IMPROVING MY MATHEMATICAL RESILIENCE

MATHEMATICAL RESILIENCE CAN BE BUILT THROUGH 3 SIMPLE COMPONENTS! FIRSTLY, BY RECOGNISING THE VALUE OF MATHS. SECONDLY, BY UNDERSTANDING STRATEGIES TO OVERCOME THE STRUGGLE OF LEARNING MATHEMATICS. LASTLY, IT'S TO ADOPT A GROWTH MINDSET!

ABSTRACT

This paper presents a comprehensive investigation of the impact of a mindset intervention on mathematical resilienceand anxiety among students. The primary aim was to discern whether the mindset intervention could foster an enhancement in mathematical resilience and reduction in mathematical anxiety. Furthermore, the research sought to explore the relationship between these two critical psychological constructs in the context of mathematical learning. Despite the methodological approach, the findings revealed that the mindset intervention did not significantly alter the levels of either mathematical resilience or mathematical anxiety in the sample. Additionally, no significant correlation was found between post-intervention mathematical resilience and mathematical anxiety, contributing to an increasingly nuanced understanding of these concepts. These findings suggest that the intricacies of mathematical resilience and anxiety are not easily modulated by a singular mindset intervention, implying the need for further development of the mindset intervention or to incorporate more comprehensive strategies. The current study adds to the growing body of knowledge around these constructs and their interplay, providing a platform for future research aimed at improving student attitudes towards mathematical learning. This research underscores the importance of continued investigation into more holistic and multifaceted interventions that can better support student experiences in their mathematical journey.

KEYWORDS:
Mathematical Resilience,
Mathematical Anxiety,
Mindset Intervention

PROPOSED MINDSET INTERVENTION

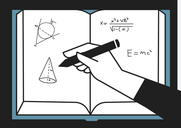
VALUE OF MATHEMATICS

1. ENHANCING CAREER OPPORTUNITIES:
A strong foundation in mathematics is important for many careers, including science, technology, engineering, and finance. By learning mathematics well, you open up a range of career opportunities in the future.

2. DEVELOPING CRITICAL THINKING & PROBLEM-SOLVING SKILLS:
Mathematics involves solving problems and analyzing data, which helps children develop logical thinking and reasoning skills. These skills are important for success in school and in life.

3. UNDERSTANDING THE WORLD AROUND US:
Mathematics is a fundamental part of our world and is used to understand and analyse many aspects of life, from finance and economics to engineering and science.

4. IMPROVING CONCENTRATION AND ATTENTION TO DETAIL:
Mathematics requires focus and attention to detail, which can help children improve their ability to concentrate and pay attention to important information.



STRUGGLE OF MATHS

1. IDENTIFY THE SPECIFIC AREAS OF DIFFICULTY:
Before you can begin to overcome your challenges in mathematics, it's important to identify what those challenges are. This could involve working with a teacher or tutor to determine where you are struggling.

2. SEEK OUT ADDITIONAL RESOURCES AND SUPPORT:
Once you have identified your areas of difficulty, it can be helpful to seek out additional resources and support to help you understand theconcepts. This could include working with a tutor, using online resources or textbooks, or seeking help from a peer.

3. PRACTICE REGULARLY:
Like any skill in life, becoming proficient in mathematics requires practice. Make a habit of reviewing math concepts and practicing problem solving regularly to improve your skills and build confidence.

4. SEEK OUT OPPORTUNITIES TO APPLY MATHEMATICS IN REAL-WORLD CONTEXTS:
One of the best ways to overcome challenges in mathematics is to see how it is used in the real world. Look for practical opportunities to apply mathematics concepts, such as solving problems in your everyday life or participating in mathematics-related extracurricular activities.

GROWTH MINDSET

1. THE APPROACH KNOWN AS "GROWTH THEORY" IN LEARNING MATHEMATICS
is based on the idea that individuals can improve their mathematical abilities through effort and practice, rather than being limited by their innate abilities (Dweck, 2007).

2. SETTING CHALLENGING BUT ACHIEVABLE GOALS:
Setting goals helps you focus your efforts and provides a sense of direction. Make sure to set goals that are challenging but achievable, as this will help you stay motivated and engaged.

3. SEEK FEEDBACK AND LEARN FROM MISTAKES:
One of the best ways to learn and improve is by seeking feedback and learning from mistakes. When you encounter challenges in mathematics, try to see them as opportunities to learn and become better, rather than setbacks.

4. EMBRACE CHALLENGES AND PERSEVERE:
Embracing challenges and persevering in the face of difficulties is a key component of a growth mindset. When you encounter challenges in mathematics, try to stay positive and keep working at it. With effort and persistence, you will be able to overcome your challenges and succeed.

RESEARCH QUESTIONS

RQ1: Does the proposed mindset intervention increase mathematical resilience?

RQ2: Does the proposed mindset intervention reduce mathematical anxiety?

RQ3: Does mathematical resilience inversely correlate with mathematical anxiety?

PARTICIPANT DEMOGRAPHIC AND IMPORTANCE OF RESEARCH

The demographic focus on 15-17 year-old students from a mathematics tutoring chain in Singapore, Acer Academy Private Limited, provides a greater insight into the concepts of mathematical resilience and mathematical anxiety, as much of the existing literature are primarily concentrated on older students already in university and the general population. This younger age group is of particular importance as students at this stage have to make critical decisions about their future academicpaths and professional career – and mathematical anxiety could potentially deter them from selecting STEM fields.

RESEARCH DESIGN

In this pre- and post-intervention study, students' baseline mathematical resilience and mathematical anxiety will be measured through an online survey developed inexisting scales that have been validated, followed by the proposed intervention. After 1-2 weeks which will allow time for the participants to process the information from the brochure, they will retake the same online survey to measure their post-intervention levels of mathematical resilience and mathematical anxiety. This methodology offers a robust way of comparing the pre- and post-interventionmeasures, setting up a foundation for a clear evaluation of the intervention's effectiveness.

KEY FINDINGS:

Mathematical Resilience (RQ1). The mindset intervention led to an enhancement in the mean levels of mathematical resilience (M = 4.91 → M = 5.24), which is in line with the wider literature. The results were not statistically significant, t(20) = -1.39, p = 0.18, 95% CI [-0.83, 0.17], with a moderate effect size (d = 0.59).

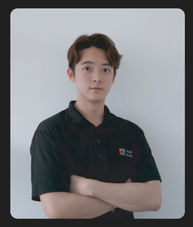
Mathematical Anxiety (RQ2). The mindset intervention led to a reduction in the mean levels of mathematical anxiety (M = 4.12 → M = 3.91), giving support to the literature that resilience-promoting mindsets may help alleviate mathematical anxiety. The results were not statistically significant, t(20) = 0.39, p = .70, 95% CI [-0.92, 1.35], with a small effect size (d = 0.16).

Reducing Mathematical Anxiety by Enhancing Mathematical Resilience (RQ3). A multiple regression analysis accounted for 14.99% of the variance in post-intervention levels of mathematical anxiety, supporting the relationship between mathematical resilience and mathematical anxiety. However, the overall model was not statistically significant, F(2, 8) = 0.705, p = 0.52.resilience and mathematical anxiety.

LIMITATIONS & FUTURE RESEARCH

Sample size. The biggest limiting factor of this study was its small sample size given time constraints, limited resources, and missing data. The study did not achieve the lower bound target of 15 participants, which could have contributed to not statistically significant findings for all three research questions. The small sample size reduced the statistical power of the study, which made it unlikely to detect significant effects if they exist (Cohen, 1992). Future research could perhaps conduct recruitment from multiple schools or education centres to achieve a larger sample size.

LEAD RESEARCHER



Daryl Chiang holds a BSc in Psychologicaland Behavioural Sciences from LSE (2023) and is LSE Generate's Ambassador for the Singapore Chapter. With a keen passion for the educational sector, he founded AlgresHoldings, a holding company for a portfolio of EdTech solutions. Their most notable asset is Acer Academy, for which he is the COO running its daily operations. Acer Academy is a customised mathematics tutoring chain spanning 7 locations in Singapore and Myanmar. He conducted this research paper across his education centres.

SUPERVISOR

Meena joined the Department of Psychological and Behavioural Science, at the LSE as the Programme Leader and Course Tutor in Quantitative Methods and Statistics in September 2022. Her key area of expertise is mathematics anxiety reported by university non-specialists.

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A MINDSET INTERVENTION

REDUCING MATHEMATICS ANXIETY BY ENHANCING MATHEMATICAL RESILIENCE

Dweck, C. S. (2007). Is Math a Gift? Beliefs That Put Females at Risk. In S. J. Ceci & W. M. Williams (Eds.), Why aren't more women in science?: Top researchers debate the evidence (pp. 47–55). American Psychological Association.