tres secciones interdependientes: (1) la relación entre el contexto, las regulaciones y las prácticas pedagógicas; (2) la articulación entre las políticas educativas, la formación docente y las redes comunitarias; y (3) las directrices epistémicas para la innovación curricular y didáctica. En general, los resultados establecieron que la resolución de problemas se consolida como una competencia integradora para vincular la sostenibilidad con la enseñanza de las matemáticas. Se concluye que este constructo constituye un marco teórico para guiar la transformación educativa hacia la formación de ciudadanos críticos, reflexivos y comprometidos con el desarrollo sostenible.

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Palabras Clave: Enseñanza de las matemáticas, desarrollo sostenible, resolución de problemas, educación integral, calidad educativa.

Abstract

This article aimed to formulate a theoretical construct that articulates mathematics teaching, sustainable development, and the key competence of problem-solving, within the framework of a doctoral research project conducted in public educational institutions in the municipality of Soledad, Atlántico (Colombia). The research was structured using a qualitative approach and a hermeneutic-dialectical method based on the postulates of grounded theory, which allowed for the integration of empirical findings with theoretical and normative references. Semi-structured interviews, focus groups, and documentary analysis were used for data triangulation. The results revealed tensions between educational regulations, teaching practice, and contextual conditions, which required the construction of a theoretical corpus that recognized mathematics teaching as a contextualized, ethical, and sustainable process. The resulting construct is composed of three interdependent sections: (1) the relationship between context, regulations, and pedagogical practices; (2) the articulation between educational policies, teacher training, and community networks; and (3) the epistemic guidelines for curricular and didactic innovation. Overall, the results established that problem-solving is consolidated as an integrative competence for linking sustainability with mathematics teaching. It is concluded that this construct constitutes a theoretical framework for guiding educational transformation toward the development of critical, reflective citizens committed to sustainable development.

Keywords: Mathematics Teaching, Sustainable Development, Problem-solving, Comprehensive Education, Educational Quality.

Introduction

Mathematics teaching has evolved from a traditional conception focused on the transmission of abstract knowledge to a humanistic, ethical, and socially committed approach. In the current context, environmental, technological, and cultural challenges demand a mathematics education oriented toward sustainability, which promotes the resolution of meaningful and contextualized problems (Russo et al., 2020).This article presents the theoretical construct of Mathematics Teaching for Sustainable Development, based on the Key Competence of Problem-Solving. This article is derived from a doctoral research project whose purpose was to integrate the epistemological, axiological, and pedagogical dimensions of mathematics within the framework of the Sustainable Development Goals (SDGs) (Anthony & Walshaw, 2023)

The main purpose of this construct is to offer a theoretical framework that allows us to rethink the teaching of mathematics as a social, critical, and ethical process that contributes to the comprehensive development of students(Marpa, 2021). Its importance lies in the fact that it

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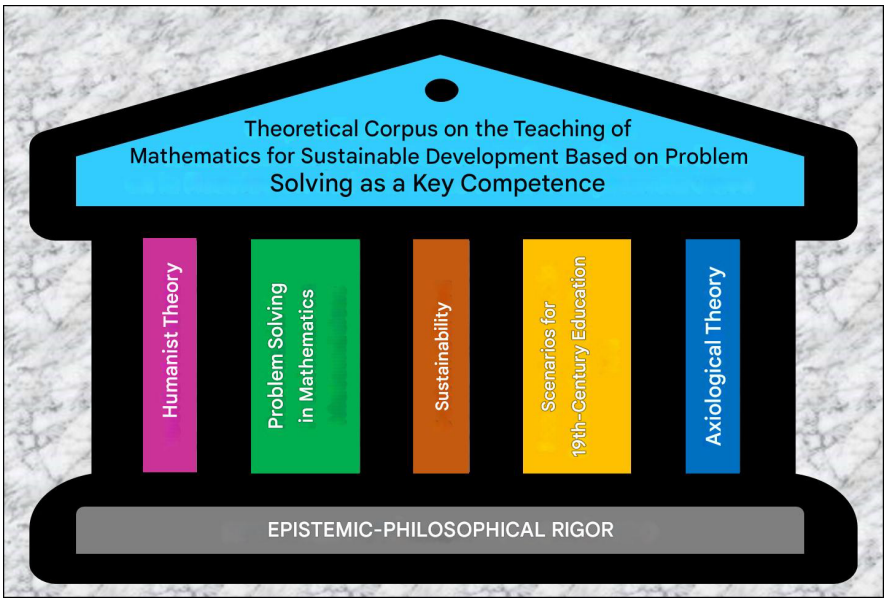
redefines the relationship between mathematical knowledge, context, and values, positioning learning as an act of interpretation and transformation of reality. At the national level, this work responds to the guidelines of the Ministry of National Education (MEN) that promote inclusive, quality education, in line with the National Environmental Education Policy and the Strategy for Education for Sustainable Development (MEN, 2018). At the international level, it aligns with UNESCO (2020) guidelines on the need to integrate sustainability into educational systems as a global ethical commitment.

In this context, the theoretical construct is based on five epistemic foundations that guarantee its coherence and applicability: humanism, axiology, education for sustainable development, problem-solving in mathematics, and 21st-century educational settings. These dimensions comprise an interdisciplinary theoretical framework that allows us to understand mathematics teaching as a cultural, ethical, and transformative practice (see Figure 1).

Figure 1.

Epistemic-Philosophical Rigor of the Theoretical Construct



Own elaboration (2025)

From a humanistic perspective, based on the contributions of Rogers (1961) cited by(Mailizar et al., 2021) , learning is conceived as a person-centered process, where the teacher acts as a facilitator in the student's comprehensive development. Teaching mathematics is therefore interpreted as a life experience that stimulates autonomy, creativity, and reflection. This approach fosters an understanding of mathematical problems from the perspective of the individual and their environment, generating meaningful learning (Mawela & Mahlambi, 2021)

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Likewise, axiology reinforces the ethical value of mathematical knowledge by positioning education as a practice oriented toward the common good and social justice (Hartman, 1967) cited by. In the theoretical construct, mathematics teaching acquires an ethical dimension that promotes responsibility, equity, and solidarity. Thus, contextualized problem-solving not only enhances cognitive skills but also ethical decision-making in the face of the challenges of sustainable development (Gidalevich & Mirkin, 2024)

Regarding Education for Sustainable Development (ESD), UNESCO (2017) proposes that education systems should strengthen sustainability competencies: critical thinking, problem-solving, creativity, and collaboration. This principle is translated into the construct as a commitment to developing citizens capable of understanding and responding to the environmental, economic, and social challenges of their environment (Turakulov & Mamanov, 2023)

Problem-solving in mathematics, for its part, stands as the core of the construct. Polya (1945) and Schoenfeld (1992) emphasize that problem-solving involves metacognitive processes of analysis, planning, and verification. In this theoretical model, this competence transcends the disciplinary sphere to become an ethical and social practice that fosters a critical understanding of the world and transformative action (Deogratias, 2022)

Regarding the educational scenarios of the 21st century, according to Fadel (2015) and Darling-Hammond (2017), they require flexible, interdisciplinary, and key competency-oriented curricula. This foundation broadens the scope of the construct by integrating sustainability, innovation, and global citizenship as inherent dimensions of contemporary mathematics education.

On an academic level, the construct contributes to the understanding of how mathematics can be a vehicle for sustainability and social transformation. On a practical level, it constitutes a guide for teachers and institutions seeking to strengthen curricular relevance through the use of contextualized problems. In contexts like Soledad, Atlántico, where socioeconomic conditions challenge educational equity, this proposal offers a framework for building meaningful and socially relevant learning experiences (Chan et al., 2023)

Thus, current knowledge on mathematics education for sustainability reveals progress in countries such as Finland (English & Goos, 2011), Germany (Ludwig & MathCityMap, 2020), and Australia (Galbraith & Stillman, 2006), which promote models based on problem-solving and environmental education. However, in Latin America, gaps persist between policies and practices, reinforcing the relevance of this construct as an innovative benchmark for the Colombian context.

Materials and methods

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The research was conducted using a qualitative approach, based on an interpretive understanding of educational phenomena from the perspective of the participants. This approach allowed us to access the meanings, tensions, and relationships present in the discourses and practices of mathematics teaching aimed at sustainable development. The study was framed within a hermeneutic-dialectical method, which enabled a deep understanding of the meanings constructed by the participants and their contrast with theoretical and normative references (Gadamer, 2002; Ricoeur, 1990).

In this regard, Grounded Theory (Charmaz, 2006) was adopted as a methodological strategy in its constructivist form, due to its potential to generate an emergent substantive theory based on the collected information. This approach allowed for the establishment of conceptual categories and relationships that led to the formulation of the theoretical construct of Teaching Mathematics for Sustainable Development, based on the Key Competence of Problem-Solving. The process was systematically structured, from data collection to the development of the final theoretical corpus, ensuring coherence between the empirical findings and the theoretical construction.

Context and Study Population

The research was conducted in the municipality of Soledad, Atlántico (Colombia), characterized by complex social and educational conditions that demand contextualized pedagogical strategies. School principals, mathematics teachers, and basic secondary education students from public educational institutions participated. Key participants were selected through theoretical-purposive sampling, following the category saturation criterion (Glaser & Strauss, 1967). A total of four teachers, two school principals, and 40 students participated, whose experiences provided significant insights into mathematics teaching in relation to sustainable development and problem-solving.

This scenario allowed for an analysis of the interconnection between educational policies, teacher training, and pedagogical practices, as well as the influence of the sociocultural context on mathematics learning. The municipality of Soledad, presenting cultural diversity and vulnerable conditions, offered a favorable framework for understanding the tensions between regulatory intentions and school realities (Atta-Sakyi et al., 2020).

Techniques and Instruments for Information Collection

Various qualitative techniques were used to collect data, ensuring the richness and depth of the information obtained:

- *Semi-structured Interviews:*applied to managers and teachers in order to explore perceptions about the teaching of mathematics, teacher training and the integration of sustainable development into the curriculum.
- *Focus Groups:*developed with elementary and middle school students, aimed at identifying how they perceive mathematical learning in relation to environmental problems and sustainability.

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- *Documentary Analysis:*focused on regulatory documents (Law 115 of 1994, Decree 1290 of 2009, Law 1620 of 2013, Resolution 089 of 2019) and institutional references (PEI, SIEE, Area Plans) and guiding documents of the MEN.

The triangulation of sources and techniques strengthened the validity of the research process, ensuring a holistic understanding of the phenomenon studied. All instruments were validated by experts, who evaluated their relevance, clarity, and consistency with the study's objectives (Andrades-Moya, 2024).

Data Processing and Analysis

Data processing followed a systematic coding process based on grounded theory. First, open coding was performed, which allowed for the identification of units of meaning and recurring patterns in participants' discourse. Subsequently, axial coding established relationships between categories and subcategories, articulating pedagogical, axiological, and contextual dimensions. Finally, selective coding led to the interpretative categories, which gave rise to the theoretical construct (Pillai & Kaushal, 2020)

During this process, analytical memos were used to record the researcher's theoretical reflections, and data and method triangulation were employed to strengthen the credibility of the analysis. Similarly, the analytical process led to the generation of a substantive theory consistent with the study's epistemological and pedagogical postulates, consolidating the theoretical construct of teaching mathematics for sustainable development, based on the key competency of problem-solving as the final outcome of the research process (Haydam & Steenkamp, 2020)

Analysis Categories

The interpretive categories were constructed through open, axial, and selective coding, following the guidelines of grounded theory (Strauss & Corbin, 1990). These categories represented the main axes of analysis and allowed for the structuring of the final theoretical construct. Thus, the three macro categories derived from the analytical process were:

- *Teaching Mathematics for Sustainable Development:*understood as the integration of environmental, social and economic sustainability into the educational process.
- *Key Problem-Solving Competence:*conceived as the articulating axis of critical thinking and reflective action in real contexts.
- *Contextualized Pedagogical Transformation:*referring to the curricular and didactic innovations necessary to guide mathematical teaching towards equity and social justice.

From these categories, the subcategories that made up the sections of the theoretical corpus were configured (see Figure 2).

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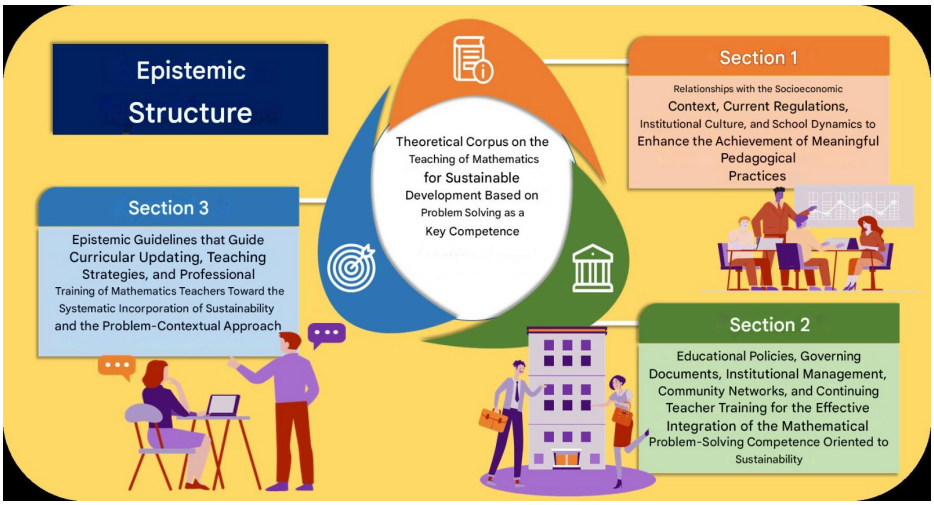
Figure 2.

Epistemic Structure of the Theoretical Corpus



Own elaboration (2025)

Results

The analytical process derived from grounded theory allowed for the construction of the theoretical corpus on Teaching Mathematics for Sustainable Development, grounded in the Key Competency of Problem-Solving, supported by the three sections that comprised its epistemic structure. Each section represented a level of integration between empirical findings and theoretical references, articulating the contextual, pedagogical, axiological, and political dimensions of mathematics education (Seventina et al., 2023)

The results showed that mathematics teaching, when guided by sustainable development and problem-solving, fostered a deeper understanding of knowledge, strengthened independent thinking, and promoted ethical action in the face of environmental challenges. Consequently, the emerging theoretical construct was consolidated as a coherent and relevant proposal for transforming educational practice in school settings characterized by inequality and social vulnerability (Carrillo-Gallego et al., 2023)

Section 1: Socio-educational Context, Policies and Pedagogical Practices

The first section of the theoretical corpus (see Figure 3) integrated findings related to the contextual, institutional, and regulatory conditions that influence mathematics teaching. It was identified that educational institutions in Soledad, Atlántico, faced structural tensions derived from limited infrastructure, high student density, and the need for teacher training. These conditions directly impacted learning opportunities and the ability to incorporate sustainability as a cross-cutting theme in the curriculum.

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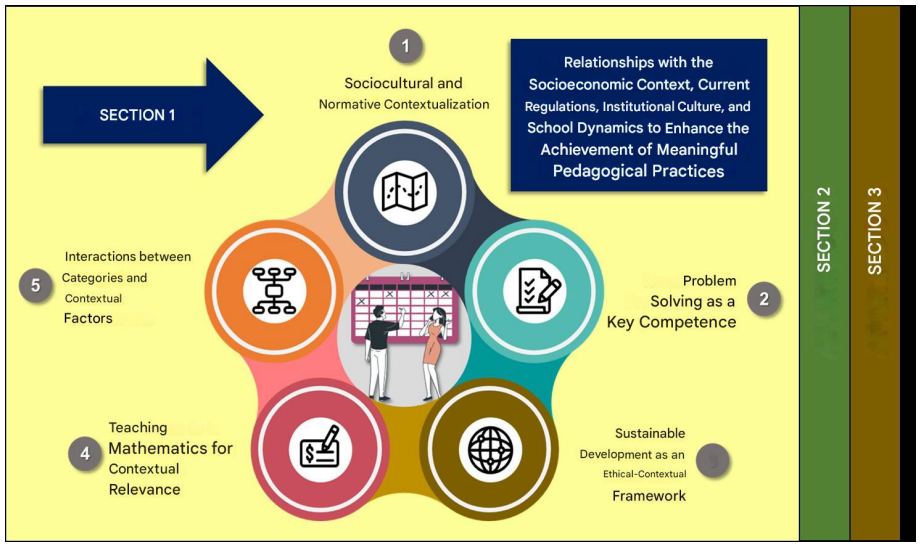
Figure 3.

Dimensions of the Socio-Educational Context and its Relationship with the Teaching of Mathematics



Own elaboration (2025)

The results also showed that national education policies (Law 115 of 1994, Decree 1290 of 2009, Law 1620 of 2013, and Resolution 089 of 2019) provided a regulatory framework oriented toward inclusion, equity, and relevance, but their practical implementation remained fragmented and dependent on institutional management. School leaders recognized the importance of strengthening the relationship between school and community, highlighting that cross-cutting projects—such as the Comprehensive Training Plan and the CRESE strategy—were ideal spaces for linking mathematics with everyday life and critical thinking.

For their part, teachers expressed that connecting mathematics with the social and environmental context increased students' motivation and sense of belonging. However, they also stated that pedagogical resources and training opportunities were limited, which restricted the development of sustainable learning experiences. In this sense, the first section of the theoretical construct allowed them to understand that mathematics teaching should be conceived as a process mediated by the context, where the teacher acts as a transformative agent who articulates educational policies with the real needs of the environment.

Section 2: Educational Policies, Teacher Training and Community Networks

The second section (see Figure 4) addressed the relationship between educational policy, teacher training, and community action as pillars of educational sustainability. The results revealed that teacher professional development programs still lacked a comprehensive vision that linked disciplinary knowledge with socio-environmental competencies. Although the Ministry of National Education has promoted strategies such as the Everyone to Learn

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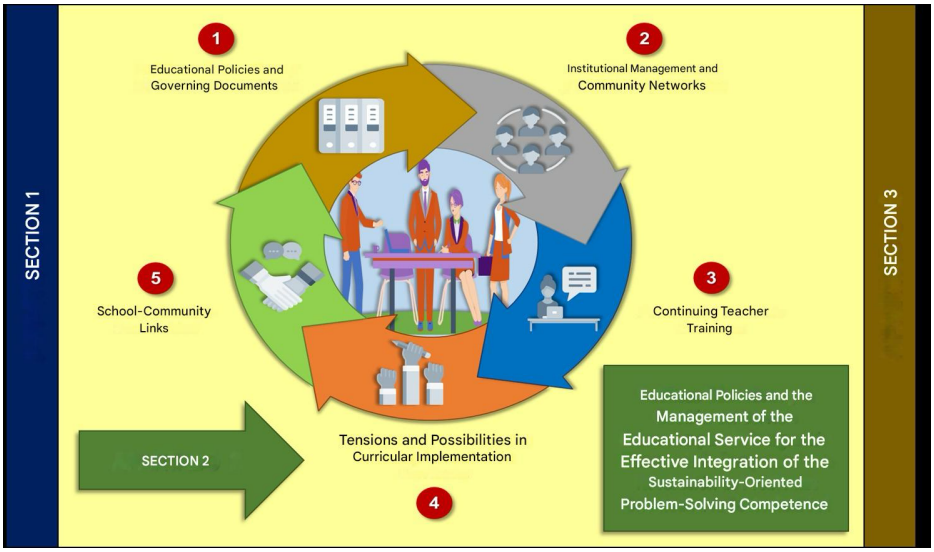
Program (PTA) and the Quality and Equity Schools, teachers pointed out the need for ongoing support to translate national guidelines into contextualized pedagogical practices.

Figure 4.

Articulation between Educational Policies, Teacher Training and Community Networks



Own elaboration (2025)

At this level, the theoretical construct highlighted the importance of reflective teacher training as a condition for transforming mathematics teaching. Teachers' professional knowledge should go beyond technical instruction to incorporate ethical, cultural, and environmental components, which fosters the development of students' critical thinking and moral autonomy (Ausubel, 1963; Vygotsky, 1978).

The results also highlighted the importance of community networks as spaces for collective knowledge construction. The interaction between school, family, and community broadened the notion of sustainability by integrating local knowledge, cultural traditions, and everyday experiences into mathematical problem-solving. Thus, teachers became mediators between curricular content and social practices, fostering meaningful knowledge appropriation.

In summary, this second section was structured into three key dimensions: (1) strengthening teacher training for sustainability, (2) linking public policy and educational practice, and (3) building community learning networks. These dimensions consolidated the understanding of mathematics teaching as an ethical, social, and transformative process.

Section 3: Epistemic Guidelines for Curricular and Didactic Innovation

The third section (see Figure 5) integrated the findings related to curricular renewal, didactic innovation, and contextualized assessment, laying the groundwork for consolidating the

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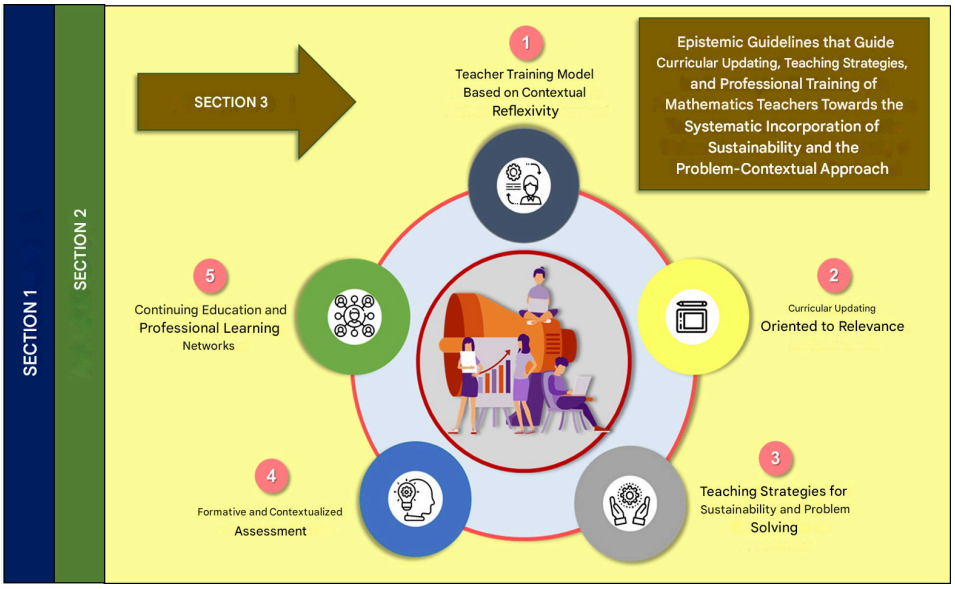
theoretical construct. A set of epistemic guidelines was proposed to reorient mathematics teaching toward sustainable development by systematically incorporating problem-solving skills as a cross-cutting theme.

Figure 5.

Epistemic Guidelines for Curricular and Didactic Innovation



Own elaboration (2025)

The established guidelines were structured around four fundamental principles:

- *Pedagogical Contextualization:*Design learning experiences that start from real-life problems and connect mathematical content with everyday situations.
- *Sustainability Integration:*Promote ethical, environmental, and social analysis in mathematical activities, encouraging reflection on the impact of human decisions.
- *Didactic Innovation:*Use active methodologies such as project-based learning, mathematical modeling, and gamification to encourage active participation and critical thinking.
- *Formative Assessment:*Assess learning processes from a qualitative perspective, recognizing advances in understanding, argumentation, and responsible action.

These principles formed an applicable theoretical framework that can guide both teaching practice and curriculum design in institutions interested in incorporating sustainability as a core curriculum. In this way, mathematics teaching became a space for ethical reflection and social action, where knowledge is linked to building a more just and equitable world.

In summary, the integration of the three sections gave rise to the final theoretical construct, which represents a dynamic conceptual structure applicable to diverse educational contexts.

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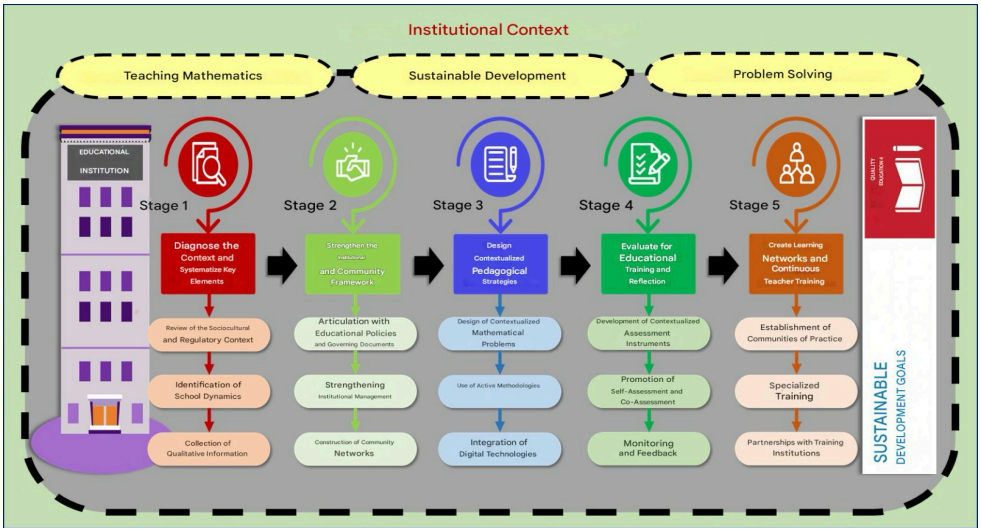
This construct articulates mathematical knowledge with the values of sustainability, problem-solving, and ethical action, projecting a vision of education as an emancipatory and socially responsible practice. In this sense, the resulting framework is organized into three levels:

- *Epistemic Level:*philosophical and theoretical foundations (humanism, axiology, sustainability).
- *Pedagogical Level:*articulation between policies, teacher training and community networks.
- *Praxeological Level:*guidelines for innovative and contextualized educational practice.

Figure 6.
Practical Outline for Teaching Mathematics for Sustainable Development



Own elaboration (2025)

This final construct represents a significant contribution to the field of mathematics education, offering a solid and contextualized theoretical foundation that integrates ethical reflection with pedagogical action, strengthening the development of citizens capable of thinking, deciding, and acting in favor of sustainable development.

Discussion

The theoretical construct developed is not limited to a conceptual formulation, but rather translates into a methodological proposal for practical application in school settings. This transition from theory to practice involves the articulation of epistemological foundations humanism, axiology, sustainability, problem-solving, and 21st-century education with concrete pedagogical actions that transform the classroom into a space for critical reflection and responsible action (Greefrath et al., 2022a)

In practice, this construct proposes that mathematics teaching and learning processes be built on real environmental problems, contextualized within the environmental, social, and

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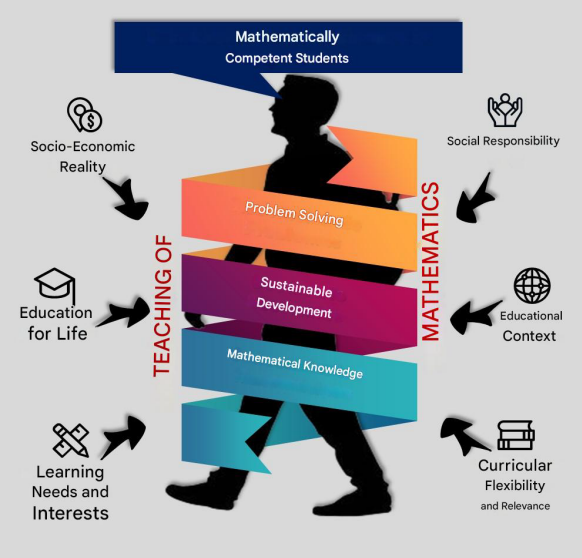
economic dimensions of sustainable development. In this way, teachers not only teach mathematical content but also promote understanding of complex phenomena such as pollution, equitable resource distribution, responsible consumption, and climate change, through the use of analytical tools specific to the discipline (Mainali, 2021)

Problem-solving is thus defined as the integrative skill that links mathematical thinking with sustainable development, allowing students to develop logical reasoning, critical thinking, and creativity skills (see Figure 7). When faced with contextualized situations, students do not simply seek numerical solutions but rather reflect on the ethical, social, economic, and environmental impact of their decisions, consolidating the connection between cognition and transformative action (Sosa-Gutierrez et al., 2023)

Figure 7.

Teaching Mathematics for Sustainable Development



Own elaboration (2025)

This approach is consistent with the research of Polya (1945) and Schoenfeld (1992), who argue that problem-solving involves understanding, planning, executing, and reflecting; these phases are enriched in this construct by incorporating the axiological and sustainable dimension. It is also aligned with Vygotsky's (1978) approach to the social mediation of learning and with Ausubel's (1963) theory of meaningful learning, recognizing that deep understanding is achieved when new knowledge is related to prior experiences relevant to the student.

Pedagogical Implications of the Theoretical Construct

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The construct offers a framework that redefines the role of the teacher as an ethical agent, researcher, and mediator of knowledge. The educator ceases to be a transmitter of closed knowledge and becomes a facilitator who guides the student in the exploration of their environment through mathematical reasoning. This paradigm shift responds to UNESCO's (2017) guidelines on strengthening competencies for sustainability and to the contributions of Fadel (2015) and Darling-Hammond (2017), who argue that 21st-century education must train individuals capable of analyzing, collaborating, and innovating (Fhloinn & Fitzmaurice, 2021)

In this sense, teaching practice based on the theoretical construct is characterized by four essential components:

- *Contextualization:*Mathematical content is developed around real-life situations that are relevant and close to the students' lives.
- *Interdisciplinarity:*Mathematics is integrated with natural sciences, environmental education, citizenship and technology, broadening the interpretive horizon of problems.
- *Critical Reflection:*Argumentation and dialogue are encouraged, allowing students to understand the ethical and social implications of their decisions.
- *Social Transformation:*Learning is oriented toward action, promoting community participation and the construction of sustainable solutions.

These characteristics coincide with the postulates of Biesta (2010), who emphasizes that education must transcend performance indicators and be oriented toward the formation of responsible, critical, and democratic individuals. It also relates to the proposal of Galbraith and Stillman (2006) on mathematical modeling as a tool to address real-world problems, and with the approaches of English and Goos (2011) regarding the teaching of mathematics as a vehicle for complex thinking and social innovation.

Theoretical and Practical Contributions to the Educational Field

The proposed theoretical-argumentative construct contributes to the educational field in three dimensions:

- *Epistemological:*redefines the teaching of mathematics as an act of meaning-making, where knowledge is produced through the interaction between subject, context, and values. This contribution recovers Morin's (2001) thinking on complexity, recognizing the interdependence between knowledge and human realities.
- *Methodological:*It establishes a practical application route based on the resolution of contextualized problems and sustainability as a cross-cutting axis, offering a structure adaptable to different school contexts.
- *Socio-educational:*It promotes the participation of the educational community in the search for solutions to local problems, strengthening the link between school, family and environment, in coherence with the perspective of Marta Civil (2016) on community mathematics education.

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Together, these contributions consolidate a situated educational theory that recognizes the unequal conditions of contexts such as Soledad and Atlántico, and proposes an alternative to promote emancipatory and ethical mathematics education.

This theoretical corpus not only fits into the critical tradition of education, but also offers a replicable and transferable framework for other Latin American contexts, incorporating universal principles of sustainability, social justice, and equity into pedagogical practice (Chand et al., 2021)

Relations in the Research Field

The construct engages with international research that has addressed the relationship between mathematics education and sustainability. In Germany, Ludwig and the MathCityMap project (2020) highlight outdoor mathematics learning as a strategy for linking the discipline with environmental reality. In Finland, English and Goos (2011) promote complex problem-solving in everyday contexts as a means of developing critical thinking. In Australia, Galbraith and Stillman (2006) demonstrate that mathematical modeling is a bridge between school knowledge and the real problems of the contemporary world (Rodríguez-Jiménez et al., 2023)

In the Latin American context, the theoretical and argumentative contributions proposed here (Celis, 2025) broaden these perspectives by explicitly incorporating the ethical and axiological dimension, establishing a balance between conceptual understanding, social sensitivity, and transformative action. This integration transforms the construct into an innovative theoretical contribution that responds to the challenges of education for sustainable development from a local perspective with a global projection (Greefrath et al., 2022b).

Conclusions

The theoretical construct on Teaching Mathematics for Sustainable Development, based on the Key Competency of Problem-Solving, constitutes a substantive contribution to the field of contemporary education, integrating epistemological, pedagogical, and axiological dimensions into a coherent framework that responds to the demands of the 21st century. The resulting theory offers a deep understanding of mathematics teaching as a social, critical, and ethical practice, in which knowledge is linked to transformative action and the development of responsible citizenship.

From an epistemological perspective, the construct reconfigures mathematics teaching as a situated cultural practice, supported by the articulation of five pillars: humanism, axiology, sustainability, problem-solving, and 21st-century educational scenarios. This convergence establishes a framework that guides education toward the development of autonomous, reflective individuals who are aware of their role in society and in caring for the planet.

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At the pedagogical level, the theory proposes an innovative model that transcends traditional teaching by incorporating problem-solving as a key competency for understanding real-life phenomena and constructing meaningful learning. The construct demonstrates that mathematical problems contextualized within sustainable development strengthen motivation, conceptual understanding, and critical thinking, while promoting dialogue between science, ethics, and community. In this way, mathematical learning becomes an experiential process that unites knowing, doing, and being.

Regarding its axiological and social dimension, the construct posits education as a practice oriented toward the common good, equity, and social justice. Mathematics teaching is redefined as a space for the development of values such as solidarity, responsibility, and sustainability, moving beyond the instrumental view of knowledge and promoting holistic education. By situating learning in local contexts, the theory fosters the construction of collective solutions to social and environmental problems, strengthening the relationship between school and community.

In summary, the theoretical construct generated provides a conceptual and methodological foundation that can guide educational policies, teacher training programs, and integrative pedagogical projects. Its value lies in the possibility of replicating the model in diverse educational contexts that share similar challenges of inequality, lack of resources, or disconnection between curriculum and social reality.

Likewise, these contributions offer a viable alternative for rethinking mathematics teaching as an emancipatory process, where problem-solving becomes a vehicle for critical reflection and sustainable action. Thus, mathematics education is positioned not only as a discipline of logical thinking, but also as a tool for building more conscious, equitable, and responsible societies for the future.

Consequently, this theory contributes to the advancement of educational knowledge by demonstrating that the integration of sustainability and problem-solving in mathematics teaching is not an isolated methodological option, but an ethical and epistemological necessity for integral human development.

Conflicts of Interest

The author declares that there are no financial, institutional, or personal conflicts of interest that could have influenced the conduct, analysis, or publication of this research. The study was conducted independently, with academic support from the educational institutions where the fieldwork was conducted, and without receiving external funding or sponsorship that would have conditioned its results or conclusions.

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