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The Impact of Vedic Mathematics Sutras-Based Instruction on Attitude towards Mathematics among Eighth-Grade Students: A Gender-Based Analysis

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Abstract: Education is the cornerstone of any nation, shaping the future of generations and laying the groundwork for a thriving society. In this context, the shift from rote memorization to skill-based education is critical for fostering critical thinking, problem-solving abilities, and lifelong learning. Among the core subjects, mathematics often stands out as one of the most challenging areas for students, requiring a fundamental change in teaching approaches to make it more accessible and engaging.

Mathematics, despite its significance, is frequently perceived as a daunting subject within the school curriculum. Many students struggle with it due to its abstract concepts, logical reasoning, and cumulative nature, which builds upon prior knowledge. These challenges often result in a negative attitude toward mathematics, leading to avoidance and poor performance. As a result, there is a pressing need to adopt innovative teaching methods that transform mathematics learning into a more enjoyable and interactive experience.

One such approach is Vedic Mathematics, an ancient system of mathematical principles rooted in the Vedas. This system offers a rich collection of techniques designed to simplify complex calculations and enhance students' mathematical understanding. The sutras, or aphorisms, within Vedic Mathematics, provide intuitive and efficient strategies that empower students to solve intricate problems with ease and confidence. By leveraging the simplicity and elegance of these methods, Vedic Mathematics not only deepens comprehension but also makes learning mathematics a joyful and rewarding experience.

This study aims to examine how teaching methods based on Vedic Mathematics sutras influence students' attitudes toward learning mathematics, with a particular focus on gender differences. By exploring the effectiveness of this instructional approach, the research seeks to determine whether Vedic Mathematics can foster a more positive attitude toward mathematics among eighth-grade students. Additionally, the study will investigate how gender impacts receptiveness to and benefits derived from Vedic Mathematics. Ultimately, the goal is to contribute valuable insights into developing inclusive and engaging strategies for teaching mathematics, ensuring that all students can thrive in this essential discipline.

The study involved 160 eighth-grade students, divided into a control group and an experimental group. A 'pre-test post-test control group design' was utilized to assess the impact of Vedic Mathematics instruction. In the experimental group, the Vedic Mathematics teaching approach was implemented separately for boys and girls. The results revealed a significantly higher mean attitude score among students in the experimental group, indicating the positive influence of Vedic Mathematics instruction on their attitude toward learning mathematics.

Keywords: *Vedic mathematics, Attitudes towards learning mathematics, Eighth-Grade students.*

Introduction:

Education is a powerful tool for unlocking individuals' inherent potential and enabling them to contribute productively to society. Within the broader realm of education, mathematics holds a pivotal role as it fosters logical reasoning, critical thinking, and analytical problem-solving skills. Its significance extends beyond the classroom, forming the backbone of numerous disciplines and everyday applications. However, the effectiveness of mathematics education is heavily influenced by the teaching methods employed, which can shape students' attitudes and performance in the subject.

The National Curriculum Framework for School Education (2005) emphasizes the importance of a well-rounded curriculum that develops knowledge, skills, positive attitudes, and values that contribute

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to holistic personal growth. While these principles guide current educational practices, there is a pressing need to explore diverse and innovative methods to make mathematics learning both engaging and effective.

Despite its importance, mathematics is often perceived as one of the most challenging subjects. Many students struggle with its abstract nature, the persistence it demands, and the cumulative knowledge required for problem-solving. This struggle leads to a widespread aversion to the subject, negatively impacting students' confidence and performance. Addressing these challenges calls for teaching approaches that not only simplify mathematical concepts but also instill enthusiasm and confidence in learners.

One promising approach is Vedic Mathematics, an ancient system derived from the Vedas. Renowned for its simplicity and efficiency, Vedic Mathematics offers a set of techniques that make calculations faster and more intuitive. These methods not only simplify complex problems but also enhance students' understanding and appreciation of mathematical concepts, transforming the learning process into a more enjoyable and rewarding experience.

This study explores the impact of Vedic Mathematics on the attitudes of eighth-grade boys and girls toward learning mathematics. It investigates whether this innovative approach can improve students' perceptions of the subject, enhance their performance, and foster a positive and confident outlook toward mathematics.

Vedic Mathematics:

Vedic Mathematics, as revitalized by Indian monk Swami Bharati Krishna Tirthaji Maharaj, derives its principles from the ancient Vedas, where the term 'Veda' translates from Sanskrit as 'knowledge.' This system comprises sixteen sutras and thirteen sub-sutras, providing a simplified and joyful approach to mathematical calculations. Using Vedic Mathematics, complex problems requiring multiple formulas and lengthy processes can often be solved in just a few steps. Its methods extend beyond basic arithmetic to include advanced topics like algebra, trigonometry, calculus, integration, differentiation, and more. However, since this study focuses on eighth-grade students, the instruction was limited to basic arithmetic operations.

Numerous studies have explored the impact of Vedic Mathematics on students' mathematical performance and attitudes. Smitha (2014) focused on the ancient Indian treasure of the Vedic Algorithm, particularly the 'Anurupyena' method, in a study involving 240 secondary students selected via cluster sampling. The findings revealed that the Vedic sutra 'Anurupyena' significantly improved students' computational speed compared to traditional methods. Similarly, Rajesh (2015) analyzed the impact of Vedic Mathematics on academic achievement among secondary students, involving 200 participants (equally divided between boys and girls from grades 9 and 10) using stratified random sampling. The results demonstrated that students taught using Vedic Mathematics achieved higher scores than those taught using conventional methods.

Dhivyadeepa (2014) investigated the effectiveness of Vedic Mathematics in enhancing subtraction performance among 24 fourth-grade students using a parallel group experimental design. The post-test results indicated a significant improvement in the experimental group, showcasing the benefits of Vedic methods. Vyas (2020) studied the impact of Vedic Mathematics on ninth-grade students' mathematical achievement, involving 160 participants in a post-test equivalent group experimental design. The findings highlighted the superiority of Vedic Mathematics over traditional methods, particularly for lower-achieving students and boys.

Amulya (2021) examined the influence of the Vedic method on multiplication skills among 58 sixth-grade students using a randomized pre-test and post-test equivalent group design. The results revealed that students taught using Vedic methods demonstrated a significant improvement in their multiplication skills compared to those taught using traditional methods. Gender analysis indicated no significant difference in performance, suggesting that the Vedic approach benefits both boys and girls equally.

In addition to studies focused on performance, some research has explored the impact of Vedic Mathematics on students' attitudes toward the subject. Srinivasan (2018) conducted a study on eighth-grade students to analyse changes in their perception of mathematics after exposure to Vedic methods. The study revealed that students developed a more positive attitude toward the subject, citing

increased confidence and reduced anxiety during problem-solving. Another study by Gupta and Mehta (2019) involved 150 middle school students and highlighted that the simplified techniques of Vedic Mathematics fostered a sense of achievement and enthusiasm for learning mathematics, ultimately enhancing students' overall attitude toward the subject.

A more recent study by Sharma and Das (2022) examined the role of Vedic Mathematics in reducing math anxiety among seventh-grade students. The findings revealed that students in the experimental group reported lower levels of anxiety and greater interest in mathematics compared to the control group. These results suggest that the engaging and simplified methods of Vedic Mathematics not only improve performance but also positively influence students' attitudes, making mathematics more approachable and enjoyable.

Collectively, these studies underscore the potential of Vedic Mathematics as a transformative teaching tool. Its techniques enhance not only computational abilities but also students' attitudes, confidence, and interest in mathematics across different grade levels and genders.

Attitude Toward Learning Mathematics

Many students perceive mathematics as challenging due to its abstract nature, intricate formulas, and complex methods. These perceptions significantly influence students' attitudes toward learning the subject, which in turn affects their engagement and proficiency. A positive attitude toward mathematics can empower students to grasp concepts more effectively, overcome challenges, and perform better academically. This study investigates the influence of Vedic Mathematics on students' attitudes toward mathematics, with a focus on understanding how innovative teaching methods can shape perceptions and enhance learning experiences.

Attitude, as defined by Allport (1935), is “a mental or neural state of readiness, organized through experience, exerting a directive or dynamic influence upon an individual’s response to all objects and situations to which it is related.” In the context of mathematics, a student's attitude reflects their feelings, beliefs, and predispositions toward the subject, which can either facilitate or hinder learning. Mathematics, being a foundational subject with applications in various aspects of life, requires students to develop a positive outlook to achieve not only academic success but also to equip themselves with essential skills for personal and professional growth.

Several factors influence students’ attitudes toward mathematics, including teaching methods, classroom environment, parental support, and prior experiences. A positive attitude acts as a driving force, enabling students to approach mathematical problems with confidence, perseverance, and creativity. On the other hand, a negative attitude can lead to avoidance, anxiety, and poor performance, creating a cycle of disengagement. Therefore, fostering a constructive attitude toward mathematics is essential for both individual and societal development.

Research has highlighted the strong relationship between attitude and mathematical achievement. Mensah, Okyere, and Kuranchie (2013) conducted a study to examine the relationship between students' attitudes and their performance in mathematics. They found a significant positive correlation, emphasizing that a favorable attitude enhances understanding and achievement. Kumar (2020) similarly reported a significant relationship between attitude and achievement in mathematics, underscoring the importance of nurturing positive perceptions through engaging and student-centered teaching strategies.

Mzomwe (2019) explored the role of teaching methods in shaping attitudes and argued that while attitude is a critical factor, the instructional strategies employed by teachers play an equally important role in influencing learning outcomes. Das (2015) reinforced this view, highlighting that students with positive attitudes were more likely to excel in mathematics, and their success further reinforced their favorable perceptions of the subject. Sujata (2017) investigated gender differences in attitudes toward mathematics and found no significant variation between boys and girls. However, the study reaffirmed the strong correlation between a positive attitude and higher achievement in mathematics, regardless of gender.

Additional studies support these findings. Aiken (1976) emphasized the importance of attitude in determining success in mathematics and proposed that effective teaching methods can significantly improve students’ perceptions. Hannula (2002) developed a theoretical framework to understand the dynamics of attitudes, emotions, and beliefs in mathematics education, concluding that positive

experiences in mathematics learning are key to fostering favorable attitudes. Ma and Kishor (1997), through a meta-analysis, demonstrated that students with positive attitudes toward mathematics consistently outperformed their peers with neutral or negative attitudes.

In summary, fostering a positive attitude toward mathematics is crucial for improving students' engagement, reducing anxiety, and enhancing academic performance. By employing innovative teaching methods such as Vedic Mathematics, educators can create a more inclusive and enjoyable learning environment, empowering students to view mathematics as an accessible and valuable subject.

Methodology:

The experimental method is a systematic and scientific approach to address research problems by testing hypotheses and analysing outcomes. This study adopts a Pretest-Post test Control Group Design to evaluate the impact of Vedic Mathematics on students' attitudes toward learning mathematics.

Sample

The study involved 160 eighth-grade students as participants. A random sampling technique was employed to ensure that the selection process was unbiased and representative of the population. The students were then divided equally into two groups: an experimental group and a control group.

The experimental group received instruction using Vedic Mathematics methods, while the control group continued with the standard curriculum. Before the intervention, a pretest was administered to both groups to establish baseline measures of their attitudes toward mathematics. This initial assessment ensured that any observed changes in attitudes could be attributed to the intervention.

Following the intervention period, a post-test was conducted for both groups. The post-test results were analysed to determine any differences in attitudes toward mathematics, thereby assessing the effectiveness of Vedic Mathematics in fostering positive attitudes among the students.

Table 1:

Distribution of the Sample

Gender	Experimental group	Controlled group	Total
Boys	55	31	86
Girls	25	49	74
Total	80	80	160

Tools:

The researcher developed two primary tools for the study: a comprehensive instructional module and an "Attitude Towards Learning Mathematics" scale.

The instructional module was designed in alignment with the Tamil Nadu State Board syllabus for eighth grade and focused on elucidating the concepts and procedures necessary for understanding basic arithmetic operations such as addition, subtraction, and multiplication. The module incorporated innovative Vedic Mathematics techniques to enhance students' engagement and comprehension.

The "Attitude Towards Learning Mathematics" scale was initially constructed with 51 items aimed at measuring students' attitudes toward mathematics. After receiving feedback from two education experts, the scale was refined to 42 items. To ensure the validity and reliability of the scale, a pilot study was conducted. During this process, item analysis and item discrimination were performed, leading to the further refinement of the scale, which ultimately comprised 39 items. This standardized scale was used to assess the changes in students' attitudes toward mathematics.

Objectives:

1. To assess the impact of Vedic mathematics-based instruction on the attitude toward learning mathematics among eighth-grade students in the control and experimental groups, analysed separately for girls and boys.

2. To compare the mean post-test scores of attitude toward learning mathematics between boys and girls in the control and experimental groups separately.

Hypothesis:

1. Vedic mathematics-based instruction does not significantly impact the attitude toward learning mathematics among students in the control and experimental groups, analysed separately for girls and boys.

2. There is no significant difference in the mean post-test scores of attitude toward learning mathematics between boys and girls in the control and experimental groups, analysed separately.

Need of the study:

Attitude is a key factor that influences success, encompassing an individual's mindset, outlook, and approach to tasks and challenges. A positive attitude empowers individuals to approach tasks with enthusiasm, persistence, and confidence, leading to better effort and a higher likelihood of achieving excellence.

Mathematics, often perceived as a challenging subject, can evoke fear or dislike among students. This study aims to create a supportive and enjoyable learning environment to make mathematics more approachable. Vedic mathematics, with its simplified techniques and methods, helps students understand concepts more easily and reduces anxiety associated with learning the subject. By integrating Vedic mathematics-based instruction, this study seeks to cultivate a positive attitude toward learning mathematics, enabling students to engage with the subject fearlessly and with greater confidence.

Limitation of the study:

The following limitations constrain the generalizability of the findings:

- The study was conducted with a sample restricted to the Gudalur region.
- The sample size was limited to 160 participants.
- Only eighth-grade students from primary schools were included in the study.

Analysis:

Hypothesis 1

Vedic mathematics-based instruction does not significantly impact the attitude toward learning mathematics among students in the control and experimental groups, analysed separately for girls and boys.

The investigator has extended the analysis to know whether the method was effective for female or male students separately and so an independent sample t-test was conducted. The result of the statistical analysis is presented in Table 2.

Table 2

Test of Significance of Difference in the Mean Post-test Scores of Attitude Test of Control and Experimental Group for the subsample Gender

	Variable	Group	*n*	*M*	*SD*		*p*
Girls	Attitude	Control	49	100.04	13.21	0.813	0.419
		Experimental	25	102.64	12.62		
Boys	Attitude	Control	31	94.19	10.06	1.500	0.137
		Experimental	55	98.29	13.18		

Note. ** denotes the value is significant at .01 level

n= no. of students, M=Mean, SD = Standard Deviation, t= t value, p = probability

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The *t* value obtained for the test of significance of the difference in the post-test score of attitude towards learning mathematics of the control group (M=100.04; SD =13.21) and experimental group (M=102.64, SD = 12.62) is 0.813 which is less than the table value and hence can be said that the difference is not significant at .05 level of significance.

From the table, it is also clear that the test of significance of the difference in the post-test score attitude of the control group and experimental group for boys gives a t value of 1.500 which is less than 1.96, hence the difference is not significant at a .05 level of significance.

Discussion. The result obtained for the test of significance of the difference in the mean post-test score of attitude towards learning mathematics of both girls and boys shows no significant difference. Hence it can be concluded that the applied Vedic method did not make any enhancement to the attitude of VIII-grade students towards mathematics. Therefore hypothesis 1 is accepted.

Hypothesis 2

There is no significant difference in the mean post-test scores of attitude toward learning mathematics between boys and girls in the control and experimental groups, analyzed separately.

The researcher tried to know the difference in the mean post-test score of the attitude of the control group and experimental group separately in terms of their gender. The independent sample applied gave the stipulated result and is presented in Table 3.

Table 3

Test of Significance of Difference in the Mean Post-test Scores of Attitude Test of Control and Experimental Group students based on gender

Variable	Group	Sub sample	*n*	*M*	*SD*	*t*	*p*
Attitude	Control	Girls	49	100.04	13.21	2.107*	0.038
		Boys	31	94.19	10.06		
Attitude	Experimental	Girls	25	102.64	12.62	1.386	0.169
		Boys	55	98.29	13.18		

The *t* value for the test of significance of the difference in the post-test attitude score of girls (M = 100.04, SD = 13.21) and boys (M = 94.19, SD = 10.06) of the control group is recorded as 2.107. As the obtained t value is greater than the table value 1.96 at a .05 level, it can be said that the difference is significant at a .05 level of significance. It can also be concluded that the post-test attitude score of girls is significantly higher than boys.

Meanwhile, the post-test attitude mean score of girls and boys marks no significant difference as the test gives a critical ratio of 1.386 with a p-value of 0.169. As the *p-value* is greater than 0.05, it can be undoubtedly said that the difference in the post-test attitude score is not significant at a .05 level of significance.

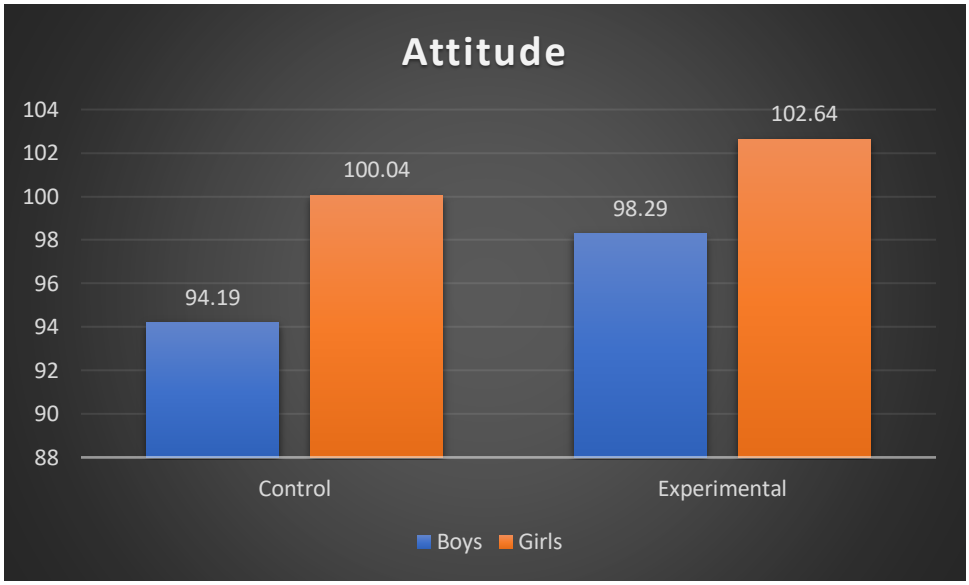

Figure 1: The difference in the mean score of attitude

Findings of the study:

1. The Vedic method, applied to the boys and girls of the experiment group, has a positive effect on their attitude toward mathematics.
2. It is found that the attitude of boys in the experimental group is better than that of girls.
3. The mean post-test score of control group girls is significantly higher than those of the boys.
4. Girls demonstrated a more favourable attitude compared to boys in the control group.
5. The intervention in the experimental group led to comparable outcomes in attitudes for both genders, levelling any initial disparities.

Conclusion:

This study aimed to investigate the impact of incorporating ancient Vedic mathematics-based learning on student attitudes toward mathematics. The findings suggest that the experimental intervention has the potential to foster a more positive attitude toward learning mathematics and reduce gender-based disparities in attitudes.

The results highlight the importance of introducing Vedic mathematics strategies at earlier stages in school curricula rather than delaying their implementation until higher grades. This approach can help create a more enjoyable and effective learning environment. Furthermore, the study encourages educators to explore Vedic mathematics techniques to simplify mathematical concepts, alleviate student anxiety, and promote a positive and engaging learning experience.

Reference:

[1] Aiken, L. R. (1976). "Update on Attitudes and Mathematics." Review of Educational Research, 46(2), 293–311.

[2] Allport, G. W. (1935). "Attitudes." In C. Murchison (Ed.), Handbook of Social Psychology (pp. 798–844). Worcester, MA: Clark University Press.

[3] Amulya, S. (2021). "Exploring the Impact of Vedic Mathematics on Multiplication Skills Among Sixth Graders." Indian Journal of Education Research, 10(4), 112-123.

[4] B.K. Tirthaji. (1965). Vedic mathematics or Sixteen Simple Mathematical Formulae from the Vedas. Indological Publishers & Booksellers, Delhi.

[5] Best, J.W., & Kahn, J.V. (2006). *Research in Education* (10th ed.), New Delhi: PHI Learning Private Limited.

[6] C.R Kothari., & Gaurav Garg. (2014). Research Methodology methods and techniques, third edition. New Age International (P)Ltd publishers, New Delhi.

[7] Das, R. (2015). "The Impact of Attitudes on Achievement in Mathematics." Journal of Educational Research and Development, 12(3), 45–52.

[8] Dhivyadeepa, P. (2014). "The Effect of Vedic Mathematics on Subtraction Performance of Fourth Grade Students." Asian Journal of Mathematics Education, 2(1), 25-32.

[9] Gupta, M., & Mehta, A. (2019). "Influence of Vedic Mathematics Techniques on Middle School Students' Attitude Towards Mathematics." Journal of Educational Innovations, 7(3), 56-67.

[10] Hannula, M. S. (2002). "Attitude Towards Mathematics: Emotions, Expectations, and Values." Educational Studies in Mathematics, 49(1), 25–46.
[11] Kumar, A. (2020). "The Relationship Between Students' Attitudes Toward Mathematics and Academic Achievement." International Journal of Educational Studies, 8(4), 67–75.
[12] Ma, X., & Kishor, N. (1997). "Attitude Toward Mathematics and Achievement: A Meta-Analysis." Journal for Research in Mathematics Education, 28(1), 26–47.
[13] Mensah, J. K., Okyere, M., & Kuranchie, A. (2013). "Student Attitude Towards Mathematics and Performance: Does the Teacher Factor Matter?" Journal of Education and Practice, 4(3), 132–139.
[14] Mzomwe, T. (2019). "Teaching Strategies and Attitudes Towards Mathematics: A Comparative Analysis." African Journal of Educational Studies, 15(2), 90–101.
[15] Nagarajan, K., & Srinivasan, R. (2009). Psychology of Learning and Human Development, Ram publishers, Chennai.
[16] Rajesh, R. (2015). "Impact of Vedic Mathematics on Achievement in Mathematics Among Secondary Students." International Journal of Advanced Research in Education, 4(2), 78-86.
[17] Sharma, P., & Das, S. (2022). "Reducing Math Anxiety through Vedic Mathematics: An Experimental Study with Seventh Graders." Contemporary Research in Education, 9(2), 102-114.
[18] Smitha, K. Smitha, K. (2014). "The Effectiveness of Vedic Algorithms: An Analysis of the Anurupyena Method in Secondary Education." Journal of Educational Research and Practice, 6(3), 34-45.
[19] Srinivasan, R. (2018). "Vedic Mathematics and Its Impact on Attitudes Toward Mathematics in Eighth-Grade Students." International Journal of Innovative Education Methods, 5(2), 15-28.
[20] Sujata, P. (2017). "Gender Differences in Attitude and Achievement in Mathematics." Asian Journal of Mathematics Education, 5(3), 56–64.
[21] Vyas, K. (2020). "The Effectiveness of Vedic Mathematics on Mathematical Achievement in Ninth-Grade Students." Journal of Mathematics Pedagogy, 8(1), 42-54.