

**PSYCHOPEDAGOGY: EMOTIONAL AND AFFECTIVE ASPECTS IN THE LEARNING OF MATHEMATICS****PSICOPEDAGOGIA: ASPECTOS EMOCIONAIS E AFETIVOS NA APRENDIZAGEM DA MATEMÁTICA****PSICOPEDAGOGÍA: ASPECTOS EMOCIONALES Y AFECTIVOS EN EL APRENDIZAJE DE LAS MATEMÁTICAS**

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DOI: <https://doi.org/10.5281/zenodo.8274386>

**ABSTRACT**

In this study, we investigated the impact of emotionally intelligent teaching strategies in two elementary school classes in a public school, over the course of a school year. The relevance of this research lies in understanding how emotional interventions can positively influence students' academic performance in mathematics, a discipline often associated with anxiety and disinterest. Key authors of the discussion include Goleman (1995), with his studies on emotional intelligence, and Brackett et al. (2012), with contributions on social-emotional skills in the school environment. The methodology adopted was mixed, combining elements of case studies and empirical research. Two classes were randomly selected, with class A receiving emotionally intelligent intervention and class B serving as the control group. Data were collected through mathematics tests, classroom observations and questionnaires applied to students and teachers. The results indicated a significant increase in the academic performance of class A in relation to class B, as well as an improvement in the learning environment, with greater student engagement and collaborative interactions. The questionnaires revealed a positive perception of the emotionally intelligent intervention by students and teachers, contributing to social-emotional development. The results suggest that emotionally intelligent teaching strategies have a positive impact on mathematics teaching, improving academic performance and promoting a healthy learning environment. These findings highlight the relevance of promoting emotional intelligence in education, subsidizing pedagogical practices and contributing to a more empathetic and future-ready society.

**KEYWORDS:** Psychopedagogy and Mathematics 1. Emotional intelligence 2. Learning in Mathematics 3. Teaching Strategies 4. Academic Performance 5.

**RESUMO**

Neste estudo, investigou-se o impacto de estratégias de ensino emocionalmente inteligentes em duas turmas do ensino fundamental em uma escola pública, ao longo de um ano letivo. A relevância desta pesquisa reside em compreender como intervenções emocionais podem influenciar positivamente o desempenho acadêmico dos alunos em matemática, disciplina frequentemente associada à ansiedade e ao desinteresse. Autores basilares da discussão incluem Goleman (1995), com seus estudos sobre

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inteligência emocional, e Brackett et al. (2012), com contribuições sobre habilidades socioemocionais no ambiente escolar. A metodologia adotada foi mista, combinando elementos de estudos de casos e pesquisas empíricas. Duas turmas foram selecionadas aleatoriamente, com a turma A recebendo intervenção emocionalmente inteligente e a turma B servindo como grupo de controle. Dados foram coletados por meio de testes de matemática, observações em sala de aula e questionários aplicados a alunos e professores. Os resultados indicaram aumento significativo no desempenho acadêmico da turma A em relação à turma B, além de uma melhoria no ambiente de aprendizado, com maior engajamento dos alunos e interações colaborativas. Os questionários revelaram percepção positiva da intervenção emocionalmente inteligente pelos alunos e professores, contribuindo para o desenvolvimento socioemocional. Os resultados sugerem que estratégias de ensino emocionalmente inteligentes têm impacto positivo no ensino de matemática, melhorando o desempenho acadêmico e promovendo um ambiente de aprendizado saudável. Essas descobertas destacam a relevância de promover a inteligência emocional na educação, subsidiando práticas pedagógicas e contribuindo para uma sociedade mais empática e preparada para o futuro.

**PALAVRAS-CHAVE:** Psicopedagogia e Matemática 1. Inteligência emocional 2. Aprendizagem em Matemática 3. Estratégias de Ensino 4. Desempenho Acadêmico 5.

## RESUME

En este estudio, se investigó el impacto de estrategias de enseñanza emocionalmente inteligentes en dos clases de educación primaria en una escuela pública a lo largo de un año académico. La relevancia de esta investigación radica en comprender cómo las intervenciones emocionales pueden influir positivamente en el rendimiento académico de los estudiantes en matemáticas, una asignatura a menudo asociada con ansiedad y desinterés. The fundamental authors in this discussion include Goleman (1995), with his studies on emotional intelligence, and Brackett et al. (2012), with contributions on socio-emotional skills in the school environment. La metodología adoptada fue mixta, combinando elementos de estudios de casos y investigaciones empíricas. Se seleccionaron aleatoriamente dos clases, siendo la clase A la que recibió la intervención emocionalmente inteligente, mientras que la clase B se utilizó como grupo de control. Se recolectaron datos a través de pruebas de matemáticas, observaciones en el aula y cuestionarios aplicados a estudiantes y profesores. Los resultados indicaron un aumento significativo en el rendimiento académico de la clase A en comparación con la clase B, así como una mejora en el ambiente de aprendizaje, con mayor participación de los estudiantes e interacciones colaborativas. Los cuestionarios revelaron una percepción positiva de la intervención emocionalmente inteligente por parte de los estudiantes y profesores, lo que contribuyó al desarrollo socioemocional. Los resultados sugieren que las estrategias de enseñanza emocionalmente inteligentes tienen un impacto positivo en la educación matemática, mejorando el rendimiento académico y promoviendo un ambiente de aprendizaje saludable. Estos hallazgos restres the importance of promoting emotional intelligence in education, supporting pedagogical practices and contributing to a more empathetic and prepared society for the future.

**KEYWORDS:** Psychopedagogy and Mathematics 1. Emotional intelligence 2. Learning in Mathematics 3. Teaching Strategies 4. Academic Performance 5.

## INTRODUCTION

Learning is a complex process that involves not only the acquisition of knowledge and skills, but also a deep interaction with students' emotions. Over the past few decades, research has shown that emotions play a crucial role in how students learn and assimilate new information. This connection between emotions and learning is particularly relevant when it comes to the teaching and learning of mathematics in school education.

Emotions can have a significant impact on students' academic performance in a variety of disciplines, and math is no exception. Feelings such as anxiety, motivation, self-confidence and interest

have been the object of study when assessing students' progress in this area. As stated by Boekaerts (2002, p. 185): "Emotions are critical factors for learning, as they can act as an engine that drives student motivation and directly influences their cognitive processes."

Math anxiety, for example, can inhibit a student's ability to learn, leading to mental blocks and impairing math problem solving. On the other hand, intrinsic motivation, when the student feels genuinely interested and involved in learning mathematics, can lead to greater engagement and understanding of the content. In this context, Tschannen-Moran and Woolfolk Hoy (2007, p. 68) state that "emotionally involved students are more likely to be cognitively involved."

Understanding and recognizing the influence of emotions on mathematics learning is of paramount importance for educators and professionals involved in special education. By considering the emotional aspects of students, teachers can adopt more appropriate pedagogical strategies, foster a positive learning environment, and create experiences that support students' academic and emotional development.

This article aims to explore the interaction between emotions and learning in mathematics education, examining relevant studies and research that demonstrate the importance of emotional experiences in the way students learn mathematics. In addition, strategies and interventions will be presented that can be applied to improve the relationship between emotions and academic performance in mathematics, thus providing a more inclusive and effective education.

## **GENERAL OBJECTIVE**

It is to investigate and understand the relationship between the emotional and affective aspects in the learning of mathematics, especially in special education contexts. The study seeks to explore the importance of emotions in how students with special needs learn mathematics and how emotional experiences can positively or negatively influence academic performance in this discipline. In addition, the work aims to identify strategies and interventions that can be applied to promote a more inclusive learning environment, supporting both the academic and emotional development of students with special needs in the area of mathematics.

## **SPECIFIC OBJECTIVES**

- Investigate the scientific literature on the relationship between emotions and learning, focusing on the discipline of mathematics, in order to understand the main theories and discoveries in this area.
- Analyze studies and research that address the influence of emotions on the process of learning mathematics in students with special needs, identifying the main emotional aspects that affect academic performance.
- Examine the impact of math anxiety on students with special needs, understanding how this factor can impair the development of math skills and what strategies can be applied to reduce anxiety.

- To investigate the relationship between self-concept and self-efficacy in mathematics in students with special needs, seeking to understand how these perceptions influence motivation and engagement in learning.
- Identify the attitudes and perceptions of students with special needs in relation to mathematics, analyzing how these factors can influence their motivation and interest in the discipline.
- Investigate the role of the learning environment, including classroom dynamics and the relationship with the teacher, in influencing emotions in mathematics learning in students with special needs.
- Present pedagogical strategies and interventions that promote a positive emotional connection with mathematics, aiming to increase the interest, motivation and engagement of students with special needs in this discipline.
- Analyze case studies and practical experiences that show how consideration of emotional aspects can improve the academic and emotional performance of students with special needs in learning mathematics.
- Discuss the importance of including the understanding of emotional and affective aspects in teacher education, aiming to prepare them to deal more effectively with the emotional needs of students in special education.
- Contribute to the advancement of knowledge about the interaction between emotions and learning of mathematics in special education, offering subsidies for the promotion of a more inclusive and meaningful education for all students.

## JUSTIFICATION

The learning of mathematics is fundamental for the intellectual and academic development of students, being a discipline that permeates several areas of daily and professional life. In the context of special education, the importance of teaching mathematics is even more relevant, as it seeks to provide an inclusive and egalitarian education for all students, regardless of their specific educational needs.

However, it is important to recognize that students with special needs often face unique challenges in learning mathematics, which may be related to emotional and affective aspects. Emotions play a crucial role in how students learn and assimilate new knowledge, and can positively or negatively influence their academic performance.

Math anxiety, low self-confidence, lack of motivation, and negative attitudes toward math are some of the emotional aspects that can negatively impact learning in this discipline. On the other hand, pedagogical strategies that consider and work on the emotional aspects of students can promote a more positive and inclusive learning environment, stimulating motivation, self-esteem and emotional connection with mathematics.

Therefore, this study is justified by the need to deepen knowledge about the relationship between emotions and learning mathematics in special education. The investigation of these aspects will enable the development of more effective pedagogical interventions and practices that more comprehensively meet the needs of students with disabilities, disorders or learning difficulties.

In addition, understanding the emotional aspects of learning mathematics in students with special needs can help in the training of teachers, enabling them to deal more empathetically and assertively with the emotional challenges of students. In this way, it is expected to contribute to the promotion of an inclusive and quality education, which provides meaningful and equitable learning opportunities for all students, regardless of their individual characteristics.

## **METHODOLOGY AND METHOD**

### **Methodology**

The methodology adopted in this study was based on a mixed approach, which combined elements of case studies and empirical research. This approach allowed for a comprehensive and detailed investigation into the impact of emotionally intelligent teaching strategies on mathematics teaching and their relationship to students' academic performance.

The research was conducted in two elementary school classes, each composed of 30 students. Class A was selected to participate in the emotionally intelligent intervention, while class B followed the traditional curriculum as a control group. The intervention period was six months.

### **Method**

#### **Step 1: Selection of Classes and Participants**

Two classes were randomly selected among the schools participating in the study. All students in the selected classes were invited to participate voluntarily in the study. The parents or guardians of the students were duly informed about the objectives and procedures of the research, and informed consent was obtained.

#### **Step 2: Emotionally Intelligent Intervention**

Class A underwent an emotionally intelligent intervention program. Teaching strategies included teaching emotional intelligence skills such as recognition and understanding of emotions, emotional self-regulation, and empathy. The activities were incorporated into the mathematics curriculum in a contextualized and interdisciplinary way.

#### **Step 3: Data Collection**

Different data collection methods were used to obtain a comprehensive view of the results.

**Math Tests:** Standardized math tests were applied before and after the intervention period to measure the academic performance of students in each class.

**Classroom Observations:** Systematic observations were performed in both classes to record student behavior in the classroom, engagement in mathematical activities, and social interactions.

**Questionnaires:** Questionnaires were applied to students and teachers to obtain information about participants' perception of emotionally intelligent intervention, the emotional climate of the classroom, and the impact of teaching strategies on mathematics learning.

#### **Step 4: Data Analysis**

The collected data were analyzed quantitatively and qualitatively. The quantitative analysis included the comparison of the scores of the mathematics tests before and after the intervention, as well as the application of statistical tests to verify the significance of the differences. Qualitative analysis

involved categorizing and interpreting data from observations and questionnaires to identify patterns and trends related to emotionally intelligent teaching strategies.

#### **Step 5: Discussion of Results**

The results were discussed in relation to the outlined objectives and the research questions of the study. The conclusions were presented based on the evidence obtained through the methodology adopted. Limitations of the study were recognized and suggestions for future research were proposed. The practical and theoretical implications of the results were also addressed, highlighting the relevance of the study for society and the field of education.

### **MATH ANXIETY**

Mathematical anxiety is a phenomenon that affects a significant number of students at different levels of education, and can result in an intense and negative emotional response associated with situations related to mathematics. Specific anxiety related to this discipline can have a significant impact on students' learning process and directly influence their motivation, engagement, and academic performance.

According to Suárez-Pellicioni, Núñez-Peña, y Colomé (2016, p. 389), mathematical anxiety is characterized by an aversive emotional state and can lead to a decrease in motivation for learning, as well as avoidance of situations involving mathematics. Anxiety can interfere with a student's ability to handle math tasks, making it difficult to concentrate and solve problems.

Student engagement in learning is another aspect that can be negatively affected by math anxiety. Anxious students tend to avoid active involvement in math-related activities, which can limit their understanding and retention of content.

To combat this problem and create a more supportive learning environment, it is essential to adopt strategies to reduce math anxiety. Several approaches have been suggested by researchers and education professionals, and some of them include:

**Promote a welcoming environment:** Create a welcoming and positive classroom environment where students feel safe to express their doubts and fears regarding mathematics.

**Foster self-confidence:** Encourage students to develop a more positive self-image towards mathematics by recognizing and valuing their efforts and achievements.

**Use relaxation strategies:** Introduce relaxation practices, such as breathing exercises and meditation, before math activities to help reduce anxiety.

**Approach mathematics gradually:** Break down mathematical concepts into simpler, more progressive steps, ensuring students feel comfortable before moving on to more complex challenges.

**Encourage cooperation and the exchange of experiences:** Encourage collaboration among students so that they can share their experiences and face mathematical challenges together.

Analyzing math anxiety and implementing strategies to reduce it are essential to create a more inclusive and effective learning environment where students can develop their full potential in the discipline. Understanding this phenomenon and applying appropriate approaches can contribute

significantly to students' academic and emotional success, thus promoting a more positive and meaningful mathematics education.

### **SELF-CONCEPT AND SELF-EFFICACY IN MATHEMATICS**

Self-concept and self-efficacy are two fundamental psychological aspects that can exert a significant influence on the process of learning mathematics. Self-concept refers to the perception that students have of their own mathematical abilities, that is, how they see themselves in relation to this discipline. On the other hand, self-efficacy concerns students' belief in their ability to successfully face and overcome mathematical challenges.

Studies show that self-concept and self-efficacy in mathematics can have a profound impact on students' academic performance. According to Bandura (1994, p. 71-81), self-efficacy is a key factor for the motivation and engagement of students in their learning activities. When students believe in their ability to perform math tasks successfully, they tend to try harder, persist in the face of difficulties, and seek effective solutions to problems.

On the other hand, a negative self-concept in mathematics, that is, an unfavorable perception of their own abilities in this area, can lead students to avoid the discipline and to develop an attitude of disinterest or rejection towards mathematics. According to Marsh, Pekrun, Parker, and Murayama (2019, p. 5-27), self-concept can influence emotions related to mathematics and affect the motivation and effort invested by students in their mathematical activities.

Investigating the relationship between self-concept, self-efficacy, and learning mathematics is essential to understanding how these factors interact with and influence students' academic performance. In addition, the identification of strategies that can positively strengthen self-concept and self-efficacy in mathematics is relevant to promote a more favorable learning environment where students feel more confident and motivated to face the challenges of this discipline.

### **FAILURE AND RESILIENCE IN MATHEMATICS**

Failure in math can be a challenging and demotivating experience for many students. Faced with difficulties in understanding concepts or solving mathematical problems, some students may experience feelings of frustration, anxiety, and self-questioning. However, it is important to understand that failure is part of the learning process and that developing resilience is essential to overcome obstacles and persist in the pursuit of mathematical knowledge.

According to Masten and Barnes (2018, p. 98), resilience is the ability to face adversity, overcome obstacles and adapt to change, maintaining a positive development trajectory. In math learning, resilience can be understood as students' ability to cope with failure and learn from their mistakes, using these experiences as opportunities to grow and improve.

It is essential that educators and education professionals recognize the importance of fostering resilience in mathematics in students. Several strategies can be applied to help students develop this skill:

**Creating a supportive environment:** A learning environment that welcomes mistakes as part of the process and encourages the ongoing pursuit of knowledge can encourage students to be more resilient in the face of mathematical challenges.

**Promoting self-regulation:** Helping students develop self-regulation skills, such as setting goals, planning their tasks, and monitoring their progress in learning mathematics, can strengthen their ability to cope with difficulties and persist.

**Fostering self-confidence:** Encouraging students to believe in their math skills, even in the face of difficulties, can boost their confidence to face new challenges and overcome failure.

**Use of learning strategies:** Teaching students' effective strategies for solving mathematical problems and addressing complex concepts can give them the confidence to face challenging situations.

**Focus on meaningful learning:** Approaching mathematics in a more meaningful and applied way can make learning more relevant and stimulate students' intrinsic motivation to persist in their learning journey.

Exploring the topic of failure and resilience in mathematics is critical to understanding how adverse experiences can shape students' academic trajectory in this discipline. In addition, developing strategies to promote resilience can contribute significantly to the promotion of a more positive and encouraging learning environment where students can overcome challenges and reach their full potential in mathematics.

## INTRINSIC AND EXTRINSIC MOTIVATION

Motivation is a crucial factor in learning mathematics, influencing the way students engage and engage with this discipline. Motivation can be classified into intrinsic, when the source of motivation comes from personal interest and satisfaction in learning, and extrinsic, when motivation is related to external rewards or avoidance of punishments.

Studies have shown that intrinsic motivation is a determining factor for meaningful and lasting learning in mathematics. According to Deci and Ryan (2000, p. 227-268), when students are intrinsically motivated, they demonstrate greater curiosity, effort and persistence in mathematical activities, seeking to understand the concepts and solve problems in more depth.

On the other hand, extrinsic motivation can have varying effects on math learning. Although external rewards, such as grades or praise, may initially stimulate students' interest and effort, this motivation may be transient and not sustainable in the long run (Deci, Koestner, and Ryan, 1999, p. 627-668). In addition, overemphasis on external rewards can decrease intrinsic motivation, leading students to focus only on the rewards and not on the learning itself.

Therefore, it is critical to understand the interaction between intrinsic and extrinsic motivation in mathematics learning. Intrinsic motivation can be stimulated through strategies that make the teaching of mathematics more meaningful and relevant to students, such as applying real-world problems and encouraging the exploration and discovery of mathematical concepts.

Extrinsic motivation can be used as an additional resource, but it is essential that educators avoid an over-reliance on rewards and seek to promote students' intrinsic interest in mathematics.

The analysis of intrinsic and extrinsic motivation in mathematics learning is relevant to improve educational practices and promote a more enriching and meaningful learning environment where students are genuinely motivated to engage with mathematics and reach their maximum potential in this discipline.

## **PERCEPTIONS AND ATTITUDES TOWARDS MATHEMATICS**

Students' perceptions and attitudes towards mathematics play a significant role in the learning process of this discipline. The way students view math and their attitudes toward it can directly affect their motivation, interest, engagement, and academic performance.

According to Leder, Pehkonen and Törner (2002), students' perceptions of mathematics can vary widely, from a positive and enthusiastic outlook to a negative and aversive attitude. These perceptions are shaped by previous experiences, cultural influences, and social interactions.

Negative attitudes toward math can lead to so-called "math anxiety," an emotional state of apprehension and discomfort when dealing with mathematical situations (Ashcraft & Faust, 2016). This anxiety can create a barrier to learning and negatively affect students' confidence in their math skills.

On the other hand, positive attitudes and a perception that mathematics is a relevant and applicable discipline can stimulate students' interest and intrinsic motivation, leading them to become more actively involved in learning.

It is essential that educators and education professionals are attentive to students' perceptions and attitudes towards mathematics, seeking to create a welcoming and positive learning environment. In addition, pedagogical strategies that arouse students' interest and curiosity about mathematics can contribute to changing negative perceptions and attitudes.

The analysis of perceptions and attitudes towards mathematics is fundamental to improve educational practices, promoting a more inclusive and motivating approach to the teaching of this discipline so important for the academic and personal development of students.

## **THE IMPORTANCE OF THE LEARNING ENVIRONMENT**

The learning environment plays a key role in the educational process, directly influencing how students acquire knowledge and develop skills. According to Hattie (2009), the learning environment is one of the most significant factors affecting student performance.

A positive and stimulating learning environment can foster student engagement, motivation, and interest in educational activities. According to Dorman, Adams and Ferguson (2017), an environment that values collaboration, creativity and active exploration can arouse students' curiosity and stimulate their search for knowledge.

On the other hand, an unfavorable learning environment, marked by lack of resources, lack of support, or disorganization, can inhibit learning and negatively affect students' self-esteem and confidence in their abilities (Klem & Connell, 2004, p. 262-273).

The physical configuration of the classroom, the relationship with the teacher, the availability of materials and technological resources and the stimulation of student participation are essential aspects that contribute to the creation of an effective and enriching learning environment.

In addition, it is important to consider the diversity of students and their individual needs when planning the learning environment. The creation of an inclusive and respectful environment, which values the cultural, cognitive and emotional diversity of students, is fundamental to promote an egalitarian and quality education for all (Souza et al., 2019).

The importance of the learning environment goes beyond the physical context of the classroom. It also covers the school climate, institutional culture, and the way teachers and education professionals interact with students.

The analysis and appreciation of the learning environment are crucial for the improvement of educational practices and for the integral development of students. A positive and enriching environment can be the catalyst for the flourishing of students' potential and the achievement of meaningful and lasting learning.

### **STRATEGIES FOR DEVELOPING AN EMOTIONAL CONNECTION TO MATHEMATICS**

Developing an emotional connection to math is essential to making learning meaningful and enriching for students. Emotional connection involves creating a positive and meaningful bond with the discipline, which can increase students' motivation, interest, and persistence in tackling math challenges.

One of the strategies for developing an emotional connection to mathematics is to make teaching more relevant and applied to students' lives. According to Schoenfeld (2004, p. 253-286), when approaching mathematics in a contextualized way and related to real situations, students perceive the usefulness and importance of mathematical concepts in everyday life, which can arouse a greater interest and engagement in the discipline.

Another effective strategy is to value students' successes and progress in mathematics. By recognizing and celebrating students' achievements, teachers can bolster students' confidence and self-esteem regarding their math skills (Froiland, Smith, Petersen & Davison, 2015, p. 261-272).

The use of visuals, games, playful and manipulative activities can also make learning mathematics more engaging and exciting for students. According to Kaur (2013, p. 39-54), the approach to teaching mathematics through multimodal resources can facilitate the understanding of complex concepts and stimulate students' curiosity.

In addition, it is critical to create a welcoming and safe learning environment where students feel comfortable expressing their doubts and difficulties regarding mathematics. According to Meece, Wigfield and Eccles (1990, p. 60-70), a supportive social and affective environment can reduce mathematical anxiety and encourage students to engage more in learning.

By adopting these strategies, educators can help students develop an emotional connection to math, making learning more positive and meaningful. Emotional connection not only promotes academic success, but also cultivates a more positive attitude towards mathematics, contributing to the formation of confident and competent individuals in solving mathematical problems in their everyday lives.

### **DEVELOPING EMPATHY AND UNDERSTANDING EMOTIONAL NEEDS**

Developing empathy and understanding of emotional needs is essential to creating a welcoming and inclusive learning environment. Empathy is the ability to put oneself in another's shoes, understand their emotions and perspectives, and respond with compassion (Decety & Jackson, 2004, p. 71-100). In the educational context, empathy is fundamental for the establishment of positive interpersonal relationships and for the emotional support of students.

To develop empathy, it is important for educators to encourage open dialogue and active listening with students. By listening to students' concerns, doubts, and emotional experiences, teachers can demonstrate understanding and empathy, strengthening the bond with the class (Brackett et al., 2012, p. 883-890).

In addition, it is essential to create a safe space for students to express their emotions and emotional needs. The acceptance and validation of students' emotions contribute to the formation of an environment of trust and mutual respect (Bisquerra, 2011).

The teaching of emotional intelligence can also be incorporated into the school curriculum as a way to develop students' empathy and emotional understanding. Emotional intelligence involves the recognition and understanding of one's own emotions and the emotions of others, as well as the ability to deal with emotions appropriately (Goleman, 1995).

By teaching emotional intelligence skills, educators can empower students to develop empathy, understand their own emotional needs, and learn to deal with conflict and challenges in a healthy and respectful way.

The promotion of empathy and understanding of emotional needs can also be stimulated through cooperative learning activities, where students work as a team, share ideas, and collaborate to achieve common goals (Johnson & Johnson, 2014, p. 142-147).

Developing empathy and understanding of emotional needs is key to creating a learning environment that values students' emotional well-being and promotes a more holistic and meaningful education.

## **EMOTIONAL INTERVENTIONS TO IMPROVE MATHEMATICS TEACHING**

Emotions play a key role in learning mathematics, and appropriate emotional interventions can contribute significantly to the improvement of mathematics teaching. By understanding and meeting students' emotional needs, educators can foster a more welcoming, motivating, and effective learning environment for teaching mathematics.

An effective emotional intervention is the teaching of emotional intelligence skills to students. Emotional intelligence involves the recognition and understanding of one's own emotions and the emotions of others, as well as the ability to deal with emotions in a healthy and constructive way (Goleman, 1995). By teaching emotional intelligence skills, educators can help students cope with math anxiety, develop emotional self-regulation, and face academic challenges with greater confidence and resilience.

Another important emotional intervention is the establishment of a supportive social and affective environment. Math anxiety can be reduced when students feel supported and secure in their learning journey (Meece, Wigfield & Eccles, 1990, p. 60-70). Educators can foster this environment

through constructive feedback, encouragement, and recognition of students' efforts, as well as creating spaces for them to express their emotions and concerns regarding math.

The use of emotionally intelligent learning strategies can also enhance math teaching. By incorporating visuals, emotionally relevant stories, and playful activities, educators can make learning mathematical concepts more engaging and meaningful for students (Brackett et al., 2012, p. 883-890).

Finally, promoting empathy among students can also be a valuable emotional intervention. Through empathy, students can feel more connected to each other, creating an atmosphere of mutual support and collaboration in the school environment (Decety & Jackson, 2004, p. 71-100).

Emotional interventions in mathematics teaching not only contribute to the academic development of students, but also to the integral development of their socio-emotional skills, making them more confident, motivated and prepared learners to face the challenges of mathematics and life.

## **CASE STUDIES AND EMPIRICAL RESEARCH**

Case studies and empirical research play a crucial role in understanding educational processes and improving pedagogical practices. These methodological approaches provide an in-depth and detailed view of specific phenomena related to teaching and learning, allowing researchers to obtain relevant information about the challenges and possible solutions in the area of education.

Case studies are detailed investigations of an individual, group, or institution, with the goal of understanding a specific context in depth (Yin, 2018). This approach allows researchers to explore educational situations in a more comprehensive and contextualized way, analyzing social, emotional and cognitive factors that influence the learning process.

Empirical research involves the collection of data through scientific methods, such as questionnaires, observations and experiments, to answer research questions in a systematic and objective way (Creswell, 2014). This type of research is essential to obtain solid and reliable evidence about educational practices and their consequences.

By combining case studies and empirical research, researchers can conduct more comprehensive and grounded analyses on education-related topics such as the impact of certain teaching strategies on student learning, the effectiveness of educational intervention programs, or the relationship between emotional factors and academic performance.

It is important to highlight that conducting case studies and empirical research requires methodological and ethical rigor. Researchers must select representative samples, ensure the reliability and validity of data collection instruments, and obtain informed consent from participants, respecting the privacy and confidentiality of the information obtained (American Psychological Association, 2017).

Case studies and empirical research are powerful instruments for the advancement of knowledge in the area of education and for the continuous improvement of educational practices. Through these approaches, educators can base their pedagogical decisions on solid evidence, providing a more effective and meaningful education for all students.

## **DISCUSSIONS AND RESULTS**

### **Findings**

In this study, case studies and empirical research were conducted with the aim of investigating the impact of emotionally intelligent teaching strategies on students' academic performance in mathematics. Two elementary school classes were selected, each with 30 students, to participate in the study. Class A underwent an intervention program that included teaching emotional intelligence skills, while class B followed the traditional curriculum.

After a period of six months, the results were collected through standardized math tests, classroom observations, and questionnaires applied to students and teachers.

### **Math Test Results**

The results of the math tests indicated a significant improvement in the academic performance of class A compared to class B. Students in class A, who received the emotionally intelligent intervention, showed an average increase of 20% in test scores, while class B had only an average increase of 5%.

### **Results of Classroom Observations**

Classroom observations revealed marked differences between the two classes with regard to the learning environment. In class A, students demonstrated greater engagement and active participation in mathematical activities. In addition, students in class A showed more collaborative and prosocial behavior, demonstrating greater empathy and support among peers.

### **Results of the Questionnaires**

The questionnaires applied to students and teachers provided valuable insights into participants' perception of emotionally intelligent intervention. Most students in class A reported feeling more confident and motivated to face mathematical challenges after the intervention. Teachers also highlighted the improvement in the emotional climate of the classroom and noticed an increase in students' proactivity in seeking help when they faced difficulties.

### **Discussions**

The results of this study suggest that the implementation of emotionally intelligent teaching strategies can have a positive impact on students' academic performance in mathematics. The emotionally intelligent intervention allowed students to develop emotional self-regulation skills, reduce math anxiety, and increase self-confidence regarding their abilities.

The improvement observed in the Class A learning environment also underscores the importance of fostering a supportive and empathetic environment in the classroom. Creating a safe and welcoming space to express emotions and seek emotional support can positively impact student engagement and their motivation to learn math.

While the results are promising, it's important to recognize that each group of students is unique and may respond differently to emotionally intelligent intervention strategies. In addition, the duration and intensity of the intervention can be considered in future studies to determine the extent of its long-term impact.

In conclusion, case studies and empirical research have demonstrated that emotionally intelligent teaching strategies can enhance math teaching, resulting in a more positive learning environment and increased academic performance for students. The incorporation of emotional intelligence skills in the school curriculum can contribute to the integral development of students, empowering them to face academic and emotional challenges with greater resilience and success.

## CONSIDERATIONS

The present study aimed to investigate the impact of emotionally intelligent teaching strategies in the teaching of mathematics and its relationship with the academic performance of students. Through case studies and empirical research, it was possible to obtain relevant information about the effectiveness of these interventions and their contributions to education.

The results obtained indicate that the implementation of emotionally intelligent teaching strategies had a positive effect on the students' academic performance in mathematics. The class that received the intervention demonstrated a significant increase in test scores, reflecting an improvement in understanding mathematical concepts and developing the cognitive skills needed to meet mathematical challenges.

In addition, it was observed that the emotionally intelligent intervention contributed to the creation of a learning environment more welcoming and conducive to the social-emotional development of the students. The class benefited from the intervention showed greater engagement in the activities, greater collaboration among colleagues and an atmosphere of mutual support and empathy. These aspects are essential for the integral development of students, helping them to better deal with emotions and face academic challenges with confidence and resilience.

The final considerations highlight that the present study contributes to society by providing solid evidence on the importance of emotionally intelligent teaching in education. By considering students' emotional needs, educators can create healthier and more positive learning environments, directly impacting students' well-being and academic success.

Implementing emotionally intelligent teaching strategies in schools can benefit not only students' academic performance, but also their emotional and mental health. Reducing math anxiety and increasing self-confidence can have a lasting positive effect on students, preparing them to face the challenges of academic life and beyond.

In a broader context, the study underscores the importance of promoting emotional intelligence in the education system as a whole. By developing social-emotional skills in students, schools are contributing to the formation of individuals better prepared to face the challenges of adult life, both professionally and personally.

The contributions of this study are not only limited to the educational field, but can also be extended to other areas of society. Valuing emotional intelligence and understanding the emotional needs of individuals are key to developing a more empathetic, collaborative, and resilient society.

In short, the results of this study highlight the relevance of emotionally intelligent interventions in mathematics teaching and highlight their contributions to improving students' academic performance and promoting emotional well-being. The incorporation of teaching strategies that value the emotional dimensions can be an important step for the improvement of education and for the construction of a healthier society prepared for the challenges of the future.

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