
Implementation of Vygotsky's Developmental Psychology Theory to Overcome Mathematics Learning Anxiety

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Abstract

This study explores the application of Vygotsky's developmental psychology theory to overcome mathematics learning anxiety among students. It emphasizes the importance of key concepts such as Zone of Proximal Development (ZPD), Scaffolding, and the role of language as a mediating tool in the learning process. By fostering a collaborative learning environment, where students engage in group discussions and share ideas, this research highlights how emotional support can reduce the fear and anxiety often associated with mathematics. This research includes research studies using literature review methods. Data in the form of articles relevant to Vygotsky's theory and mathematical anxiety. Then the data is analyzed and concluded. Findings suggest that implementing social-emotional interventions, such as providing extra time for assignments and creating a safe learning atmosphere, can significantly increase students' self-confidence and reduce stress.

Keywords: Developmental Psychology; Vygotsky's Theory; Mathematics Learning Anxiety

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INTRODUCTION

Mathematics has an important impact on the role of human life, conveying ideas and information using mathematical language and style. According to the opinion (Tampubolon et al., 2019). The application of mathematics is closely related to everyday life. Mathematics has many functions, including comparing pocket money, calculating the weight of objects and various other disputes, playing a role in resolving conflicts between humans. At this time, mathematical ability and the ability to use mathematics are important requirements for humanity. Without the contribution of mathematical concepts and basic mathematical processes, humanity will face many difficulties. According to (Siti Ashari Arbiah Harahap & Vebi Radiatul Rahman, 2023) mathematics is one of the compulsory subjects at every level from elementary school to college. This is because mathematics is not only useful for learning other subjects, mathematics can also be used in solving everyday problems such as when making transactions, determining land area, or others (Rawa & Mastika Yasa, 2019).

In pedagogical approaches, Vygotsky's theory has been used to explain how social interaction and the environment can help students understand mathematical concepts. (Salsabila & Muqowim, 2024) highlighted that constructivist theory, including the concepts of the Zone of Proximal Development (ZPD) and scaffolding, plays a role in enhancing students' understanding of mathematics. (Iva Swastika & Puji Utami, 2025) also emphasized that using relevant media and learning models can help students overcome anxiety in learning mathematics.

Mathematics Learning Anxiety (MLA) remains a significant concern in contemporary education, affecting students across various academic levels. This form of anxiety often originates from early negative experiences with mathematics and tends to intensify over time if left unaddressed (Setiawan, 2024). MLA has been shown to negatively impact academic achievement by impairing concentration, reducing working memory capacity, and fostering avoidance behaviors during mathematical tasks (Amariza et al., 2024). Furthermore, research indicates a gender disparity in the prevalence of MLA, with female students typically experiencing higher levels of anxiety often influenced by social expectations and gender stereotypes (Bornaa et al., 2023). Teachers' own math anxiety also plays a critical role, as it can be inadvertently transmitted to students, particularly in early childhood education settings (Ramirez et al., 2018). Despite its pervasive effects, current pedagogical approaches frequently overlook the affective dimension of learning, focusing primarily on cognitive outcomes and thereby failing to address the emotional barriers posed by mathematics anxiety in a comprehensive manner (Victor-Aigbodion, 2023).

Although many studies have discussed the role of mathematics in everyday life and learning strategies to address students' anxiety (Tampubolon et al., 2019; Siti Ashari Arbiah Harahap & Vebi Radiatul Rahman, 2023), several research gaps remain. First, there is a lack of research that directly links Vygotsky's theory to reducing mathematics learning anxiety at the primary and secondary levels. Second, there is limited exploration of the effectiveness of scaffolding in reducing mathematics learning anxiety using various interactive media and learning models. Third, few studies examine how using language as a mediation tool in mathematics learning can help students overcome their fear of abstract concepts. Fourth, there is still little empirical research on how social interaction in mathematics learning can enhance students' motivation and self-confidence.

To fill these gaps, this study offers several novelties. It proposes a Vygotsky-based approach to reducing mathematics learning anxiety by integrating the concepts of ZPD and

scaffolding into the learning process. particularly the concepts of the Zone of Proximal Development (ZPD) and scaffolding, offers valuable insights for studying mathematics learning anxiety (MLA). Students with high anxiety often struggle to engage with mathematical tasks independently; thus, guided support within their ZPD can reduce pressure and build confidence. Scaffolding allows educators to provide step-by-step assistance, helping learners gradually overcome challenges without becoming overwhelmed. Moreover, Vygotsky's emphasis on social interaction highlights the importance of collaborative and supportive learning environments in reducing anxiety. Investigating MLA through this theoretical lens can inform more empathetic and effective teaching strategies.

Vygotsky's sociocultural theory, particularly the concepts of the Zone of Proximal Development (ZPD) and scaffolding, provides a useful framework for understanding and addressing mathematics learning anxiety (MLA). Students often experience anxiety when faced with mathematical tasks they perceive as too difficult or when they feel isolated in their struggle. By offering guided support within the ZPD, teachers can help students engage with challenging material in a manageable way, gradually building confidence and reducing fear. Scaffolding enables learners to receive the right amount of help at the right time, preventing them from becoming overwhelmed. Additionally, Vygotsky's emphasis on social interaction promotes collaborative learning environments that foster emotional safety and reduce anxiety. Thus, applying Vygotsky's theory in mathematics education can play a crucial role in minimizing anxiety and supporting students' emotional and cognitive development. Based on the description, this study aims necessary to conduct an in-depth study related to the application of Vygotsky's theory to overcome mathematics learning anxiety.

RESEARCH METHODS

This study employs a literature review methodology to examine existing research on mathematics learning anxiety and Vygotsky's theoretical framework. The literature review is conducted by collecting and analyzing relevant academic articles, books, and conference papers from reputable databases such as Google Scholar, Scopus, and Web of Science. The selection criteria include studies published within the last ten years, focusing on mathematics anxiety, Vygotsky's learning theory, scaffolding, and social interaction in mathematics education. The data analysis process involves categorizing findings based on key themes such as factors influencing mathematics anxiety, the role of scaffolding in reducing anxiety, the effectiveness of social interaction in learning, and the impact of language as a mediating tool. A systematic

review approach is used to synthesize findings and identify patterns, trends, and gaps in the literature. By employing a literature review method, this study aims to provide a comprehensive understanding of how Vygotsky's concepts can be applied to reduce mathematics learning anxiety. This approach also ensures that theoretical perspectives and empirical findings from previous studies inform the development of future research directions and pedagogical strategies.

RESULTS AND DISCUSSION

The following are the research results at each research stage: In the Data Collection stage, a total of 50 relevant articles were gathered from major academic databases, including Google Scholar, Scopus, and Web of Science. During the Filtering stage, a more focused selection process was conducted to identify articles that closely aligned with the research theme on mathematics learning anxiety and Vygotsky's theoretical framework, resulting in 13 selected articles. The Categorization stage involved grouping these articles into key thematic areas. The categorization revealed that 5 articles addressed anxiety-related factors, 3 articles discussed scaffolding and the Zone of Proximal Development (ZPD), 2 articles focused on social interaction, 1 article explored language mediation, and 2 articles examined the use of technology in mathematics learning. During the Analysis stage, a detailed examination of the selected articles was carried out, particularly focusing on how scaffolding, social interaction, and language mediation contribute to reducing mathematics anxiety. Although not all articles directly referenced Vygotsky's theory, many highlighted the importance of social and instructional support in the learning process. Finally, in the Synthesis stage, findings were summarized to identify effective strategies for addressing mathematics anxiety. These include the use of structured scaffolding, the creation of collaborative learning environments through social interaction, and the use of language and technology as mediational tools. These strategies reinforce the applicability of Vygotsky's sociocultural theory in contemporary mathematics education. The following are the results of data collection

Tabel 1. Results Summary Data

Stage	Description	Number of Articles
Data Collection	Gathering relevant articles from Google Scholar, Scopus, and Web of Science	50
Filtering	Selecting articles that closely align with the research theme	13

Categorization	Grouping articles into key themes: anxiety factors, scaffolding, social interaction, and language mediation	5 (anxiety factors), 3 (scaffolding & ZPD), 2 (social interaction), 1 (language mediation), 2 (Using Technology)
Analysis	Identifying key findings on scaffolding, social interaction, and language mediation	-
Synthesis	Summarizing findings and identifying effective strategies for reducing mathematics anxiety	-

The analysis phase identified key findings, including the effectiveness of scaffolding techniques in reducing anxiety, the role of social interaction in improving student motivation, and the impact of language as a mediation tool in enhancing comprehension. The synthesis of these findings highlights that a Vygotsky-based pedagogical approach incorporating these elements is effective in addressing both cognitive and emotional challenges in mathematics learning.

Based on the reviewed articles, the following results were obtained:

Table 2. Results of Reviewed Articles

No	Writer	Title	Results
1.	Fandhila Aprilia Rahmawati, Jayanti Putri Purwaningrum (Aprilia R. & Putri P., 2022)	Application of Vygotsky's Theory in Mathematics Learning	A teacher also needs to create ZPD so that students can develop knowledge of their cultural concepts and by providing questions and representations of thinking.
2.	Saputra, Novaliyosi, Syamsuri, Aan Hendrayana (Saputra et al., 2024)	Systematic Literature Review: Scaffolding Strategy in Mathematics Learning to Improve Students' Understanding	The application of the Scaffolding strategy in mathematics learning involves various techniques such as providing gradual assistance, using open questions, and providing learning aids that are appropriate to the student's development level.
3.	Adinda Alifya Nur Fadhilah, Nasichah, Dara Alviyanti, Maghfy Ray Ramadhan Husny (Fadhilah et al., 2023)	The Influence of Peer Support on Mental Health of BPI UIN Jakarta Students	The influence of peer social support on the mental health of BPI UIN Syarif Hidayatullah Jakarta students turned out to be quite influential, so that what was felt had a positive impact. Conversely, if peer social support has no effect, then what can be felt has a negative impact.
4.	Nia Wahyu Damayanti (Damayanti, 2021)	Practice of Providing Scaffolding by Mathematics Education Students in the Mathematics Teaching and Learning Strategy (SBM) Course	Based on the results of observations and interviews from the scaffolding practices that have been carried out, students can carry out scaffolding practices at level 1 and level 2 namely at the explaining, restructuring and reviewing stages.
5.	Silviana Maya Purwasih and Erika Rahmadhani	Implementation of Scaffolding as a Solution to Minimize	From the results of the analysis that has been carried out, it is known that all subjects in this study made conceptual

No	Writer	Title	Results
	(Purwasih & Rahmadhani, 2022)	Student Errors in Solving SPLDV Problems	errors, technical errors and procedural errors, therefore the type of scaffolding provided was not much different between subject 1, subject 2 and subject 3.
6.	Freddy Prasetyo, Dadang Juandi (Prasetyo & Juandi, 2023)	Systematic Literature Review: Identification of the Application of Learning Models to Students' Mathematics Anxiety	The results of this study indicate that of the various existing mathematics learning models, there are twenty learning models that can be alternatives to overcome mathematics anxiety in students.
7.	Dinil Kholidah Amaliah (Arifah & Nur, 2025)	Effective Strategies for Guiding Small Group Discussions to Enhance Student Collaboration	The results of the study showed that effective strategies included the use of open-ended questions, providing constructive feedback, and assigning roles within the group. In addition, the dynamics of small group discussions can be improved with good conflict management by teachers. The study also found that small group discussions can improve students' collaboration skills, which are reflected in communication, individual responsibility, and group decision making.
8.	Yunita Embong Bulan, Beautiful Nisa' (Bulan et al., 2022)	The Influence of Social Environment on Development Teenage Mentality	The results of the study show that the family environment plays a major role in shaping values, norms, and emotional support that influence adolescent mental development.
9.	Arie setiawan (Setiawan, 2024)	Overcoming Student Anxiety in Learning Mathematics	Based on the results of the study, it shows that anxiety can be overcome by using more images in mathematics learning. Graphics and images are able to reduce anxiety in students. However, this will be hampered by materials that do not have an image base. So the role of the teacher becomes the main thing to reduce anxiety in students. The teacher's strategy in teaching is an important point and at the same time helps reduce student anxiety in mathematics.
10.	Diyah Septiyaningsih, Najma Alkhayya, Nana Mardiana, Didik Tri Setiyoko (Septiyaningsih et al., 2025)	The Role of Technology in the Use of Learning Media for Elementary School Students	Educational technology has a very important and inseparable role in the learning process. Thus, the development of technology and education complement each other, collaborate, and contribute to the progress of education itself.
11.	Mira, Irmawati, Suci Maulidya Baharuddin, Grace, Jonial, Ronald Kurniawan, Sitti Aisyah Mustafa, Rosmiati	Analysis of Mathematics Learning Problems at State Vocational School 3 Majene	The results of the study showed that students had difficulty in understanding basic mathematical concepts, low problem-solving skills, and lacked motivation to learn.

No	Writer	Title	Results
12.	(Mira et al., 2024) Ridho Muhammad Reza, Eka Sari Setianingsih, Ardiatma Rio Respati (Reza et al., 2023)	The Effectiveness of Mindfulness Training Deep Breathing Technique to Improve Self-Control of Grade 10 Students of Sma Negeri 6 Semarang	Mindfulness therapy deep breathing technique is effective in improving students' self-control as shown by the statistical data results of the average pre- test and post-test scores of 49.78 for the pre-test score and 60.47 for the average post-test score, an increase of 10.69.
13.	Ma'ruf Bin Hussein (Husein, 2020)	Learning Difficulties in Elementary School Students	From the results of the interview, it can be concluded that FI students are indicated to be experiencing learning difficulties. Therefore, in this study, the author examines the learning difficulties experienced by students, so that the learning process that occurs in the classroom can run well and smoothly because no children are left behind in delivering the material given by the teacher.

Mathematics anxiety is defined as a condition where students experience worry, fear and discomfort when thinking about activities related to mathematics, which will cause them to avoid mathematics (Prasetyo & Dasari, 2023). Factors that cause mathematics anxiety can be classified into three categories: (1) environmental factors, such as negative experiences in the classroom, parental pressure, insensitive teachers, mathematics content, conventional mathematics education delivered with strict rules; (2) mental factors, such as teaching methods that do not match learning styles, lack of student determination, lack of self-confidence in mathematics, and lack of belief in the usefulness of mathematics; and (3) personal factors, such as reluctance to ask questions due to embarrassment, fear and low self-esteem (Amariza et al., 2024).

Vygotsky's developmental psychology theory provides a highly relevant perspective on addressing math anxiety, particularly through its emphasis on social and cultural interactions. One of the core concepts in Vygotsky's theory is the zone of proximal development (ZPD), which describes the distance between what students can do independently and what they can achieve with support from others, such as teachers or peers. In the context of math learning, many students feel anxious or unable to solve difficult problems because they are beyond their ability to understand them without help. By understanding students' ZPD, teachers can provide appropriate and tailored support to each student's needs, so that they feel more capable and confident in learning.

The application of Vygotsky's theory in overcoming math anxiety can be done by optimizing social interactions between students and teachers or peers. For example, teachers can provide clear explanations or instructions to help students break down difficult math problems into easier-to-understand steps. In this case, the teacher acts as a facilitator who provides assistance according to the student's ZPD (Aprilia R. & Putri P., 2022). In addition, collaboration with peers who are more proficient in math can also help students feel more comfortable in learning (Fadhilah et al., 2023). Group discussions and cooperation in solving math problems allow students to learn from each other, which in turn reduces anxiety and provides a sense of security in the learning process. This collaboration not only improves understanding of the material but also strengthens students' self-confidence because they feel supported by their friends.

To address mathematics learning anxiety (MLA), the application of Vygotsky's sociocultural theory can be operationalized through six interconnected strategies. First, identifying each student's Zone of Proximal Development (ZPD) allows educators to tailor tasks that are challenging yet achievable, minimizing frustration. Scaffolding then provides the necessary support within this zone, gradually guiding students toward independent mastery. Collaborative learning with peers fosters a sense of belonging and reduces performance pressure through shared problem-solving and mutual support. Positive social interactions help build self-confidence, offering encouragement and constructive feedback that counters negative self-perceptions often linked to anxiety. The use of learning aids such as visual tools, manipulatives, or educational technologies serves as cognitive mediators that make abstract concepts more accessible and less intimidating. Finally, incorporating social-emotional interventions into the classroom environment supports emotional regulation and resilience, helping students manage anxiety more effectively. Together, these strategies reflect Vygotsky's emphasis on guided learning, social interaction, and psychological development as essential components for reducing mathematics anxiety.

1. Identification of the Zone of Proximal Development (ZPD)

The application of Vygotsky's theory in mathematics learning begins with identifying the student's Zone of Proximal Development (ZPD), which is the range between the abilities that students can do independently and the abilities that can be achieved with assistance. This process is important for understanding individual learning needs, especially for students who experience anxiety in learning mathematics. Teachers can conduct initial assessments through observation, discussion, or giving simple questions to identify the level of student

understanding (Aprilia R. & Putri P., 2022). By knowing the ZPD, teachers can design targeted learning, provide appropriate challenges, and ensure students feel supported during the learning process. For example, students who already understand the concept of basic addition can be directed to learn subtraction with the help of relevant steps or visual aids.

Once the ZPD is identified, the next step is to provide scaffolding or temporary support to help students overcome learning challenges (Saputra et al., 2024). In mathematics, scaffolding can take the form of verbal support, step-by-step instructions, the use of manipulatives such as number blocks, or real-world examples that make abstract concepts easier to understand. This support is provided gradually and tailored to the student's needs, and is reduced as their abilities improve. For example, a student who is struggling with division might be taught to physically divide groups of objects before moving on to abstract calculations. This approach not only improves students' understanding but also helps them feel more capable and confident in solving math problems.

In addition, the application of Vygotsky's theory also emphasizes the role of social interaction and language as a mediation tool in learning (Prasetyo & Dasari, 2023). Teachers can create a collaborative learning environment, where students are encouraged to discuss, share ideas, and help each other solve math problems. Group discussions provide students with the opportunity to learn from their peers and reduce their fear of failure because they are working in a supportive atmosphere. In addition, through verbal reflection, students can explain their thinking, which helps them internalize math concepts better. These interactions not only improve cognitive understanding but also provide emotional support, so that math anxiety can be managed more effectively. With this approach, teachers not only help students overcome anxiety but also build their confidence to face future academic challenges.

2. Scaffolding (Stage Support)

The concept of scaffolding or incremental support is an important approach to helping students overcome math anxiety. Scaffolding involves providing temporary support from teachers, parents, or peers, designed to support students until they are able to complete tasks independently (Saputra et al., 2024). In the context of mathematics, anxiety often arises when students find it difficult to understand abstract or complex material. Therefore, teachers must provide assistance that is appropriate to the individual needs of students. This assistance can be in the form of verbal guidance, concept visualization, example problems, or the use of concrete teaching aids (Purwasih & Rahmadhani, 2022). This strategy allows students to feel more confident because they get relevant support according to their level of understanding.

Scaffolding done by breaking down large tasks into smaller, more manageable steps. For example, when students have difficulty understanding a story problem in math, teachers can start by helping students identify important information in the problem. After that, teachers can guide students to understand the logical steps in solving the problem, such as making diagrams, tables, or arranging calculation steps in stages (Damayanti, 2021). Teachers can also use guiding questions to direct students' attention to relevant aspects of the problem, or provide simple analogies that help them understand more abstract concepts. In this way, students not only learn to solve problems but also feel emotionally supported.

As students' understanding increases, the level of support in scaffolding is gradually reduced. Teachers begin to provide more opportunities for students to try to complete tasks independently, but still provide constructive feedback when necessary. This process helps students build independence, increase self-confidence, and reduce dependence on external help (Mustofa et al., 2023). In addition, this positive experience gives students the courage to face future math challenges without feeling anxious or afraid of failure. By implementing scaffolding effectively, teachers not only help students understand math material better, but also create a learning environment that supports students' cognitive and emotional development.

Scaffolding is a learning strategy that focuses on teachers' efforts to guide students to achieve success in learning. This concept involves providing temporary assistance tailored to students' needs, with the aim of helping them master material or skills that were previously difficult to reach independently. As a learning facilitator, teachers not only act as information providers but also as supporters who ensure that each student gets the support needed to achieve their learning goals. In this way, scaffolding becomes an effective tool in addressing the gap between students' current abilities and their potential. According to Aprilia Rahmawati & Putri Purwaningrum (2022) teachers are required to provide motivation or encouragement that can help students in the process of achieving a higher level.

Motivation provided by teachers in scaffolding is the key to increasing students' self-confidence. In the learning process, students often face difficulties that can lower their enthusiasm or even cause fear of trying new things. Therefore, teachers need to provide positive encouragement, either through praise for the efforts made or by providing challenges that are in accordance with the students' abilities. For example, a teacher can motivate students by saying, "You have understood the first step well, now let's try the next step together." This approach not only helps students feel appreciated but also encourages them to continue trying

to achieve success. With consistent support, students will feel more confident in facing more complex material.

Over time, the support provided through scaffolding is gradually reduced to encourage student independence. In this process, teachers provide opportunities for students to test their own abilities, while remaining ready to provide assistance when needed. In this way, students not only gain a deeper understanding of the material but also learn to rely on themselves to solve problems. As a result, students not only achieve success in learning but also experience significant development in critical thinking skills and emotional management. Scaffolding, as expressed by Aprilia Rahmawati & Putri Purwaningrum (2022), is a bridge that helps students step up to a higher level of achievement, while building solid self-confidence to face future challenges.

3. Collaboration with Peers

Collaboration with peers is an effective learning strategy, especially in the context of overcoming math anxiety. This strategy is rooted in Lev Vygotsky's view that emphasizes the importance of social interaction in learning (Fadhilah et al., 2023). Collaborating with peers creates a more relaxed learning environment, where students do not feel as pressured as they would when studying alone or under the direct supervision of a teacher. In this supportive atmosphere, students feel freer to ask questions and explore concepts that they find difficult to understand. Peers who have a better understanding of a particular material can provide simpler and more relevant explanations, making it easier for other students to grasp the concepts being taught.

In practice, this collaboration can be realized through small group discussions, where students share views and strategies for solving math problems (Arifah & Nur, 2025). This discussion process helps students see different approaches that they might not have thought of before, while also motivating them to try new ways of solving problems. For example, a student who is having difficulty understanding the concept of fractions may be helped by a peer who explains it visually using diagrams or real-life examples. This peer support is often more relatable and easier to understand than a formal explanation from a teacher. This type of collaboration also allows students to actively learn, which increases their confidence in their own abilities.

In addition to helping academic understanding, collaboration with peers also has a positive impact on students' emotional health (Bulan et al., 2022). Positive interactions with peers create a sense of social support, which helps students feel less alone in facing learning

difficulties. This supportive atmosphere reduces students' anxiety about mathematics lessons, making them more willing to try and take risks in learning. By feeling appreciation from peers for their efforts, students are encouraged to continue learning and developing. Therefore, collaboration with peers not only helps improve understanding of mathematics materials but also creates a learning environment that strengthens students' self-confidence and emotional well-being.

4. Building Self-Confidence Through Positive Interactions

Building self-confidence through positive interactions is an important step in helping students overcome math anxiety. Anxious students often have negative perceptions of their abilities, are afraid of failure, or are reluctant to try for fear of making mistakes. Teachers can change these perceptions by creating a supportive and welcoming learning environment where mistakes are understood as a natural part of the learning process, rather than a sign of failure (Setiawan, 2024). This way, students will feel more comfortable trying new things without fear of being overly evaluated. Teachers can also give specific praise to students' efforts, not just their outcomes, to show that their learning is valued. For example, praising a student for their courage in trying a difficult problem can provide a significant morale boost.

Positive interactions between teachers and students play a key role in building this sense of self-confidence. Teachers can use strategies like rewarding small improvements, even if students don't fully complete the task (Jelita & Sholehuddin, 2024). For example, if a student only gets part of a math problem right, the teacher can praise the part that is correct and provide guidance on how to improve the rest. Using supportive language, such as "You're getting better at understanding this concept" or "The next step will be easier if we work on it together," can provide encouragement and a sense of security for students. Teachers can also adjust the pace of learning so that students don't feel rushed, for example by allowing extra time for assignments or more in-depth discussions.

In addition to teachers, positive interactions can also come from peer support. Small group discussions allow students to support each other and learn from each other's experiences. By sharing perspectives and strategies, students can find new ways to understand the material, which are often more relevant and relatable. This kind of social support helps students feel that they are not alone in facing learning difficulties. With a supportive environment, students will be more confident in taking on challenges, feel valued for their efforts, and ultimately reduce any anxiety they may have about math (Arifah & Nur, 2025). This process not only helps students academically but also strengthens their emotional skills in managing study stress.

5. Use of Learning Aids

The use of learning aids is a very effective strategy in helping students overcome math learning anxiety. This strategy is in line with Vygotsky's theory, which emphasizes the importance of tools or media in bridging students' understanding of abstract concepts. Learning aids help simplify complex mathematical concepts into more concrete and understandable forms (Septianingsih et al., 2025). For example, to introduce the concept of fractions, teachers can use physical manipulatives such as colored paper cut into small pieces. In this way, students can visually and directly see the relationship between fractions, making it easier for them to understand the concept compared to just reading or hearing an explanation. All existing learning models in order to work effectively in overcoming mathematics anxiety, namely the learning model that will be used must be able to create an interactive, communicative, and of course enjoyable learning atmosphere, so that negative emotions in students such as fear, anxiety, tension, worry, and so on related to mathematics can be reduced or even disappear (Prasetyo & Juandi, 2023).

In addition to physical manipulatives, graphic visualizations can also be an effective tool in learning mathematics. Diagrams, graphs, or tables can be used to help students visualize mathematical data, patterns, or relationships. For example, a pie chart can help students understand fractions or percentages more clearly (Kurniasih et al., 2018). By using these tools, students not only develop a deeper understanding of the material but also feel more confident because they are able to solve problems with the help of relevant visualizations. In this situation, the teacher acts as a facilitator who provides tools and accompanies students in using the tools to achieve learning goals.

Technology also offers innovative tools, such as math apps or interactive simulations, that can provide dynamic and engaging learning experiences. These apps allow students to learn at their own pace, explore different ways of solving problems, and receive immediate feedback on their work (Septianingsih et al., 2025). Additionally, technology tools often include elements of gamification, which makes the learning process more fun and motivates students to keep trying. With the combination of physical, visual, and technological aids, students can experience small successes throughout the learning process. These successes are critical to building their confidence, reducing anxiety, and changing negative views of math to positive ones.

6. Social-Emotional Interventions

Social-emotional interventions have a very important role in helping students overcome math learning anxiety. Anxiety experienced by students often stems from emotional factors, such as fear of failure, feelings of anxiety about poor results, or low levels of self-confidence. When this anxiety is not handled properly, it can hinder students' ability to process information and complete tasks well (Victor Aigbodion, 2023). Therefore, one approach that teachers can apply is relaxation techniques, such as deep breathing exercises or mindfulness. These techniques can help calm students' minds before they start a lesson or take a test, so they can feel calmer and ready to learn (Reza et al., 2023). By practicing these relaxation skills, students will learn how to manage their anxiety more effectively.

Besides breathing exercises or mindfulness, giving students who need extra time can also be a useful intervention. Many students feel pressured or rushed when they have to complete math assignments in a limited amount of time, which can actually increase their anxiety. By giving students more time to complete problems, they can feel more relaxed and have a chance to think more clearly. It also gives students a chance to process information thoroughly and correct mistakes without rushing. In this way, students can reduce the stress they experience and feel more confident when working on math problems, which will also improve their ability to solve math problems (Reza et al., 2023).

It is also important for teachers to create a supportive and safe learning environment, where students feel valued and are not afraid to express their feelings. A safe environment can reduce students' anxiety because they do not feel judged or pressured by others. Teachers who are open and empathetic, and who can create a positive classroom atmosphere, allow students to learn more freely and without fear (Husein, 2020). In addition, it is important for teachers to provide constructive and supportive feedback, where mistakes are seen as part of the learning process, rather than as failures. With this approach, students can feel more valued and accepted, which helps them develop effective emotion management skills. Finally, with reduced anxiety, students will be better able to understand and solve math problems with confidence.

CONCLUSION

The application of Vygotsky's developmental theory in overcoming math anxiety emphasizes the importance of social interaction, gradual support, and the use of appropriate learning aids. By identifying the zone of proximal development (ZPD), teachers can adjust challenges according to students' abilities, so that the learning process becomes more focused

and enjoyable. Scaffolding helps students overcome difficulties by providing gradual support until they are able to learn independently. Collaboration with peers creates a positive, supportive, and pressure-free learning environment. Positive interactions from teachers, such as praise and appreciation for students' efforts, strengthen their self-confidence. The use of learning aids also makes abstract mathematical concepts more concrete and easier to understand. In addition, social-emotional interventions, such as relaxation exercises and creating a safe learning atmosphere, help students manage anxiety and build emotional resilience. By implementing these strategies, math anxiety can be minimized, so that students are more confident and able to enjoy the learning process.

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