Impact of Vedic Mathematics on Students' Performance

Yasir[1*], Amil Hussain[2], Hasnain Khan[3], Nia Kania[4]

[1,2,3]School of Mathematical Sciences, East China Normal University, China

[4]Mathematics Education, Universitas Majalengka, Indonesia

*Corresponding author: 51275500108@stu.ecnu.edu.cn

ABSTRACT

Purpose – Mathematics is a foundational subject essential to daily life and professional practice; however, many students perceive it as difficult and uninteresting due to rigid rules and complex procedures, which often lead to a fear of mathematics. This study aims to examine the effectiveness of Vedic Mathematics (VM) training in improving students' mathematical performance and attitudes toward mathematics.

Methodology – An experimental research design was employed involving 146 undergraduate students from business management and commerce programs. Participants were divided into an experimental group and a control group using a non-random sampling technique. The experimental group received one week of Vedic Mathematics training focused on mental calculation strategies, while the control group followed conventional instructional methods. Data were collected using timed pre-test and post-test assessments to measure mathematical performance, along with a self-developed questionnaire to assess mathematics phobia and interest. Data analysis was conducted by comparing pre- and post-test results between groups.

Findings – Students who received Vedic Mathematics training demonstrated improved calculation speed and accuracy, increased interest in mathematics, and reduced mathematics phobia compared to the control group. These results indicate that VM training positively influences both cognitive performance and affective attitudes toward mathematics.

Novelty – This study contributes empirical evidence on the effectiveness of Vedic Mathematics as an alternative instructional approach in higher education, particularly in addressing affective barriers in mathematics learning.

Significance – The findings are beneficial for educators, curriculum developers, and higher education institutions seeking instructional strategies to enhance students' mathematical proficiency, confidence, and engagement.

Keywords: Math phobia; Shankaracharya; Students' performance; Vedic mathematics.

1. Introduction

Mathematics has long been recognized as a fundamental body of knowledge that underpins scientific, technological, and economic development across civilizations. Almost all ancient civilizations contributed to the development of mathematics as a means of understanding the world, and India was no exception. The ancient Indian knowledge system was deeply rooted in the Vedas, which encompassed diverse disciplines such as astronomy, architecture, medicine, philosophy, and mathematics. Among the intellectual contributions of this tradition, VM emerged as a unique system offering alternative computational approaches grounded in mental agility and logical simplicity.

Vedic Mathematics (VM) is one of such gifts of ancient India. Vedic mathematics is an Indian system of mathematics comprising 16 sutras that simplify arithmetic calculations, make them more accurate, and speed them up. It is an ancient Indian method of solving mathematical problems, rediscovered by His Holiness Shankaracharya Shri. Bharti Krishna Tirthaji from 1911 to 1918 (Sharma, 2022). VM includes a set of precise rules that help solve problems in algebra, trigonometry, arithmetic, geometry, and other areas. The VM system consists of 16 Vedic sutras that can be used to solve even complex arithmetic and algebraic calculations easily, without resorting to the cumbersome procedures of conventional mathematics. These methods can also be called as shortcut methods that will reduce the burden and fear of mathematics dramatically.VM includes a set of precise rules that help solve problems in algebra, trigonometry, arithmetic, geometry, and other areas (Kania et al., 2024; Apriliani et al., 2025).

Many students perceive mathematics as a challenging and unengaging subject, often developing Math phobia that hinders their performance (Olaniyan & Salman, 2015). (David Geary, 2013) is of the opinion that a basic deficit in numerosity is one of the causes of Math phobia. If students start believing that mathematics is a difficult subject, it conditions their minds, making them reluctant learners. As a result, they perform poorly in mathematics examinations (Ihendinihu, 2013). Fu Sai & Chin Kin (2017) said that for the students who really enjoy learning, mathematics is a very interesting and fun subject to prove.

Speed, accuracy, and reliability are important factors in customer satisfaction today. Business executives and operating-level personnel are expected to perform at the highest speed and accuracy. The cutthroat competition of this global era, coupled with the high volume and complexity of business operations, necessitates ultra-high-speed decision-making by business executives and frontline personnel. To tackle this, companies are utilizing artificial intelligence (AI). *The limitations of AI, such as its ability to handle uncertain situations, the uncertainty of variables, the cost of technology, the time required for technology updates, and the diminishing brain ability to calculate due to excessive usage of AI and calculators, necessitate the use of alternative methods for fast, accurate, and reliable calculations* (Santika et al., 2025). Vedic Mathematics (VM) can be useful in this situation. It is observed that many students have Math phobia and they tend to avoid calculations. Students in courses like business administration and commerce cannot afford to develop a math phobia and avoid calculations. Hence, it is necessary to find an alternative way to overcome Math phobia among these students. A few research scholars have found that Vedic Mathematics sutras can be useful for removing Math Phobia among students. This research paper aims to verify the effectiveness of Vedic Math (VM) for students of business management & commerce. The

outcome of this research will be useful for designing appropriate policy measures to improve students' performance in examinations and in the corporate world.

This study makes several significant and original contributions to the existing body of knowledge on mathematics education and alternative computational pedagogy. First, it introduces a contextual contribution by extending the application of Vedic Mathematics beyond its conventional focus on school-level education and engineering domains to undergraduate students in business management and commerce. Kania et al. (2024), a group for whom rapid, accurate, and reliable numerical reasoning is essential for both academic success and professional decision-making. Second, the study advances an integrated cognitive–affective perspective by simultaneously examining computational performance outcomes (calculation speed, accuracy, and test performance) alongside affective dimensions (mathematics phobia and interest). This dual-focus approach provides a more comprehensive understanding of how Vedic Mathematics influences not only students' mathematical competence but also their emotional engagement with the subject. Apriliani et al. (2025); Santika et al. (2025), third, the research offers a pedagogical contribution by empirically validating the effectiveness of a short-duration, one-week Vedic Mathematics training intervention, thereby demonstrating its practicality and scalability for incorporation into higher education curricula without requiring extensive instructional restructuring (Santika et al., 2025). Collectively, these contributions provide evidence-based insights relevant to curriculum developers, higher education institutions, and policymakers seeking innovative instructional strategies to enhance mathematical proficiency, learner confidence, and employability-related skills among undergraduate students.

To ascertain whether the sutras of Vedic Mathematics improve the speed, accuracy, and reliability of calculations of students. To ascertain students' opinions on whether the VM sutras have reduced their math phobia and sparked interest in the Mathematics subject.

$H_0 1$: The Mean time required for attempting the test is the same before & after Vedic Maths training

$H_0 2$: Mean marks scored in the test are the same before & after Vedic Maths training

$H_0 3$: Vedic Maths training does not minimize Maths phobia among the students

$H_0 4$: Vedic Maths training does not create interest in the Maths subject among the students

1.2 Literature Review

The word 'Veda' originated in Sanskrit, meaning 'knowledge'. It includes grammar, philosophy, architecture, astronomy, psychology, economics, medicine, and archery (Eka Ratna Acharya, 2015). Fast and accurate mental calculations can be performed using Vedic mathematics sutras, and the fastest VSLI arithmetic architecture can also be derived from them (Thapliyal, H., 2008). Research studies on the application of computer arithmetic using Vedic Mathematics have shown that multiplying numbers can be faster and more effective than conventional methods (Bengali, S., 2011). For those who enjoy learning, Mathematics can be fun, provoking, and very interesting (Fu Sai & Chin Kin, 2017).

In contrast, for children who struggle with computation and application, mathematics can be frustrating (Chinn, 2015). Thus, students' perceptions vary, and many feel that Mathematics is a boring and disengaging subject (Colgan, 2014). Due to this mathematics anxiety, students tend to avoid the subject, and sometimes even hate it. It is observed that the attitude of our society (like parents & teachers) is also negative towards the mathematics subject, and it is considered a hard subject that seems uninteresting, inaccessible, and not

suitable for engaging cool people & girls (Boaler & Dweck, 2016). Mathematics phobia is a significant contributor to poor academic performance at the school level. A research study conducted at an American university found that more than 20 years of constant calculator use significantly atrophies a person's brain. Vedic mathematics helps us use both hemispheres of the brain, thereby ensuring an individual's mental fitness (Bose & S, 2014).

Vedic mathematics methods are effective for school students in handling Mathematics anxiety and developing their cognitive skills (Shastri, Hankey, Sharma, & Patra, 2016). It is also found that these VM methods are useful for emotional regulation, aggression control, and mindfulness enhancement (Shastri, Hankey, Sharma, & Patra, 2017). The thinking style of logical mathematical persons is abstract and conceptual. They are good at experiments, handling puzzles, classifications, numbers, and formulae, and identifying relationships between different things. They can perform scientific investigation and handle complex ideas. Another category of students is those with strong visual-spatial intelligence. They have expertise in remembering fine details and images. A study using a brain imaging technique revealed that mathematics and logic emerge through language and visuospatial cognition (Houde & Tzourio-Mazoyer, 2003). This fact establishes a link between these 2 skill sets. Vedic Mathematics (VM) is one way to nourish these problem-solving skills (Bharati Krsna Tirthaji Maharaja, 1992). VM includes simple methods of mental calculation that increase calculation speed. The research findings indicate that the speed and accuracy of mathematical calculations have improved with the use of Vedic Mathematics sutras compared to conventional methods (Indukuri, A., 2012). While discussing the marks scored in the mathematics subject by the students while using Vedic Mathematics sutras, it is found that the performance of students improved (Jiji, 2012)24.

Students' interest in the subject 'Mathematics' can be fostered by having them practice and use various sutras of Vedic Mathematics (Das, S., 2013). When solving multiplication problems, it is found that Vedic Mathematics sutras are more effective than traditional school techniques (Sharma, 2014). VM includes simple rules and principles, and is useful for calculations. VM sutras can be used for solving many mathematical and numerical problems, such as algebra, trigonometry, geometry, and arithmetic (Agarwal, J., Matta, V., & Arya, D., 2013). VM comprises 16 sutras & 13 sub-sutras. Basic arithmetic operations get simplified by this. Algebraic concepts such as quadratic equations, simultaneous equations, and cubic equation factorization can be simplified more effectively than the conventional approach. It reduces the time required to solve numerical problems and enhances students' confidence (Agarwal, J., Matta, V., & Arya, D., 2013). VM is effective & works faster in some areas, such as calculus, trigonometry, and coordinate geometry.

Students' careless mistakes can be minimized by the use of VM. Vedic mathematics is simple and includes a series of checks, which is an inbuilt system to avoid mistakes, and facilitates mental exercise. According to research in medical sciences, if we do not engage in mental exercises, the weight of our brain increases by 5%, a change that cannot be reversed by any method (Bajaj, R., 2005). (Tiwari et al 2008) has proposed a Vedic multiplier circuit and found that it increases calculation speed. The chapters on Vedic Mathematics are a very interesting and joyful experience in the history of mathematics (Nicholas,1984). (SV Mogre and DG Bhalke, 2015) said "Urdhava Trigyagbhyam" Sutra of Vedic Mathematics can be useful in designing Integrated Circuits, especially Field Programmable Gate Arrays, *to enable speedy calculations. In such cases, the design of such ICs can be made very compact in size, and it also increases the multiplier's running frequency.* Aditi Tadas & Dinesh (Rotake, 2015) studied

the comparative performance of 3 sutras of Vedic Mathematics in designing a 64-bit divider and found that the new algorithm they developed is more efficient and economical than a conventional processor. (Kunal Jadhav, Aditya Vibhute et al., 2015) said the speed of the Arithmetic logic unit (ALU) can be enhanced by using circuits based on Vedic principles.

This can also improve the machine's power efficiency. (Ramalatha, Dharani et al., 2009) said "Anurupya" Vedic sutra can be used to reduce the computational complexities while designing I.C.'s. This can help improve the circuit's performance. After careful review of 13 research studies on digital signal processor (DSP) design (Anuradha Savadi & Raju Yamanshetti, 2016), the authors observed that multiplier design using VM sutras is better in terms of speed, efficiency, complexity, and compactness. (Himanshu Thapliyal & M.B. Srinivas, 2005) was working on the encryption of elliptic curves said the task can be better accomplished by using the sutras of Vedic Mathematics. (Diganta Sengupta, Mahamuda Sultana et al., 2012) compared the time required for the division algorithm by the conventional method and by using Vedic Mathematics, and found that for 15-digit dividends, speed improved by using the Vedic method from 49.3µs to 2.3µs.

2.   Methods

This study employed a randomized, between-subjects experimental design to evaluate the impact of Vedic Mathematics (VM) training on students' performance and attitudes toward mathematics. A total of 146 undergraduate students from first-year Bachelor of Business Administration (BBA) and Bachelor of Commerce (BCom) programs at a university undergraduate level. were randomly assigned to two equivalent groups: a control group (n = 73) and an experimental group (n = 73). Randomization was achieved using a random-number generator to minimize uncontrolled variables, such as history, maturation, and carryover effects. The experimental group received one week of VM training, while the control group followed conventional mathematics instruction. Performance and attitudes were assessed pre- and post-training, including timed multiplication tests and a self-developed questionnaire measuring math phobia and interest in mathematics.

2.1.   Sample Size

Determining an appropriate sample size is critical for ensuring the accuracy of research outcomes. Cohen et al. (2007) suggest a rule of thumb that experimental research requires a minimum of 15 participants per group. Similarly, Gall et al. (1996) recommend at least 15 participants in both the control and experimental groups for effective comparison. (Brysbaert, 2109) notes that for psychological research designs with 80% power and a moderate effect size (d = 0.4), approximately 50 participants are needed for within-group studies, while between-group studies require 100 to 200 participants. Using an online sample size calculator (https://clincalc.com/stats/samplesize.aspx), a sample size of 146 (73 per group) was determined to detect a moderate effect size (d = 0.4) with 80% power (α = 0.05, β = 0.2) in a two-tailed test.

2.2.   Study Parameters

The study was designed to detect a 10% improvement in performance or attitudes in the VM-trained group compared to no improvement in the control group (α = 0.05, β = 0.2, power = 0.8). This 10% incidence rate was informed by prior studies reporting moderate improvements in calculation speed and engagement (Sharma, 2014; Jiji, 2012). The sample size of 146 (73 per group) was calculated to detect a moderate effect size (d = 0.4; Brysbaert, 2019). Significant

findings were observed for time (H01) and attitudes (H03, H04), but the non-significant result for marks (H02, p = 0.071) suggests a smaller effect, indicating the need for further investigation with a larger sample or extended training duration.

2.3. Study Variables

In the study, the independent variables are the teaching approaches for Mathematics, specifically Vedic and conventional methods, which are manipulated to assess their impact. The dependent variable is the marks participants scored on a prespecified Mathematics test, serving as the measurable outcome influenced by the teaching approaches. Controlled variables include time, classroom conditions, and participants' average age, which are held constant to ensure consistency across the study. Uncontrolled variables, such as participants' interest, socio-economic status, self-concept, and attitudes, may vary and potentially influence the results but are not controlled in the study design.

2.4. Training Process

The experimental group underwent five daily VM training sessions, each lasting two hours, over one week. The training focused on four VM sutras relevant to multiplication: Urdhva Tiryagbhyam (vertical and crosswise multiplication), Nikhilam Navatashcaramam Dashatah (all from 9 and the last from 10), Ekadhikena Purvena (by one more than the previous one), and Anurupye Shunyamanyat (proportionately). These sutras were chosen for their applicability to arithmetic tasks in business and commerce curricula. Training was delivered by an experienced mathematics instructor using interactive lectures, worked examples, and practice problems. The control group received equivalent instructional time using conventional multiplication methods (e.g., long multiplication) taught by the same instructor to ensure consistency.

2.5. Research Tools

To assess the impact of Vedic Mathematics (VM) training on students' performance and math-related attitudes, a self-developed questionnaire was designed and administered to the 146 participants from business management and commerce disciplines. This instrument was informed by established concepts from prior literature on math interest and anxiety, including Olaniyan & Salman (2015) on the psychological dimensions of math phobia and Fu Sai & Chin Kin (2017) on perspectives on math as an engaging subject. The questionnaire comprises 15 items, divided into two dimensions: interest in learning mathematics (8 items) and mathematics anxiety (7 items). Each item is rated on a 5-point Likert scale, ranging from 1 = "Strongly Agree" to 5 = "Strongly Disagree," with reverse-scored items where appropriate to reflect positive attitudes (lower scores indicate higher interest or lower anxiety). For example, items such as "I find mathematics enjoyable" are reverse-scored to align with the scale's intent. This scaling has been clarified in the revised item descriptions to ensure consistency and transparency.

The questionnaire was pilot-tested with a small sample (n=5) to ensure content validity, with feedback from subject matter experts used to refine item wording and structure. As it is a self-developed tool rather than an established scale, an Exploratory Factor Analysis (EFA) was conducted to examine structural validity; the results are detailed below.

2.6. Structural Validity of Questionnaire

An Exploratory Factor Analysis (EFA) using principal component analysis with varimax rotation was conducted on the full dataset (N = 146) to assess the questionnaire's structural validity. The analysis confirmed two distinct factors. Factor loadings ranged from 0.62 to 0.81, with no

cross-loadings above 0.40, ensuring factor distinctiveness. Specific item descriptions and loadings are presented in Tables 1 and 2.

Table 1 - Factor Loadings and Eigenvalues from EFA

Factor	Number of Items	Eigenvalue	Variance Explained (%)	Factor Loadings Range
Interest in Mathematics	8	4.12	27.5	0.62 - 0.81
Mathematics Anxiety	7	3.45	23	0.62 - 0.81

2.7. Validity & Reliability Testing of Questionnaire

Before the actual survey, a Pilot survey was conducted with 5 respondents to identify terms and questions that were ambiguous or could be interpreted differently. Accordingly, a few questions were modified, thereby establishing the content's validity.

Table 2 - Item Descriptions and Factor Loadings

Factor	Item Description	Factor Loading
Interest in mathematics	I find mathematics enjoyable	0.78
	Mathematics is an interesting subject	0.81
	I look forward to math classes	0.75
	Solving math problems is fun	0.79
	I am good at understanding math concepts	0.76
	Math helps me think creatively	0.73
	I enjoy challenging math tasks	0.77
	Math is relevant to my future career	0.74
Mathematics anxiety	I feel nervous when doing math	0.7
	Math problems confuse me	0.68
	I worry about making mistakes in math	0.65
	Math tests make me anxious	0.72
	I avoid math whenever possible	0.67
	I feel pressured during math lessons	0.64
	Math is too difficult for me	0.62

The questionnaire's reliability was assessed using Cronbach's alpha, which was 0.702. Since Cronbach's Alpha > 0.6, the Questionnaire's reliability is established.

Table 3 - Reliability Statistics

| Dimension	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
Interest in mathematics	0.702	0.702	8
Mathematics anxiety	0.681	0.681	7

2.8. Data Collection and Analysis

Data were collected in controlled classroom settings during the pre-test (before training) and post-test (immediately after training). Pre- and post-tests were administered to both groups simultaneously to ensure consistency. Paired-samples t-tests compared pre- and post-training outcomes within the experimental group for hypotheses H03 (interest) and H04 (math phobia). Independent-samples t-tests assessed baseline equivalence and post-test differences between groups for H01 (time) and H02 (marks). Statistical analyses were conducted using SPSS and Excel with a significance level of $\alpha = 0.05$.

2.9. Ethical Considerations

Participants provided informed consent, and the study was approved by the university's institutional ethics review board. Participation was voluntary, with no penalties for withdrawal. Data were anonymized to protect participants' privacy, and no personally identifiable information was collected.

Figure 1 presents a schematic overview of the research methodology adopted in this study, illustrating the process of participant enrollment, random assignment to control and experimental groups, implementation of the Vedic Mathematics intervention, and post-test analysis.
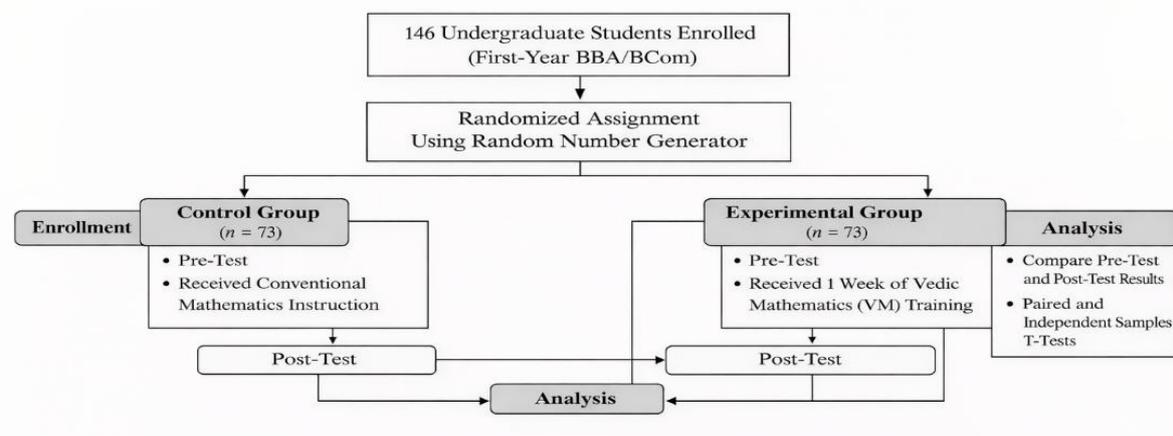
Figure 1. Research Methodology Flow Diagram

3. Results and Discussion

3.1. Results

3.1.1. Baseline Equivalence Check

To ensure comparability between the experimental and control groups, independent-samples t-tests were conducted on pre-test measures. For time (H01), pre-test sums were identical ($\sum X = \sum A = 934$ minutes), yielding t (144) = 0.00, p = 1.00, indicating no significant difference. For marks (H02), pre-test means were 17.73 (experimental) and 18.97 (control), with t (144) = -1.82, p = 0.071, which was not significant at $\alpha = 0.05$ but showed a marginally higher mean in the control group. These results are summarized in Table 4.

Table 4 - Baseline Equivalence T-Test Results

Variable	Group	Mean	SD	t-value	Df	p-value
Time	Experimental	934	1.5	0	144	1
	Control	934	1.5			
Marks	Experimental	17.73	4	-1.82	144	0.071
	Control	18.97	4			

3.1.2. Hypothesis Testing for Attitudes

The study further investigated the impact of Vedic Mathematics (VM) training on students' attitudes, specifically interest in learning mathematics (H03) and mathematics anxiety (H04),

within the experimental group. Paired-samples t-tests were performed to compare pre- and post-training total scores, aggregated across the 15 questionnaire items. For H03 (interest), the pre-training mean was 3.41 (SD = 0.72), which decreased significantly to a post-training mean of 1.91 (SD = 0.58), with t (72) = 14.26, p < 0.001, and a Cohen's d = 2.32, indicating a large effect.

Table 5 - Paired t-Test Results for Interest (H03)

Measure	Pre-Training Mean	Pre-Training SD	Post-Training Mean	Post-Training SD	t-value	df	p-value	Cohen's d
Total Score	3.41	0.72	1.91	0.58	14.26	72	<0.001	2.32

For H04 (anxiety), the pre-training mean was 3.31 (SD = 0.91), reducing to a post-training mean of 1.64 (SD = 0.64), with t (72) = 15.47, p < 0.001, and a Cohen's d = 2.11, also reflecting a large effect. These results confirm significant increases in interest and reductions in anxiety, leading to the rejection of H03 and H04. Note that these analyses are based solely on the experimental group (n = 73), as the control group did not receive VM training, consistent with the study design.

Table 6 - Paired t-Test Results for Anxiety (H04)

Measure	Pre-Training Mean	Pre-Training SD	Post-Training Mean	Post-Training SD	t-value	Df	p-value	Cohen's d
Total Score	3.31	0.91	1.64	0.64	15.47	72	<0.001	2.11

Table 7 - Effectiveness of VM w.r.t. time

Experimental Group			Control Group			Treatment Effect	TE Square
Before	After	$D_e=X-Y$	Before	After	$D_c=A-B$	$\mathbf{D_e\text{-}D_c}$	
X Minutes	Y Minutes		A Minutes	B Minutes		$\sum D =\sum (D_e- D_e)$	$\sum D^2$
						$\sum D$ 233-22=211	$\sum D^2=793$
$\sum X=934$	$\sum Y=701$	$\sum D_e=233$	$\sum A=934$	$\sum B=912$	$\sum D_c=22$	Avg.=2.85 Min.	

$$t = \frac{(\sum D)/n}{\sqrt{\frac{\sum D^2-((\sum D)^2/n)}{(n-1)n}}} \qquad (1)$$

At DF=73-1=72 and Level of Significance (LOS) Table Value of t=1.96. Since (t)Calculated > (t) table, hence, the Null hypothesis (H01) is rejected. Therefore, it is concluded that the mean time required for attempting the multiplication test significantly differs before & after Vedic Maths training. Further, the impact of the Vedic mathematics workshop calculated (∑D = De – Dc) shows a significant reduction, i.e., 2.85 minutes (171seconds) in the time period.

Table 8 - Effectiveness of VM w.r.t. marks

Experimental Group			Control Group			Treatment Effect	TE Square
Before	After	D_e=X-Y	Before	After	D_c=A-B	D_e-D_c	
X Marks	Y Marks		A Marks	B Marks		$\sum D=\sum(D_e$-$D_e)$	$\sum D^2$
						148-14=134	$\sum D^2$=536
$\sum X$=1294	$\sum Y$=1442	$\sum D_e$=148	$\sum A$=1385	$\sum B$=1399	$\sum D_c$=14	Avg D=1.83	

At DF=73-1=72 and Level of Significance (LOS) Table Value of t=1.96. Since (t) Calculated < (t) table, hence, Null hypothesis (H02) is accepted. Therefore, it is concluded that a significant difference does not exist between the average marks scored in the mathematics test by the conventional method and the Vedic Maths method. Further, the average impact of the Vedic mathematics workshop calculated ($\sum D$ = De – Dc) shows an increase of 1.83 marks/student by the adoption of VM sutras.

Table 9 - Impact of VM Training on Students Interest

S. N	Questions	Before	After	Deviation
1	I have an interest in the mathematics subject	4.13	1.21	2.92
2	I always enjoy the mathematics subject	4.16	1.86	2.3
3	I like attending Lectures on the Mathematics subject in College/School	3.87	1.84	2.03
4	I am not afraid of the mathematics subject	3.13	2.29	0.84
5	I believe I can score well on the mathematics exam.	3.56	2.14	1.42
6	I do not have math phobia	2.74	2.42	0.32
7	I always enjoy doing Maths homework	3.63	1.73	1.9
8	I do not feel nervous in situations that demand mathematical calculations	2.03	1.85	0.18
	TOTAL	**3.40625**	**1.91**	**1.49625**

Thus, Table No. 3 shows that the impact of training in Vedic Mathematics on students' interest in learning the Mathematics subject is positive. Thus, the Null hypothesis H03 is rejected, and it is concluded that students' interest in learning Mathematics increases due to training in Vedic Mathematics.

Table 10 - Impact of VM Training on Students' Maths Phobia

S	Questions	Before	After	Deviation
1	While preparing for the mathematics exam. I get tense	3.62	1.86	1.76
2	Using Mathematics outside school makes me nervous	1.64	1.19	0.45
3	I believe my performance in the mathematics subject will always be poor	2.03	1.11	0.92
4	I am always worried that I won't score a good grade in the mathematics subject	3.73	1.78	1.95
5	Attending mathematics lectures is boring & stressful for me	3.79	1.77	2.02

S	Questions	Before	After	Deviation
6	I get nervous when questions related to mathematics are asked of me	3.66	1.52	2.14
7	Working on mathematics homework is stressful for me	4.71	2.28	2.43
	TOTAL	**3.31**	**1.64**	**1.67**

Thus, Table No. 5 shows that the impact of Vedic Mathematics training on students' interest in learning the mathematics subject is positive, and the training could help minimize Maths Phobia. Thus, the Null hypothesis H04 is rejected, and it is concluded that students' Maths Phobia is reduced through training in Vedic Mathematics.

3.2. Discussion

This study examined the impact of a one-week Vedic Mathematics (VM) training program on the performance and attitudes of 146 undergraduate students in business management and commerce disciplines. The results provide strong evidence that VM training significantly reduces the time required to complete multiplication tests (H01 rejected, $p < 0.05$), with an average reduction of 2.85 minutes (171 seconds). This finding aligns with prior research highlighting VM's efficiency in simplifying arithmetic calculations through sutras such as Urdhva Tiryagbhyam and Nikhilam Navatashcaramam Dashatah (Sharma, 2014; Agarwal et al., 2013).

The speed improvement is particularly relevant for business and commerce students, who require rapid and accurate calculations in professional contexts, such as financial analysis and decision-making. (Kania et al., 2024; Apriliani et al., 2025) Contrary to expectations, no significant difference in marks was observed between the VM-trained and control groups (H02 accepted, $p = 0.071$), though a modest increase of 1.83 marks per student was noted. This non-significant result may be due to the short training duration, which limited participants' mastery of VM techniques, or to the marginally higher baseline scores in the control group ($t(144) = -1.82$, $p = 0.071$). (Jiji, 2012) reported improved marks with VM, but their study involved extended training, suggesting that longer exposure could enhance accuracy. This discrepancy highlights the need for further investigation into optimal training durations for VM to translate speed gains into improved performance outcomes. The attitudinal outcomes were particularly robust, with significant improvements in interest in mathematics (H03 rejected, $t(72) = 14.26$, $p < 0.001$, Cohen's $d = 2.32$) and reductions in math phobia (H04 rejected, $t(72) = 15.47$, $p < 0.001$, Cohen's $d = 2.11$) within the experimental group. These large effect sizes underscore VM's potential to transform students' perceptions, making mathematics more approachable and engaging. These findings corroborate studies by (Shastri et al. 2016, 2017), which found that VM reduces math anxiety and enhances cognitive skills. The simplicity and intuitive nature of VM sutras likely contributed to these outcomes by reducing the cognitive load associated with complex calculations, thereby alleviating anxiety and fostering enjoyment. The study's implications are significant for educational policy and practice. Incorporating VM into business and commerce curricula could enhance students' calculation speed and engagement, addressing math phobia and preparing them for professional demands. Universities and policymakers should consider integrating VM training into foundational mathematics courses, potentially as a supplementary module to complement conventional methods. The large attitudinal improvements suggest that VM could be particularly effective for students with math phobia, a critical barrier in disciplines

requiring quantitative skills. Several limitations must be acknowledged. The one-week training duration may have constrained participants' ability to fully master VM sutras, potentially explaining the non-significant improvement in marks. The study focused exclusively on multiplication, limiting insights into the efficacy of other VM sutras (e.g., for division or square roots). Additionally, the sample was drawn from a single institution, which may limit generalizability to other populations. Uncontrolled variables, such as prior mathematical ability and socio-economic status, could also have influenced outcomes. Future research should explore longer training periods to assess whether extended exposure enhances performance outcomes. Investigating additional VM sutras, such as those for division or algebraic operations, could broaden the understanding of VM's applicability. Studies with larger, more diverse samples, including students from different institutions or academic disciplines, would enhance generalizability. Finally, longitudinal designs could examine the sustained impact of VM training on academic performance and career outcomes. In last, this study demonstrates that VM training significantly improves calculation speed and attitudes toward mathematics, offering a promising approach to address math phobia and enhance engagement. While further research is needed to optimize training duration and scope, these findings support the integration of VM into educational curricula to foster mathematical proficiency and confidence among students.

4. Conclusions

It is observed that learners found Mathematics subject as boring & difficult to learn. It is also found that few students also develop Phobia for Mathematics subject which significantly affect their career prospects. Due to this, making the students learn and like the subject is a challenge being faced by the academicians across the world. The outcome of this research work found that Vedic Mathematics sutras can be one of the options to address this issue and can make the learning of Mathematics interesting for learners. This research work which is an experimental design concludes that Vedic Mathematics is helpful in speedy, easy and accurate mathematical calculations. Students' performance in terms of marks scored and time taken to attempt a mathematical multiplication test was assessed & found that application of Vedic mathematics sutras has reduced the time of calculation and increased marks scored of students. Further, it was also found that training on Vedic Mathematics has reduced students' Maths Phobia and created interest in learning mathematics subject. Vedic Mathematics contain 16 sutras. This research study has tested only 4 sutras concerning to multiplication only. Testing of other sutras of VM involving division, square roots & other mathematical calculations with larger sample size may lead to interesting results.

Conflict of Interest

The author declares no conflicts of interest.

References

Acharya, E. R. (2015). Mathematics hundred years before and now. *History Research, 3*(5), 1-5.

https://doi.org/10.11648/j.history.20150303.11

Agarwal, J., Matta, V., & Arya, D. (2013). Design and implementation of FFT processor using Vedic multiplier with high throughput. *International Journal of Emerging Technology and Advanced Engineering, 3*(4), 207-211.

Apriliani, A., Kania, N., & Umar, N. (2025). Developing teaching materials to enhance critical thinking skills through group investigation in composite functions. *International Journal of Applied Learning and Research in Algebra*, 2(1). https://doi.org/10.56855/algebra.v2i1.1347

Bajaj, R. (2005). *Vedic mathematics: The problem solver*. Black Rose Publications.

Bengali, S. (2011). Research on Vedic mathematics and its application in computer arithmetic (Master's thesis). North Carolina State University. Retrieved from http://repository.lib.ncsu.edu/ir/bitstream/1840.16/7232/1/etd.pdf

Bharati Krsna Tirthaji Maharaja. (1965). *Vedic mathematics*. Indological Publishers & Booksellers.

Bharati Krsna Tirthaji Maharaja. (1992). *Vedic mathematics* (V. S. Agrawala, Ed.). Motilal Banarsidass.

Boaler, J., & Dweck, C. S. (2016). *Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages and innovative teaching*. Jossey-Bass.

Bose, S. (2014). *Vedic mathematics*. V and S Publishers.

Brysbaert, M. (2019). How many participants do we have to include in properly powered experiments? A tutorial of power analysis with reference tables. *Journal of Cognition, 2*(1), 16, 1-38. https://doi.org/10.5334/joc.72

Chinn, S. J. (Ed.). (2015). *The Routledge International Handbook of Dyscalculia and Mathematical Learning Difficulties*. Routledge.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). Routledge.

Colgan, L. (2014). Making math children will love: Building positive attitudes to improve student achievement in mathematics. *What works? Research into practice* (Research Monograph #56). Student Achievement Division, Ontario Ministry of Education. Retrieved from http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/WW_MakingMath.pdf

Das, S. (2013). The history & future of Vedic maths. Retrieved from http://hinduism.about.com/od/vedicmaths/a/vedicmath_history_future.htm

Fu Sai, H., & Chin Kin, E. (2017). Online survey research regarding awareness of dyscalculia among educators in Sandakan District Sabah. *International Journal of Academic Research in Progressive Education and Development, 6*(2), 1-11. https://doi.org/10.6007/IJARPED/v6-i2/2874

Gall, M. D., Borg, W. R., & Gall, J. P. (1996). *Educational research: An introduction* (6th ed.). Longman Publishing.

Geary, D. C. (2013). Early foundations for mathematics learning and their relations to learning disabilities. *Current Directions in Psychological Science, 22*(1), 23-27. https://doi.org/10.1177/0963721412469398

Houdé, O., & Tzourio-Mazoyer, N. (2003). Neural foundations of logical and mathematical cognition. *Nature Reviews Neuroscience, 4*(6), 507-514. https://doi.org/10.1038/nrn1117

Ihendinihu, U. C. (2013). Enhancing the mathematics achievement of secondary school students using the mastery learning approach. *Journal of Emerging Trends in Educational Research and Policy Studies, 4*(6), 848-854.

Indukuri, A. (2012). Research on improving computational skill using Vedic mathematics. Retrieved from http://www.magicalmethods.com/FREE/EOVM_R_Apik.pdf

Jadhav, K., Vibhute, A., Iyer, S., & Dhanabal, R. (2015). Novel Vedic mathematics based ALU using application specific reversibility. In *2015 9th International Conference on Intelligent Systems and Control (ISCO)* (pp. 1-5). IEEE. https://doi.org/10.1109/ISCO.2015.7282293

Jiji, S. (2012). A study of effectiveness of teaching Vedic mathematics on students' achievement (Doctoral dissertation, SJJT University, Jhunjhunu, Rajasthan). Retrieved from http://shodhganga.inflibnet.ac.in/handle/10603/21247

Kania, N., Suryadi, D., Kusumah, Y. S., Dahlan, J. A., Nurlaelah, E., & Elsayed, E. E. (2024). Comparative praxeology: Assessing high-level cognitive skills in TIMSS and Indonesian national examinations. *International Journal of Applied Learning and Research in Algebra*, 1(1). https://doi.org/10.56855/algebra.v1i1.1160

Mogre, S. V., & Bhalke, D. G. (2015). Implementation of high speed matrix multiplier using Vedic mathematics on FPGA. In *2015 International Conference on Computing Communication Control and Automation* (pp. 152-156). IEEE. https://doi.org/10.1109/ICCUBEA.2015.37

Nicholas, A. P., Williams, K. R., & Pickles, J. (1984). *Vertically and crosswise*. Inspiration Books.

Olaniyan, M. O., & Salman, M. F. (2015). Causes of mathematics phobia among senior school students: Empirical evidence from Nigeria. *The African Symposium, 15*(1), 50-56.

Ramalatha, M., Thanushkodi, K., Deena Dayalan, K., & Dharani, P. (2009). A novel time and energy efficient cubing circuit using Vedic mathematics for finite field arithmetic. In *2009 International Conference on Advances in Recent Technologies in Communication and Computing* (pp. 873-875). IEEE. https://doi.org/10.1109/ARTCom.2009.117

Savadi, A., & Yanamshetti, R. (2016). A survey on design of digital signal processor. In *2016 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET)* (pp. 2483-2486). IEEE.

Sengupta, D., & Sultana, M. (2012). An algorithm facilitating fast BCD division on low end processors using ancient Indian Vedic mathematics sutras. In *2012 International Conference on Communications, Devices and Intelligent Systems (CODIS)* (pp. 376-379). IEEE. https://doi.org/10.1109/CODIS.2012.6422213

Sharma, A. (2014). A comparative study of multiplication operation. *Bharatiya Shiksha Shodh Patrika, 33*(1), 28-32.

Shastri, V. V., Hankey, A., Sharma, B., & Patra, S. (2016a). Efficacy of Vedic mathematics and yogic breathing in school children: A pilot study. *International Journal of Yoga - Philosophy, Psychology and Parapsychology, 4*(1), 16-23. https://doi.org/10.4103/2347-5633.186475

Shastri, V. V., Hankey, A., Sharma, B., & Patra, S. (2016b). Investigation of yoga pranayama and Vedic mathematics on mindfulness, aggression, and emotion regulation. *International*

Journal of Yoga, 10(3), 138-144. https://doi.org/10.4103/0973-6131.213470

Shastri, V. V., Hankey, A., Sharma, B., & Patra, S. (2017). Impact of pranayama and Vedic mathematics on math anxiety and cognitive skills. *Yoga Mimamsa, 49*(2), 35-41. https://doi.org/10.4103/ym.ym_5_17

Tadas, A., & Rotake, D. (2015). 64 bit divider using Vedic mathematics. In *2015 International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM)* (pp. 317-320). IEEE. https://doi.org/10.1109/ICSTM.2015.7225423

Thapliyal, H. (2008). Vedic mathematics for faster calculation and high-speed VLSI arithmetic. Retrieved from http://www.csee.usf.edu/hthapliy/

Thapliyal, H., & Srinivas, M. B. (2005). An efficient method of elliptic curve encryption using ancient Indian Vedic mathematics. In *Proceedings of the 48th Midwest Symposium on Circuits and Systems, 2005* (pp. 826-828 Vol. 1). IEEE. https://doi.org/10.1109/MWSCAS.2005.1594233

Tirthaji, S. B. K. (1965). *Vedic mathematics*. Motilal Banarsidass.

Tiwari, H. D., Gankhuyag, G., Kim, C. M., & Cho, Y. B. (2008). Multiplier design based on ancient Vedic mathematics. In *2008 International SoC Design Conference* (Vol. 2, pp. II-65-II-68). IEEE. https://doi.org/10.1109/SOCDC.2008.4815685

Santika, A., Nisa, R. K., Nasrullah, A., Alfiyanti, F., Aminah, M., & Dwiyanti, W. (2025). Development of articulate storyline 3 learning media for mathematical computational thinking skills. *International Journal of Applied Learning and Research in Algebra*, 2(1). https://doi.org/10.56855/algebra.v2i1.1355

Sengupta, D., & Sultana, M. (2019). Radix-10 Fixed Point Division Hardware. International Journal of Recent Technology and Engineering. https://doi.org/10.35940/IJRTE.C4450.098319

Sharma, T., Khubnani, R., & Subramanyam, C. (2022). Study of mathematics through Indian Vedas: A review. In *Futuristic Research in Modeling of Dynamical Systems (FRMDS 2022)* (p. 012006). IOP Publishing. https://doi.org/10.1088/1742-6596/2332/1/012006