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Relevance of the prioritized curriculum with emphasis on competencies: teachers' perspectives on the teaching of mathematics in Bachelor of Science

Pertinencia del currículo priorizado con énfasis en competencias: perspectivas docentes sobre la enseñanza de matemáticas en Bachillerato en Ciencias

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Abstract

This article analyzes the relevance of implementing the prioritized curriculum in the teaching and learning of mathematics among second-year science baccalaureate students during the 2023-2024 academic year. This article focuses on the development of communication, mathematical, digital, and socioemotional competencies, as defined by the Ministry of Education. This research, based on teachers' perceptions of their classes and their use of the mathematics textbook provided to students, focuses on qualitative and quantitative approaches. The research combines documentary analysis with a field study, conducting surveys with teachers from 22 educational institutions in Quito. A worksheet was used for text analysis. The results show a high level of contextualization and relevance in the implementation of the curriculum, as well as a significant promotion of mathematical and socioemotional competencies. However, the development of digital competencies shows a medium level of integration. Regarding the text analysis, it was determined that the limit of a function is not studied. It is concluded that, although there is an effort to incorporate these competencies into the teaching-learning process, it is necessary to strengthen training in the use of digital tools and improve textbooks to ensure more effective implementation of the prioritized curriculum.

Keywords

Communicational competencies, digital competencies, mathematical competencies, socio-emotional competencies, prioritized curriculum.

Resumen

El presente artículo analiza la pertinencia de la aplicación del currículo priorizado en la enseñanza y aprendizaje de las matemáticas en estudiantes de segundo año de bachillerato en Ciencias durante el año lectivo 2023-2024, con énfasis en el desarrollo de competencias comunicacionales, matemáticas, digitales y socioemocionales, definidas por el Ministerio de Educación, con base en la percepción de los docentes en el desarrollo de sus clases y en la utilización del texto de Matemática entregado a los estudiantes. La investigación, de enfoque cualitativo y cuantitativo, combina el análisis documental con un estudio de campo, a través de la aplicación de encuestas a docentes de 22 instituciones educativas de la ciudad de Quito y para el análisis del texto se empleó una ficha de análisis de contenido. Los resultados evidencian un alto nivel de contextualización y pertinencia en la implementación del currículo, así como un fomento significativo de las competencias matemáticas y socioemocionales. No obstante, el desarrollo de competencias digitales presenta un nivel medio de integración. En cuanto al análisis del texto se determinó que no se estudia el límite de una función. Se concluye que, aunque existe un esfuerzo por incorporar estas competencias en el proceso de enseñanza-aprendizaje, es necesario fortalecer la formación en el uso de herramientas digitales y mejorar los libros de texto para garantizar una implementación más efectiva del currículo priorizado.

Palabras clave

Competencias comunicacionales, competencias digitales, competencias matemáticas, competencias socioemocionales, currículo priorizado.

1. Introduction

The education system faces global challenges, including the need to adapt education to technological advances, constant social change, and the inclusion of universal values that



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promote peace and coexistence (Delors, 1996). Furthermore, the education system must shift from a traditional approach based on the accumulation of knowledge to one that fosters the development of skills, as proposed by various studies on curricular modernization (Castillo and Gamboa, 2012; Egido, 2022). In this context, mathematics education also faces significant difficulties, especially in the teaching of abstract concepts such as the limit of a function. This concept, fundamental to differential and integral calculus, presents cognitive and emotional barriers that hinder its learning (Blázquez and Ortega, 2000; Socas, 2007). In Ecuador, for example, PISA assessment results have shown low performance in mathematics, underscoring the need for a change in pedagogical methods and teaching curricula to improve educational outcomes (El Comercio, 2018; OECD, 2023).

This article stems from a thesis whose objective was to analyze the relevance of the prioritized mathematics curriculum, with an emphasis on communication, mathematical, digital, and socio-emotional skills, among second-year science students during the 2023-2024 school year. It also seeks to evaluate teachers' perceptions of the relevance and contextualization of this curriculum in their classes. To this end, the following research questions have been posed:

- What is teachers' perception of the implementation of the prioritized curriculum in relation to communication, mathematical, digital, and socio-emotional competencies with second-year high school students in the context of mathematics learning?
- How do teachers perceive the relevance and contextualization of the prioritized curriculum in their mathematics classes?
- What methodology should be used to evaluate the concept of the limit of a function in the mathematics textbook for second-year high school students based on the Ministry of Education's communication, mathematical, digital, and socio-emotional competencies?

This study is not only relevant for students and teachers but also has practical value, as it seeks to generate proposals that improve the learning of key concepts in mathematics, such as limits, which are fundamental to the exact sciences and other areas such as physics, engineering, and economics. The research also contributed to the continuing education of teachers, enabling them to implement teaching activities and improve their performance in the classroom.

The structure of this document is as follows: introduction, theoretical foundation, design of this research (approach, types, and level of research), data collection techniques and instruments, validity and reliability of the instruments, analysis and discussion of results. And finally, conclusions summarizing the findings obtained.

2. Theoretical foundation

2.1 Ecuadorian educational model

Ecuador's educational model is a "set of principles and approaches that guide the implementation of teaching and learning processes, based on a contextualized and flexible educational offering, to improve educational quality" (Ministry of Education, 2023a, p. 4). It is also considered "a framework that clarifies the meaning and paradigm of education; however, it allows institutions to generate innovative, relevant, and meaningful educational actions for their stakeholders" (Ministry of Education, 2023b, p. 5). The term "protagonists"



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refers to the students who interact inside and outside the educational institution with their teachers, peers, authorities, and families. These interactions "return to individuals the ability to discover, explore, inquire, and learn from one another through collaboration, cooperation, and the relationships established between stakeholders" (Ministry of Education, 2023b, p. 8). This model has a constructivist approach in which students are the permanent builders of their own knowledge through interaction with their family, social, and cultural environment. To achieve this, students must actively participate in their learning, developing critical and problem-solving skills by working in teams (Ministry of Education, 2023b, p. 10).

2.2 Educational quality

For the Ministry of Education of our country, educational quality allows for the co-responsible participation of the entire educational community, the autonomy of school management, and the relevance and flexibility in learning for the comprehensive training of competent citizens who achieve their life plans and contribute to the development of society, based on democratic, sustainable, equitable, and inclusive practices (2023b, p. 9). From this definition, it can be highlighted that the quality of education, in addition to focusing on students' academic achievements, also focuses on forming their values, emotions, attitudes, and skills to face the challenges of society. It is important to emphasize that the quality of education is an object in constant change and improvement; therefore, it requires adaptation as the needs and challenges of society evolve (Ministry of Education, 2023b, p. 9).

2.2.1 Relevance

The relevance of education implies that it must be meaningful to all people, regardless of their social or cultural context, abilities, and interests. This way, everyone can embrace the content of culture, both global and local, and develop themselves as subjects in society, developing their autonomy, self-governance, freedom, and identity (Blanco et al., 2008, p. 13). Along these same lines, for the Ecuadorian Ministry of Education, relevance in education constitutes one of the characteristics that the Organic Law on Intercultural Education attributes to the concept of educational quality. It is, therefore, a principle of education that seeks to ensure the quality of the educational process received by students, guaranteeing "an education that responds to the needs of their social, natural, and cultural environment at the local, national, and global levels" (Organic Law on Intercultural Education, 2015). "For the educational offer to be relevant, the curriculum and teaching methods must be flexible to adapt to the needs and characteristics of the students and the diverse social and cultural contexts" (Blanco et al., 2008, p. 13).

2.3 Ecuadorian curriculum

A curriculum is an educational project of each country with the aim of promoting the development and socialization of a new generation. The curriculum ensures the minimum conditions necessary to maintain continuity and coherence in the realization of pedagogical intentions, guaranteeing quality teaching and supporting the learning process (Ministry of Education, 2016, p. 4). "A curriculum is a document that guides and directs the learning process. Its content includes the knowledge, skills, and attitudes that the student is expected to learn at each stage of their educational path" (Ministry of Education, 2021, p. 5).

2.4 Prioritized curriculum with emphasis on competencies

The prioritized curriculum with an emphasis on communication, mathematical, digital, and socio-emotional skills is a document created with the aim of providing a quality education that adapts to the reality and needs of each educational institution and each student after



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the Covid-19 pandemic. Applying these skills helps provide a quality education and contributes to the comprehensive development of students and improves their ability to cope with situations that arise in their daily lives (Ministry of Education, 2021, p. 5).).

2.4.1 Competencies of the prioritized curriculum

For the Ministry of Education (2021), communication skills (CC), mathematics (CM), digital skills (CD), and socio-emotional skills (SC) are students' ability to develop, integrate, and utilize different levels of interrelated knowledge, skills, procedures, aptitudes, and attitudes (pp. 7-9). Communication skills are the skills that promote the comprehension and production of texts, effective communication, and thus improve social interaction. Students must be able to speak relevantly and fluently. They must also understand a text when reading or listening to it and produce texts that can be written or oral so that the recipient can understand them. Reading is a source of information and study that allows for intellectual and human growth and allows for the development of "reflection, critical thinking, complex thinking, awareness, creativity, and the construction of new knowledge" (Ministry of Education, 2021, pp. 7-8).

Mathematical competencies are skills that promote critical, logical, and rational thinking when making decisions based on ethical and moral values. Students must be able to perform basic operations and use mathematical symbols with different numerical sets. They must also be able to solve everyday problems and express them in a reasoned, logical, argumentative, and communicative manner, integrating different types of knowledge. Furthermore, they will be honest, fair, ethical, and respectful members of a democratic, equitable, and inclusive society. Finally, mathematical competencies go hand in hand with the 21st-century competencies of "problem-solving, decision-making, and critical thinking" (Ministry of Education, 2021, p. 8).

Digital competencies are the knowledge and skills that foster the development of computational thinking, the responsible use of technology, as well as creating, sharing, communicating, collaborating, and providing solutions in digital environments. Students must be able to identify, define, and solve problems that arise in digital environments and that can lead them to educational, cultural, political, and economic environments through critical thinking. Furthermore, students cease to be technological consumers and become analysts and creators, people who manage technology appropriately, consciously, and responsibly. Digital competencies enable autonomous participation in the learning process (Ministry of Education, 2021, pp. 8-9).

Socio-emotional competencies are the knowledge, capacities, skills, and attitudes that enable the understanding and appropriate management of personal emotions versus the emotions of others. Students must be able to self-regulate their emotions, respect the emotions of their peers, collaborate and work as a team, make responsible decisions, and handle situations that challenge them in their learning process in a constructive and ethical manner. Furthermore, these competencies allow the development of "life skills proposed by the World Health Organization: self-knowledge, empathy, assertive communication, interpersonal relationships, decision-making, problem and conflict resolution, critical thinking, management of emotions and feelings, management of tension and stress" (Ministry of Education, 2021, p. 9).



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2.5 Learning theories associated with Mathematics

2.5.1 APOE

The Action-Process-Object-Schema (APOE) theory, for Arias (2019), is a cognitive model that is part of advanced mathematical thinking and through reflexive abstraction as a constructive mechanism allows the construction of mental objects. This theory describes how students understand mathematical concepts by applying the mental constructs of Actions, Processes and Objects, whose interaction with each other are organized into a Schema. These mental constructs are developed from the following mental mechanisms: internalization, coordination, inversion, generalization, encapsulation and/or decapsulation. The process that students follow to understand a mathematical concept, based on the APOE theory, begins with the manipulation of physical or mental objects constructed to form actions, which are internalized to form processes that are encapsulated and form objects. Objects can be de-encapsulated in the processes from which they were formed. Finally, actions, processes and objects can be organized into schemes that, if treated as objects and circumscribed in the organization of other more advanced schemes, it is concluded that they have been thematized into a mathematical object (Arias, 2019, pp. 83-84).

3. Research design

This research employs a mixed-methods approach, combining quantitative and qualitative techniques to analyze the relevance of the prioritized curriculum with an emphasis on competencies in the teaching of mathematics. From a quantitative perspective, a survey was conducted among teachers about their classes, and the results were statistically analyzed to draw general conclusions. According to Ulloa et al. (2017), "quantitative research offers us the possibility of generalizing the results more broadly; it gives us control over the phenomena and a perspective on their counting and magnitude" (p. 171). In parallel, a qualitative approach was incorporated, as it allows for greater interpretive depth when analyzing the contents and activities of the Ministry of Education's official textbook for the 2023-2024 school year using an analysis sheet. This approach provides "dispersion, interpretive richness, contextualization of the environment, details, and unique experiences" (Ulloa et al., 2017, p. 171).

The level of research is descriptive, as it details the characteristics of the curriculum and describes how students learn mathematical concepts from the perspective of communication, mathematical, digital, and socio-emotional competencies. As Hernández et al. (2014) state, this type of research seeks to "specify the properties, characteristics, and profiles of people, groups, communities, processes, objects, or any other phenomenon that is being analyzed" (p. 92). Furthermore, the study is based on documentary and field research. Information was collected from books, scientific articles, and testimonies from mathematics teachers. In the words of Arias (2012), "documentary research is a process based on the search, recovery, analysis, critique, and interpretation of secondary data [...] in documentary sources: print, audiovisual, or electronic" (p. 27), while field research "consists of collecting data directly from the subjects under investigation [...] without manipulating or controlling any variable" (p. 31).

3.1 Research techniques and instruments

For field research, the survey technique was used with its respective instrument, the questionnaire. For documentary research, the Document Analysis technique was applied



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through its instrument, Cards, as well as the content analysis technique using record tables as an instrument (Arias, 2012, p. 68).

3.1.1 Description of the questionnaire

The questionnaire of this research aimed to collect the perspective of mathematics teachers on the promotion of communication, mathematical, digital and socio-emotional skills in the development of their classes and was applied to 112 teachers through an online survey consisting of a questionnaire with eight items and a total of 29 subitems. The scale of possible responses is structured as follows: 5. Always (100%), 4. Almost always (75%), 3. Sometimes (50%), 2. Almost never (25%), 1. Never (0%).

3.1.2 Description of the record

The worksheet used in this research aimed to analyze specific content from two mathematics textbooks for second-year high school students in relation to the competencies of the prioritized curriculum. This worksheet applied the mathematics textbook analysis methodology (MALTM), proposed by Acaro (2020), which consists of three stages: 1) reference data from the textbook, 2) general outline of the textbook, 3) conceptual analysis. In total, the worksheet had 44 items and a scale with two possible answers: Yes or No. The value of "Yes" is three points and that of "No" is one point. The score is obtained by adding the score obtained (PO), multiplying it by one hundred (100) and dividing it by the sum of the ideal score (PI).

3.2 Validity of the instruments

The criterion used for instrument validation was expert validation. The questionnaire and the form were validated in terms of their structure, mathematical content, didactic aspects, and item wording. Table 1 presents the expert validators of the questionnaire, and Table 2 presents the expert validators of the form.

Expert	Area	Workplace
MSc. Cinthya Veloz	Mathematics	U.E.M. San Francisco de Quito.
MSc. Ruth Gonzáles	Spanish Language and Literature	U.E. Pedro José Arteta.
MSc. Edwin Lozano	Research and Psychology	Central University of Ecuador.

Cuadro 1. Expertos que validaron el cuestionario

Experto	Área	Lugar de Trabajo
PhD. Ana Lucía Arias	Mathematics	Central University of Ecuador.
MSc. Franklin Molina	Mathematics	Central University of Ecuador.
MSc. Lucia Goyes	Pedagogy	Central University of Ecuador.

Table 2. Experts who validated the form

3.3 Reliability of instruments

According to Hernández et al. (2014), "the reliability of a measuring instrument refers to the degree to which its repeated application to the same individual or object produces consistent and coherent results" (p. 200). This means that the results obtained must be the same in successive repetitions. To calculate the reliability of the questionnaire, a survey was administered to 21 master's students in Mathematics. Based on the results obtained, it was decided to calculate Cronbach's alpha coefficient, a numerical value that can vary between zero and one. The value obtained of 0.91 indicates that the instrument has high reliability.



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4. Results

This section is divided into two sections. The first analyzes and interprets the results obtained from the application of the questionnaire to 112 Mathematics teachers from 73 public, municipal, and private educational institutions, as well as the information collected from the application of the form to analyze Mathematics textbooks for second-year high school students during the 2023-2024 school year. The second section discusses the results, considering the theoretical constructs, background, and objectives of this research. In order to qualify the numerical results obtained from the application of the questionnaire and the form, a qualitative description was established as shown in Table 3.

Number of respondents	Percentage of respondents	Qualitative description
De 103 a 112	De 92 % a 100 %	Muy alto
De 90 a 102	De 80 % a 91 %	Alto
De 72 a 89	De 64 % a 79 %	Medio
De 50 a 71	De 44 % a 63 %	Bajo
De 0 a 49	De 0 % a 43 %	Muy bajo

Cuadro 3. Cualificación de los resultados numéricos para el cuestionario y la ficha

4.1 Analysis and interpretation of the questionnaire results

The analysis of each item included statistical column graphs and frequency tables to extract the most significant findings, highlighting the highest values of each sub-item and was qualitatively assessed as established in Table 3. In addition, for the interpretation of the information, the meaning of the results obtained was explained, relating them to the objectives and guiding questions of this research.

4.1.1 Relevance of the prioritized curriculum

To analyze the relevance of the prioritized curriculum, mathematics teachers were asked about the way they teach their classes. The question was whether Mathematics teachers consider their classes contextualized and relevant through the following actions: relating mathematical content to everyday situations and other subjects; adapting lessons to students' needs and interests; and connecting the content learned in class to their sociocultural environment.

Figure 1 presents the results regarding mathematics teachers' perspectives on the contextualized delivery of their lessons, considering several key elements to analyze the relevance of the prioritized curriculum in the area of Mathematics. Of the 112 teachers surveyed, 62 indicated that they always relate mathematical content to everyday situations and other subjects (subitem 1.1); 42 teachers responded that they do so almost always, and 8 that they do so sometimes. Regarding the adaptation of lessons to students' needs and interests (subitem 1.2), 55 teachers stated that they do this always; 50 almost always; and 7 sometimes. Finally, regarding the connection between the content learned and the students' sociocultural environment (subitem 1.3), 47 teachers indicated that they do this always; 56 almost always; 8 sometimes; and 1 teacher stated that they never do this.



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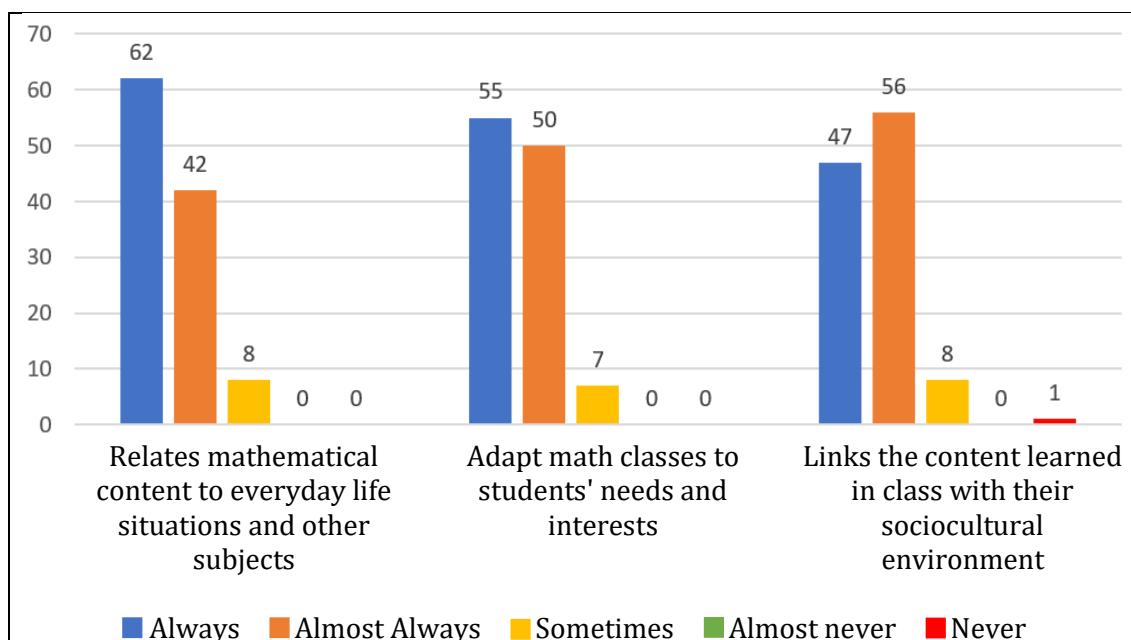


Figure 1. Perspective of the relevance of the prioritized curriculum. Adapted from: (Lima, 2024, p. 59).

These values show that, in this research according to the 112 teachers surveyed, the level of contextualization and relevance in the application of the prioritized curriculum in the teaching and learning process of mathematics is very high, since in all sub-items between 103 and 112 teachers surveyed, that is, between 92% and 100%. In addition indicate that they always or almost always conduct their mathematics classes connecting learning and educational actions with the realities, needs and aspirations of the student to guarantee an education that responds to the needs of their social, natural and cultural environment, contributing to the fulfillment of the right of students to receive a quality education.

4.1.2 Communication skills

To analyze the development of communication skills in Mathematics, teachers were asked whether they believe they foster these skills through the following actions: developing oral and written expression skills related to mathematics topics; improving reading comprehension and information production related to mathematics; communicating problem-solving processes using mathematical language in an orderly and coherent manner; and promoting reflection and creativity in academic activities.

Figure 2 shows teachers' perspectives on the application of communication skills in the classroom, highlighting specific actions that teachers are expected to promote. Of the 112 teachers surveyed, 45 indicate that they always develop oral and written expression skills related to mathematics topics (subitem 2.1); 57 do so almost always, 8 sometimes, and 2 almost never. Regarding improving reading comprehension and information production related to mathematical content (subitem 2.2), 43 teachers state that they always do so; 53 almost always, 14 sometimes, 1 almost never, and 1 never. Regarding the communication of problem-solving processes through orderly and coherent mathematical language (subitem 2.3), 76 teachers state that they always do so; 31 almost always, 4 sometimes, and 1 almost never. Finally, in relation to the promotion of reflection, critical and complex



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thinking, awareness, and creativity in academic activities (subitem 2.4), 64 teachers respond that they always do so, 42 almost always, and 6 sometimes.

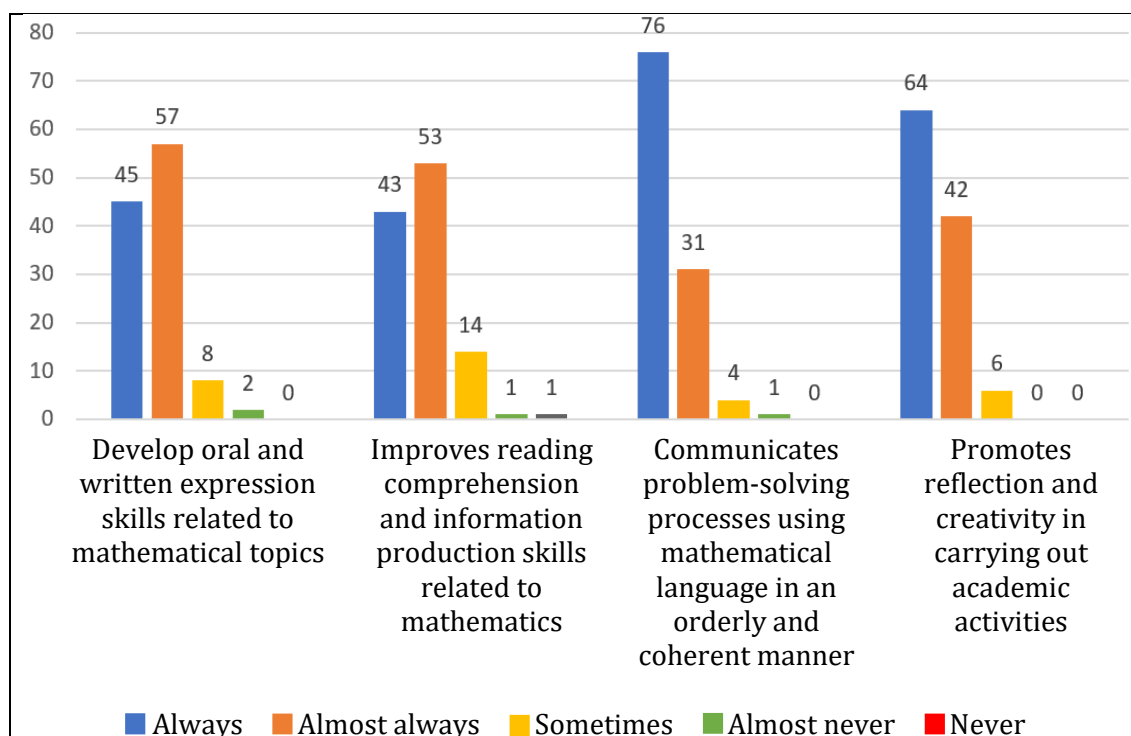


Figure 2. Application of communication skills. Adapted from: (Lima, 2024, p. 64).

These values show that, in this research according to the 112 teachers surveyed, the extent to which teachers promote communication skills in the teaching and learning process of mathematics is high, since in all sub-items between 90 and 102 teachers surveyed, that is, between 80% and 91%, indicate that they always or almost always conduct their classes encouraging oral and written expression, comprehension and production of texts and the resolution of mathematical problems, with the aim that students are able to speak with good enunciation, in an orderly and coherent manner, make correct use of the language and listen carefully, analyze a text when reading or listening to it and produce written or oral texts in a comprehensive way.

4.1.3 Mathematical skills

To analyze the development of mathematical competencies, teachers were asked how they foster them in the classroom. Teachers considered that these competencies were promoted through the following actions: explaining and applying mathematical concepts in solving exercises; proposing logical-mathematical reasoning problems of varying complexity related to everyday situations; and encouraging critical thinking and mathematical reasoning in decision-making, both inside and outside the classroom.

Figure 3 presents the results related to the application of mathematical competencies in classroom teaching. The data obtained show that, of the 112 teachers surveyed, 91 indicated that they always explain and apply mathematical concepts in solving exercises (sub-item 3.1); 19 do so almost always, and 2 do so sometimes. Regarding the formulation of logical-mathematical reasoning problems of varying complexity, linked to everyday life situations (sub-item 3.2), 71 teachers indicate that they do it always, 33 almost always, 7 sometimes and 1 almost never. Finally, regarding the promotion of critical thinking and mathematical



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reasoning in decision-making (sub-item 3.3), 81 teachers indicate that they do it always, 25 almost always and 6 sometimes.

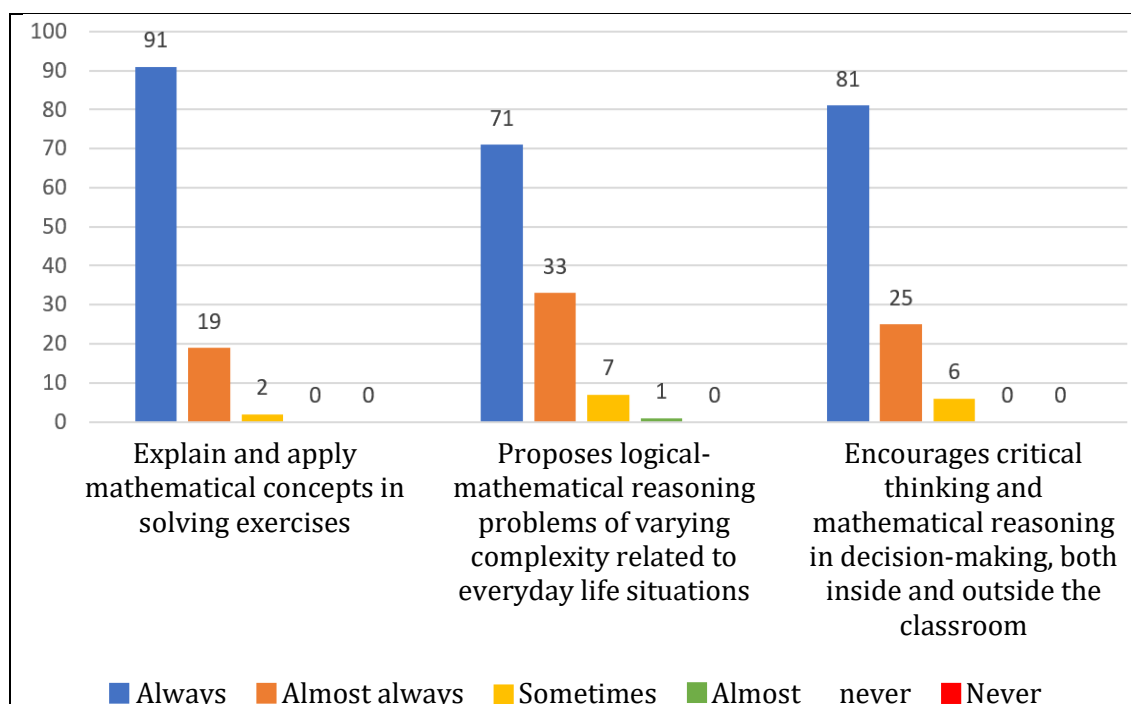


Figure 3. Application of mathematical skills. Adapted from: (Lima, 2024, p. 66).

These values show that, in this research according to the 112 teachers surveyed, the extent to which teachers promote mathematical skills in the teaching and learning process of mathematics is very high, since in all sub-items between 103 and 112 teachers surveyed, that is, between 92% and 100%, respond that they always or almost always conduct their classes encouraging the explanation and application of mathematical concepts, the posing of problems with varying complexity and encourage critical thinking and reasoning, so that students are able to correctly use mathematical operations, use their symbols with number sets, solve problems of everyday life and express them in a reasoned, logical, argumentative, communicative way, and integrating different knowledge.

4.1.4 Digital skills

To analyze the development of digital competencies in mathematics, teachers were asked how they integrate the use of technologies into their teaching practices through the following actions: creating digital mathematical content by identifying problems, defining them, and proposing solutions; using ICTs as tools to facilitate mathematics learning; explaining how to ethically and responsibly use information obtained in digital environments on mathematics-related topics; and selecting appropriate educational platforms to promote meaningful, interactive, and contextualized learning.

Figure 4 presents the results related to the application of digital competencies in Mathematics. The data show that, of the 112 teachers surveyed, 40 indicate that they always create digital mathematical content, identifying problems, defining them, and proposing solutions (subitem 4.1); 49 do so almost always, 18 do so sometimes, 4 almost never, and 1 never. Regarding the use of ICT for learning mathematics (subitem 4.2), 38 teachers state that they do so always, 47 almost always, 22 sometimes, and 5 almost never. Regarding the



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responsible use of information obtained in digital environments on mathematical topics (subitem 4.3), 45 teachers respond that they always explain it, 44 almost always, 20 sometimes, and 3 almost never. Finally, in relation to the selection of appropriate educational platforms to achieve meaningful learning (subitem 4.4), 44 teachers indicate that they always do so, 47 almost always, 15 sometimes, and 6 almost never.

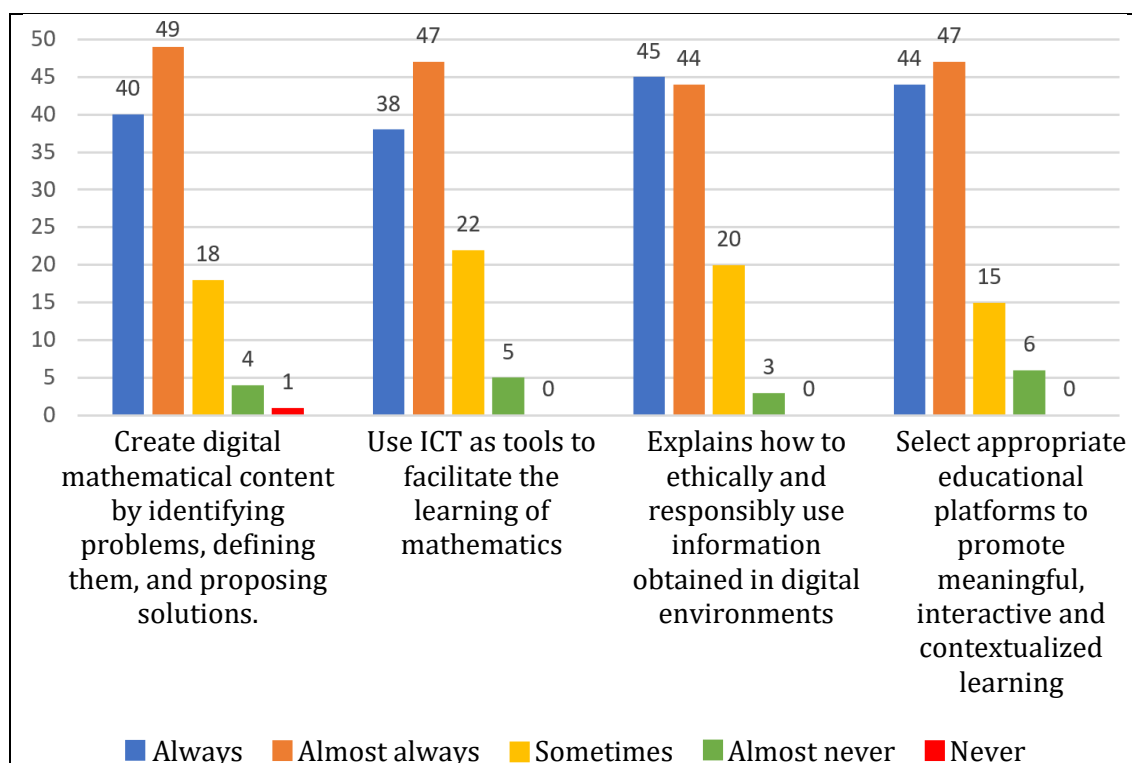


Figure 4. Application of digital skills. Adapted from: (Lima, 2024, p. 68)).

These values show that, according to the 112 teachers surveyed, the extent to which teachers promote digital skills in the teaching and learning process of mathematics is medium, given that in all sub-items between 72 and 89 teachers surveyed, that is, between 64% and 79%, always or almost always conduct their classes promoting the creation of digital mathematical content, the responsible use of ICTs and the selection of appropriate platforms for learning Mathematics so that students are able to identify, define and solve problems that arise in digital environments and that can lead them to educational, cultural, political and economic environments, through critical thinking, ceasing to be technological consumers and becoming analysts and creators, people who handle technology appropriately, consciously and responsibly.

4.1.6 Socio-emotional skills

To analyze the development of socioemotional competencies in Mathematics, teachers were asked how they integrate them into their teaching practices. In this question, consider that you foster these competencies through the following actions: you promote teamwork and collaboration among peers to solve mathematical problems; you guide students in controlling their emotions when faced with challenges related to mathematics in the classroom; you encourage the prevention of all types of violence and psychosocial risks inside and outside the classroom; and you promote self-awareness, empathy, communication, and tension and stress management.



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Figure 5 shows the results related to the application of socioemotional competencies in mathematics. Of the 112 teachers surveyed, 74 indicate that they always promote teamwork and collaboration among peers to solve Mathematical problems (subitem 5.1); 35 do so almost always, 2 do so sometimes, and 1 teacher never does this. Regarding guidance for controlling emotions when faced with challenges in the classroom related to mathematics (subitem 5.2), 63 teachers stated that they do it always, 42 almost always, and 7 sometimes. Regarding the prevention of all types of violence and psychosocial risks inside and outside the classroom (subitem 5.3), 82 teachers indicated that they always encourage it, 22 almost always, and 8 sometimes. Finally, regarding the promotion of self-knowledge, empathy, communication, and stress management (subitem 5.4), 77 teachers responded that they always do it, 31 almost always, 3 sometimes, and 1 never includes these actions in their classes.

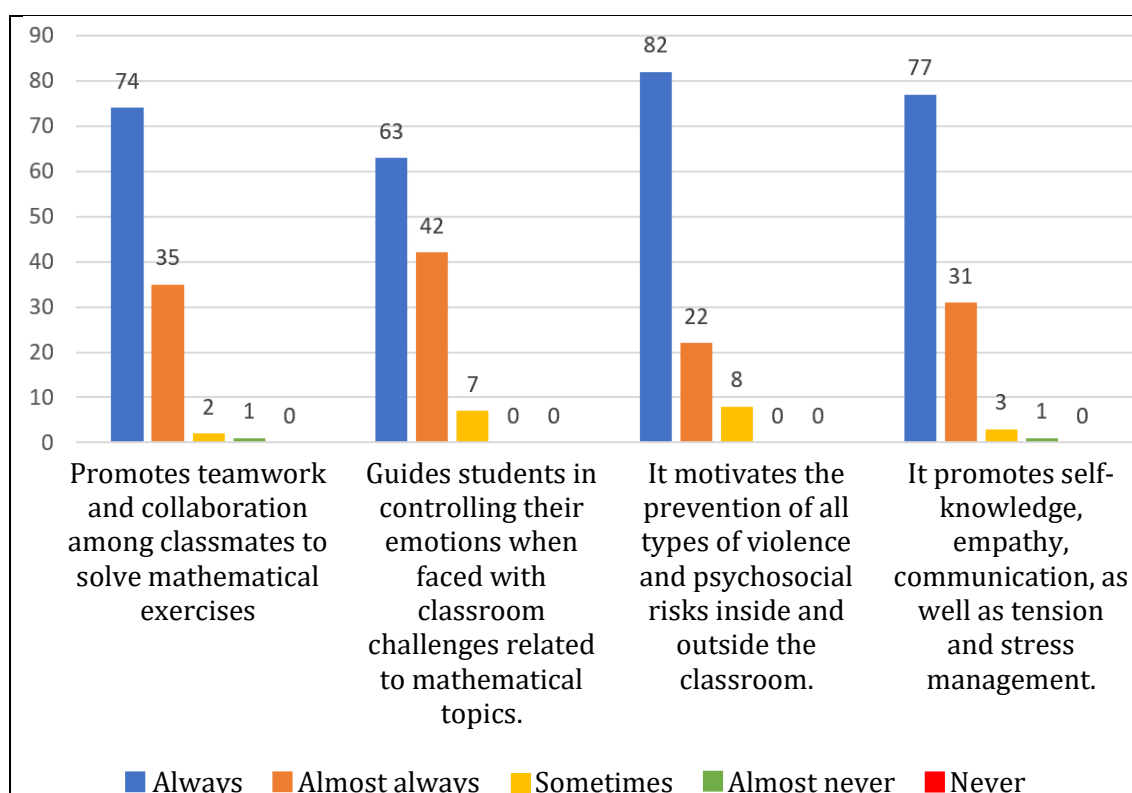


Figure 5. Application of socio-emotional competencies. Adapted from: (Lima, 2024, p. 71)).

These values show that, in this research, according to the 112 teachers surveyed, the extent to which teachers promote socio-emotional competencies in the teaching and learning process of mathematics is very high, because in all sub-items between 103 and 112 teachers surveyed, that is, between 92% and 100%, always and almost always conduct their classes encouraging teamwork and collaboration, self-knowledge, empathy, guiding the control of emotions and motivating the prevention of violence, with the aim of contributing to the socio-emotional development of their students in the context of learning mathematics..

4.2 Analysis and interpretation of the results of the form

The textbooks analyzed in this study were: Student Textbook for 2nd Year of High School Mathematics (Alfa), provided free of charge by the Ministry of Education, and the book, Culture and Mathematical Ingenuity (Beta), published by Santillana. Both textbooks were



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used during the 2023-2024 school year, and their content related to the limit of a function was analyzed, obtaining results in the three stages of the MALTm methodology.

4.2.1 First stage: reference data from the textbook

The following characteristics are observed in the Mathematics textbooks: it lists the author(s), the publisher, the year of publication, the place of publication, the availability of free textbooks, and the Ministry of Education's curriculum certification.

Table 4 shows that the Alfa textbook meets all six items in the first stage, giving it a score of 18. The Beta textbook, on the other hand, meets four items, but since it is neither free (item 5) nor certified by the Ministry of Education (item 6), it obtained a score of 14.

The results obtained in this research show that the Alfa textbook, by meeting all the evaluated items, is an option aligned with the official curriculum and equitably accessible to students, obtaining 18 points. In contrast, the Beta textbook, since it is neither free nor certified by the Ministry of Education, obtained 14 points, suggesting that, although it may be a complementary resource, it is not officially validated for use in the public education system. This highlights the importance of certification and accessibility in the selection of teaching materials.

Ítem	Alfa book		PI	PO	Beta book		PI	PO
	Yes 3	No 1			Yes 3	No 1		
1	x		3	3	x		3	3
2	x		3	3	x		3	3
3	x		3	3	x		3	3
4	x		3	3	x		3	3
5	x		3	3		x	3	1
6	x		3	3		x	3	1
Subtotal			18	18	Subtotal		18	14

Table 4. Reference data for mathematics textbooks

4.2.2 Second stage: general outline of the textbook

The following characteristics are observed in the mathematics textbooks: they present the general objective, the author's objective(s), the general objectives of the national curriculum, a table of contents, a profile of the Ecuadorian high school graduate, the didactic organization of the units, icons to identify specific activities, knowledge assessment guidelines, the technological resources used, a bibliography, and the topic to be analyzed is included in the content. Table 5 shows that both textbooks analyzed achieve a PO of 22 out of 30. From items 7 to 16, the textbooks agree on the aspects they include and those they omit. However, there is a difference in item 17, which does not have an assigned score. However, it is determined that the Alpha textbook does not address the limit of a function, while the Beta textbook does.

The results obtained in this research indicate that both textbooks have a similar didactic structure and meet most of the criteria analyzed. However, a key difference is that the Alfa book, published by the Ministry of Education, does not address the limit of a function, while the Beta book, published by Santillana, does. Since both texts are aimed at second-year high school students, this difference is significant, as the limit of a function is a fundamental concept in the mathematics curriculum. This suggests that, although the Alfa book is the



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official material, it may not be sufficient to address all the required content, highlighting the importance of complementing teaching with other resources.

Ítem	Alfa book		PI	PO	Beta book		PI	PO
	Yes 3	No 1			Yes 3	No 1		
7		x	3	1		x	3	1
8		x	3	1		x	3	1
9		x	3	1		x	3	1
10	x		3	3	x		3	3
11		x	3	1		x	3	1
12	x		3	3	x		3	3
13	x		3	3	x		3	3
14	x		3	3	x		3	3
15	x		3	3	x		3	3
16	x		3	3	x		3	3
	Subtotal		30	22	Subtotal		30	22
17	Si	No x			Si	No x		

Table 5. General outline of mathematics textbooks

4.2.3 Third stage: conceptual analysis

The following activities are observed in Mathematics textbooks to promote the application of the prioritized curriculum competencies.

Communication skills (CC) include readings with examples and appropriate language; spaces for writing texts or summaries; and materials that stimulate reflection, critical and complex thinking, awareness, creativity, and the construction of new knowledge in students. Additionally, activities are included in which students communicate problem-solving processes through the effective use of language, both oral and written, with relevance and fluency.

Mathematical skills (MC) include activities to use and relate real numbers and their operations; employ formal mathematical language; work with different forms of representation (numerical, graphical, algebraic, and verbal); encourage logical and reasoned reasoning; relate mathematics to different contexts of everyday life; and promote awareness, responsibility, and critical analysis in the context of mathematical processes.

Digital skills (CD) include activities that enable the development of computational thinking. Activities to identify, define, and solve problems through the responsible use of mathematics-related software; activities in which students analyze and build mathematical knowledge through the use of ICTs (presentations, videos, web pages, simulators); and activities aimed at promoting digital responsibility.

In socio-emotional competencies (SC), activities are presented to promote self-knowledge, empathy, assertive communication, emotional management, collaboration, positive relationships, decision-making, as well as problem-solving and conflict management from a socio-emotional perspective.



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Table 6 shows that the Alpha book does not address the topic of the limit of a function, while the Beta book does, albeit partially. The latter obtains a score of 3 in items 19, 20, and 21, which focus on communication skills; in two of the six items related to mathematical skills; in items 33 and 35, which address digital skills; and in items 39, 41, 42, and 43, which refer to socio-emotional competencies, achieving a PO of 49 out of 81. In the other items, like the Alfa book, it does not meet the assessed aspects. Thus, the Alfa book achieves a PO of 9 out of 81.

Competencies	Ítem	Alfa book				Beta book			
		Yeas 3	No 1	PI	PO	Yes 3	No 1	PI	PO
CC	18		X	3	1		x	3	1
	19		X	3	1	x		3	3
	20		X	3	1	x		3	3
	21		X	3	1	x		3	3
	22		X	3	1		x	3	1
	23		X	3	1		x	3	1
	24		X	3	1		x	3	1
	25		X	3	1		x	3	1
CM	26		X	3	1		x	3	1
	27		X	3	1		x	3	1
	28		X	3	1		x	3	1
	29		X	3	1	x		3	3
	30		X	3	1	x		3	3
	31		X	3	1		x	3	1
CD	32		X	3	1		x	3	1
	33		X	3	1	x		3	3
	34		X	3	1		x	3	1
	35		X	3	1	x		3	3
CS	36		X	3	1		x	3	1
	37		X	3	1		x	3	1
	38		X	3	1		x	3	1
	39		X	3	1	x		3	3
	40		X	3	1		x	3	1
	41		X	3	1	x		3	3
	42		X	3	1	x		3	3
	43		X	3	1	x		3	3
	44		X	3			x	3	1
		Subtotal		81	27	Subtotal		81	49

Table 6. Curriculum competencies prioritized in mathematics textbooks

The conceptual analysis of communication, mathematical, digital, and socio-emotional competencies in the Alpha and Beta textbooks reveals that, although both textbooks have similar subscores, the Beta textbook outperforms the Alpha textbook in several aspects. Beta includes more activities that encourage reflection, critical thinking, the creation of reading-based texts, different forms of representation (numerical, graphical, algebraic, and verbal), logical and reasoning, the development of computational thinking, the analysis and design of mathematical content using ICT, as well as assertive communication, collaboration, positive relationships, and decision-making.



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However, both textbooks are significantly lacking in activities related to the curriculum competencies. This suggests that neither textbook fully meets the curriculum's objectives in terms of competency development, especially in the context of the boundary topic of a function.

4.2.4 Level of Compliance with Curriculum Competencies Prioritized by Mathematics Textbooks

In this research, the compliance level is considered a percentage obtained from the evaluation of specific content in a mathematics textbook using the MALTm methodology. To obtain this value, the score obtained (SO) is added, multiplied by one hundred (100), and divided by the sum of the ideal score (IS). Table 7 shows the results obtained from the application of the worksheet to mathematics textbooks for second-year high school students. In order to qualify the numerical results obtained from the application of the worksheet, for this research, the same qualitative description of the questionnaire (Table 3) is considered. It was determined that the Ministry of Education textbook (Alfa) obtained a compliance level of 52%, which is evaluated as low, while the Santillana Publishing House textbook (Beta) obtained a level of 66%, which is evaluated as medium.

Ítem 1 al 44	Alfa book		Beta book	
	PI	PO	PI	PO
Total	129	67	129	85
Percentage compliance level	100%	52%	100%	66%
Qualitative description	Low level		Medium level	

Table 7. Qualification of numerical results for the record

These values highlight the need to design teaching activities that enable the achievement of the competencies of the prioritized curriculum in the Ministry of Education's textbook for the second year of high school. Likewise, in the textbook used by private institutions (Beta), there is a need to improve and enhance activities in order to further promote the communication, mathematical, digital, and socio-emotional competencies of the prioritized curriculum.

4.3 Discussion of the results

The research evaluated the contextualization and relevance of the curriculum in second-year high school mathematics teaching, revealing that between 92% and 100% of the teachers surveyed relate the content to everyday life and other subjects, adapting their lessons to students' needs and interests. This finding confirms a strong ownership of the prioritized curriculum, in line with Barrios (2016), who emphasizes the importance of a structured and contextualized curriculum to promote meaningful learning. However, it is important to reflect on how this contextualization translates into concrete learning outcomes, given that adaptation to varied contexts can present challenges to the uniformity of educational quality.

Regarding the development of communication skills, teachers report fostering these skills in a range between 80% and 91%, promoting oral expression, reading comprehension, and the use of mathematical language. While teacher perceptions are positive, studies such as Toalombo (2021) and the INEVAL (National Institute of Statistics and Censuses)'s "Being a Student 2023" report show real deficiencies in students' verbal skills, which could indicate a discrepancy between teacher perceptions and student



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performance. This gap raises the need to investigate additional factors such as teacher training, applied pedagogical strategies, and the classroom environment that impact communication development in mathematics.

Analysis of the development of mathematical competencies shows that between 92% and 100% of teachers encourage the explanation of concepts, problem-solving, and critical thinking—essential practices for logical reasoning. However, the low achievement levels reported by INEVAL suggest that these efforts, although relevant, may not be sufficient to overcome learning challenges. This invites critical reflection on the effectiveness of the methodologies employed and the possible impact of external factors such as infrastructure, resources, and institutional support. Regarding digital skills, there is evidence of medium use of technological tools (64% to 79%), revealing a significant area for opportunity. Although it is worth noting that a considerable proportion of teachers use ICTs responsibly and recognize their importance, the average level of digital integration indicates the need to strengthen teacher training and support for more effective implementation of technologies that enhance mathematical learning.

Regarding the development of socio-emotional skills, this is perceived as a strengthened aspect, with 92% to 100% of teachers promoting teamwork, emotional control, and violence prevention, key aspects for comprehensive learning. This commitment coincides with Mina et al. (2023), who identify socio-emotional skills as the most accessible for teaching practice. However, it is important to explore how these skills impact academic performance and student motivation in the long term.

To conclude this discussion of results and with the aim of evaluating the fulfillment of communication, mathematical, digital, and socio-emotional competencies in Mathematics textbooks for second-year high school, specifically in the concept of the limit of a function. When comparing the results obtained with those of Acaro (2020), who analyzed textbooks for first and third years of high school, it is concluded that the official texts of the Ministry of Education, for the most part, present the dynamic conception of the limit. In contrast, the Santillana publishing house textbook for second-year high school shows both a dynamic and metric conception. In this analysis, the Maya publishing house textbook (2023) for second-year high school does not address the topic of the limit of a function, resulting in low compliance with the established indicators. On the other hand, the Santillana (2023) textbook for second-year high school shows an average level in the application of communication, mathematical, digital, and socio-emotional competencies. With these results it can be seen that the mathematics textbooks for second year of high school, with respect to the application of communication, mathematical, digital and socio-emotional skills of the prioritized curriculum, have on average a low level.

5. Conclusions

This research demonstrated that second-year science teachers perceive a contextualized and relevant application of the prioritized curriculum in teaching Mathematics. This contextualization favors the integration of content with everyday life and other subjects, promoting more meaningful and inclusive learning, regardless of the type of educational institution.



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One of the main contributions of the study is confirming that teachers promote the development of communication, mathematical, and socioemotional skills at high levels, which suggests a clear appropriation of the prioritized curriculum's approaches. However, the integration of digital skills still presents challenges, highlighting the need to strengthen teacher training in the pedagogical use of technologies. The analysis of textbooks, especially on the topic of the limit of a function, reveals that, although there has been partial progress, compliance with the prioritized curriculum criteria is still limited. This highlights the need to review and update teaching materials to ensure adequate coverage of the established content and skills. As a future line of research, comparative studies between teacher perceptions and student performance in mathematics are recommended to verify the real impact of the prioritized curriculum. It would also be valuable to analyze curriculum implementation at other educational levels and areas of knowledge, as well as to delve deeper into the design of innovative teaching strategies that effectively integrate digital skills.

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