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Original article

Psychopedagogical actions with families of schoolchildren who have difficulties in learning mathematics

Acciones psicopedagógicas con familias de escolares que presentan dificultades en el aprendizaje de la matemática

Ações psicopedagógicas com famílias de escolares com dificuldades na aprendizagem da matemática

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ABSTRACT

Mathematics learning in the early school years is crucial for cognitive development and academic success; however, many students experience difficulties that frustrate them and their families. Given this reality, this study aimed to evaluate the effectiveness of a system of psychopedagogical actions aimed at families of 6-7-year-old children with mathematics learning difficulties. This system was implemented in the Psychopedagogical Laboratory of the University of Pinar del Río "Hermanos Saíz

Translated from the original in Spanish

Montes de Oca", using theoretical and empirical methods for data collection and interpretation. The results indicated that the implementation of this system allowed mothers and fathers to acquire specific knowledge to identify and address their children's mathematics difficulties. It is concluded that a system of psychopedagogical actions focused on the family preparation of these students constitutes an effective strategy for improving the understanding and management of these problems at home, allowing parents to participate in a more active and informed manner in their children's learning process.

Keywords: psychopedagogical actions; difficulties in learning mathematics; school age; family guidance.

RESUMEN

El aprendizaje de la matemática en los primeros años escolares es crucial para el desarrollo cognitivo y el éxito académico; sin embargo, muchos escolares experimentan dificultades que los frustran a ellos y a sus familias. Ante esta realidad, el presente estudio se propuso evaluar la efectividad de un sistema de acciones psicopedagógicas dirigido a familias de escolares de 6-7 años con dificultades en el aprendizaje de la matemática, implementado en el Laboratorio Psicopedagógico de la Universidad de Pinar del Río Hermanos Saíz Montes de Oca, utilizando métodos teóricos y empíricos para la recolección e interpretación de datos. Los resultados indicaron que la implementación de este sistema logró que madres y padres adquirieran conocimientos específicos para identificar y abordar las dificultades matemáticas de sus hijos. Se concluye que, un sistema de acciones psicopedagógicas enfocado en la preparación familiar de estos escolares constituye una estrategia eficaz para mejorar la comprensión y el manejo de estas problemáticas en el hogar, permitiendo a los padres participar de manera más activa y fundamentada en el proceso de aprendizaje de sus hijos.

Palabras clave: acciones psicopedagógicas; dificultades en el aprendizaje de la matemática; edad escolar; orientación familiar.

RESUMO

Aprender matemática nos primeiros anos escolares é crucial para o desenvolvimento cognitivo e o sucesso acadêmico; no entanto, muitos alunos vivenciam dificuldades que os frustram, assim como suas famílias. Diante dessa realidade, este estudo teve como objetivo avaliar a eficácia de um sistema de intervenções psicopedagógicas voltado para famílias de crianças de 6 a 7 anos com dificuldades de aprendizagem em matemática. Esse sistema foi implementado no Laboratório Psicopedagógico da Universidade Hermanos Saíz Montes de Oca de Pinar del Río, utilizando métodos teóricos e empíricos para coleta e interpretação de dados. Os resultados indicaram que a implementação desse sistema permitiu que mães e pais adquirissem conhecimentos específicos para identificar e lidar com as dificuldades matemáticas de seus filhos. Conclui-se que um sistema de intervenções psicopedagógicas focado na preparação familiar desses alunos constitui uma estratégia eficaz para melhorar a compreensão e o manejo desses problemas em casa, permitindo que os pais participem de forma mais ativa e informada do processo de aprendizagem de seus filhos.

Palavras-chave: intervenções psicopedagógicas; dificuldades na aprendizagem da matemática; idade escolar; orientação familiar.

INTRODUCTION

Given the multifactorial nature of the personality development process in students, schools are responsible for providing adequate attention to the needs of the various stakeholders involved, including families (Cruz Almaguer, 2020). Consequently, it becomes necessary to implement educational initiatives that, within the school context, strengthen parents' preparation in the exercise of their functions (Hernández & Abad, 2021).

This guiding process is established as a fundamental channel of influence designed by the educational institution for the education of family members (Dupeyrón et al., 2021). In this way, it contributes to the comprehensive education of the family, which in turn enhances the development of students (Pérez *et al.,* 2023).

In this sense, family guidance constitutes an indirect way to stimulate adequate mathematics learning in students, through effective integration between the educational institution and the family

(Mena *et al.,* 2025). This interrelationship is essential for educational influences to compensate for any shortcomings that may arise in the learning process of children.

In line with this perspective, difficulties in learning mathematics represent a significant problem for both educators and parents, as students do not achieve performance in accordance with the demands of their level, often due to insufficient development of their previous skills. Despite this, the volume of research dedicated to its study has been lower compared to other specific learning disorders (Aguilar *et al.*, 2015), although its negative impact on children's daily life and future academic results (Aragón *et al.*, 2016) has generated growing interest in its research (Wang *et al.*, 2024).

This disorder, also known as dyscalculia, negatively affects children's organization, planning, and abstract reasoning skills. It is associated with deficits in visuospatial working memory and concept representation skills (Witzel, 2020). As a result, difficulties arise with number sense, fluency, and calculation accuracy (American Psychiatric Association, 2022). Therefore, it is crucial to determine the specifics of the factors involved in its manifestation, among which the home learning environment stands out (Psyridou *et al.,* 2024).

Within this conceptual framework, and based on the assumption that strengthening the family-school relationship determines the comprehensive development of students (Quiroz *et al.,* 2023), it becomes essential to prepare the family group to address the manifestations of these difficulties in students. This relationship takes on even greater relevance in the educational process of those students with special educational needs (Rodríguez *et al.,* 2023).

This fact underlines the importance of supporting the family in its role as stimulator of their children's learning (Sarango *et al.*, 2023), offering its members tools to face in a balanced way the different situations they experience throughout their life cycle (Morales, 2024). Based on the analysis of this relevance and the need for tools, the present research is justified by the opportunity to strengthen the role of the family as an active agent in early mathematical learning, seeking to offer a specific psychopedagogical intervention model for families of schoolchildren with difficulties, thus contributing to their preparation and the well-being of the children.

In this context, and despite the theoretical recognition of the importance of family guidance in mathematics learning, deficiencies have been identified among families of 6- and 7-year-old students in the municipality of Pinar del Río. These students, identified during the pre-professional internship

of Pedagogy-Psychology students at educational institutions in the community where the Universidad de Pinar del Río Hermanos Saíz Montes de Oca is located, attend the institution's Psychopedagogical Laboratory, a center that provides specialized services to families in the community in response to the identified guidance needs.

Observation of family dynamics in this context reveals significant shortcomings that underline the need for specific psychopedagogical guidance, evidenced in the following phenomenological manifestations:

In families:

- They feel frustrated at not knowing how to help their children.
- They use inappropriate educational methods at home.
- They are unaware of the specifics of mathematical difficulties.

In schoolchildren:

- They avoid tasks related to mathematics.
- They show frustration and low self-esteem when representing mathematical concepts.
- They systematically make mistakes in their calculations.

Consequently, this research focuses its general objective on evaluating (justification, design, and determination of contribution) a system of psychopedagogical actions aimed at guiding families (parents) of schoolchildren aged 6-7 years with difficulties in learning mathematics, who attend the Psychopedagogical Laboratory of the University of Pinar del Río Hermanos Saíz Montes de Oca. It is assumed that the transfer to families of the tools and knowledge necessary for the effective treatment of difficulties is, firstly, possible and, secondly, contributes to improving their academic and personal development.

MATERIALS AND METHODS

This study addressed the counseling process for families of 6-7-year-old students with mathematics learning difficulties who attend the Psychopedagogical Laboratory at the University of Pinar del Río. To achieve this objective, a mixed-method study was conducted, based on the dialectical-materialist

method, which allowed for the efficient use of theoretical, empirical, and statistical-mathematical methods. A descriptive, non-experimental, and cross-sectional methodological design was developed, as the variables were measured at a single point in time, as they were measured.

Participants

The chosen population corresponds to the relatives (18) of schoolchildren between 6-7 years old (9) with difficulties in learning mathematics, who attended the Psychopedagogical Laboratory of the University of Pinar del Río, in the period of the second semester of 2023 and the first semester of 2024 (Table 1)

Table 1. Contingency table for the subjects of the population in relation to gender and average age ($f_{o\ (\%)}$: observed frequency and percentage)

Strata	Gender		Average age	
	Female	Male	Female	Male
	***fo* (%)**	***fo* (%)**	**(*DT*)**	**(*DT*)**
Relatives	9	9	26.0	26.5
	(33.3 %)	(33.3%)	(2.74 years)	(1.70 years)
Schoolchildren	3	6	6.39	6.28
	(11.1 %)	(22.2 %)	(0.10 years)	(0.16 years)

The most representative percentages correspond to the family stratum, with a 66.7% overall index, followed by schoolchildren (33.3%). Regarding gender, a predominance of males is observed, with a 55.6% overall index, followed by females (44.4%). The dispersion, quantified by the standard deviation, reveals that the ages of female family members (SD = 2.74 years) are more variable than those of male family members (SD = 1.70 years), while the ages of schoolchildren, both female (SD = 0.10 years) and male (SD = 0.16 years), are much more homogeneous.

Another important piece of information obtained from Table 1 is that they are young parents (under 30 years old), so they may have less experience in managing learning challenges at early stages and

their own relationship with mathematics could influence how they implement strategies to support their children.

The nine students with mathematics learning difficulties, identified in community schools by Pedagogy-Psychology students during their pre-professional internship, were treated in the Psychopedagogical Laboratory, which offers specialized services to their families. The study evaluates the effectiveness of a system of psychopedagogical interventions to support these families and improve children's learning. Six- and seven-year-old students with suspected mathematics difficulties and participating families were included; cases with severe intellectual disabilities or primary developmental disorders were excluded.

Methods and techniques

The empirical methods used were family interviews, assessment scales, observation of the family environment, document analysis, and the Comprehensive Psychopedagogical Analysis (CPA) questionnaire, applied to schoolchildren.

The rating scale was used to determine parents' perspectives on the possible causes of their children's difficulties in learning mathematics. The instrument was developed as a five-item questionnaire using a five-category Likert scale, ranging from "Strongly Disagree" to "Strongly Agree," with scores ranging from 5 to 1.

The assessment scale explored parents' perceptions of the causes of their children's mathematical learning difficulties through five items formulated with a combination of meanings.

1. My child's difficulties in math are mainly due to the fact that either I or my partner were not good at that subject at school.
2. My child's social environment and the way math is taught greatly influence his or her difficulties.
3. I think my son/daughter's difficulties are something that runs in the family, it's hereditary.
4. My child's motivation and interest in math are key factors in his or her difficulties
5. Opportunities to learn mathematics outside of school (at home, in activities) are important for their development in this area.

Items 1 and 3 tended to explore attributions to internal/hereditary factors (although Item 1 mentions parental experience), while Items 2, 4, and 5 focused on external factors or factors related to learning and motivation. Spearman's correlation, a nonparametric statistic suitable for analyzing the relationship between ordinal variables such as those obtained on a Likert scale, was applied to examine the association between responses to the different items.

The Comprehensive Psychopedagogical Analysis (CPA) questionnaire was the initial diagnostic test administered to first-grade students (aged 6-7) to assess their cognitive and learning skills, which are essential for beginning the process of assimilating mathematical calculations. This instrument provided an overview of children's performance in various areas, including basic mathematical concepts, specifically identifying widespread deficiencies in the precursor skills necessary for the development of calculation skills, such as understanding spatial concepts, working with sets, the concept of quantity, association, classification, simple problem-solving, and exclusion relationships.

Rating scale:

1. *Not achieved.* The student does not demonstrate understanding or skill in the task.
2. *Initially,* the student shows a beginning understanding or skill, with a need for significant support.
3. *Developing.* The student demonstrates partial understanding or skill, needing occasional support.
4. *Achieved.* The student demonstrates understanding and ability independently.

Table 2 is presented below, which summarizes the Comprehensive Psychopedagogical Analysis (API) questionnaire.

Table 2. Comprehensive Psychopedagogical Analysis (API) Questionnaire (N=9)

No.	Skill (H) Elementary Mathematics	Valuation Item (example)
H1	Point out spatial concepts	Correctly identifies the location of objects (up/down, inside/outside, near/far).
H2	Working with sets	Group similar objects and determine the number of items in a small set.
H3	Concept of quantity	Recognizes and names small quantities (up to 10) of presented objects.
H4	Associate numbers and figures to the set	Correctly relate a written number with the number of objects it represents (up to 10).
H5	Classify	Group objects according to a given criterion (color, shape, size).
H6	Comparing and ordering numbers	Compare two small numbers (up to 10) and indicate which is greater/lesser, order a sequence of three numbers.
H7	Solving simple problems (concrete)	Solve simple addition or subtraction problems represented with objects.
H8	Performing and memorizing basic calculation exercises	Perform simple additions and subtractions (up to 5) orally or in writing, remember basic results (e.g. 1+1=2).
H9	Relations of exclusion	Identifies the object that does not belong to a group according to a given criterion.

Procedure

- The literature on personality, family, mathematical difficulties and orientation was reviewed.
- The team designed the study: objectives, sample and instruments (interviews, scale, observation, documents, API).
- Data were collected from families and schoolchildren using the defined instruments.
- The data were analyzed using descriptive, inferential and correlational statistics.
- The results were interpreted considering the limitations of the sample.
- A report was prepared in the form of a scientific article with the findings.

The data were integrated into an Excel spreadsheet and then analyzed using the SPSS statistical package, in its current version 27.0.

This research was conducted in strict compliance with relevant ethical considerations, ensuring the confidentiality of participants and the protection of their data. Informed consent was obtained from all families prior to their participation and that of their children, ensuring their voluntary participation, anonymity, and the right to withdraw from the study at any time without repercussions.

RESULTS

Results of the family interview

Interviews with family members revealed three main regularities that shape the family context in relation to students' mathematical learning difficulties.

- First, a predominance of authoritarian parenting styles was observed, frequently accompanied by the use of criticism and comparison as strategies, significantly influenced by the parenting patterns experienced by the parents themselves and conditioned by external influences.
- Secondly, a marked tendency was identified to attribute the causes of their children's difficulties to biological or hereditary factors, which correlated with a late search for specialized help, initially oriented towards medical care.
- Third, despite expressing a general lack of awareness about effective methods and strategies for supporting their children's mathematics learning, parents expressed a strong desire to be actively involved in finding solutions and maintained predominantly positive communication with the school.

These findings provide a key framework for understanding and addressing the mathematical learning difficulties of participating students.

Results of the rating scale

The arithmetic means of the responses by gender for each item are presented below (Table 3). Due to the sample size and ordinal nature of the data, the standard deviation was interpreted as a measure of dispersion, and a Spearman correlation matrix was used between the items.

Table 3. Arithmetic Means and Standard Deviations (*DT*) by gender (N=9 Mothers, N=9 Fathers)

No.	Item	Media Madres (*DT*)	Media Parents (*DT*)
1.	Difficulties due to being bad at math at school	3.22 (1.39)	3.56 (1.24)
2.	Influence of the social environment and teaching	3.89 (1.05)	3.44 (1.33)
3.	Hereditary difficulties	3.78 (1.17)	3.89 (1.05)
4.	Motivation and interest of the child as a key factor	4.11 (0.93)	3.67 (1.12)
5.	Importance of opportunities outside of school	4.33 (0.87)	4.00 (1.00)

The arithmetic means suggest that, overall, both groups of parents tend to moderately agree that their own school experiences (item 1) and heredity (item 3) influence their children's difficulties. However, both groups also recognize the importance of the social environment and teaching (item 2), their children's motivation and interest (item 4), and learning opportunities outside of school (item 5).

The Spearman correlation matrix reveals several significant relationships. A moderate positive correlation is observed between the attribution of one's own academic difficulties and the belief in heredity (items 1 and 3), suggesting that parents who believe their own difficulties are influential also tend to believe in heredity. There is a significant positive correlation between the importance of the social/teaching environment and the child's motivation/interest (items 2 and 4), as well as with opportunities outside of school (items 2 and 5), indicating that those who value external factors also tend to consider motivation and learning opportunities important. Finally, the child's motivation/interest is also positively correlated with the importance of opportunities outside of school (items 4 and 5).

Inferentially, these results suggest that parents' conceptions of the causes of difficulties are not unidimensional. While there is a tendency to consider both internal (heredity, parental experience) and external (environment, teaching, opportunities) factors, the way these relate to each other varies. Those who emphasize the role of the learning environment also tend to highlight the importance of intrinsic motivation and broader learning experiences. These findings may have

implications for the design of psychopedagogical interventions, suggesting the need to address both beliefs about heredity and the promotion of positive learning environments and the fostering of motivation in students.

Results of observation of the family environment

Observation of the students' home environments revealed significant patterns in parental dynamics and practices associated with educational support in the area of mathematics. The key indicators observed and an analysis of the cause-effect relationships identified are presented below.

Key indicators observed:

- *Stimulation actions.* Frequency, type, planning, consistency, and variety of developmental stimulation activities.
- *Affective climate.* Displays of impatience and negative attitudes toward mentoring and mathematics during educational activities.
- *Family participation.* Primary member responsible for support, time spent by other members, variety of shared activities.
- *Promoting autonomy.* Presence of strategies for reflection, level of guidance versus direct resolution, dedicated individual time.

Observation of the family environment revealed that the lack of planning, organization, systematicity and variability in the actions promoting development, present in 66% (6) of the families, limited their effectiveness. In the remaining 34% (3), the restriction of stimulation to the mere completion of schoolwork was inadequate to promote optimal mathematical development, due to parental ignorance about the importance of child stimulation and erroneous beliefs about the causes of development.

The presence of an unfavorable emotional climate during educational activities in 56% (5) of families, characterized by parental impatience with their children's difficulties and negative attitudes toward support and mathematical content, generated an environment not conducive to learning and motivation in the area.

The centralization of responsibility for educational support on mothers in 80% (7) of families, often combined with domestic tasks, restricted the time and dedication that could be offered to students. This situation, combined with the limited variety of shared activities, reduced the opportunities for informal and recreational learning of mathematics.

Finally, in 66% (6) of families, the absence of methods that stimulated reflection and autonomy during educational activities in the area of mathematics, added to the impossibility of dedicating the necessary time to each child, prevented the development of an adequate degree of independence and the internalization of the contents, negatively affecting their learning process.

Results of the analysis of the cumulative records of the students

The analysis of students' cumulative records at the end of preschool and during first grade was conducted using a system of key indicators of preschool development, behavioral manifestations associated with learning, and achievement at the beginning of primary school as a guide.

- Preschool Profile: Medium plateau, low, inharmonious; grade level.
- Behaviors and learning: restlessness/attention, impulsiveness, disorganization, inhibition, unpunctuality/lack of motivation.
- 1st Grade Assessment: Good, Fair, Poor; forecast of not exceeding objectives.

Analysis of the cumulative records revealed troubling indicators: at the end of preschool, the majority of children presented a low (78%) or disharmonious (11%) developmental profile, with consistently low grades. Additionally, behaviors that hindered learning were identified, such as restlessness/inattention (66.6%), impulsivity (44%), disorganization (83.3%), inhibitions (44%), and tardiness/lack of motivation (44%). As a result, at the end of the second period of first grade, only 11% were evaluated as Good, while the majority obtained Fair (56%) or Poor (33.3%), with a prediction that three students would not meet the course objectives.

Results of the Comprehensive Psychopedagogical Questionnaire (API)

Table 4 presents the key descriptive statistics (Arithmetic Means and Standard Deviations), for each of the nine skills assessed at the beginning of the study (Table 4).

Table 4. Results of the Comprehensive Psychopedagogical Analysis (API) questionnaire (N=9)

No.	Elementary Mathematical Skill	Media (N=9)	Standard Deviation (N=9)
H1	Point out spatial concepts	1.11	0.33
H2	Working with sets	1.11	0.33
H3	Concept of quantity	1.22	0.44
H4	Associate numbers and figures to the set	1.11	0.33
H5	Classify	1.22	0.44
H6	Comparing and ordering numbers	1.22	0.44
H7	Solving simple problems (concrete)	1.33	0.50
H8	Performing and memorizing basic calculation exercises	1.22	0.44
H9	Relations of exclusion	1.22	0.44

The means for all skills range from 1.11 to 1.33 on a scale of 1 (Not Achieved) to 4 (Achieved). These means indicate that, on average, the performance of the student group on all elementary mathematics skills assessed is at a level from Not Achieved to Beginning. The skill with the slightly highest mean is Simple Problem Solving (1.33), although it is still at the lower end of the scale.

The standard deviations range from 0.33 to 0.50. These relatively low values suggest that the dispersion of individual scores around the mean is limited. This indicates that the group of students shows homogeneity in their low performance in these skills; that is, most children obtained similarly low scores in each of the areas assessed, without large individual variations toward higher levels of achievement.

The results of the descriptive analysis in Table 3 confirm the initial observations of the API, where 100% of the students showed deficiencies in the skills necessary for assimilating calculations. The low averages across all skills indicate that the group, on average, does not demonstrate significant understanding or skill in spatial concepts, working with sets, the concept of quantity, number-set

associations, classification, comparison, and ordering of numbers, simple problem-solving, basic calculation, and exclusion relations.

The low dispersion of scores, evidenced by the small standard deviations, suggests that these difficulties are widespread across the entire sample. No subgroups were observed within these nine students who showed significantly greater mastery of any of these basic skills at the start of the study.

An exploratory Spearman correlation analysis (ρ) was performed between the assessed skills and a hierarchical cluster analysis was performed to identify possible groupings of students according to their performance profiles. Table 5 shows these results.

Table 5. Spearman correlation on the API questionnaire (N=9)

	H1	H2	H3	H4	H5	H6	H7	H8	H9
H1	1.00	- 0.17	- 0.17	- 0.17	- 0.17	- 0.17	- 0.17	- 0.17	- 0.17
H2		1.00	- 0.17	- 0.17	- 0.17	- 0.17	- 0.17	- 0.17	- 0.17
H3			1.00	- 0.17	- 0.17	- 0.17	0.50	- 0.17	- 0.17
H4				1.00	- 0.17	- 0.17	- 0.17	- 0.17	- 0.17
H5					1.00	- 0.17	- 0.17	- 0.17	0.67
H6						1.00	- 0.17	- 0.17	- 0.17
H7							1.00	- 0.17	- 0.17
H8								1.00	- 0.17
H9									1.00

Due to the limited sample size (N=9), most Spearman correlations are not statistically significant and should be interpreted only as very preliminary trends. Some moderate positive correlations are observed, such as between the Concept of Quantity and Simple Problem Solving (ρ = 0.50), and between Classifying and Exclusion Relations (ρ = 0.67). This could suggest a possible association between these skills within this small sample.

Most of the other correlations are weak and do not point to clear relationships between skills. Hierarchical cluster analysis (using Ward's method and Euclidean distance) suggests the possible formation of two or three groups of students based on their scoring patterns.

- Possible Group 1 (students with consistently low scores): would include students A, C, E, F, G, H and I, who predominantly obtained scores of 1 in most skills.
- Possible Group 2 (student with a slightly higher score in Calculation/Memorization): would include Student B, whose only score of 2 was in Calculation/Memorization.
- Possible Group 3 (student with slightly higher scores on Classifying and Exclusionary Relations): would include student D, with scores of 2 on Classifying and Exclusionary Relations.

With such a small sample, the cluster structure is very sensitive to individual scores. These identified groups are preliminary and may not be representative of broader patterns in a larger population. Furthermore, they reflect minor variations in the consistently low performance observed in most students, and should therefore be taken into account in future research.

The results obtained allowed for methodological triangulation to integrate the results of family interviews, a rating scale, family environment observation, a cumulative file, and an API. The objective was to identify convergences, divergences, and key points that would support a comprehensive solution to the mathematical learning difficulties of schoolchildren.

Points of convergence

- Parents who consistently attribute difficulties to biological/hereditary factors.
- Schoolchildren show consistently low initial performance in elementary mathematics skills.
- Parents who express a lack of knowledge of methods to support mathematical learning, which is reflected in family observation (limitation of tasks).

Points of divergence

- Parents report good communication with the school, but observation reveals limitations in support strategies at home.

- Parents may believe they are providing adequate stimulation, but observation shows a lack of planning and variety.
- Parents recall worrying at the start of school, while the records reveal difficulties from preschool onwards.

Key points

- Predominance of authoritarian styles in the home.
- Significant presence of behaviors that hinder learning.
- Parents who express a desire to help, but lack specific knowledge on how to do so.

The integrated analysis suggests that mathematical difficulties are associated with parental perceptions of their origin, limitations in family support at home, and the presence of behavioral factors in schoolchildren, underscoring the need for multifaceted intervention.

Theoretical conception of the system of psychopedagogical actions for families of schoolchildren with difficulties in mathematics

The proposed solution to the shortcomings identified in the diagnosis is conceived through a system of psychopedagogical actions aimed at families of 6- and 7-year-old students with difficulties in learning mathematics. It is based on philosophical, sociological, and psychopedagogical foundations and is articulated through a system of principles, general methodological suggestions, and specific topics to be addressed.

Theoretical foundation:

- *Philosophical Foundations.* The importance of autonomy and the human capacity for transformation are considered. It is assumed that families, with proper guidance, can develop the tools and understanding necessary to positively influence their children's learning, overcoming initial limitations. Emphasis is placed on a vision of learning as an active and constructive process, where family interaction plays a crucial role.
- *Sociological Foundations. The family* is recognized as the first and most influential socializing agent. Family dynamics, communication styles, and parental expectations have a significant impact on children's cognitive and emotional development, including their academic readiness

and success. The proposal seeks to strengthen the role of the family as an effective support system for learning, recognizing the interconnectedness between home, school, and community.

- *Psychopedagogical Foundations*. The proposal draws on learning theories such as Vygotsky's sociocultural approach (the role of interaction and ZPD), principles of meaningful learning, and motivation. It considers the specificities of mathematical difficulties, their psychological effects, and the need for early and differentiated intervention. It aligns with corrective-compensatory and developmental approaches to overcome difficulties and enhance comprehensive development.

System of principles for family guidance

The principles underlying this proposal are aligned with the theoretical foundations, the goal of preparing families, and seek to address diagnostic commonalities. Its importance lies in guiding psychopedagogical actions in a coherent and effective manner.

- *Family theory and practice.* Integrating theoretical knowledge and practical skills to help families address their children's difficulties; this empowers parents with concrete tools.
- *Affective-cognitive unit.* Establish meaningful relationships that facilitate learning strategies for solving family and school problems; a positive emotional climate optimizes knowledge assimilation.
- *Development Zone.* Guide family learning from its current level to its potential through interaction in the guiding process; active collaboration fosters growth for all participants.
- *Teaching and family development.* The adoption of content on mathematical difficulties will take place under organized conditions to stimulate family development; a clear structure facilitates understanding and application of strategies.
- *Systematization of actions.* Coherently interlink actions to prepare the family and correct children's learning difficulties through collaborative participation; an integrated approach maximizes the impact of the intervention.
- *Attention to parents (equals) attention to children.* Parental training is a direct way to address students' math difficulties; it strengthens parents' skills and has a positive impact on children's learning.

- *Methodological flexibility.* Adapt methods to the needs and potential of families and students during the implementation of actions; customization ensures the relevance and effectiveness of the intervention.
- *Corrective-developmental work.* Considering child development and their potential to overcome difficulties with a system of support; the intervention is aimed at both overcoming obstacles and promoting growth.

General methodological suggestions for implementation

The following methodological suggestions, integrated into the activities of the Family Psychopedagogical Laboratory, seek to address the problems identified, driven by previously defined principles and employing practical and tailored guidance and intervention strategies.

- *Initial diagnosis and adaptation.* Starting with a thorough assessment of the initial status of families and children (identified problems), this allows for precise guidance and intervention tailored to their specific needs (methodological flexibility). This is part of the Laboratory as the joint assessment and planning phase.
- *Positive emotional environment and participation.* Create a safe and trusting emotional climate (affective-cognitive unity) that encourages the participation of families and students in the Laboratory's activities (group and individual sessions), streamlining the guidance process and facilitating intervention.
- *Recognition and progression.* Recognize and encourage the achievements of families and children (corrective and developmental work) during the intervention process in the Laboratory (individualized follow-up), using guidance to reinforce progress and encourage continued development.
- *Affective experiences and meaningful content.* Consider participants' emotional experiences (affective-cognitive unit) when addressing the Laboratory content (reflection workshops), ensuring that the guidance is sensitive to their experiences and the intervention is meaningful.
- *Various guidance and intervention modalities.* Use a variety of modalities in the Laboratory (joint sessions, parenting schools, workshops) for family guidance and psychopedagogical intervention, addressing different needs and learning styles (methodological flexibility).

- *Participatory techniques and contextual resources.* Use participatory techniques and teaching aids adapted to the needs and resources available in the laboratory and the family context, enriching both guidance and intervention (linking theory and practice).
- *Satisfaction, confidence, and commitment.* Stimulate feelings of satisfaction, confidence, and commitment to the change process (teaching guides development) through ongoing guidance and the design of intervention activities that generate visible results in the laboratory and at home.
- *Clear structuring of activities*. Structure each laboratory activity (following the format Objective; Introduction; Techniques of presentation, development and closing; Teaching aids; Bibliography) to ensure clear guidance and organized and effective intervention (systematization of actions).

Topics addressed and their alignment with the diagnosis and actions

The system of psychopedagogical actions, implemented through the activities of the Family Psychopedagogical Laboratory, will address the following topics in an interrelated and progressive manner, responding to the results of the diagnosis and seeking to prepare families to effectively support students with difficulties in learning mathematics, including those with low performance and at risk of not achieving course objectives.

- *The Role of the Family in Homework Completion.* It focuses on analyzing and modifying family support styles, addressing the predominance of authoritarian styles and the observed lack of effective strategies. The Lab's activities include practical workshops and collaborative work sessions to develop positive communication skills, support autonomy, and establish structured homework routines, addressing the disorganization and poor habits detected.
- *Families that foster development.* Strategies were explored to enrich the home environment with activities that stimulate children's cognitive and mathematical skills beyond homework, countering the limited variety of stimulation observed. The Lab's activities offer models for recreational activities, the use of everyday resources, and guidelines for fostering curiosity and mathematical exploration at home.
- *The home-school-community relationship.* The goal is to strengthen communication and collaboration between families and schools, addressing the need for a coordinated approach to supporting students with difficulties. The Lab's activities include meetings with teachers,

workshops on how to actively participate in school life, and the exploration of community resources that can offer additional support.

- *Losses and Gains in Younger Students.* This book addresses the changes and challenges children face at the beginning of primary school, considering the potential "losses" of preschool and the new demands. It seeks to raise awareness among families about the emotional and adaptive needs of their children, especially those with disabilities, offering strategies to facilitate this transition and strengthen their motivation for school.
- *Main characteristics of difficulties in learning mathematics.* Clear and accessible information was provided on the nature of mathematical learning difficulties, demystifying misconceptions (such as attributing them exclusively to biological factors) and offering a broader framework for understanding. The Lab's activities include informative talks, testimonials, and opportunities for dialogue so that families can better understand the challenges their children face.
- *Psychological effects caused by difficulties in learning mathematics.* The possible emotional and motivational consequences of mathematical difficulties (low self-esteem, lack of motivation, observed inhibitions) are explored. The Laboratory's activities focus on strategies to strengthen children's self-esteem, foster a positive attitude toward mathematics, and develop coping mechanisms in the face of frustration.
- *Addressing Manifestations of Mathematics Learning Difficulties.* It addresses practical strategies and methods that families can use at home to support their children's mathematics learning, focusing on the specific areas of difficulty identified in the assessment (spatial concepts, sets, quantity, etc.). The Laboratory's activities include intensive workshops on active methodologies, the use of concrete materials, and strategies for effectively completing homework, promoting collaborative participation and the creation of appropriate study routines.

Evaluation of the system of psychopedagogical actions

The evaluation of the implemented system of psychopedagogical actions had the main objective of determining its effectiveness in promoting positive changes, both in the practices and beliefs of families of students with difficulties in learning mathematics, and in the academic performance of the students themselves at the end of first grade.

Transformations in families

A widespread improvement in family engagement was observed. Fully 100% (n=18) of parents increased their involvement in child development stimulation activities, with 83.3% (n=15) categorizing themselves as "stimulating child development" and 16.6% (n=3) as "somewhat stimulating". This transformation was evidenced by changes in their beliefs about their ability to influence, increased time devoted to tutoring, the creation and use of stimulating educational resources, and greater consistency in providing individualized support to their children.

Regarding parenting methods, 94% (n=17) of the parents demonstrated an attitude of acceptance, negotiation, and tolerance toward their children's psychological characteristics. At the same time, a significant decrease in the use of authoritarian styles and criticism was observed in 94% (n=17) of the participants, based on a new understanding of the importance of a positive emotional environment. This translated into a reduction in the use of commands and prohibitions and an increase in active and understanding listening.

The relationship with the school also improved in 90% (n=16) of participants, who showed greater initiative in requesting information about their children's development and seeking specific guidance to support their mathematical learning. Finally, 90% (n=16) of parents recognized the influence of their own attitudes toward mathematics and how understanding new strategies contributed to positively changing these attitudes. All participants (100 %, n=18) recognized the active role of the home environment in mathematical learning and the importance of its educational influence. Furthermore, they demonstrated knowledge of the specific characteristics of learning difficulties and strategies for correcting them, actively incorporating resources such as stories, drawing, and educational games into their routines.

Improvement in school performance

At the end of first grade, a notable improvement was observed in the students' performance in the subject of Mathematics, with 33% (n=3) rated as Very Good and 67% (n=6) as Good. This improvement was corroborated in the post-intervention psychopedagogical tests, where 100% (n=9) of the students showed progress in the previously affected skills: number-set association, comparison and ordering, calculation, memorization of inverse operations, and problem-solving. Table 6

illustrates the individual progression of the percentiles achieved in the psychopedagogical test at the beginning and end of the study, evidencing a general trend toward significantly higher percentiles.

Table 6. Comparison of percentiles achieved by the students at the beginning and end of the research

Schoolchildren	Initial percentile	Final percentile
1	19	59
2	24	59
3	29	60
4	29	68
5	29	69
6	29	70
7	29	75
8	38	76
9	38	79

The evaluation results demonstrate the effectiveness of the implemented system of psychopedagogical interventions. The significant transformations observed in families, including the adoption of more positive parenting styles, greater commitment to school support, and a deeper understanding of their children's difficulties, directly correlate with substantial improvements in the students' mathematics performance. These findings suggest that a family-centered intervention can be an effective strategy for addressing learning difficulties in mathematics in early primary education. The students' individual progress toward higher percentiles indicates a generalized improvement in their fundamental mathematical skills.

The consistency between the changes reported by families and the progress shown by the children reinforces the validity of the system of actions. The intervention appeared to generate a change in family dynamics, which, in turn, positively impacted the students' learning process.

Limitations of the evaluation

While the results are promising, the absence of a control group limits the possibility of attributing direct and exclusive causality to the implemented system of actions. Future research could strengthen the validity of these findings by designing comparative studies. In conclusion, the evaluation of the psychopedagogical action system suggests its potential as a valuable tool for supporting families and students facing difficulties in learning mathematics, highlighting the importance of a comprehensive approach that actively involves the family environment.

DISCUSSION

Guiding families of students with mathematics learning difficulties requires an approach that values emotional experiences as a fundamental driver of engagement and the transformation of educational practices (Mena *et al.,* 2025). In the present study, the observed improvement in parental involvement and the adoption of more positive educational styles was directly correlated with the implementation of strategies that fostered a climate of trust and recognition of family efforts.

The effectiveness of the intervention was supported by a thorough initial diagnosis, as recommended by Quiroz *et al.* (2023) and Rodríguez-Martínez *et al.* (2023). The identification of parental patterns, causal attributions, and an understanding of the specific needs of families and students allowed for a more relevant selection of guidance and intervention modalities. The implementation of various strategies, including collaborative work sessions and reflective workshops, proved to be an effective way to facilitate the learning and application of new parenting skills, in line with the findings of Hernández and Abad (2021) and Rodríguez-Martínez *et al.* (2023).

The creation of a positive emotional environment during the Family Psychopedagogical Laboratory sessions emerged as a driving force for change. The reported decrease in the use of authoritarian styles and the adoption of more empathetic communication suggest that attention to family emotional dynamics, in line with the proposal, facilitated active participation and receptivity to guidance. Promoting parental autonomy and stimulating their involvement in their children's educational process (Cruz Almaguer, 2020; Dupeyrón *et al.*, 2021; Pérez *et al.*, 2023) was reflected in greater initiative to collaborate with the school and seek specific solutions to learning difficulties.

Methodological flexibility, adapting actions to the specific characteristics of each family and school (Rodríguez-Martínez *et al.,* 2023; Morales, 2024), contributed to the relevance of the intervention. The individualized improvement in student performance, evidenced both in the specific skills assessed and in the final evaluation of the Mathematics subject (where 33% achieved "Very Good" and 67% "Good"), suggests the effectiveness of an approach sensitive to the needs of each case.

The results of this research confirm the importance of a comprehensive family counseling approach to addressing mathematical learning difficulties. The development of strategies that prioritize the emotional climate, based on a detailed diagnosis, employing diverse and flexible modalities, and encouraging active parental participation, proved effective in generating positive changes in family practices and a significant improvement in students' academic performance.

Compared with the literature, this study reaffirms the centrality of affective factors and family-school collaboration (Mena *et al.*, 2025; Cruz Almaguer, 2020). The notable improvement in the final evaluation of the Mathematics subject suggests that the implemented system of actions could offer superior results to interventions that focus in isolation on the student or on purely cognitive aspects.

The research highlights the need for family psychopedagogical intervention models that integrate a deep understanding of family dynamics, emotional needs, and specific pedagogical strategies for mathematical learning difficulties. This multifactorial and personalized approach presents a promising avenue for optimizing support for these students and their families, offering a more holistic and potentially more effective perspective than more reductionist approaches.

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Conflict of interest

Authors declare no conflict of interests.

Authors' contribution

The authors participated in the design and writing of the article, in the search and analysis of the information contained in the consulted bibliography.