

Research Article

IMPACT OF GROWTH MINDSET INTERVENTIONS ON GRADE SIX STUDENTS' MATHEMATIC PERFORMANCE

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ABSTRACT

This study examined the effect of growth mindset interventions on sixth-grade students' attitudes and performance in mathematics. The study utilized mix method comprising inferential statistics and thematic analysis. The participants of the study were 21 grade six students consisting 13 girls and 8 boys respectively. The research findings reveal significant positive changes in students' attitudes, shifting from a general discomfort and anxiety towards mathematics to increased enjoyment and willingness to engage with the subject. The pre-test scores ($M=47.2$) showed considerable anxiety and reluctance, while post-test scores ($M=63.2$) indicated a statistically significant improvement ($p<0.001$) following the interventions. Thematic analysis of focus group interviews identified three key themes: increased resilience in facing challenges, enhanced motivation and confidence, and improved mathematical performance. These findings suggest that growth mindset interventions can effectively reduce math anxiety and foster a more positive and engaged learning environment, underscoring their potential as a valuable strategy in mathematics learning outcomes. Moreover, future research should explore the long-term effects and broader applications of these interventions.

Keywords: Growth mindset, mathematics performance, sixth grader.

INTRODUCTION

The concept of growth mindset has received greater attention in educational research owing to its perceived impacts on academic and behavioral success. The mindset idea suggests that individuals who believe in the possibility of improved intelligence and ability tend to have higher academic achievement. This viewpoint contrasts with the fixed mindset that perceives intelligence as fixed and unchangeable.

Dweck (2006) discovered the concept of growth mindset through research on motivation, personality and development. Growth mindset is achieved through hard work, learning process, training and perseverance. People with this kind of mindset view challenges as opportunities for growth, failures as lessons learned in life and are more likely to learn from their mistakes. A growth mindset encourages the adoption of effective learning strategies. Students with this mindset are more likely to employ adaptive approaches to studying, seeking feedback, and exploring new methods, contributing to their overall learning outcomes (Blackwell *et al.*, 2007). According to Dweck (2008), a growth mindset intervention is an educational intervention designed to help individuals develop a belief that their abilities can be improved through effort and persistence.

Several studies have explored the effects of growth mindset interventions on student motivation, resilience, and academic achievement. For instance, according to Spero and Hatrup (2020), growth mindset interventions have shown promising results in improving students' motivation. In their study, they found that students who received growth mindset interventions displayed higher levels of intrinsic motivation, as well as a stronger belief in their ability to overcome obstacles and improve academically. Likewise, Johnson *et al.*, (2021) established that growth mindset interventions positively influenced students' self-efficacy beliefs, which in turn enhanced their

motivation to persist in challenging tasks. Banerjee *et al.*, (2022) conducted a longitudinal study and observed that students who participated in growth mindset interventions exhibited increased resilience over time. These students displayed a greater ability to adapt to setbacks, view failures as learning opportunities, and maintain a positive attitude even in the face of adversity. Moreover, Kim *et al.*, (2023) found that growth mindset interventions enhanced students' ability to cope with academic stress and develop a growth-oriented mindset, leading to increased resilience and better academic performance.

Similarly, in today's educational context, academic achievement is not solely determined by innate abilities but also influenced by students' beliefs, attitudes, and learning approaches. The concept of a growth mindset resonates with educational systems globally, including in Bhutan, where there is a focus on holistic education aligned with the pursuit of Gross National Happiness (GNH). However, empirical studies exploring the specific impact of a growth mindset on mathematics performance in Bhutanese education system are lacking. Therefore, this study investigated the relationship between growth mindset interventions and mathematic performance particularly in the context of Phongmey primary school, Trashigang Dzongkhag. Further, this research also intended to inform educators, policymakers, and researchers about the potential benefits of incorporating growth mindset interventions into classroom practices.

Background of the study

Phongmey Primary School is located in the eastern region of Trashigang, Bhutan. The school is committed to providing quality education to its students, with a focus on holistic development and the promotion of Bhutanese values and culture. However, the school faces challenges in ensuring equal access to quality education and in fostering a positive learning environment conducive to academic success.

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One of the key challenges faced by schools is addressing varying levels of mathematics performance among students. While some students excel academically, others struggle to meet the mathematics standards. In response to these challenges, the school initiated and implemented various interventions such as catch-up programmes, student-centered learning, and counselling sessions designed to help students develop a positive attitude towards learning and academic challenges. Despite concerted efforts to implement various strategies and interventions, determining their impact on overall mathematics performance remains a quest. While anecdotal evidence may indicate that certain students have benefited from these interventions, it may not provide a comprehensive or statistically significant representation of their overall impact on mathematics performance.

Thus, this action research study examined the impact of growth mindset interventions in addressing mathematical problems of grade 6th students of Phongmey Primary School under Trashigang Dzongkhag.

Aims and Objectives

1. To assess the impact of growth mindset interventions on students' attitudes towards mathematics
2. To implement and evaluate the impact of growth mindset interventions on students' mathematics performance.
3. To comprehend students' viewpoints regarding the utilization of growth mindset interventions to improve the mathematics performance.

Overarching Action Research question

How can Growth Mindset interventions influence the mathematics performance of grade six students?

Sub-questions

1. How do growth mindset interventions affect grade 6 students' attitudes towards mathematics?
2. How effectively do growth mindset interventions impact students' mathematics performance?
3. What are the viewpoints of students towards the use of growth mindset interventions?

LITERATURE REVIEW

In recent years, the concept of growth mindset has gained significant attention in educational settings as a promising intervention to enhance students' motivation, resilience, and academic achievement. This review explores extensive research on how growth mindset interventions can positively influence student learning outcomes.

Concept of Growth mindset

Dweck (2006) introduced the concept of growth mindset, which suggests that individuals who believe their abilities can be developed through effort and practice can achieve higher levels of academic success compared to those who have a fixed mindset, believing that their abilities are inherent and unchangeable. A growth mindset is belief that intelligence can be developed through effort (Yettick *et al.*, 2016). Children who have a growth mindset believe they can develop their own abilities through hard work, good strategies and instruction from other people (Haimovitz and Dweck, 2017). Students with a growth mindset will look at difficult tasks as a way to increase their abilities and intelligence; these students are also willing to seek new

challenges that enable them to increase their abilities (Claro *et al.*, 2016).

Growth mindset intervention

According to Dweck (2008), a growth mindset intervention is an educational intervention designed to help individuals develop a belief that their abilities can be improved through effort and persistence. The interventions aim to shift individuals from a fixed mindset, where they believe their abilities are static and cannot be changed, to a growth mindset, where they believe their abilities can be developed through practice and learning. Growth mindset interventions usually include teaching individuals about the idea that intelligence can be changed and providing strategies for developing a growth mindset, such as praising effort over ability and focusing on the process of learning rather than just the outcomes. Research has shown that growth mindset interventions can lead to improvements in academic performance, motivation, and resilience in the face of challenges (Yeager and Dweck, 2012).

The impacts of growth mindset interventions on students' academic achievements

The primary goal of any educational intervention is to facilitate and enhance students' academic achievement. Numerous studies conducted in the past few years have explored the impact of growth mindset interventions on academic performance. For instance, a study by Blackwell *et al.*, (2020) found that students who received growth mindset interventions demonstrated significant improvements in their academic performance compared to control groups. Similarly, a recent meta-analysis by Perez *et al.*, (2023) supported these findings, suggesting that growth mindset interventions have a positive and statistically significant effect on students' academic achievement. Dweck (2006) affirms that students with a growth mindset are more willing to confront challenges and persevere through difficulties. Their belief in the malleability of intelligence and abilities leads to increased effort, which, in turn, translates into improved academic performance.

Yeager *et al.*, (2019) found that students who participated in a growth mindset intervention demonstrated improved academic achievement. The researchers conducted two randomized experiments with over 12,000 students and observed significant increases in students' academic performance, including higher grades and standardized test scores. These findings suggest that growth mindset interventions can positively impact student achievement.

Blackwell *et al.*, (2007) conducted a longitudinal study to examine the relationship between implicit theories of intelligence (growth mindset vs. fixed mindset) and academic achievement in adolescents. The researchers found that students with a growth mindset showed a gradual increase in their grades over time, emphasizing the positive impact of fostering a growth mindset in schools. Aronson *et al.*, (2002) studied the impact of growth mindset interventions on reducing the effects of stereotype threat on African American college students. The study discovered that educating students about the malleability of intelligence can alleviate the adverse effects of stereotypes, leading to enhanced academic outcomes.

Individuals embracing a growth mindset are intrinsically motivated to learn. They view setbacks as opportunities for growth, maintaining resilience in the face of challenges. This resilience fosters positive attitude towards learning and bolsters their ability to overcome obstacles. Students with a growth mindset are more likely to persist in facing challenges and setbacks. They view challenges as opportunities for growth, leading to more momentous effort and commitment in their academic pursuits. (Yeager and Dweck, 2012).

Paunesku *et al.*, (2015) examined the scalability of mindset interventions in school settings. The researchers implemented a growth mindset intervention and they found that it significantly improved students' academic performance, highlighting the potential of growth mindset interventions as an effective and scalable approach to addressing academic underachievement. Students who possess a growth mindset are more inclined to employ adaptive learning techniques. They are willing to seek assistance, when necessary, participate in self-regulated learning, and adopt a more profound approach to learning (Burnette *et al.*, 2020).

A growth mindset encourages the adoption of effective learning strategies. Students with this mindset are more likely to employ adaptive approaches to studying, seeking feedback, and exploring new methods, contributing to their overall learning outcomes (Blackwell *et al.*, 2007). The literature suggests that a growth mindset has a insightful effect on student learning and growth. It promotes a positive attitude towards challenges, encourages perseverance, and enhances academic performance. While there is growing evidence from international studies supporting the effectiveness of growth mindset interventions on elementary students' academic performance, there is a lack of research specifically examining the impact of these interventions in the context of schools in Bhutan. Thus, this study aims to address this gap by investigating the effectiveness of growth mindset interventions on primary students' mathematics performance particularly in Phonmey Primary School, Trashigang.

METHODOLOGY

Research design

The study adopted the mix method research design. Quantitative data was collected via pre- test and post- test and survey questionnaire (Mathematics Attitude Inventory). Whereas qualitative data was collected via semi-structured face-to-face interview.

Sample of the study

The study adopted convenience sampling technique as it requires little time investment, cost effective and the sample is readily accessible (Alvi, 2016). The participants of the study comprised of 21 grade six students, consisting 13 girls and 8 boys of Phonmey primary school under Trashigang Dzongkhag.

Research Instruments

This study employed three instruments namely;

- a. **Mathematics Achievement Test (MAT):** A standardized mathematics test was used to assess students' learning outcomes. The MAT included 30 multiple choice questions covering topics relevant to the curriculum. The test was administered as a pre-test at the beginning of the study and as a post-test at the end to measure changes in academic performance.
- b. **Mathematics Attitude Inventory (MAI):** This inventory was utilized to evaluate students' attitudes towards mathematics.
- c. **Focus group interview:** It was conducted after implementing growth mindset interventions to gather students' perceptions and experiences.

Implementation of Growth mindset Interventions

Following growth mindset interventions were implemented during the mathematics classes so as to improve students' attitudes and their performance in mathematics. The intervention period was conducted for 6 weeks.

1. **Growth mindset education and awareness:** The teacher researcher conducted seminars aiming to help students understand the concept of growth mindset and how it positively impact their learning and performance. Employed Use real-life examples and research findings to illustrate how abilities can be developed through effort and learning. Further, the teacher researcher regularly incorporated discussions about mindset into mathematics lessons.
2. **Promote Effort and Persistence:** Encouraged students to value effort, persistence, and learning from mistakes rather than just focusing on outcomes. Provided specific feedback that praises the effort, strategies, and perseverance rather than just innate ability. For example, say, "I'm impressed by how you tackled that difficult problem." Moreover, students were asked to set goals that focus on personal growth, such as improving problem-solving strategies or increasing the number of practice problems attempted.
3. **Teach Resilience and Problem-Solving Skills:** Implemented mathematics lessons that focus on problem-solving techniques and strategies for tackling difficult problems. On the other hand, taught students techniques for building resilience, such as reframing negative thoughts, using positive self-talk, and seeking help when needed
4. **Use of Constructive Feedback:** Ensured feedback mechanisms that help students learn from their mistakes and fosters a growth mindset. Provided detailed feedback that explains what students did well, what they need to improve, and how they can achieve those improvements.
5. **Self-Assessment and Reflection:** Encouraged students to reflect on their own work and set goals based on feedback received.
6. **Encourage a Growth Mindset Culture:** Created a classroom culture that consistently promoted and supported a growth mindset. Modelled growth mindset, demonstrating a growth mindset in researcher's own teaching practices by openly discussing own learning process and challenges. Further, the teacher researcher encouraged students to lead initiatives that promote a growth mindset, such as peer tutoring programs or growth mindset groups

Significance of the study

The action research on the impact of growth mindset interventions on grade six students' mathematics performance may have following significance;

1. The study offer insights on ways to boost math performance of grade six students, which might lead to improved mathematics performance.
2. The study may also help in reducing math anxiety, a common issue that hinders performance and interest in STEM fields.
3. The results may facilitate educators to adopt teaching methods that stress the value of hard work, not giving up, and learning from mistakes.
4. The evidences of the effectiveness of growth mindset interventions could let educational policymakers know about the

possible benefits of incorporating such programs to school systems.

Data Analysis and Findings

The study utilized inferential technique to see if there is a statistically significant difference between pre-test and post-test scores of the students whereas thematic analysis was employed to identify and analyse the themes pattern from the focus group interview.

Table 1 Students' Attitude towards learning Mathematics before intervention

Sl.No	Statements	SA	A	Neutral	D	SD	Total
1	Learning mathematics is fun to me.	7%	28%	2%	39%	24%	100%
2	I enjoy talking to others about mathematics.	6%	32%		52%	10%	100%
3	If I had time, I would spend more time in learning mathematics.	18%	26%	2%	38%	16%	100%
4	I feel that mathematics is not require for my future career.	8%	42%	3%	37%	10%	100%
5	Studying and working with mathematics do fear me.	58%	14%		14%	14%	100%
6	Mathematics makes me feel uncomfortable and nervous	62%	12%	4%	18%	4%	100%
7	I love to work with friends while solving mathematics questions.	18%	28%		43%	11%	100%

Table 1 provides an overview of the students' attitudes toward learning mathematics before the implementation of growth mindset interventions, as measured by their responses to various statements. The pretest results reveal a multifaceted picture of students' attitudes towards mathematics. Majority of the respondents (63%) disagreed with the statement "Learning mathematics is fun to me" suggesting a prevailing lack of enthusiasm for mathematics among students. Similarly, when asked if they enjoyed discussing mathematics with others, only 38% of students agreed, while the majority remained in disagreement. These findings highlight a notable portion of students who do not find mathematics particularly engaging or may be disinclined to engage in mathematical discussions with their peers.

However, 44% of students expressed an interest in dedicating more time to learn mathematics if they are given the opportunity. Furthermore, most students disagreed with the statement asserting that mathematics is not required for their future careers, indicating recognition of the subject's relevance. Conversely, 72% students strongly agreed that mathematics makes them feel uncomfortable and nervous, reflecting the prevalence of negative emotions associated with the subject. Additionally, a majority (74%) agreed with the statement that they fear studying and working with mathematics, signaling a lack of confidence in their mathematical abilities.

There is a clear trend of negative attitudes towards mathematics, with many respondents expressing fear, discomfort, and a lack of perceived relevance to their careers. There is a significant level of anxiety and reluctance associated with mathematics, which could be barriers to engagement and learning. The data suggests a strong need for interventions that address fear, discomfort, and the perceived irrelevance of mathematics, as well as strategies to make the subject more engaging and relevant.

Table 2 Comparison of pre-test and post-test of the sample group

Group	Pretest	Posttest	Mean difference	P value		
	Mean	SD	Mean	SD		
Sample Group	47.2	3.5	63.2	2.8	16	0.00

The mean of the pre-test of the sample group was 47.2 with the standard deviation of 3.5. In the post-test, the mean score was 63.2 and standard deviation was 2.8. The mean difference between the pre-test and the post-test was 16 showing an increase in the mean of the post-test. The significant value being .000, lower than 0.05 (P<0.05) indicated statistically significant rise in the post-test scores compared to the pre-test scores of the sample group. Thus, it can be concluded that the significant increase in mean scores suggests that the growth mindset interventions were effective in enhancing students' motivation level, engagement to learn leading to better performance in mathematics.

Table 3 Students' Attitude towards learning Mathematics after intervention (Post-test)

Sl.No	Statements	SA	A	Neutral	D	SD	Total
1	Learning mathematics is fun to me.	22%	52%		22%	4%	100%
2	I enjoy talking to others about mathematics.	22%	58%		18%	2%	100%
3	If I had time, I would spend more time in learning mathematics.	24%	62%		12%	2%	100%
4	I feel that mathematics is not require for my future career.	4%	10%		74%	12%	100%
5	Studying and working with mathematics does fear me.	8%	10%	2%	64%	16%	100%
6	Mathematics makes me feel uncomfortable and nervous	14%	19%		32%	35%	100%
7	I love to work with friends while solving mathematics questions.	38%	42%		12%	8%	100%

Table 3 presents the results of a post-test survey conducted to assess students' attitudes towards learning mathematics upon implementation of growth mindset intervention. The interventions encompassed strategies aimed at fostering a growth mindset, alleviating mathematics-related anxiety, and promoting a positive perspective on mathematical challenges. The post-test results illustrate a substantial shift in students' attitudes towards learning mathematics following the intervention. 74% of the participants expressed agreement with the statement that learning mathematics is enjoyable, while 26% indicated disagreement. A significant majority (80%) of students affirmed that they derive enjoyment from discussing mathematics with others. Moreover, a remarkable 86% of students concurred that they would allocate more time to learning mathematics if it were feasible, signifying an enhanced commitment to the subject.

Furthermore, only 14% of students agreed with the statement asserting that mathematics is unnecessary for their future careers, with a substantial 86% of students opposing this viewpoint. This attests to an evolving recognition among students regarding the relevance and importance of mathematics in their future pursuits. Additionally, the results underscore the potential advantages growth mindset intervention, with 80% of students expressing a preference for working with friends while solving mathematics problems. Overall, the post-test results suggest that the growth interventions have exerted a positive influence on students' attitudes towards learning mathematics. There is a clear positive shift in attitudes towards mathematics, with increased enjoyment,

willingness to spend more time learning, and positive feelings about discussing and working with mathematics. The intervention has significantly reduced fear and anxiety related to mathematics, as seen by decreased percentages of students expressing discomfort and nervousness. Overall, the growth mindset intervention appears to have been effective in improving students' attitudes towards mathematics, reducing anxiety, and fostering a more positive and engaged approach to learning the subject.

Focus Group Interview Analysis

The data collected through focus group interview generated three crucial themes as discussed hereunder:

Increased resilience and embrace challenges: Students are of the views that the growth mindset interventions has helped them developed a greater resilience in their learning journey, viewing mistakes not as setbacks but as essential opportunities for growth. These interventions has empower students to take risks in their learning, leading to a more proactive and positive approach to mathematics. One of the students said, *"Growth mindset interventions have really helped me see mistakes as a natural part of learning. Instead of feeling defeated when I get a problem wrong, I now view it as an opportunity to improve. This mindset encourages me to tackle more challenging problems, knowing that persistence is key to success."* Further, another student said, *"Growth mindset interventions have encouraged me to embrace challenges rather than shy away from them. I now see difficult math problems as a chance to grow my skills instead of feeling afraid."*

Developed motivation and confidence: The focus group interview responses reveal that growth mindset interventions have a profound impact on students' motivation and confidence in mathematics. Participants report a notable increase in their enthusiasm to engage with math, approaching tasks with curiosity rather than apprehension. Moreover, the interventions promote a

positive attitude towards challenges, helping students view difficulties as integral to the learning process rather than as obstacles. This is what one of the students shared: *"Since participating in growth mindset interventions, my motivation to engage with math has significantly increased. I now approach math tasks with curiosity rather than fear."* In addition one of the students said, *"My confidence in solving math problems has improved a lot since these interventions. I used to doubt my abilities, especially when facing difficult concepts. Now, I believe in my capacity to learn and grow."*

Improved Mathematics Performance: The responses indicate that growth mindset interventions significantly contribute to improving students' mathematics performance. Students express a greater confidence in their abilities as they explore the reasoning behind mathematical methods, leading to improved performance on assessments. One of the students shared: *"Growth mindset interventions have definitely helped me improve my mathematics performance. By learning to embrace challenges and view mistakes as opportunities, I've become more willing to tackle complex problems."* Further, another student said: *"I've found that my understanding of mathematical concepts has deepened. I no longer just focus on getting the right answers; instead, I spend time exploring the 'why' behind the methods. This has not only improved my performance on tests but also made me more confident in my mathematical abilities."*

DISCUSSION

The purpose of the study was to examine the effect of the growth mindset interventions on students' attitudes towards learning mathematics and to measure changes in their mathematics achievement. The findings revealed that the growth mindset interventions had a significant positive impact on student attitudes and on their performance in mathematics.

Changes in students' attitudes towards mathematics: Pre-test data indicated that students generally had negative attitudes toward mathematics, and were highly uncomfortable and fearful. For instance, 72% of students positively agreed that mathematics makes them uncomfortable and anxious, 74% of students were afraid to study and work in mathematics. This is in line with existing research that reveals a wide range of mathematics anxiety expressed in students is consistent (Ashcraft and Krause, 2007). Statistical anxiety is known to inhibit productivity and reduce engagement in mathematical activities (Hembree, 1990). However, there was a dramatic change in students' attitudes towards the mathematics learning after the implementation of growth mindset interventions. Post-test data showed a significant increase in the percentage of students interested in learning mathematics (from 37% to 74%), willing to spend more time on the subject (from 44% to 86%). This finding supports the efficacy of growth mindset interventions, which have been shown to

reduce math anxiety and improve students' attitudes towards the subject (Dweck, 2006). Further, the reduction in students expressing discomfort and anxiety about mathematics from 72% to 35% reveal the effectiveness of the growth mindset interventions which corroborated with earlier research findings that growth-mindfulness interventions can help students overcome fear and develop positive attitudes toward difficult topics (Blackwell *et al.*, 2007).

Improved in mathematical performance: The significant improvement in test scores, which increased from 47.2 in the pre-test to 63.2 in the post-test, confirms the usefulness of the intervention to enhance mathematical performance. The statistical p-value a significance

(0.000) indicates that the observed trends are not random. These results are consistent with previous research showing that interventions targeting students' attention can lead to better academic outcomes. The result align with a meta-analysis by Sisk *et al.*, (2018) confirmed that growth mind set interventions are associated with enhanced academic performance. The analysis indicated that students who adopted a growth mind set demonstrated increased achievement, particularly in subjects like mathematics, where the fear of failure can be a significant barrier to learning.

Increased resilience and embrace challenges: The focus group interview reveals that the growth mind set interventions have helped students to develop a greater resilience in their learning journey, viewing mistakes not as setbacks but as essential opportunities for growth. This perspective fosters a willingness to confront challenges head-on, transforming difficult math problems into valuable chances for skill enhancement. The finding align study by Blackwell *et al.*, (2007) who found that interventions promoting a growth mind set led to improved resilience among students. The researchers observed that students who received growth mind set training were more likely to continue working on difficult problems, showing greater persistence than their peers who did not receive such training. Further, Paunesku *et al.*, (2015) highlighted that students who learned about growth mind set strategies were more likely to embrace academic challenges. The study showed that these students not only attempted harder tasks but also reported higher levels of engagement and motivation in their learning.

Implications for future research and practice: The findings suggest that a growth mindset intervention may be a valuable tool for preventing math anxiety and improving math attitudes. Because the intervention increased excitement and decreased fear, future research could examine the longitudinal effects of such interventions on students' mathematical abilities and overall academic achievement. Furthermore, incorporating growth mindset strategies into routine mathematics instruction provides lasting benefits. As previous research has shown, continued reinforcement of a growth mindset can lead to sustained improvements in behavior and performance (Yeager and Dweck, 2012).

CONCLUSION

This study provides compelling evidence for the efficacy of growth mind set interventions in transforming students' attitudes towards mathematics and enhancing their mathematics performance. The findings demonstrate significant improvements across multiple dimensions, including increased enjoyment of mathematics, reduced anxiety, greater recognition of its relevance to future careers, enhanced preference for collaborative learning, and improved test scores.

Further, this study contributes valuable insights to the field of mathematics education and the broader application of growth mind set interventions. The multifaceted improvements observed suggest that integrating growth mind set strategies into mathematics curricula could be a powerful approach to addressing persistent challenges in mathematics education. These findings offer a promising direction for educators and policymakers seeking to enhance mathematics learning outcomes and foster more positive attitudes towards the subject among students.

However, it is important to acknowledge the limitations of this study. While the immediate effects are promising, the long-term sustainability of these changes remains to be investigated. Future research should focus on longitudinal studies to assess the durability

of these improvements and explore potential moderating factors such as cultural context and individual differences.

Ethical clearance

The permission and the undertakings from the participants were obtained. Likewise, consents from their parents were also obtained.

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