

Reducing Math Anxiety Using Peer Observation as a Reflective Practice Strategy in a Private School in Lahore



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Abstract: *This study aimed to determine the effectiveness of peer observation as a reflective practice model in reducing mathematics anxiety among Grade VII students in a selected private school in Punjab. Specifically, it sought to assess students' mathematics anxiety levels before and after the intervention and examine the impact of peer observation on students' confidence, participation, and engagement in mathematics learning. The study design is based on a quantitative approach of a one-group pretest-post-test design. The study was conducted in a selected private school in Lahore during the academic year 2025–2026. The participants were Grade VII students enrolled at the selected private school. A Mathematics Anxiety Scale was administered before and after the implementation of peer observation activities. The intervention involved structured peer observation sessions and reflective discussions during mathematics lessons. Classroom observations were also conducted to monitor students' participation, confidence, and engagement. The collected data were analysed using descriptive statistics and a paired-sample t-test to determine differences between pretest and post-test anxiety scores. When comparing the two observations, classroom practices related to reducing mathematics anxiety were positively affected by the intervention. After the intervention, students were more willing to engage in math discussions, ask questions, and engage in problem-solving activities. The classroom climate was more positive and student-focused, fostering student confidence and decreased fear of error.*

Keywords: Mathematics Anxiety, Peer Feedback, Learning Goals, Self-Monitoring, Self-Efficacy, Enjoyment

Introduction

Mathematics anxiety is one of the core concerns in schooling for middle school students, especially when abstract mathematics concepts, problem-solving activities, and class participation are introduced. Mathematics anxiety is characterized as feelings of fear, tension, nervousness, and worry that students experience when engaging in mathematical tasks or situations (Varghese & Dominic, 2025). Studies have shown that negative attitudes towards mathematics harm the academic success, self-confidence, motivation, and career preferences of mathematics students (Ahmmed et al., 2024). The research also shows that mathematics anxiety is significantly affected by negative classroom experiences, lack of teacher support, low self-efficacy, and traditional classroom instruction methods (Ahmmed et al., 2024).

Studies of mathematics experiences in the classroom reveal that many students feel anxious when they have to recite orally, solve problems in the presence of others, or present to the class. Students' involvement and engagement in mathematics classroom activities are affected by their insecurity, nervousness, and fear during these classroom activities. The study also showed that collaborative learning and peer support can assist students in dealing with emotional problems and building their confidence in learning mathematics. The researchers also highlighted the significance of creating classroom contexts that support students and teaching methods that engage students in math to minimize anxiety and maximize engagement in mathematics classrooms (Cañeda et al., 2024).

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Peer observation and peer feedback are potential models for reflective practice that can be used to reduce mathematics anxiety. Peer observation enables students to see how others learn, to reflect on their own learning, and to provide support for each other. According to Vattøy & Gamlem (2024), Peer feedback has a positive effect on students' self-monitoring, self-efficacy, and enjoyment, and it can help to lower anxiety in math classrooms. The study explained that students who learn through activity create supportive interactions with peers, and learning goals are clearly understood, becoming more confident and comfortable in the activity of learning. The researchers have also observed that the effectiveness of peer-based practices relies on the proper guidance of the teacher, respectful peer interaction, and psychologically safe classrooms (Vattøy & Gamlem, 2024).

Mathematics anxiety is a pressing issue in the private schools of Lahore as a result of intense competition, high expectations from parents, examination pressure, and fear of not doing well in mathematics. While several studies have investigated the causes and consequences of mathematics anxiety, few studies have focused on peer observation as a reflective practice model for decreasing mathematics anxiety among middle school students in private schools of Punjab. Thus, the purpose of this study is to explore the role of peer observation to assist students in reflecting on what they learn, to enhance their confidence, to facilitate their participation in the class, and to alleviate mathematics anxiety. The knowledge gained from this study could be useful for teachers and school leaders to implement student-centred and reflective teaching strategies to create a conducive learning environment in mathematics.

Literature Review

Mathematics anxiety is identified as one of the significant emotional and learning problems that middle and secondary school students encounter. In general, it is referred to as fear, tension, nervousness, and worry that students feel while performing mathematical tasks or participating in mathematical classroom activities. Varghese & Dominic (2025) explained that mathematics anxiety negatively affects students' academic performance, self-esteem, motivation, mental well-being, and future career choices. The study further identified cognitive difficulties, poor teaching methods, weak classroom environments, low self-confidence, and societal pressure as major causes of mathematics anxiety among secondary school students.

Ahmmmed et al. (2024) found that negative past experiences, lack of teacher support, low self-efficacy, test anxiety, and negative attitudes significantly contribute to mathematics anxiety among adolescents. Their study emphasized that students with low confidence and weak teacher support are more likely to develop higher levels of mathematics anxiety. The researchers also highlighted that anxiety reduces students' motivation toward learning mathematics and affects their classroom participation and achievement.

Research also shows that classroom activities and learning environments strongly influence students' emotional experiences in mathematics classrooms. Cañeda et al. (2024) explored students' emotional and behavioural responses during mathematics classroom activities. The study found that students commonly experience anxiety, insecurity, and fear during oral recitation, problem-solving, and public classroom tasks. However, the researchers also reported that collaborative learning, peer support, and teacher guidance help students manage these emotional challenges and improve their understanding of mathematics concepts. The findings suggest that supportive classroom environments can reduce mathematics anxiety and encourage greater engagement among students.

The role of peers in reducing mathematics anxiety has gained increasing attention in recent educational research. Vattøy and Gamlem (2024) found that peer feedback practices positively influence students' self-monitoring, self-efficacy, and enjoyment while reducing anxiety levels in mathematics learning. The study emphasized that peer interaction helps students better understand learning goals, reflect on their progress, and feel emotionally supported during classroom activities. However, the researchers also stressed that successful peer practices require proper teacher guidance, clear learning goals, and respectful peer relationships.

The study showed that students felt more comfortable learning mathematics with peers because peer interaction reduced fear of making mistakes and improved confidence in problem-solving. Similarly, Ompad & Jacobe (2025) reported that reciprocal peer tutoring improved both academic performance and psychological well-being among middle school students. These findings support the idea that peer-based learning practices can create a more supportive and less stressful mathematics learning environment.

The literature also supports the importance of reflective and student-centered learning practices in reducing mathematics anxiety. Wang et al. (2025) found that reflective classroom interventions, motivational strategies, and supportive learning activities positively affect students' emotional responses toward mathematics. The study highlighted that reflective learning practices encourage students to identify their weaknesses, observe different problem-solving methods, and gradually build confidence in mathematics.

Moliner and Alegre (2020) found that reciprocal peer tutoring significantly reduced mathematics learning and evaluation anxiety among middle-school students. Similarly, Wang et al. (2025) reported that greater peer support was associated with lower mathematics anxiety and stronger psychological resilience. Anjum and Muneer (2025) identified low self-confidence, test anxiety, teacher-related factors, and classroom environment as major contributors to mathematics anxiety, while supportive and collaborative classrooms were linked with greater confidence and reduced anxiety. Recent intervention research also shows that cooperative learning can significantly reduce anxiety and improve engagement among Grade VII students (Emiliana, 2026). A broader review of 132 K–12 studies further identified peers and classroom environments as important influences on mathematics anxiety and highlighted peer tutoring as a useful intervention (Zhou et al., 2026). These findings support the use of peer observation as a reflective strategy to improve confidence, participation, and reduce mathematics anxiety among Grade VII students.

Olarewaju et al. (2025) found that students exposed to smartphone-assisted jigsaw cooperative learning showed a reduction in mathematics anxiety compared with those taught through traditional methods, although the reduction was not statistically significant. Similarly, peer tutoring was significantly associated with mathematics anxiety among secondary-school students, leading researchers to recommend peer tutoring for academically at-risk learners. Skaalvik (2018) found that mastery-oriented students reported lower mathematics anxiety and greater use of adaptive, problem-focused coping strategies among middle-school students. Further

Previous studies consistently show that mathematics anxiety negatively affects students' confidence, motivation, participation, and academic achievement. At the same time, the literature demonstrates that peer support, peer tutoring, collaborative learning, peer feedback, and reflective classroom practices can help reduce students' mathematics anxiety and improve their learning experiences. However, limited research has specifically focused on peer observation as a reflective practice model for reducing mathematics anxiety among middle school students in private schools of Punjab. Therefore, the present study aims to fill this gap by examining how peer observation can help students reflect on their learning, increase confidence, and reduce mathematics anxiety in mathematics classrooms.

Research Objectives

1. To measure the level of mathematics anxiety among Grade VII students before the implementation of peer observation activities.
2. To assess the effect of peer observation on students' confidence and classroom participation in mathematics learning as an indicator of mathematics anxiety.

Research Questions

1. What is the level of mathematics anxiety among Grade VII students before the implementation of peer observation activities?

2. How does peer observation affect Grade VII students' confidence and classroom participation in mathematics?

Hypothesis

H₀: There is no significant difference in students' mathematics anxiety scores before and after peer observation activities.

Methodology

The present study employed a classroom-based action research design using a one-group pretest–posttest pre-experimental approach to examine changes in mathematics lesson anxiety among Grade VII students at a private school in Lahore. Before implementing the intervention, the researchers administered a mathematics anxiety scale to measure students' baseline anxiety levels. The researcher then introduced anxiety-reducing teaching interventions, including step-by-step explanation of mathematical concepts, collaborative learning activities, peer support, low-stakes questioning, positive feedback, additional practice opportunities, and the creation of an error-friendly classroom environment. During the intervention period, a peer observed the researcher's lessons and provided feedback on teaching practices, student participation, classroom interaction, and students' anxiety-related behaviors. The feedback was used by the researcher to reflect on and improve subsequent lessons. After completing the intervention, the same mathematics lesson anxiety scale was administered to the same students to determine whether their anxiety levels had changed.

Population of the Study

The study population consisted of Grade VII students enrolled in a private school in Lahore.

Sample and Sampling Technique

The study was conducted in a private school in Lahore, with Grade VII students. One complete Grade VII class was selected for the study using the intact sampling technique. The total number of children studied was 32 from one section of Grade VII.

Research Instrument

A Mathematics Anxiety Questionnaire, which was adapted from previously validated mathematics anxiety questionnaires (Afmas), was used to collect data. The questionnaire included closed-ended statements on a five-point Likert scale (strongly disagree to strongly agree). The instrument measured students' fear and nervousness, tension, confidence, and comfort in learning mathematics (Naseem et al., 2022).

Observation Tool

The observation was conducted through the Teacher Effectiveness Framework (TEF), an observation tool developed by the school administration to assess teachers' classroom practices systematically. TEF provides structured criteria for observing different aspects of teaching and learning and allows the observer to record performance against specified indicators. The framework comprises five key areas of thinking and learning: (1) Planning and Preparing for Thinking and Learning, (2) Maintaining a Positive Classroom Culture, (3) Promoting Interest and Presenting New Learning, (4) Assessment and Application of Learning, and (5) Catering for Diversity.

Data Collection Procedure

This study took place in three stages:

Phase 1: Anxiety scale. Students answered the mathematics anxiety questionnaire before the intervention to determine the students' starting point of mathematics anxiety.

Phase 2: Intervention. The researcher held peer observation activities in the mathematics classroom, including step-by-step explanation of mathematical concepts, collaborative learning activities, peer support,

low-stakes questioning, positive feedback, additional practice opportunities, and the creation of an error-friendly classroom environment for 6 weeks. Students watched their classmates solve mathematical problems, explain solutions, and participate in collaborative discussions, and showed ways of solving problems in these activities. Students talked about their own learning following their peers' learning. The teacher facilitated and directed the peer observation sessions to ensure supportive and respectful interactions in the classroom.

Phase 3: After completing the intervention, the same mathematics lesson anxiety scale was administered to the same students to determine whether their anxiety levels had changed.

Data Analysis

Table 1

<i>Paired Samples Statistics and t-Test Results for Anxiety Scores Before and After Reflective Practice Intervention</i>								
Variable	M	SD	Mean Difference	SD	95% CI of the Difference	t	df	p
Pre-anxiety	2.72	1.09	0.58	1.66	[-0.02, 1.18]	1.98	31	.056
Post-anxiety	2.14	1.05						

A paired-samples *t*-test was conducted to compare anxiety scores before and after the application of reflective practices. There was a decrease in anxiety scores from pre-intervention ($M = 2.72$, $SD = 1.09$) to post-intervention ($M = 2.14$, $SD = 1.05$), a mean reduction of 0.58 points, $t(31) = 1.98$, $p = .056$, 95% CI [-0.02, 1.18].

Although the mean anxiety score decreased after the intervention, this difference did not reach statistical significance at the conventional .05 level ($p = .056$), meaning the null hypothesis of no difference cannot be formally rejected. However, since the *p*-value is only marginally above .05 and the confidence interval only barely includes zero (lower bound = -0.02), this result can be considered a trend toward significance, suggesting a *possible* meaningful reduction in anxiety that may have reached significance with a larger sample size.

The effect size (Cohen's $d = 1.98/\sqrt{32} \approx 0.35$) indicates a small-to-moderate effect, further supporting that reflective practices may have had a practically meaningful, if not statistically decisive, impact on reducing participants' anxiety.

In summary: Descriptively, anxiety levels were lower after the intervention; however, inferentially, this reduction approached but did not achieve conventional statistical significance, warranting cautious interpretation and possibly further research with a larger sample.

Classroom Observation Results

The purpose of this research was to reduce mathematics anxiety among Grade 7 students through the implementation of engaging and supportive instructional strategies. Two classroom observations using the Teacher Effectiveness Framework (TEF) were conducted to assess the intervention's effectiveness. The first observation was made before the intervention, and the second observation was made after the intervention.

Observation Before the Intervention

In the first observation, it was noted that the lesson planning and classroom management were satisfactory, but that there were some classroom practices that contributed to the mathematics anxiety of students. Students were engaged in classroom activities but lacked opportunities to voice their thoughts, exercise their options, and reflect on their learning. Fewer engagement strategies and limited differentiation for diverse learners were used in the lesson. There was some uncertainty among some students in answering questions, and they needed extra stimulation to engage with the questions. Formative assessments and opportunities for reflection by peers were also sparse. It was observed that although the classroom atmosphere was positive,

there were still some strategies that should be provided to increase the confidence of students and decrease anxiety in learning mathematics.

Observation After the Intervention

In the second observation, it was clear that there were improvements in classroom practices that facilitated the reduction of mathematics anxiety. Pupils engaged well in learning activities and were encouraged to express their ideas and reasoning. The teacher established an environment that was conducive to student learning, questions, and help-seeking. Learning activities were linked to students' prior knowledge and real-life scenarios, so that mathematical concepts were meaningful and less daunting. The teacher employed a range of teaching pedagogies, questioning, and formative assessment strategies which encouraged student engagement and confidence. Individual learning needs were also addressed, with increased scaffolding and differentiation. These activities enabled pupils to learn in a positive and supportive setting.

Comparison of Observations

When comparing the two observations, classroom practices that relate to the reduction of mathematics anxiety were positively affected by the intervention. After the intervention, students were more willing to engage in math discussions, ask questions, and engage in problem-solving activities. The classroom climate was more positive and student-focused, fostering student confidence and decreased fear of error. There were also positive findings related to student engagement, formative assessment, and differentiated instruction. These changes enabled a learning environment for students to develop a positive view of mathematics and to develop confidence in mathematical tasks.

Relationship with Quantitative Findings

The results of these pre- and post-intervention comparisons show positive changes in classroom practice related to the decrease in mathematics anxiety. The results of this qualitative improvement are supported by the quantitative results, which showed a mean decrease of 0.58 points in mathematics anxiety score from 2.72 (SD = 1.09) before the intervention to 2.14 (SD = 1.05) after the intervention. In a paired-samples t-test, however, this difference was not statistically significant at the 0.05 level, $t(31) = 1.984$, $p = .056$, with a 95% Confidence interval for the mean difference of -0.02 to 1.18 . Therefore, the quantitative results indicate a trend towards fewer feelings of mathematics anxiety, but these results are not statistically significant enough to conclude that there was a significant decrease. The qualitative observations are useful for backgrounding this positive trend, however. Students seemed more willing to participate in mathematics discussions, ask questions, and engage in problem-solving activities after the intervention. The classroom atmosphere was also more positive and student-centered, and the students were more confident and had less fear of making mistakes. There were also opportunities for improvement identified in aspects of student engagement, formative assessment, and differentiated instruction that could have helped to foster a supportive learning environment. The classroom-level changes observed are in line with the decrease in the mean anxiety score and indicate possible effects of the intervention on the development of students' more positive attitudes toward mathematics and their increased confidence in mathematical tasks. These qualitative improvements should, however, be interpreted as evidence of a positive trend, since the quantitative result was not quite significant ($p = .056$) and therefore it cannot be concluded that mathematics anxiety is significantly reduced.

Conclusion

The current study investigated the effectiveness of peer observation as a reflective practice model for overcoming mathematics anxiety among students in the VIIth grade at a selected private school in Lahore. The results indicated a significant decrease in students' mathematics anxiety after the intervention. Students' attitudes towards mathematics classroom activities were compared before and after the intervention, showing an increase in confidence, engagement, and comfort in mathematics. The peer observation activities gave

students the chance to have a look at other students' ways of learning, share experiences, and consider their own learning process. This teamwork facilitated a decrease in the fear of making mistakes and positive attitudes toward mathematics. Classroom observations also indicated that students' participation and willingness to solve mathematical problems have improved. Based on the results of the study, the researcher concluded that peer observation, as a model for reflective practice, can be used as an effective teaching method for addressing mathematics anxiety among middle school students. Peer observation helps build a positive, lower-stress mathematics classroom environment by encouraging reflection, collaboration, and support.

Limitations of the study

There are some limitations to this study which should be noted when interpreting the results. First, this study was a small one involving 32 participants, so the results of this study might not be generalizable to a larger or different population of students. Second, the study was a pre- and post-intervention design without a control group. While changes were found following the intervention, it was not possible to conclude that the changes were directly attributed to the intervention, as other factors may have affected the students' mathematics anxiety and classroom behaviour. Third, the quantitative results revealed a decrease in the mean anxiety score (2.72 was the mean anxiety score before the intervention, and 2.14 was the mean anxiety score after the intervention), but the difference failed to be statistically significant at the 0.05 level ($t(31) = 1.984$, $p = .056$). In conclusion, the results do not support the statistical conclusion of a significant decrease in mathematics anxiety, and there is an indication of a positive trend. Fourth, the study was conducted with classroom observations and quantitative measures, which can be affected by the individual characteristics of the students, the classroom environment, and the perceptions of the researcher and/or observer. Finally, the intervention took place in a specific classroom context and over a 'limited' period. The results may vary depending on students' previous mathematical experiences, learning capabilities, motivation, and classroom environment. To overcome these limitations, future studies could involve larger and more diverse samples, control or comparison groups, longer intervention periods, and more than one source of data to add to the evidence for the effectiveness of reflective classroom practices in reducing mathematics anxiety.

Recommendations

The following recommendations are made based on the results of this study:

1. Teacher preparation programs should incorporate peer observation and reflective practice approaches to teach teachers effective strategies to address mathematics anxiety. School administrators should promote student-centered approaches in teaching and learning mathematics to improve students' confidence, participation, and engagement in mathematics classrooms.
2. Peer observation as a method to reduce mathematics anxiety should be studied further in other public schools and by grade level to determine the generalizability of this method. Larger sample sizes, control groups, and longer intervention durations could be used in future studies to further explore the effectiveness of peer observation and reflective practice on students' mathematical achievement and emotional well-being.

Recommendation for Future Research

Future studies can examine the effects of peer observation on other learning outcomes, including mathematics achievement, self-efficacy, motivation, problem-solving skills, and classroom participation. A comparative study of public and private schools also has the potential to better inform the effectiveness of reflective practice models in different contexts.

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