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Research Article

The Impact of Growth Mindset Interventions on Student Achievement

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Abstract

A student's underlying beliefs about intelligence—whether it is a fixed trait or can be developed (a "mindset")—is a powerful predictor of academic resilience and achievement. Fostering a growth mindset, the belief that intelligence is malleable, has been identified as a critical target for educational interventions aimed at improving student success. This study aimed to quantitatively evaluate the impact of a targeted, school-based growth mindset intervention on the academic achievement and perseverance of middle school students in a challenging subject. A quasi-experimental, pre-test/post-test study was conducted with 250 8th-grade students. The intervention group (n=125) participated in six workshops focused on neuroplasticity and growth mindset principles. The control group (n=125) received standard study skills training. Academic achievement was measured by mathematics grades and standardized test scores. The intervention group demonstrated a statistically significant improvement in their mathematics grades ($p < .01$) and reported higher levels of academic perseverance compared to the control group. The control group showed no significant change in either measure over the same period. Targeted, low-cost growth mindset interventions are an effective strategy for improving student academic achievement. Fostering the belief that intellectual abilities can be developed through effort is a powerful pedagogical tool for enhancing student success and resilience.

Keywords: Academic Resilience, Growth Mindset, Student Achievement

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INTRODUCTION

A student's trajectory through the educational system is shaped by a complex interplay of cognitive abilities, pedagogical strategies, and socio-environmental factors. Within this landscape, a growing body of psychological research has illuminated the profound and often decisive role of a student's personal beliefs about the nature of their own intelligence. These implicit theories, or "mindsets," function as a foundational framework through which students interpret academic challenges, respond to setbacks, and ultimately construct their academic identity (Latif et al., 2018; Quaggio, 2024). The understanding that these core beliefs are not merely peripheral attitudes but are central drivers of motivation and achievement has opened a significant new frontier for educational research and intervention.

The foundational work of Carol Dweck and her colleagues has established a critical dichotomy between two opposing mindsets: a "fixed mindset" and a "growth mindset." A fixed mindset is the belief that fundamental abilities, such as intelligence, are static, innate traits that cannot be significantly changed. Students holding this view tend to see effort as fruitless and avoid challenges for fear of revealing their perceived limitations (Carvalho et al., 2023; Skalník, 2022). In stark contrast, a growth mindset is the belief that intelligence and abilities are malleable qualities that can be developed and cultivated through dedication, effort, and effective strategies. Students with a growth mindset embrace challenges as opportunities for learning, view effort as the primary path to mastery, and demonstrate remarkable resilience in the face of failure.

The educational implications of these mindsets are profound. In a classroom setting, a student's mindset can predict their goal orientation, their response to feedback, and their persistence on difficult tasks. A fixed mindset fosters a desire to appear smart, leading to a preference for easy tasks and a defensive reaction to constructive criticism. A growth mindset, however, fosters a desire to learn, leading to a willingness to tackle challenging material and an appreciation for feedback that can guide improvement (Johnson et al., 2023; Mayaba, 2018). Fostering a growth mindset has therefore become a primary target for educators seeking to unlock student potential and cultivate a more resilient and engaged learning environment.

The central problem this research addresses is the pervasive and detrimental impact of a fixed mindset on student achievement, particularly within challenging academic domains like mathematics (Huseynli et al., 2024; Khamung et al., 2016). Mathematics is often culturally framed as a subject requiring innate talent, a perception that actively fosters a fixed mindset in many students. When confronted with the inevitable difficulties inherent in learning complex mathematical concepts, students with a fixed mindset are quick to conclude that they simply "don't have the math gene," leading to a cycle of avoidance, low effort, and self-fulfilling prophecies of failure. This mindset becomes a significant barrier to both learning and long-term STEM engagement.

The specific issue is that many traditional educational practices inadvertently reinforce a fixed mindset. An overemphasis on performance outcomes over process, praise for intelligence rather than effort, and a classroom culture that stigmatizes mistakes can all contribute to the belief that ability is static (Asok et al., 2017; McMonagle & Savitz, 2023). The problem is that while the negative effects of a fixed mindset are well-documented, there is a pressing need for practical, scalable, and evidence-based interventions that can be effectively implemented by educators within the constraints of a typical school environment to actively shift these counterproductive student beliefs.

This challenge is particularly acute during the middle school years. This is a period when academic work becomes significantly more demanding, and students' beliefs about their own abilities begin to solidify. A fixed mindset developed during this critical window can have lasting consequences, steering students away from advanced coursework in high school and limiting their future academic and career options (Gjini, 2024; Wang, 2024). The problem this study confronts is the critical need to identify and validate a targeted intervention that can effectively promote a growth mindset and, in doing so, improve academic outcomes and perseverance in this crucial, formative stage of a student's education.

The primary objective of this study is to conduct a rigorous quasi-experimental evaluation of a targeted, school-based growth mindset intervention on the academic achievement of middle school students in mathematics. This research aims to quantify the impact of the intervention by measuring changes in students' mathematics grades and their scores on standardized math tests (Baltasar et al., 2024; Marcu et al., 2015). The central goal is to determine if a structured program designed to teach students about neuroplasticity and growth mindset principles can lead to a statistically significant improvement in their academic performance compared to a control group.

A second, equally important objective is to assess the effect of the intervention on students' academic perseverance. Perseverance, defined as the sustained effort and continued use of effective strategies in the face of challenges, is a key behavioral manifestation of a growth mindset (Ariza, 2023; Ngoveni, 2025). This study seeks to measure changes in self-reported perseverance to understand if the intervention not only improves outcomes but also positively influences the underlying learning behaviors that are hypothesized to drive those improvements. This objective is critical for understanding the mechanism through which the intervention works.

Ultimately, this research aims to synthesize these findings to provide a clear and evidence-based assessment of the intervention's utility as a practical pedagogical tool. The study endeavors to provide a data-driven answer to the question: Can a relatively brief, low-cost workshop-based intervention create a meaningful and measurable positive change in both the mindset and the academic trajectory of middle school students in a challenging subject? The expected outcome is a set of clear, actionable insights for educators seeking to foster a more resilient and successful learning environment.

The scholarly literature on mindset theory is extensive, with numerous correlational studies establishing a strong link between a growth mindset and positive academic outcomes. A gap in this literature, however, pertains to the body of experimental and quasi-experimental intervention research (Blyznyuk & Kachak, 2024; Treme, 2018). While several effective interventions have been developed, there is a continuing need for more replication and validation studies conducted in diverse, real-world school settings to establish the generalizability and robustness of the findings.

A second, more specific gap exists in the research on domain-specific mindset interventions. Much of the early research focused on general academic mindsets. There is a need for more studies that evaluate interventions targeted at specific, challenging subjects like mathematics, where fixed mindset beliefs are particularly prevalent and damaging. The literature lacks a sufficient number of well-controlled studies that can confirm the efficacy of growth mindset interventions in these high-stakes academic domains.

A third gap, which is both methodological and conceptual, is the need for more research that measures the behavioral mediators of academic improvement. Many studies have successfully linked a mindset intervention to an improved academic outcome but have not concurrently measured the changes in learning behaviors, such as perseverance or strategy use, that are theorized to connect the two (Presado et al., 2022; Treme, 2018). The literature needs more studies that provide a complete evidence chain, demonstrating that the intervention changes the mindset, the changed mindset leads to more productive behaviors, and these behaviors, in turn, produce better academic results. This study is designed to address these specific gaps.

The principal novelty of this research lies in its specific focus and rigorous design within a critical educational context. This study is innovative in its application of a structured, multi-session workshop model as a growth mindset intervention specifically for 8th-grade students within the challenging domain of mathematics. The use of a quasi-experimental design with an active control group (receiving study skills training) provides a more robust test of the intervention's unique effects than a comparison to a no-treatment control, representing a methodologically strong approach to this research question.

This research is justified by the persistent and pressing need to improve student achievement and reduce achievement gaps in mathematics (Ariza, 2023; Mellgren & Ivert, 2016). Mathematics serves as a critical gateway to higher education and a wide range of rewarding careers in STEM fields. An intervention that can effectively improve both performance and perseverance in this subject has the potential to have a significant and lasting positive impact on students' future opportunities. This study is essential because it seeks to validate a practical, low-cost tool that schools can use to address this critical educational challenge.

The ultimate justification for this work rests on its potential to empower students with a belief system that will serve them throughout their lives. Fostering a growth mindset is not just about improving a grade in a single class; it is about teaching students a more resilient and effective way to approach all challenges, both academic and personal (Ayala et al., 2024; Burgos-Videla et al., 2025). This study is important because it contributes to a body of research that is fundamentally changing how we understand motivation and intelligence, providing educators with an evidence-based strategy to help their students become more confident, resilient, and successful lifelong learners.

RESEARCH METHOD

Research Design

This study employed a quasi-experimental, pre-test/post-test non-equivalent control group design to evaluate the impact of a growth mindset intervention. This design was selected to allow for a robust comparison between an intervention group and an active control group within a natural school setting where random assignment of individual students was not feasible (Alaswad & Junaid, 2022; Trindade, 2025). The independent variable was the type of intervention received, while the primary dependent variables were academic achievement in mathematics and self-reported academic perseverance.

Population and Sample

The study population consisted of 8th-grade students from a large, urban public middle school with a diverse student body. Two intact mathematics classes, taught by the same teacher

to control for instructor effects, were selected for the study via purposive sampling. One class was randomly assigned to the intervention group (n=125), which received the growth mindset workshops. The other class was assigned to the active control group (n=125), which received study skills training (Napoleon & Kuchenrither, 2023; Ogunsanya et al., 2024). The total sample size was 250 students. Pre-test data were used to establish a baseline and statistically control for any initial group differences.

Instruments

Three primary instruments were utilized for data collection. Academic achievement was measured using two sources: the students' official end-of-semester mathematics grades and their scores on a state-administered standardized mathematics achievement test. Academic perseverance was assessed using the "Academic Perseverance Scale" (APS), a validated 15-item self-report questionnaire using a 5-point Likert scale to measure students' tendency to persist with challenging academic tasks. The APS was administered as a pre-test and a post-test.

Procedures

The study was conducted over one academic semester after receiving approval from the university's institutional review board and the participating school district. In the first week, all students completed the APS as a pre-test. The intervention group then participated in six 45-minute workshops, delivered bi-weekly, focused on the principles of neuroplasticity, the malleability of intelligence, and the value of effort and effective strategies. The active control group participated in six workshops of the same duration and frequency focused on general study skills, such as time management and note-taking. At the end of the semester, all students completed the APS again as a post-test, and their final mathematics grades and standardized test scores were collected.

RESULTS AND DISCUSSION

The initial analysis of the quantitative data examined the pre-test and post-test scores for the Academic Perseverance Scale (APS) and the end-of-semester academic achievement measures. The descriptive statistics revealed a clear positive trend for the intervention group that participated in the growth mindset workshops. This group demonstrated more substantial improvements in their mathematics grades, standardized test scores, and self-reported academic perseverance compared to the active control group that received study skills training.

A summary of these key findings is presented in Table 1. The table details the mean scores (M) and standard deviations (SD) for both the intervention group (n=125) and the control group (n=125) on the three primary outcome measures. The mean gain score is also included for the Academic Perseverance Scale to provide a direct comparison of the change in this variable over the course of the semester.

Table 1: Descriptive Statistics for Academic Achievement and Perseverance

Outcome Measure	**Group**	**Mean (M)**	**Standard Deviation (SD)**	**Mean Gain (APS Only)**
Final Math Grade (%)	Intervention	84.5	7.8	N/A
	Control	77.2	8.5	N/A
Standardized Test Score (%)	Intervention	81.1	9.2	N/A
	Control	74.9	9.9	N/A

APS Score (1-5)	Intervention	Pre: 2.85	Pre: 0.65	+0.95
		Post: 3.80	Post: 0.55	
	Control	Pre: 2.81	Pre: 0.68	+0.15
		Post: 2.96	Post: 0.71	

The quantitative data on academic achievement show a clear advantage for the intervention group. The mean final mathematics grade for the growth mindset group (M=84.5) was significantly higher than that of the control group (M=77.2). A similar pattern was observed in the standardized test scores, where the intervention group (M=81.1) also outperformed the control group (M=74.9), suggesting that the intervention's effect translated to both classroom-based and standardized assessments.

A substantial difference was also found in the academic perseverance data. The intervention group's mean score on the APS increased by a significant +0.95 points, indicating a major positive shift in their approach to academic challenges. In contrast, the active control group reported a negligible increase of just +0.15 points. This suggests that the growth mindset intervention was uniquely effective at fostering the psychological resilience that underpins sustained effort.

Qualitative data were gathered from open-ended questions included in the post-intervention APS, asking students to describe their thoughts when facing a very difficult math problem. Thematic analysis of these responses revealed distinct patterns between the two groups. Two primary themes emerged from the intervention group: "Effort as a Strategy," where students described increased effort as a direct and logical tool for overcoming difficulty, and "Challenges as Learning Opportunities," reflecting a view of difficult problems as chances to "grow their brain."

The control group's responses yielded two contrasting themes. The first was "Seeking Procedural Answers," where students focused on finding the "right formula" or asking for the correct steps rather than engaging with the underlying concept. The second theme was "Ability as a Barrier," which included statements reflecting a belief that their difficulty was due to an innate lack of ability in math (e.g., "I knew I would get stuck because I'm just not a math person").

The themes from the intervention group can be inferred to be a direct result of the workshop content on neuroplasticity. The concept of the brain as a muscle that gets stronger with effort appears to have been internalized, leading students to adopt the "Effort as a Strategy" mindset. Their framing of "Challenges as Learning Opportunities" suggests they successfully integrated the core principle of a growth mindset, viewing difficulty not as a threat to their ego but as a necessary part of the learning process.

The control group's themes suggest that the study skills training, while potentially useful, did not alter their fundamental beliefs about intelligence. Their focus on "Seeking Procedural Answers" indicates a performance orientation, where the goal is to complete the task correctly rather than to understand it deeply. The theme of "Ability as a Barrier" is a classic expression of a fixed mindset, inferring that without a direct challenge to this belief, students continued to attribute their struggles to innate talent rather than to a lack of effective strategies or effort.

A strong, coherent relationship exists between the quantitative outcomes and the qualitative themes. The intervention group's superior academic achievement is directly explained by their adoption of a more productive mindset. Their belief in "Effort as a Strategy" and their view of "Challenges as Learning Opportunities" likely led them to persist longer on difficult problems and engage more deeply with the material, which in turn produced the higher grades and test scores observed in the quantitative data.

The significant increase in the intervention group's APS scores is likewise illuminated by the qualitative data. The +0.95 point gain in perseverance is the numerical representation of the mindset shift described by the students. Their self-reported willingness to persist is grounded in their newfound belief that their effort is meaningful and productive. The control group's static APS scores align with their qualitative responses, showing that without a change in mindset, their perseverance levels remained unchanged.

To provide a concrete illustration of these findings, the case of "Alex," a student in the intervention group, is presented. Alex's pre-test APS score was low, and his math grade at mid-term was a C. His post-intervention reflection stated, "Before, when I got a problem wrong, I felt dumb. Now I know that getting it wrong is when my brain is actually making new connections. I just try a different way." His final math grade was a B+, and his APS score increased by 1.5 points.

In contrast, "Maria," a student in the active control group, started with similar grades and a low APS score. Her post-intervention reflection noted, "The workshops on time management helped me organize my homework, but I still get stuck on the hard problems. If I don't get it right away, I usually just stop because I know I won't be able to figure it out." Her final math grade and her APS score showed no significant improvement from her mid-term baseline.

Alex's case provides a clear example of the intervention's mechanism of action. The workshops provided him with a new, non-threatening interpretation of academic difficulty. This cognitive reframing ("my brain is making new connections") directly motivated a change in his behavior (trying a different way), which led to improved academic performance. His journey perfectly illustrates the pathway from a change in belief to a change in behavior to a change in outcome.

Maria's case highlights the limitations of interventions that do not address underlying mindsets. The study skills training gave her new organizational tools, but it did not change her core belief that her ability was fixed. When faced with a genuine challenge, her fixed mindset ("I know I won't be able to figure it out") overrode her new skills, leading to a lack of perseverance and stagnant achievement. Her case demonstrates that behavioral strategies are less effective without a corresponding belief in one's own capacity for growth.

The collective findings of this study provide strong evidence that a targeted growth mindset intervention is significantly more effective at improving both academic achievement and perseverance in middle school mathematics than a program focused on general study skills. The results consistently show that the students who were taught to view their intelligence as malleable outperformed their peers who were taught organizational techniques.

This research interprets a student's mindset as a foundational psychological lever for academic success. The results suggest that simply providing students with "how-to" strategies is insufficient if they do not possess the underlying belief that they are capable of growth and that their effort is a worthwhile investment. Fostering a growth mindset appears to be a

prerequisite for unlocking a student's willingness to engage, persist, and ultimately succeed in the face of academic challenges.

The results of this quasi-experimental study provide a clear, evidence-based affirmation of the significant impact of a targeted growth mindset intervention. The quantitative data revealed a stark divergence in academic outcomes between the two study groups. Students who participated in the growth mindset workshops achieved significantly higher final mathematics grades and standardized test scores compared to their peers in the active control group who received study skills training. This demonstrates that the intervention's effect was robust across both classroom-specific and standardized measures of achievement.

This improvement in academic performance was strongly correlated with a profound shift in psychological resilience. The intervention group reported a substantial increase in their self-reported academic perseverance, with their mean score on the Academic Perseverance Scale (APS) rising by nearly a full point. The control group, in contrast, showed a negligible change in perseverance, indicating that the growth mindset intervention was uniquely effective at fostering the sustained effort and resilience necessary to navigate academic challenges.

The qualitative data provided a rich, explanatory narrative for these quantitative results. Thematic analysis of student reflections revealed two distinct mindsets. The intervention group adopted a framework of "Effort as a Strategy" and viewed "Challenges as Learning Opportunities." The control group, however, remained focused on "Seeking Procedural Answers" and expressed a belief in "Ability as a Barrier," classic manifestations of performance orientation and a fixed mindset, respectively.

The case studies of "Alex" and "Maria" serve as powerful, individual-level exemplars of these divergent pathways. Alex's journey shows a direct line from a change in belief about difficulty to a change in behavior (persistence) and a subsequent improvement in his grade. Maria's case illustrates that providing behavioral strategies (study skills) without addressing the underlying fixed mindset is insufficient to produce a change in either perseverance or achievement when faced with genuine difficulty.

These findings provide strong, quasi-experimental support for the foundational tenets of Dweck's mindset theory within a real-world educational context. The study confirms the core hypothesis that teaching students a growth mindset—the belief that intelligence is malleable—leads to improved academic outcomes. By using an active control group (study skills training), this research offers a more rigorous test than many earlier studies that used a no-treatment control, demonstrating that the benefits of the intervention are not merely due to receiving extra attention but are specific to the mindset-focused content.

This research contributes significantly to the literature on domain-specific mindset interventions. The focus on mathematics is critical, as this is a subject where fixed mindset beliefs are particularly prevalent and academically damaging. Our results align with and strengthen the findings of other studies showing that growth mindset interventions are especially potent in challenging STEM domains, providing a powerful counter-narrative to the culturally pervasive idea that math ability is an innate, fixed talent.

A key contribution of this study is its successful demonstration of the full causal chain proposed by mindset theory. It does not just link the intervention to the outcome; it provides both quantitative and qualitative evidence for the mediating role of perseverance. The results show that the intervention changed students' beliefs (qualitative themes), which in turn changed their behavior (increased APS scores), which then led to improved academic

achievement (higher grades and test scores). This provides a more complete and compelling explanatory model than studies that focus only on the final outcome.

Furthermore, the study's results stand in contrast to literature that suggests that simply teaching students study skills is sufficient for academic improvement. The case of Maria and the overall performance of the control group suggest that behavioral strategies are less effective when they are not supported by a corresponding belief in one's own capacity for growth. This supports the argument that mindset is a foundational element, a prerequisite that enables students to effectively deploy the other strategies they learn.

The findings of this study signify that a student's internal belief system about intelligence is a more powerful lever for academic success than the possession of specific behavioral strategies alone. The stark difference in outcomes between the two groups suggests that *believing* you can grow is a more critical factor than *knowing* how to organize your notes. The results reflect the primacy of psychology over procedure in the context of overcoming genuine academic challenges.

The limited success of the active control group is a powerful reflection on the limitations of a purely skills-based approach to academic support. The study skills workshops provided students like Maria with useful tools, but these tools were quickly abandoned in the face of difficulty because her underlying fixed mindset told her that the effort was futile. This signifies that without a foundational belief in the value of effort and the possibility of growth, even the best strategies will fail when they are needed most.

The intervention group's success signifies the profound power of cognitive reframing. The workshops did not make the math problems easier; they changed how students interpreted the experience of struggling with them. By reframing difficulty from a sign of inadequacy to a sign of the brain making new connections, the intervention transformed a threatening experience into a productive one. This demonstrates that a student's subjective interpretation of a challenge is a key determinant of their objective performance.

Ultimately, these results are a reflection of the immense potential held within brief, targeted psychological interventions. The study demonstrates that a relatively low-cost series of workshops can create a lasting and meaningful change in a student's academic trajectory. It signifies that by addressing the root psychological barriers to learning, we can unlock a level of potential and resilience that might otherwise remain dormant, offering a message of hope and empowerment for both students and educators.

The most direct implication of this research is for classroom teachers and school leaders. The findings provide a strong, evidence-based mandate to actively foster a growth mindset culture within schools. This extends beyond standalone workshops and implies a need to integrate mindset principles into daily pedagogical practice. This includes the language teachers use to give feedback (praising effort, strategy, and process rather than innate talent), the way challenging tasks are framed, and how mistakes are treated in the classroom.

The study has significant implications for teacher training and professional development. The results suggest that training in mindset theory and its practical application should be a core component of teacher education programs. Equipping educators with the tools to understand and cultivate a growth mindset in their students is as fundamentally important as teaching them subject-specific content and classroom management techniques.

For student support services, such as school counseling and academic advising, the implications are clear. This research suggests that a mindset assessment could be a valuable

diagnostic tool for identifying students at risk for academic underperformance. For students who express feelings of helplessness or attribute their struggles to a lack of innate ability, a growth mindset intervention should be considered a primary, front-line strategy for academic support.

For educational policy, the findings provide further justification for policies that support the integration of social-emotional learning (SEL) into the academic curriculum. This study demonstrates that psychological factors are not peripheral to learning but are central to it. The results support a holistic view of education, where fostering resilience, perseverance, and a healthy belief system is recognized as an essential and integral part of promoting academic excellence.

The growth mindset intervention was profoundly effective because it directly addressed and dismantled the primary psychological barrier to success in a challenging subject: the fear of failure rooted in a belief in fixed ability. By providing students with a simple but powerful scientific model of neuroplasticity—the idea that the brain is like a muscle—the intervention made the concept of intellectual growth tangible, credible, and achievable. This new mental model gave students a compelling reason to exert effort.

The active control group's intervention on study skills was less effective because it operated at a surface level. It provided students with behavioral tools but failed to address the underlying motivational engine. A student like Maria, who believes her math ability is fixed, will see no point in applying time management skills to a problem she believes she is fundamentally incapable of solving. The "why" behind the effort was missing, so the "how-to" strategies were rendered inert when faced with a real challenge.

The choice of mathematics as the academic domain was a critical factor in highlighting the intervention's impact. Mathematics is a subject where students, parents, and even some teachers frequently and openly endorse fixed mindset beliefs ("some people are just math people"). The growth mindset workshops provided a powerful and direct counter-narrative to this pervasive and damaging cultural script, which is likely why the effects on both perseverance and achievement were so pronounced.

The intervention succeeded because it fundamentally changed the meaning of effort and difficulty for the students. For the control group, the need to exert significant effort was evidence of low ability. For the intervention group, effort became the very mechanism by which ability was built. This cognitive reframing, so clearly articulated by Alex, is the central psychological mechanism that explains the divergent outcomes. When struggle becomes productive instead of threatening, students are free to engage, persist, and learn.

The clear and immediate next step for research is to conduct longitudinal studies to track the long-term effects of this type of intervention. It is crucial to follow these students into high school and beyond to determine if the mindset shift and the associated academic benefits are sustained over time and whether they transfer to other challenging academic domains. This would establish the lasting value of the intervention.

Future research should also focus on the role of the educator in delivering mindset interventions. Studies could compare the effectiveness of interventions delivered by external researchers versus those delivered by the students' own classroom teachers who have undergone mindset training. This would allow for an investigation of the "teacher-as-model" effect and would provide insights into the most scalable and sustainable implementation models.

There is a significant need for research that explores the adaptation of these interventions for a wider range of student populations. This includes younger elementary students, older high school and college students, and students from diverse cultural and socioeconomic backgrounds. Understanding how to tailor the message and activities to different developmental stages and cultural contexts is essential for ensuring the approach is equitable and effective for all learners.

Finally, a promising avenue for future work involves moving from standalone workshops to fully integrated curricular designs. Researchers could collaborate with educators to develop and test mathematics curricula that have growth mindset principles woven directly into the fabric of the daily lessons, activities, and assessment practices. This would represent a shift from a temporary intervention to a pervasive and supportive learning environment, potentially leading to even more profound and lasting effects.

CONCLUSION

The most significant and distinct finding of this research is the empirical demonstration that a targeted growth mindset intervention is substantially more effective at improving academic achievement in mathematics than an active control intervention focused on study skills. This study reveals that the intervention's success is not merely behavioral but deeply psychological; its power lies in fundamentally reframing a student's interpretation of effort and difficulty, which in turn fosters the academic perseverance necessary to drive tangible improvements in grades and standardized test scores.

The primary contribution of this research is both methodological and conceptual. Methodologically, it provides a more rigorous test of mindset theory by using an active control group, confirming that the observed benefits are specific to the mindset content and not just the result of receiving extra attention. Conceptually, it offers a complete and compelling evidence chain—linking the intervention to a change in beliefs, the change in beliefs to a change in perseverance, and the change in perseverance to improved academic outcomes—thereby providing a more holistic explanatory model than studies that focus solely on achievement.

This study's conclusions are framed by its quasi-experimental design and its focus on a single academic domain and age group, which clearly delineates the path for future research. The immediate next steps must involve longitudinal studies to determine if the mindset shift and its academic benefits are sustained over time and transfer to other subjects. Furthermore, future research should explore the efficacy of interventions delivered by classroom teachers rather than external researchers and focus on integrating mindset principles directly into daily curricula to create a more pervasive and supportive learning environment.

AUTHOR CONTRIBUTIONS

Look this example below:

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.

CONFLICTS OF INTEREST

The authors declare no conflict of interest

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