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Research article

Evaluating the Effectiveness of a Geometry Intervention Program Through Student Insights

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Abstract

This study examines the qualitative aspects of a geometry intervention program for fifth and sixth grade students. The program was conducted in 2023 in an Israeli elementary school, using emotional support tools in geometry lessons. The intervention was designed to improve mathematical achievement, reduce anxiety, and foster self-efficacy. The study investigated the impact of the program based on students' experiences and post-participation reflections. Data were collected through in-depth interviews with 20 students and an analysis of 20 student portfolios. Thematic analysis of the interviews and portfolios revealed significant improvements in academic performance, emotional balance, and students' attitudes toward geometry. These findings highlight the value of using emotional strategies in geometry teaching to improve learning outcomes and overall performance.

Keywords:
emotional tools, mathematical achievement, math anxiety, qualitative research, self-efficacy

1. Introduction

Mathematical underachievement, especially in geometry, remains a critical challenge in primary education (Kazmagambet et al., 2020). Students often experience math anxiety and low self-efficacy, which hinder their academic progress and achievement (Ashcraft et al., 2021; Hembree, 1990). The literature highlights the significant challenges students face when engaging in mathematical tasks, which often result in avoidance, increased failure, and the development of math anxiety and low self-efficacy (Barroso et al., 2021; Khasawneh et al., 2021; Levpušček, 2014; Pellizzoni et al., 2022). This paper presents an innovative geometry teaching intervention program that implements emotional support tools in mathematics education.

The intervention program was developed in response to the urgent need created by complex challenges exacerbated by global crises, such as COVID-19 (Hasson-Ohayon & Horesh, 2024; Levi-Belz et al., 2024) and ongoing security conflicts (Sagi & Gilat, 2024), which increased the need for emotional tools in education, especially in mathematics education.

In dealing with these challenges, the intervention program provides tools to reduce math anxiety, improve self-efficacy, and foster both emotional balance and academic growth.

Another study conducted in fifth grade mathematics, points to the difficulty in demonstrating improvement in self-efficacy, claiming that schools do not provide them with the tools to take personal academic responsibility (Danuri et al., 2023). Furthermore, many articles have observed a lack of attention to anxiety when performing mathematical tasks (Pellizzoni et al., 2022; Živkovi, 2022), especially at these ages.

This intervention program, providing students with tools and strategies such as real-life applications, stress management techniques, and personal development activities, aims to transform students' experiences in geometry classes. By bridging the gap between emotional and academic support, this program offers a new approach to geometry instruction that equips students with the skills they need for personal and academic success and growth.

2. Theoretical foundation and rationale developing the intervention program

This study presents an innovative intervention program designed to improve students' learning experiences in mathematics, especially geometry, by implementing emotional support tools and placing learning in real-life contexts. The intervention is based on principles of realistic mathematics education

(RME), experiential learning, and positive psychology.

The program introduces mathematical concepts through practical, everyday scenarios, fostering deeper understanding and increasing student engagement in learning (Freudenthal, 1971). The RME approach works in this intervention to bridge the gap between abstract mathematical concepts and students' life experiences, making the learning process more relevant and meaningful (Juandi et al., 2022; Listiawati et al., 2023). This approach invites students to experience mathematics that is close to their world and creates interest and motivation for learning. Teaching applications of mathematics has a positive effect on students' attitudes towards mathematics and their mathematical achievements (Asli & Zsoldos-Marchis, 2023a) based on a previous experiment conducted in Israel among high school students. Also, mathematics projects related with students' interests and hobbies increase their positive attitude towards mathematics and their achievement (London, 2022) as an experiment with Israeli high school students shows.

However, mathematics applications, and tasks from everyday life, challenge teachers in mathematics classes, as they have time constraints due to national exams and they need more training regarding applications of mathematics (Asli & Zsoldos-Marchis, 2021). Thus, good examples, especially an intervention program, which contains simple, focused, and detailed tasks, significantly contributes to the teacher's confidence in teaching and professional development (Asli & Zsoldos-Marchis, 2023b).

Therefore, the intervention program developed contains simple and accessible guidelines for teachers' implementation. Another reason why detailed intervention program was developed is that teachers tend to interpret new programs and create distortion and change in goals and objectives to align with their personal beliefs and the practical challenges specific to their school environments (Carless, 2004).

The program also aimed to improve students' mathematical achievement and performance by exposing them to a variety of emotional support tools in geometry lessons.

The activities were carefully designed to address math anxiety and low self-efficacy. Based on experiential learning theory, students participated in practical tasks such as building models and creating projects, which allowed them to actively engage in the learning process, reflect on their experiences, and enhance their comprehension of fundamental concepts (Kolb, 1984). Geometry lessons incorporated elements of art, sports, poetry, and interactive games. These enriched students' learning experiences and fostered a deeper conceptual understanding of geometry.

To address the emotional challenges associated with learning mathematics, the program incorporates methods inspired by positive psychology, with an emphasis on building emotional balance and increasing self-efficacy. Recognizing that math-related anxiety often impairs performance, additional emotional support tools such as breathing exercises, mindfulness techniques, positive feedback, and reflective journaling are implemented (Ergas et al., 2018). These strategies provide students with effective techniques for self-management and academic success. By integrating RME principles with emotional support strategies, the program fosters a balanced learning environment that promotes both academic and personal growth. This holistic approach empowers students to regulate their emotions, build resilience, and achieve success in math (Carr et al., 2021; Laakso et al., 2022).

3. Research methodology

The study was conducted during 2023, in an elementary school in grades 5-6 in Israel. The research method is a qualitative analysis. This study seeks to examine the opinions of students, their assessments of the intervention program, and their perceptions of the intervention.

3.1. Research Aim

The aim of the research was to examine the effect of the intervention program on students based on their self-report and portfolio work.

3.2. Research Questions

Question 1: What are students' opinions on the effectiveness and enjoyment of the intervention program?

Question 2: How does the intervention program influence students' learning outcomes as evidenced in their portfolios?

3.3. Research Instruments

3.3.1. In-depth Interview guide

Semi-structured interviews were conducted with students to explore their experiences, perceptions, and outcomes of the program. The interview structure was carefully designed to explore participants' experiences and perceptions regarding the program. It consisted of 14 questions aimed at eliciting insights into participants' self-perceptions following their participation in the program. Questions focused on topics such as confidence in handling challenging tasks (e.g., "Do you feel you now have the knowledge and tools to handle challenging tasks?") and reflections on changes in their abilities and attitudes (e.g., "Do you believe you are now more capable of handling geometry tasks compared to the past?"). The full set of interview questions is provided in the appendices for reference. The interviews lasted 10-15 minutes.

3.3.2. Criteria for analyzing students' portfolios

Students developed portfolios during the intervention program. These portfolios included worksheets from the lessons and reflective writing completed at the end of each lesson. The analysis used anonymized data, focusing on students' task performance and reflective writing to understand their emotional growth and learning progress during the program.

3.4. Participants

The interviews involved twenty 5th and 6th-grade students from the "Shaphir" school in Israel, 11 girls and 9 boys. Participants were selected based on parental consent and represented a diverse group of students aged 10-12.

Also, twenty portfolios were selected for analysis. The students selected for the interviews and the students selected for the portfolio analysis are not the same.

3.5. Data Analysis

For the data obtained from the interviews, thematic analysis was used to identify recurring themes and categories from the data. Thematic analysis, as outlined by Creswell (2018) and Ryan & Bernard, (2003), guided the qualitative data analysis. Recurring themes and categories were identified, verified, and refined through systematic coding.

Analyzing the portfolios, "saturation sampling" method was used. The researcher read and identified students' experiences of reflective writing and improved mathematics performance following a review of mathematics tasks. The researcher summarized the impressions and opinions collected. A table containing these data was created. The data was analyzed by identifying recurring categories and themes that emerged from the students' portfolios. Thematic analysis was performed, as described by Creswell (2018). The analysis revealed several key themes that reflected the impact of the intervention program.

3.6. Intervention program

The geometry intervention program was created as a complementary component to the existing curriculum for 5 and 6 grade students. It incorporated emotional support tools into geometry lessons, based on real-life scenarios.

A variety of tools were used, such as breathing techniques, and a sequence of 15 different mindfulness-based exercises, designed to foster emotional stability and self-regulation during mathematical tasks. Learning-oriented feedback, to create a constructive and student-oriented process for learning and improvement. At the end of each session, students received focused feedback to reinforce knowledge, identify progress, and identify learning tools and strategies that help them.

Empowerment Statements To elicit positive responses, students worked on transforming negative self-talk into positive statements, cultivating constructive academic perspectives, and increasing self-efficacy. Reflective writing, which included writing assignments about the learning process, encouraged students to build emotional insight, track their personal journey, and consolidate acquired geometric concepts.

Interactive assignments motivated students to build models and participate in activities that merged geometry with art, sports, poetry, and games. These experiential activities enriched learning and increased understanding of abstract concepts.

The program consisted of 15 lessons designed to improve students' understanding of geometry while fostering their emotional and cognitive growth in the classroom environment.

The intervention program was experimented in a study included an experimental group and a control group, 146 students in total. This paper presents follow-up qualitative research on students' opinions, experiences, and outcomes related to the intervention program.

4. Results

4.1 Results of in-depth interviews with students

Analyzing students' responses, students reported a more positive attitude towards Geometry (19 students – 95%), improvement in performance in general (18 students – 90%) and increased abilities in Geometry in particular (17 students – 85%). Students considered that they are more competent in goal setting and achieving the goals (14 students – 70%). Also, they considered the program components useful (12 students – 60%), which can be applied outside Geometry lessons (15 students – 75%). All the students considered that the program should be expanded to other classes and school. As regarding math anxiety, most of the students (16 students – 80%) considered that tests are the main source of mathematical anxiety.

As regarding suggestions for improvement, some students suggested incorporating more diverse breathing exercises and simplifying certain aspects of the program, such as writing exercises. Additionally, they highlighted the importance of expanding the program to more classrooms and schools to benefit a larger number of students. Their feedback underscores a desire for greater accessibility and confidence in the program's success.

The most effective program components mentioned by students are presented in Table 1.

Table 1
Program Components

Program Component	Number of Students	Percentage (%)
Breathing Exercises	17	85%
Writing Exercises	14	70%
Geometry Presentations	12	60%
Goal-Setting Activities	13	65%
Peer Collaboration	10	50%
Test Preparation Strategies	15	75%

Gender differences highlight different attitudes toward reflective writing and underscore the need for personalized approaches. Girls perceived a higher impact of the program (Table 2).

Table 2
Gender Differences in the perceived impact of the program

Gender	Improvement in Performance	Application of Tools	Positive Attitude
Boys (N=9)	8 (88.9%)	7 (77.8%)	9 (100%)
Girls (N=11)	10 (90.9%)	8 (72.7%)	10 (90.9%)

Students' responses were analyzed using thematic analysis, through which key themes and categories were identified. Table 3 contains these themes and categories, along with relevant quotations from students' responses.

Table 3.
Thematic and Category Analysis of In-Depth Student Interviews

Theme	Category	Selected Quotes
Impact on Academic Performance	Improved Performance	(D.V.) "...I took a language test and did the breathing; it helps with every academic subject..."
	Application of Skills	(A.B)..."The breathing exercises and the writing exercises help me when I'm nervous"
	Stress Management	(H.N) There was an alarm, my aunt and I ran to a safe room... I looked at her and said to her... Let's calm down, we learned to breathe consciously and deeply and it's really calming"
Self-efficacy and Goal Setting	Confidence in Task Completion	(D.V.) "...I can do any task. If I have difficulty, I will read all the information over and over again..."
	Seeking Help and Perseverance	(M.A.) "...I will ask a friend or teacher for help..."
	Use of Breathing Techniques	(A.M.) "...Breathing helped me a lot, and if it gets hard, I will breathe, calm down, and finish the task..."
	Positive Academic Mindset	(Y.K.) "...When I have negative thoughts about failure, I know how to turn them into positive thoughts..."
Attitudes toward Mathematics	Engagement with Lessons	(D.H.) "...Every time there was a game or creative activity, I would participate..."
	Enjoyment through Creativity	(A.B.) "...It was fun to color, draw, and create in geometry classes..."
	Value for Future Goals	(S.E.) "...I want to be an aeronautical engineer..."
	Practical Importance of Math	(R.D.) "...I want to help my children with their homework..."
	Academic and Career Aspirations	(N.P.) "...I want to go to university to be great, and mathematics is an important subject."
Program Components	Interactive and Experiential Learning	(A.M.) "...The games became a game lesson for me rather than a geometry lesson..."

	Use of Timed Assignments	(T.A.) "...The presence of a timer in the presentation helped me start the assignment right away..."
	Breathing and Mindfulness Videos	(M.A.) "...The breathing videos were cool, and each time we learned a different type of breathing..."
Gender Differences	Positive Attitude Toward Writing	(D.V.) "...I had fun writing about as much as I wanted..."
	Privacy Concerns in Reflective Writing	(T.A.) "...I think writing is personal and private..."
	Preference for Non-Written Expression	(N.A.) "...I think you can write and then tear it up and throw it away..."
Suggestions for Improvement	Flexibility in Exercises	(E.M) shared, "'Bee Breathing' calmed me down, but the SHSHHHH exercises didn't work for me." (D.H) noted, "It's better to breathe quietly without direction or guidance."
	Writing tasks	(N.A) student suggested, "Instead of writing 'What did I learn? What was challenging?' We could share secrets with a friend instead of writing them down."
	Program Expansion	(M.A)"This is very important because it helps more students learn geometry better and replace bad thoughts with good ones."

The identified themes are described in the following:

1. *Impact on Academic Performance:* Students demonstrated an improved understanding of geometry concepts, application of principles, and use of breathing exercises to manage stress.

2. *Self-Efficacy and Goal Setting*: Participants reported increased confidence in handling academic tasks and setting achievable learning goals.

3. *Attitude Toward Mathematics*: Students exhibited a positive shift in their perception of geometry, enjoying interactive and experiential learning activities.

4. *Program Components*: Breathing exercises and creative tasks were highlighted as effective tools, with feedback emphasizing structured lessons and individual assignments.

5. *Gender Differences*: Boys found reflective writing liberating, while girls expressed privacy concerns.

6. *Suggestions for Improvement*: Recommendations included more varied breathing exercises, simpler writing tasks, and expansion of the program to more schools.

As seen in Table 4, the program enabled growth and improvement in geometry while providing a sense of empowerment to set goals and regulate emotions before mathematical performance.

The qualitative findings highlight the effectiveness of the program on both academic and emotional barriers to learning. The use of emotional tools, such as breathing exercises, was instrumental in reducing math anxiety and improving students' focus and self-efficacy. Reflective writing provided students with an outlet to express their emotions while fostering self-awareness and emotional resilience.

This study highlights the importance of incorporating emotional strategies into geometry instruction. The findings suggest that addressing emotional barriers, such as math anxiety, can lead to substantial improvements in academic performance and self-efficacy. The program's success advocates for wider implementation in schools, in additional countries around the world.

4.2 Results of student portfolios

Students' portfolios included worksheets, breathing exercises, geometry assignments, reflective writing, and teacher feedback. These documents provided insights into students' academic and emotional development. Portfolios were collected from students after they participated in the intervention program. For qualitative analysis, a qualitative research saturation sampling method was used. Analysis of student portfolios revealed several key themes that reflect the impact of the intervention program. These themes provide insights into students' progress in performance, self-efficacy, attitudes towards mathematics, and engagement with program components.

4.2.1. Improvement in Student Performance

The analysis of student portfolios reveals a significant shift in performance and self-efficacy over the course of the intervention program. Initially, students displayed low engagement with self-assessment tasks, often avoiding reflective exercises perceived as unrelated to core geometry lessons. This avoidance suggests initial discomfort or a lack of perceived value in non-technical components of the program.

For example, student N.B. consistently omitted reflective writing and self-assessment tasks in early lessons. This behavior aligns with patterns of avoidance frequently observed in students experiencing low self-efficacy (Bandura, 1977). Over time, as N.B. began completing a wider range of tasks, his self-evaluations improved, signaling a growing sense of accomplishment and self-worth. Similarly, student L.Y. progressed from consistently low self-evaluations to achieving a perfect self-assessment score by the program's conclusion. This upward trend reflects enhanced self-efficacy, a critical factor in academic success (Schunk & DiBenedetto, 2020).

Teacher feedback emerged as a pivotal influence, with students eagerly anticipating and responding positively to constructive comments. The feedback not only validated student effort but also reinforced perseverance and resilience. Student A.G. experienced a noticeable shift after lesson 5, indicating that timely and meaningful feedback can serve as a catalyst for self-improvement and engagement.

4.2.2. Progress in Reflective Writing

Reflective writing emerged as an area of profound growth among students. Early reflections were minimal, characterized by brief, surface-level responses such as “easy” or “okay” (e.g., student M.G.). However, as students acclimated to the reflective process, their responses became increasingly elaborate and introspective. This evolution suggests not only improved writing skills but also deeper engagement with personal learning experience (Moon, 2004).

For instance, student A.B. transitioned from minimal input to detailed reflections that addressed perseverance, collaboration, and emotional regulation through breathing exercises. Similarly, student B.S. evolved from avoidance to generating original affirmations and empowerment statements, indicating increased self-awareness and emotional literacy.

Students who initially resisted reflective writing gradually embraced it, demonstrating that consistent encouragement and a supportive environment foster expressive growth. The trajectory of student T.E., who advanced from fragmented responses to rich, nuanced reflections, underscores the program's efficacy in developing self-expression and critical thinking skills.

4.2.3. Self-efficacy and Goal Setting

The intervention significantly enhanced students' abilities to set and pursue personal goals. The portfolios provide ample evidence of increased self-efficacy, with students articulating clear, attainable objectives and demonstrating resilience in the face of challenges. Student (U.V.) exemplifies this trend, with statements such as “When you have a difficult goal, don’t give up,” reflecting internalized perseverance strategies, reflecting Bandura's (1986) the theory that self-efficacy directly influences motivation and performance.

Expressions of anticipated pride and happiness upon goal achievement (e.g., R.F. and B.P.) indicate emotional investment in personal success, aligning with social-emotional learning (SEL) frameworks (CASEL, 2015). These findings highlight the program's role in fostering goal-setting behaviors that contribute to long-term academic motivation and achievement.

4.2.4. Attitudes toward Mathematics

A notable shift in attitudes toward mathematics was evident throughout the program. Initially, student reflections revealed negative or indifferent attitudes, with reliance on generic affirmations. Over time, students began crafting personalized, positive statements, indicating increased confidence and enthusiasm for math.

For example, student B.A. incorporated quotes from influential figures, while student A.S. transitioned from using Herzl’s well-known “If you want it, it’s not a fairy tale” to original affirmations such as “See the question and succeed.” This progression suggests not only improved self-efficacy but also the internalization of growth-oriented mindsets, essential for overcoming math anxiety (Dowker et al., 2016).

Independent use of statements beyond program requirements further emphasizes students' positive attitude changes and engagement with mathematics as a topic of personal growth.

4.2.5. Creative and Experiential Learning

Creative and experiential components of the program significantly enhanced student engagement and understanding. Activities such as art-integrated geometry assignments and breathing exercises provided alternative pathways to understanding, provided diverse learning styles, and fostered a sense of enjoyment and curiosity.

Student B.A.'s geometry project, inspired by Mondrian's art, demonstrates this impact. By transforming mathematical concepts into artistic expressions, students not only strengthened their understanding of geometric principles but also experienced personal fulfillment and pride in their work (see Figure 1).

For example, Student B.A. demonstrated exceptional engagement in a geometry assignment, creating a detailed and colorful representation of a dream classroom using squares and precise measurements (see Figure 2).

The emphasis on experiential learning highlights the value of incorporating creativity into mathematics education and reinforces research indicating that hands-on, engaging activities improve both academic performance and emotional growth (Boaler, 2016; Carroll & Isaacs, 2020; Haigh, 2016).

Figure 1.
Creative assessment work

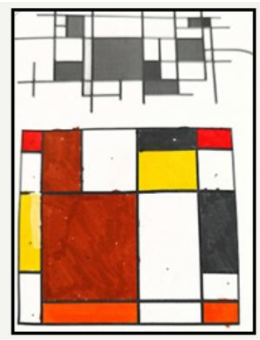
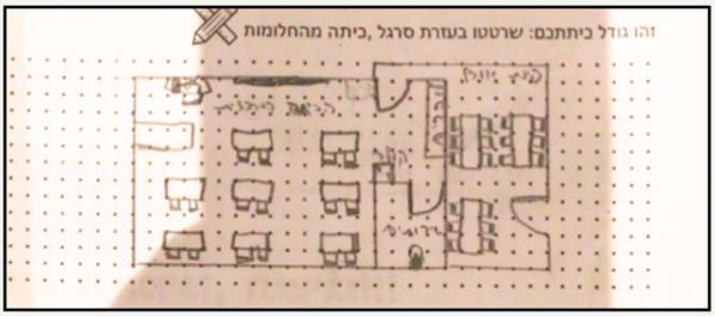


Figure 2.
Assessment related with students' life



The qualitative analysis of student portfolios illustrates the multifaceted impact of the intervention program on performance, reflective abilities, goal setting, and attitudes toward mathematics. By integrating emotional and academic tools, the program fostered significant growth, equipping students with the skills and self-awareness needed to succeed both academically and personally. Creative and experiential elements of the program, such as breathing exercises, games, and art assignments, were highly engaging for students. These activities fostered enjoyment and encouraged investment in learning. These activities enhanced students' understanding of geometric concepts while fostering enthusiasm for learning. The main benefits of the program are:

1. Emotional Regulation: Reflective writings indicated significant improvement in emotional well-being, with students expressing reduced anxiety and increased focus.
2. Academic Growth: Worksheets revealed enhanced comprehension and application of geometry principles.
3. Holistic Development: Portfolios illustrated the integration of academic and emotional learning, fostering a balanced growth trajectory for students.

The contents of the portfolios were analyzed using thematic analysis, through which key themes and categories were identified. Table 4 contains these themes and categories, along with relevant quotations from students' responses.

Table 4
Themes and cathegories that emerged from the portofolios

Theme	Category	Description	Examples
Student Performance	Engagement with Self-assessment	Initial avoidance of self-assessment, progressing to active engagement and improved self-evaluations	N.B., L.Y.
	Impact of Teacher Feedback	Feedback as a catalyst for growth and engagement	A.G.
Reflective Writing	Growth in Reflective Depth	Shift from minimal responses to rich, introspective reflections	M.G., A.B., B.S., T.E.
	Emotional Literacy and Self-awareness	Use of affirmations and emotional regulation strategies	B.S., A.B.
Self-efficacy and Goal Setting	Goal Articulation and Perseverance	Development of personal goals, resilience, and pride in achievement	U.V., R.F., B.P.
	Internalized Growth Mindset	Positive emotional responses tied to goal achievement	U.V., B.P.

Theme	Category	Description	Examples
Attitudes toward Mathematics	Positive Shift in Math Perception	Transition from negative/indifferent attitudes to personalized, affirming statements	B.A., A.S.
	Creative Affirmations	Creative statements created by students themselves, reflect high self-efficacy and self-confidence.	B.A., A.S.
Creative and Experiential Learning	Engagement through Creative Assignments	Art-integrated and experiential learning fostering enjoyment and curiosity	B.A., and other interviewees.
	Alternative Learning Pathways	Breathing exercises, games, and hands-on activities enhancing comprehension	U.V., R.F., B.P., and other interviewees.

4.2.6. The effectiveness of program components

The observed change in student engagement in self-assessment and reflective writing highlights the critical role of fostering self-awareness and confidence in learning environments. Initially, students exhibited avoidance behaviors, mirroring patterns associated with low self-efficacy and math anxiety (Bandura, 1977). Over time, consistent teacher feedback and a supportive environment facilitated participation and personal growth. This progression highlights the transformative potential of feedback and encouragement in treating academic disengagement.

Students such as N.B. and L.Y. demonstrated notable improvements, reflecting the effectiveness of integrating reflective practices with core academic tasks. These findings strengthen the argument that social and emotional learning components, when embedded in academic instruction, can lead to improved student outcomes (Allbright et al., 2019).

Growth in reflective writing serves as evidence of improved emotional literacy and critical thinking. Students moved from superficial responses to internalized and sophisticated reflections, indicating increased self-awareness and emotional regulation. This trend supports Moon's (2004) assertion that reflective writing fosters deeper learning and personal insight. The trajectories of students like T.A. and B.S. illustrate how structured reflection can foster resilience, persistence, and emotional intelligence.

The emergence of personalized affirmations and empowerment statements further emphasizes the program's role in promoting self-confidence and positive emotional engagement. The development of emotional literacy, as seen in the portfolios, aligns with research highlighting the importance of nurturing emotional skills for improved academic achievement and well-being (Boaler, 2016).

The use of emotional support tools and strategies in geometry lessons reflects the value of providing a variety of tools that accommodate different learning styles and reinforces the notion that inclusive and creative pedagogies are essential for holistic education. The program's emphasis on experiential learning highlights the need for educational settings that prioritize curiosity, exploration, and personal expression. Especially in geometry lessons.

5. Discussions

After examining the research questions, in-depth interviews with students indicate a sense of significant improvement in students' academic performance and their ability to grasp and apply geometry concepts.

There were different experiences and impressions in evaluating experiential learning techniques, such as geometry presentations, games, and creative tasks. On the one hand, teachers raised the issue of board games as a missing resource, while students noted enjoyment and improvement. Students may have seen online games as a pleasure from their familiar world, and teachers had difficulty moving forward and recognizing Internet games as an intangible value. Apparently, this tool is still far from their world, but it is a built-in and innate tool in the students' world.

However, students respectively claimed that the game tools and creative tasks contributed to a deeper understanding and retention of the material and to the development of competencies in geometry. These findings are consistent with the studies of Baranyai et al. (2019) et al. and Zsoldos-Marchis (2020), studies that emphasize the role of play as a way of learning mathematics in a joyful atmosphere and developing mental thinking. Also, games contributed to an increased depth of knowledge, and the feelings of success that come from the game motivated students.

The timer that was in each presentation was perceived by students as a resource that helps organize time and meet the deadlines assigned to each task, while teachers saw it as a busy schedule for the lesson and suggested shortening the lesson times to 30 minutes per lesson.

The feeling of reduced math anxiety was consistent with the qualitative findings of the in-depth interviews of both students and teachers.

This finding is consistent with research by Foley et al. (2017) and Ayuso et al. (2021), which highlights the role of emotional interventions in reducing anxiety and improving academic performance.

Improved self-efficacy and goal setting Teachers and students noted that the program fostered greater self-efficacy among students. Participants also reported increased confidence in their mathematical abilities and a stronger belief in their ability to achieve academic goals. This finding resonates with Bandura’s social-emotional learning (SEL) theory of goal setting and self-efficacy, which suggests that fostering belief in one’s abilities directly influences motivation and performance.

Answers to the research questions were found in the detailed qualitative analysis. Incorporating qualitative research tools allowed for a broad analysis of the study. Scalability and Long-Term Impact A recurring theme in student feedback was the desire to see the program expanded to other schools. The positive results suggest that scaling up the program could provide broader benefits, while providing tools to support math anxiety and low self-efficacy. The qualitative analysis sheds light on the impact of the intervention program on students. Students and teachers saw the program as improving emotional development and increasing performance and achievement in geometry classes.

6. Conclusions

The findings of this study highlight the significant benefits of implementing emotional tools in geometry teaching and mathematics education. Based on the results, this study suggests:

Using emotional tools in mathematics education, teachers should incorporate strategies that promote emotional development, especially in geometry teaching. These tools can support students in managing anxiety, building resilience, and fostering a positive attitude towards mathematics.

Teachers should be aware of the barriers that exist when performing mathematical tasks, regular feedback of mathematical performance, and emotional balance are essential in geometry teaching. Identifying and addressing barriers to learning, such as math anxiety and low self-efficacy, can improve both engagement and achievement.

Emotional support tools and strategies should complement traditional mathematics teaching methods. This combination can create a balanced approach that supports both cognitive and emotional development.

Combining everyday tasks and real-life examples from students’ lives can make abstract mathematical concepts more tangible. This approach can lead to improved understanding and higher achievement in mathematics.

Providing emotional balance tools and strategies, such as breathing exercises and reflective writing, can help students cope with academic anxiety. These techniques are especially valuable in mathematics, where anxiety often hinders performance.

Using portfolios to reflect on learning progress, records, and successes.

Future research should explore the long-term effects of incorporating emotional tools into mathematics education.

Future research would benefit from examining different populations. ages, cultures, and mathematical learning difficulties. Further research would benefit from broader insights into the topic, exploring the impact of emotional support tools in other academic subjects and in diverse educational contexts.

By addressing students' emotional and academic needs, this approach offers a holistic framework for improving mathematical achievement.

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Appendixes. Students' Interview Guide

The interview is anonymous and will be used for research purposes only!!

Thanks in advance for your cooperation!

Student's name: _____ Class_______________ :

Do you feel an improvement in your performance and achievements?

____

To what extent are you able to apply the principles and tools learned in the Geometry classes?

____

Do you believe that you are more capable of handling tasks in Geometry today than in the past?

____

Which tool helped you the most? ____

Today, are you able to set educational goals for yourself and meet them?

____

What is the importance of geometry classes in your opinion?

____

Do you feel you have the knowledge and tools to tackle challenging tasks?

____

Do you feel that your relationship with Geometry classes has improved?

____

In which areas of yours did you expect to see a change in performance, and the change did not happen ?

____

What component of the intervention plan made you change the most?

____

What suggestions you have for improvement?

____

How the tools learned can be applied?

____

Do you think it is important to spread the program to more classes and more schools?

____

What do you think causes students math anxiety?

____

Thanks, Dikla Polacco