



## **EFFECTIVENESS OF MARZANO'S TEACHING SUPERVISION MODEL ON ACHIEVEMENT, CRITICAL THINKING AND ANXIETY TOWARDS MATHEMATICS**

**RAKESH KUMAR**

*PhD Research Scholar, Regional Institute of Education, Bhubaneswar, Odisha, India*

**Paper Received On:** 21 AUG 2023

**Peer Reviewed On:** 27 AUG 2023

**Published On:** 01 SEPT 2023

### **Abstract**

*The effect of Marzano's Teacher Supervision Model on mathematics instruction to reduce anxiety among students in secondary schools is examined in this article. Using a systematic review approach, the study finds that the model has an effective impact on teaching strategies, improves critical thinking abilities, lowers math anxiety, and helps students develop holistically. It examines four interconnected themes: the model's impact on instructional practices, its encouragement of conceptual understanding and critical thinking, its potential to lower math anxiety and boost student self-confidence, and its effects on math performance. These results illustrate the model's all-encompassing potential for influencing critical thinking which is essential while studying mathematics.*

**Keywords:** Marzano's Teaching Supervision Model, Mathematics Teaching strategies, Anxiety



*Scholarly Research Journal's is licensed Based on a work at [www.srjis.com](http://www.srjis.com)*

### **Introduction**

Marzano's Teacher Supervision (MTS) Model influences math achievement, critical thinking, and reducing the anxiety of students in secondary schools. This study investigates how anxiety, critical thinking, and math achievement in secondary schools are influenced by Marzano's Teacher Supervision Model. Its effect on these factors is examined in this research, revealing light on the model's potential to improve teaching, and learning dynamics.

### **Background**

The research aims to illustrate the impact of the implication of Marzano's Teacher Supervision Model on achievement, critical thinking, and anxiety reduction towards mathematics in the case of secondary schools. As suggested by Hafni, Sari & Nurlaelah (2019), Marzano's

Teacher Supervision Model is effective in improving teaching quality, cognitive skills, and emotional well-being regarding mathematics education. This study investigates the impact of Marzano's Teacher Supervision Model on mathematics achievement, critical thinking, and anxiety in response to the increased need for efficient teaching methods. The research focuses on secondary schools and seeks to understand how this model might improve pedagogical practices as well as the cognitive and emotional experiences of students in the field of mathematics education.

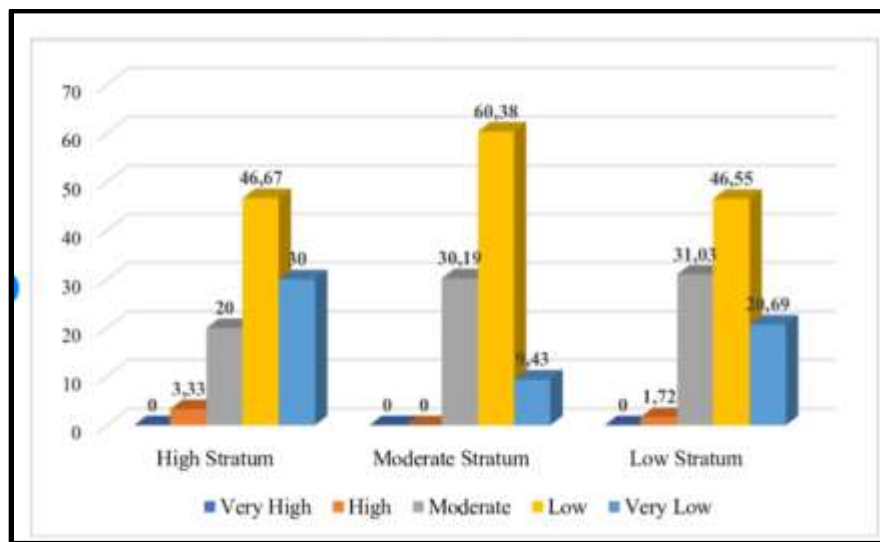


Figure 1: Percentage of Math Anxiety Criteria for secondary school students at each stratum;  
(Source: Habibullah, 2021)

Figure 1 depicts the overall percentage of math anxiety of the secondary school students at each stratum. In addition, 82% of Grade 7–10 students reported having math anxiety (National Institutes of Health, 2023). Only two out of ten people felt confident in their math skills. Notably, students' ability to answer problems decreased by 14% from 23% in Grade 7 to 9% in Grade 10, highlighting the difficulties and anxiety they experience in math. Avoiding arithmetic problems, being reluctant to pursue advanced math, and feeling more anxious in math classes are all signs of math anxiety. Thus, students' working memory and learning potential are hampered by this anxiousness.

## Literature Review

### Description of Marzano's Teacher Supervision (MTS) Model

The Marzano Teacher Supervision Model is a thorough framework created to improve instructional strategies and student results. As suggested by Cristóvão, Candeias & Verdasca (2020), the MTS model places a strong emphasis on a collaborative relationship between teachers and supervisors and a growth-oriented strategy. The strategy has four essential elements: establishing specific goals, periodically watching classroom instruction, giving helpful comments, and encouraging ongoing professional development. It encourages the use of data-driven approaches to guide instructional choices, matching instructional methodologies to particular student requirements. As commented by Härkki *et al.* (2021), the use of instructional practices that promote critical thinking, active student participation, and skill development is a key component of Marzano's approach. Thus, the approach assists teachers in creating a stimulating and productive learning environment by concentrating on evidence-based teaching strategies.

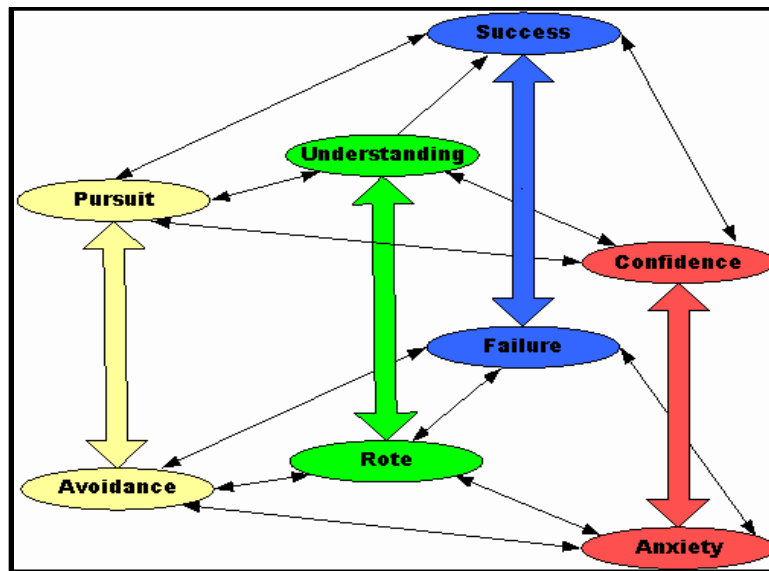


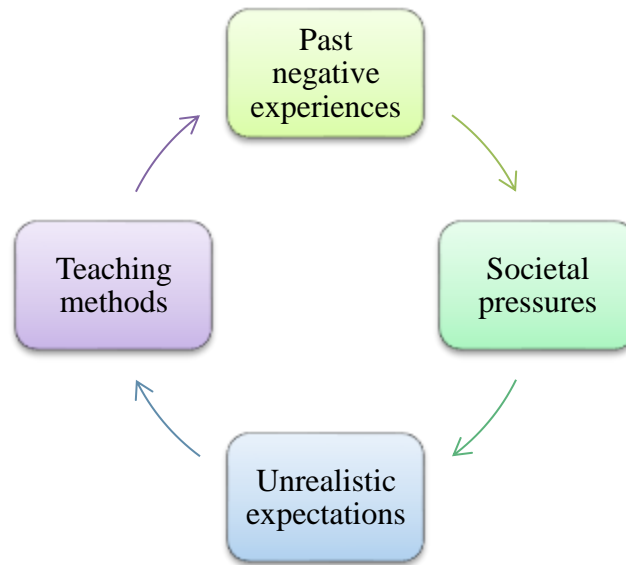
Figure 2: Marzano's Teacher Supervision Model; (Source: Influenced by Härkki *et al.* 2021)

Figure 2 depicts the principles of the MTS model, and it helps to improve the cognitive skills of the students in secondary schools towards mathematics.

### Identifying reasons for developing math anxiety

Multiple elements that combine to generate a complicated web of influences that undermine students' confidence and math performance are the issues of math anxiety in secondary schools. As per the view of Khasawneh, Gosling & Williams (2021), the existence of bad past experiences is one important factor. Students who have previously had difficulties in math acquire

a fear of failure, making them nervous about upcoming math-related assignments. Thus, students sometimes purposefully avoid math-related activities as a result of their anxiety to escape the distress it produces.



*Figure 3: Reasons for developing math anxiety; (Source: Influenced by Khasawneh, Gosling & Williams, 2021)*

Figure 3 illustrates the causes of increasing math anxiety among the students. As illustrated by Kaskens *et al.* (2020), pressures from society and culture also accelerate math anxiety. Additionally, frequently, parents, teachers, or the educational system place unreasonably high expectations on students or compare them to their peers. The idea that math skills are innate rather than learned can make students feel more anxious because they believe they don't have the "innate ability" needed to succeed. On the other hand, as argued by Lukowski *et al.* (2019), mathematical social stigma, such as the idea that it is just for the "smart" or "gifted," can also foster a hostile environment and discourage students from interacting with the topic. Additionally, how students are taught math plays a part in the development of math anxiety. Students become confused and frustrated by teachers' teaching methods, a lack of individualised attention, and insufficient explanations. Hence, students' anxiety is increased by the stress of exam time and memory concentration rather than understanding.

### **Need for critical thinking in studying math**

Learning mathematics requires critical thinking, especially when using Marzano's Teacher Supervision Model. As described by Zhang, Zhao & Kong (2019), with the help of the paradigm of the MTS model, which places a strong emphasis on the development of higher-order cognitive

abilities, students can move beyond simple memorisation and develop a more in-depth comprehension of mathematical ideas. Moreover, students who use critical thinking develop their ability to analyse issues, identify trends, and come up with original solutions.

The Marzano method encourages teachers to lead students through challenging tasks and questions to promote engagement and intellectual curiosity. This not only improves problem-solving skills but also fosters a sense of learning autonomy. As illustrated by Mutlu (2019), students' ability to apply mathematical concepts in real-world situations is made possible through critical thinking, which also improves their general mathematical literacy. Moreover, students are given the confidence, curiosity, and growth mentality they need to approach math by incorporating critical thinking inside Marzano's paradigm. Therefore, this improves their mathematical ability while also giving them transferable skills that they use in a variety of academic fields and real-world scenarios.

### **Literature gaps**

The lack of theoretical concepts on the research topic in the previous studies has been identified as the major literature gap. In the research by Habibullah (2021), lack of discussion on Marzano's model, and the way it affects students in secondary schools in terms of reducing math fear and improving critical thinking, creates a literature-based gap. In contrast to that, few studies look at how these factors interact when viewed in the context of math education. Furthermore, limited study has been done to determine the way this model's long-term implementation affects sustained gains in arithmetic proficiency, critical thinking abilities, and anxiety reduction. Therefore, the research gives a detailed insight into Marzano's Teacher Supervision model and its influence on students' cognitive development.

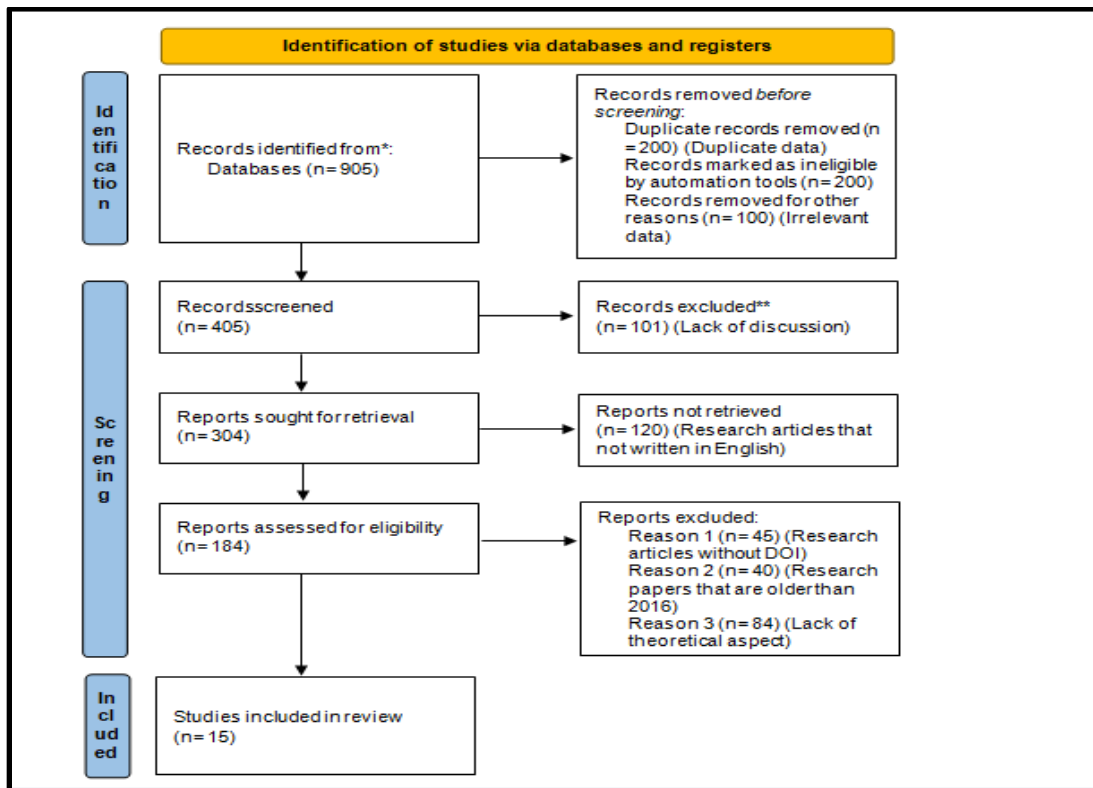
### **Research Method**

PubMed and ResearchGate have been utilised to collect the data on the “impact of the implication of Marzano's Teacher Supervision Model on achievement, critical thinking, and anxiety reduction towards mathematics in the case of secondary schools”. Additionally, fifteen articles have been selected by following the exclusion, and inclusion criteria. Furthermore, a systematic review has been adopted, and thematic analysis has been performed to interpret the secondary information. Therefore, the research adopted a secondary qualitative research method in this research context

Keyword		Keyword		Keyword	Search result
Marzano's Teacher Supervision Model	AND	Math achievement	AND	Anxiety Reduction	PubMed= 77 ResearchGate = 11
Secondary schools	OR	Educational impact	AND	Academic achievement	PubMed= 801 ResearchGate = 8
Cognitive skills	AND	Problem-solving	AND	Educational outcomes	PubMed= 5 ResearchGate = 3

*Table 1: Boolean Table*

The above table shows the Boolean table through which the topic-related keywords have been searched to find out relevant articles.



*Figure 4: PRISMA Diagram*

## **Result**

Thematic analysis has been conducted on Marzano's Teacher Supervision Model impacts, and its influence on reducing anxiety among students in secondary schools with the help of a systematic review. Additionally, A axial coding table have been constructed to check the authenticity and quality of the selected articles.

## **Axial coding Table**

Author & Year	Keywords	Theme
Muhlisin <i>et al.</i> (2016) Arshad <i>et al.</i> (2017) Wilson & Varma-Nelson, (2016) Massiah & James, (2020)	Academic ability, Critical thinking, Higher-order thinking skills, Mathematics, Reasoning skills, Anxiety, Depression, Clinical Supervision, Learners centred Teaching Strategies	“Theme 1: Marzano’s model has a positive influence on teaching quality and strategies in mathematics education in secondary schools.”
Candelario-Aplaon, (2017) Warner & Kaur, (2017) Cargas, Williams & Rosenberg, (2017) Sterrett <i>et al.</i> (2020)	Assessment, Mathematics teachers, Pedagogical knowledge, collaborative strategies, Social Learning, Instructional strategies, Creative thinking, Critical thinking, Higher education, Performance tasks	“Theme 2: Marzano’s Teacher Supervision Model fosters critical thinking skills and deeper conceptual understanding.”
Ieva & Beasley, (2022) Hafni <i>et al.</i> (2019) Madler <i>et al.</i> (2022) Nkhata <i>et al.</i> (2020)	Collaborative consultation, Student habits, Critical Thinking Skills, Teacher competencies, Training needs, Anxiety, Diverse learners, Self-efficacy	“Theme 3: Marzano’s model has the potential to reduce math anxiety and enhance students’ confidence.”
Hildenbrand & Arndt, (2016) Aouine & Sadek Fodil, (2020) Ünal, (2017)	Teacher identity, Classroom management, Problem-solving, Secondary schools, Stress management strategies, Teaching assessment, Mathematics, Teaching methods	“Theme 4: Marzano’s model has a positive impact on math achievement, emotional resilience and cognitive growth.”

Table 3: Axial Coding Table

## Analysis

### Thematic analysis

**Theme 1: Marzano’s model has a positive influence on teaching quality and strategies in mathematics education in secondary schools**



Marzano's Model has proven to have a positive influence on the effectiveness and methods of secondary school mathematics instruction. As illustrated by Massiah & James (2020), the MTS model encourages educators to use a growth-oriented approach, establish specific educational goals, effectively adapt lessons to student requirements, and use evidence-based practices. Additionally, regular inspections of the classroom and helpful criticism support help on ongoing professional growth and improved teaching abilities. Thus, the emphasis on data-driven decision-making in this paradigm equips teachers to modify their techniques for the best possible student engagement and learning results.

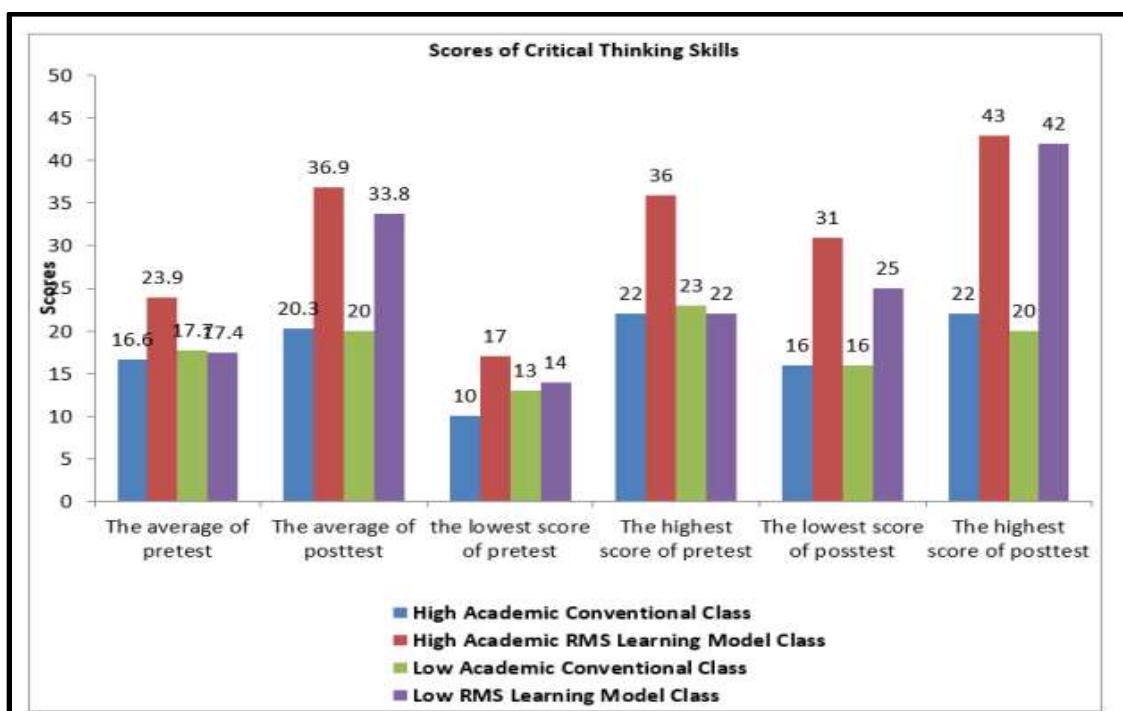


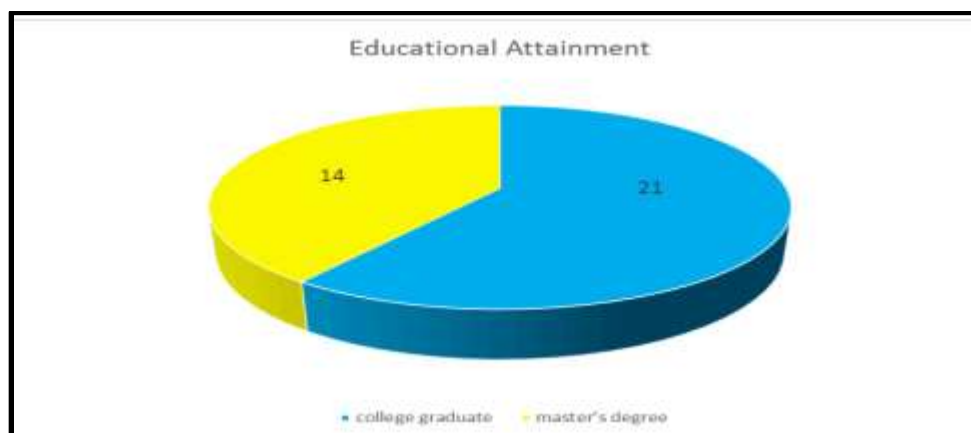
Figure 5: Summary of the scores of critical thinking; (Source: Influenced by: Muhlisin *et al.* 2016)

Figure 5 shows the different scores of critical thinking that help reduce anxiety while studying mathematics. Marzano's strategy encourages collaboration among educators by encouraging peer learning and the sharing of knowledge (Arshad *et al.* 2017; Wilson & Varma-Nelson, 2016). The model's focus on critical thinking abilities enhances classroom dynamics by motivating students to critically examine mathematical ideas and solve issues. These educational techniques meet the needs of contemporary education, giving students useful cognitive skills and improving their general mathematical competency. Thus, Marzano's Teacher Supervision Model

provides an invaluable framework for secondary school students for an enhanced mathematics learning experience.

**Theme 2: Marzano's Teacher Supervision Model fosters critical thinking skills and deeper conceptual understanding**

Marzano's Model substantially aids in the development of deeper conceptual comprehension and critical thinking abilities in students. The model encourages educators to create thought-provoking questions, engaging communication, and problem-solving exercises by emphasizing reflective practices and evidence-based teaching methodologies (Warner & Kaur, 2017). Thus, these methods encourage students to assess, synthesise, and analyse material, which develops higher-order thinking skills.



*Figure 6: Requirement of assessments of senior high school teachers of Mathematics; (Source: Influenced by: Candelario-Aplaon. 2017) .*

Figure 6 illustrates the specific requirements for assessments that are essential for high school instructors while teaching mathematics. The MTS model encourages students to use an inquiry-based methodology to investigate mathematical ideas from many perspectives, enhancing their understanding of fundamental concepts (Cargas, Williams & Rosenberg, 2017; Sterrett *et al.* 2020). The methodology helps students to move from superficial understanding to profound conceptual mastery by involving them in activities that entail the application, analysis, and synthesis of knowledge. Additionally preparing students to take on complicated issues both internally and outside, gives them the crucial cognitive tools they need within mathematics

### Theme 3: Marzano's model has the potential to reduce math anxiety and enhance students' confidence

The MTS Model has the potential to reduce arithmetic anxiety and increase students' confidence in math. The model's focus on tailored feedback and individualised instruction fosters a nurturing environment that influences each student's unique learning requirements (Hafni, Sari & Nurlaelah, 2019). The model minimises feelings of inadequacy and fosters a sense of belonging in the mathematics learning process by adapting teaching methods to varied learning styles.

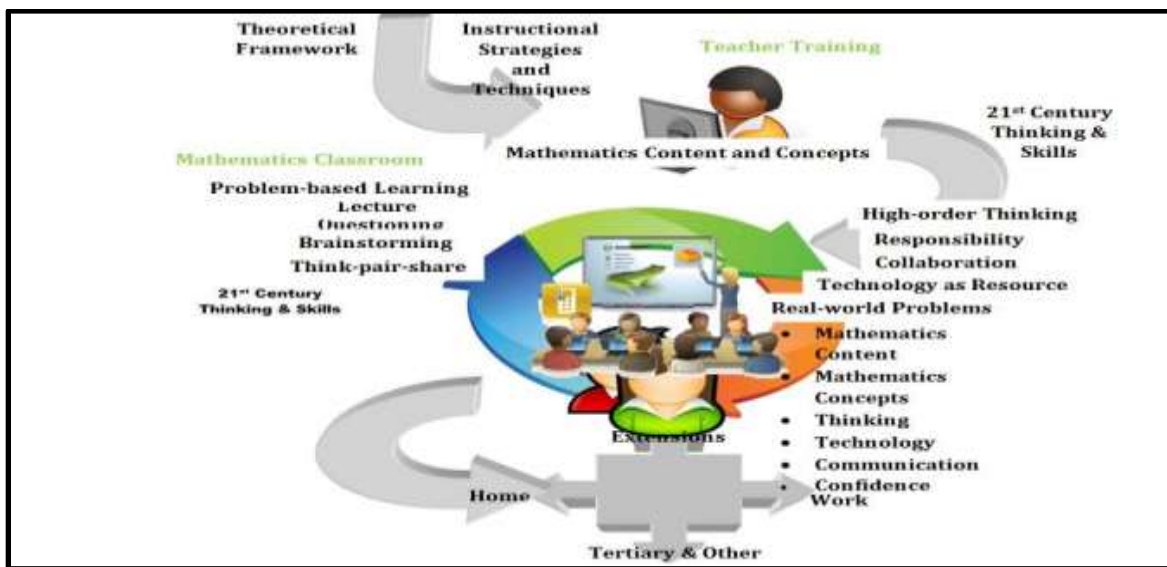


Figure 7: Instructional model for mathematics; (Source: Influenced by: Ieva & Beasley, 2017)

Figure 7 shows the instructional framework for studying mathematics for secondary school students. Additionally, the MTS model's data-driven methodology enables teachers to monitor students' development and offer prompt interventions (Madler *et al.* 2022; Nkhata *et al.* 2020). This focused support reduces the likelihood of experiencing the irritation and stress that frequently enhances math anxiety. Marzano's strategy helps students to develop a positive relationship with mathematics by continuously providing possibilities for success and growth, establishing newfound confidence. In this approach, the strategy develops students' mathematical skills while simultaneously giving them the resilience and self-assurance they need to face problems.

#### Theme 4: Marzano's model has a positive impact on math achievement, emotional resilience and cognitive growth

Marzano's model has a positive influence on a variety of educational outcomes, particularly numerical proficiency, emotional fortitude, and cognitive development. The methodology of MTS improves students' comprehension and application of mathematical ideas by emphasizing data-informed teaching practices (Hildenbrand & Arndt, 2016). It eventually improves students' academic achievement.

REASONS FOR PREFERENCE	TEACHING TECHNIQUES & METHODS											$\Sigma$
	Demo and Practice	Question: Answer	Problem: Solve	Putting Rule	Lecture	Games	Discover	Describe	Cooperate	Case study	Scenario	
Concretization								1		2	1	4
Feeling of help/ share									11			11
Get rid of monotony						2	1		1	1	1	6
NOT contemporary				3								3
Monotony					5							5
Temporary Learning					2			2				4
Waste of time						2	5		1	3	4	15
Overcrowded classes						1						1
NOT up to student level							2	2				4
NOT up to mathematics							1		1	2	1	5
Lead to memorize								3				3
$\Sigma$	30	36	31	18	33	33	36	27	31	25	23	323

Figure 8: Teaching methods and techniques for mathematics with reasons; (Source: Influenced by Ünal, 2017)

Figure 8 shows the important teaching methods for mathematics in secondary schools. Emotional resilience is facilitated by the MTS model's emphasis on building a supportive learning environment and addressing emotional barriers (Aouine & Sadek Fodil, 2020). Students are better able to handle difficulties and disappointments, improving their general emotional well-being, by lowering math anxiety and encouraging a sense of belonging. Additionally, the model's emphasis on critical thinking and individualised instruction fosters cognitive development. Hence, it also allows students to acquire analytical abilities and a deeper understanding of mathematical concepts.

## Discussion

The results of this study are consistent with the goal of the study, which was to determine how Marzano's Teacher Supervision Model reduced anxiety among secondary school students. Theme 1 focused on the impacts of the model that improves educators' instructional methods. The model's focus on making decisions based on data and providing tailored feedback improves pedagogical practices.

The model encourages teachers to provide thought-provoking exercises that enhance students' analytical talents, which supports Theme 2's emphasis on critical thinking. The results of the study demonstrate the model's potential to reduce math anxiety and increase student confidence, which is focused on Theme 3. A more inviting and inclusive learning environment for math is made possible by the MTS model's provision for individualised assistance and differentiated instruction (Khasawneh, Gosling & Williams, 2021). Moreover, Theme 4 is based on improved student performance, the observed emotional well-being, and the stimulation of important cognitive faculties of the students.

## Conclusion

The Marzano Teacher Supervision Model offers a revolutionary method for teaching mathematics in secondary schools. It improves instruction, fosters critical thinking, and lessens arithmetic anxiety. This methodology provides a comprehensive answer by addressing the cognitive and emotional elements. Research into its broader effects confirms its ability to revolutionise mathematics education and provide advantages for both students and teachers.

## Future Scope

Future scope explores the long-term consequences of the persistent application of Marzano's paradigm, looking at how it affects math performance, critical thinking, and anxiety over time. As illustrated by Kaskens *et al.* (2020), Marzano's model improves the teaching process through goal-setting, observation, data-driven strategies, and feedback to foster effective instruction and student growth. Comparative research of various student populations and educational environments would shed further light on the model's universal applicability. Additionally, investigating how to incorporate technology within this framework could improve student engagement and academic results. Moreover, focusing on teacher training programmes that follow the model's guiding principles provides insightful advice for successful implementation. Hence, the model's adaptability and efficacy in reducing math anxiety and fostering critical thinking depend on the understanding of how cultural and socioeconomic factors interact with the model's effects.

## References

- Cristóvão, A. M., Candeias, A. A., & Verdasca, J. L. (2020, January). Development of socio-emotional and creative skills in primary education: Teachers' perceptions about the Gulbenkian xxi school learning communities project. In *Frontiers in Education* (Vol. 4, p. 160). Frontiers Media SA. <https://www.frontiersin.org/articles/10.3389/educ.2019.00160/full>
- Habibullah, H. (2021). Percentage of Math Anxiety Criteria for secondary school students at each stratum. Retrieved on 31<sup>st</sup> August 2023 from: [https://www.researchgate.net/figure/Percentage-Diagram-of-the-Math-Anxiety-Criteria-for-Students-at-Each-Stratum\\_fig2\\_348564240](https://www.researchgate.net/figure/Percentage-Diagram-of-the-Math-Anxiety-Criteria-for-Students-at-Each-Stratum_fig2_348564240)
- Hafni, R. N., Sari, D. M., & Nurlaelah, E. (2019, April). Analyzing the effect of students' habits of mind on mathematical critical thinking skills. In *Journal of Physics: Conference Series* (Vol. 1211, No. 1, p. 012074). IOP Publishing. <https://iopscience.iop.org/article/10.1088/1742-6596/1211/1/012074/pdf>
- Härkki, T., Vartiainen, H., Seitamaa-Hakkarainen, P., & Hakkarainen, K. (2021). Co-teaching in non-linear projects: A contextualised model of co-teaching to support educational change. *Teaching and Teacher Education*, 97, 103188. <https://www.sciencedirect.com/science/article/pii/S0742051X20313792>
- Kaskens, J., Segers, E., Goei, S. L., van Luit, J. E., & Verhoeven, L. (2020). Impact of Children's math self-concept, math self-efficacy, math anxiety, and teacher competencies on math development. *Teaching and teacher education*, 94, 103096. <https://doi.org/10.1016/j.tate.2020.103096>
- Khasawneh, E., Gosling, C., & Williams, B. (2021). What impact does maths anxiety have on university students?. *BMC psychology*, 9(1), 1-9. <https://bmcp psychology.biomedcentral.com/articles/10.1186/s40359-021-00537-2>
- Lukowski, S. L., DiTrapani, J., Jeon, M., Wang, Z., Schenker, V. J., Doran, M. M., ... & Petrill, S. A. (2019). Multidimensionality in the measurement of math-specific anxiety and its relationship with mathematical performance. *Learning and individual differences*, 70, 228-235. <https://doi.org/10.1016/j.lindif.2016.07.007>
- Mutlu, Y. (2019). Math Anxiety in Students with and without Math Learning Difficulties. *International Electronic Journal of Elementary Education*, 11(5), 471-475. <https://files.eric.ed.gov/fulltext/EJ1222170.pdf>
- National Institutes of Health, (2023). Students have anxiety globally. Retrieved on 31<sup>st</sup> August 2023 from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4842756/>
- Zhang, J., Zhao, N., & Kong, Q. P. (2019). The relationship between math anxiety and math performance: A meta-analytic investigation. *Frontiers in psychology*, 10, 1613. <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01613/full>

## Thematic coding references

- Aouine, A., & Sadek Fodil, M. (2020). EFL Teachers' Views and Implementation of Problem-Solving Tasks in the Algerian Secondary Schools. *International Journal of Research in English Education*, 5(2), 61-81. doi: 10.1086/441359
- Arshad, M. N., Atan, N. A., Abdullah, A. H., Abu, M. S., & Mokhtar, M. (2017). Improving the reasoning skills of students to overcome learning difficulties in additional Mathematics: a Review. *Journal of Science and Mathematics Letters*, 5, 28-35. <https://ojs.upsi.edu.my/index.php/JSML/article/download/374/237>

- Candelario-Aplaon, Z. (2017, December). Needs assessment of senior high school mathematics teachers in teaching statistics and probability. In *International Forum Journal* (Vol. 20, No. 2, pp. 143-159).
- Cargas, S., Williams, S., & Rosenberg, M. (2017). An approach to teaching critical thinking across disciplines using performance tasks with a common rubric. *Thinking Skills and Creativity*, 26, 24-37. <https://www.sciencedirect.com/science/article/am/pii/S1871187116301596>
- Hafni, R. N., Sari, D. M., & Nurlaelah, E. (2019, April). Analyzing the effect of students' habits of mind to mathematical critical thinking skill. In *Journal of Physics: Conference Series* (Vol. 1211, No. 1, p. 012074). IOP Publishing. doi:10.1088/1742-6596/1211/1/012074
- Hildenbrand, S. M., & Arndt, K. (2016). Student teachers' management practices in elementary classrooms: a qualitative study. *Teacher Development*, 20(2), 147-161. <http://dx.doi.org/10.1080/13664530.2016.1143869>
- Ieva, K., & Beasley, J. (2022). Dismantling racism through collaborative consultation: Promoting culturally affirming educator SEL. *Theory into practice*, 61(2), 236-249. <https://doi.org/10.1080/00405841.2022.2036049>
- Madler, A. M., Anderson, S. K., LeMire, S. D., & Smith, K. (2022). Perceptions of teacher preparation for classroom diversity. *Mid-Western Educational Researcher*, 34(1), 42-68. <https://doi.org/10.3102/0002831217690517>
- Massiah, A., & James, F. (2020). Does Clinical Supervision Work? The Stories of Two Teachers Empowered to Adopt Student-Centred Teaching Strategies in the Classroom Through a Clinical Supervision Intervention. *Caribbean Curriculum*, 27. <https://doi.org/10.5539/ass.v13n4p25>
- Muhlisin, A., Susilo, H., Amin, M., & Rohman, F. (2016, June). Improving critical thinking skills of college students through RMS model for learning basic concepts in science. In *Asia-Pacific Forum on Science Learning and Teaching* (Vol. 17, No. 1, pp. 1-24). [https://www.researchgate.net/profile/Ahmad-Muhlisin/publication/309514622\\_Improving\\_critical\\_thinking\\_skills\\_of\\_college\\_students\\_through\\_RMS\\_model\\_for\\_learning\\_basic\\_concepts\\_in\\_science/links/5b9a23a892851c4ba81832db/Improving-critical-thinking-skills-of-college-students-through-RMS-model-for-learning-basic-concepts-in-science.pdf](https://www.researchgate.net/profile/Ahmad-Muhlisin/publication/309514622_Improving_critical_thinking_skills_of_college_students_through_RMS_model_for_learning_basic_concepts_in_science/links/5b9a23a892851c4ba81832db/Improving-critical-thinking-skills-of-college-students-through-RMS-model-for-learning-basic-concepts-in-science.pdf)
- Nkhata, L., Banda, A., Chituta, D., Jumbe, J., & Choobe, B. (2020). Mentors Views on Mathematics and Science Student Teachers School Experience. *Education Quarterly Reviews*, 3(3). <https://files.eric.ed.gov/fulltext/EJ1274562.pdf>
- Sterrett, B., Rhodes, G., Kubasko, D., Reid-Griffin, A., Robinson, K. K., Hooker, S. D., & Ryder, A. J. (2020). Shaping the supervision narrative: Innovating teaching and leading to improve STEM instruction. *Journal of Educational Supervision*, 3(3), 59. <https://doi.org/10.31045/jes.3.3.5>
- Ünal, M. (2017). Preferences of teaching methods and techniques in Mathematics with reasons. *Universal Journal of Educational Research*, 5(2), 194-202. DOI: 10.13189/ujer.2017.050204
- Warner, S., & Kaur, A. (2017). The perceptions of teachers and students on a 21st century mathematics instructional model. *International Electronic Journal of Mathematics Education*, 12(2), 193-215. <https://www.iejme.com/download/the-perceptions-of-teachers-and-students-on-a-21st-century-mathematics-instructional-model.pdf>
- Wilson, S. B., & Varma-Nelson, P. (2016). Small groups, significant impact: A review of peer-led team learning research with implications for STEM education researchers and faculty. *Journal of*

*Chemical Education*, 93(10), 1686-1702  
<https://cpltl.iupui.edu/doc/acs.jchemed.5b00862.pdf>

**Cite Your Article as:**

RAKESH KUMAR. (2023). EFFECTIVENESS OF MARZANO'S TEACHING SUPERVISION MODEL ON ACHIEVEMENT, CRITICAL THINKING AND ANXIETY TOWARDS MATHEMATICS. *Scholarly Research Journal for Interdisciplinary Studies*, 12(78), 642–657. <https://doi.org/10.5281/zenodo.8333735>