EFFECT OF VEDIC MATHEMATICS TO REDUCE MATHEMATICS PHOBIA

Mr. Indrajit Halder
Assistant Professor in Mathematics
Kanchrapara College
Kanchrapara, North 24 Parganas, West Bengal, India

1. Abstract:

Mathematics phobia is serious problem for some students. Due to lack of scientific and systematic approach of teaching mathematics, many students have been sufferings from the problem of mathematics phobia day after day without remedies. From different research and studies, it has already been established that Vedic mathematics has become an important instrument for faster calculation as well as it increases students' mental speed and intelligence. In spite of having ability to strengthen intuition and innovation of students, Vedic Mathematics has not yet been widely adopted in school curriculum. The focus of this paper is to study whether Vedic mathematics can remove fear from the students or not. In this paper, I carried out an experiment with the students of upper primary level and descriptive statics are used to describe overall characteristics of the outcomes of the experiment in order to check role of Vedic mathematics to build confidence among students.

2. Introduction:

Vedic mathematics is originated from Veda and there are four Vedas namely, Yajurveda, Rig-Veda, Atharva-veda and Samaveda. Atharva-veda concerns about engineering, mathematics, medicines and others subjects which are connected with today's science. Vedic mathematics provide us sixteen formulae and related thirteen sub formulae with basic ideas and rules. It is not only collection of some formulae, but also prepare human brain for faster calculation and works as a booster of self-confidence. Math phobia is common problem in many students and that cause great anxiety in them. That apart, many teachers use traditional and conventional methods to teach calculation which have been proven outdated by psychologists. National Council of Teachers of Mathematics, India suggested teachers to adopt different learning styles, create a variety of testing environments, refrain from tying self-esteem to success with maths, etc. Vedic mathematics help students to increase their ability of innovation and cultivates interest in mathematics. It is needed to follow techniques or methods which may reduce the difficulty of understanding of the basic rules available in mathematics. Introduction to Vedic mathematics is good option for students to reduce their fear of mathematics, as to why study of this paper is to measure effectiveness of Vedic mathematics in school curriculum of India. An experiment was done with 18 students who were residing in the remote village of district Nadia, West Bengal. Most of the students of this experiment were chosen from poor financial family background. There was no scope or support of new technologies for improving their studies, rather they got conventional type teaching guides from their schools. This experiment provides us with additional measures to determine the progress of students' performance after adoption of techniques of Vedic mathematics and also measure how much fear can be removed in this case. The methods, procedures, and operationalization tools used in this experiment can be expanded upon in future quantitative, qualitative, and mixed method designs to further analyse this topic.

Literature Review:

Swami Bharati Krishna Tirtha, the modern pioneer of Vedic mathematics, incorporates mathematical principles from Shulva-Sutras, Buddhist texts, Jain texts to Aryabhata, Varahamihira, Brahmagupta and modern-day Ramanujan and Shakuntala Devi in it. Hence, it is also called Indian mathematics or Hindu mathematics or even ancient mathematics, it being the oldest [2]. Indian mathematician Jagadguru Shri Bharathi Krishna Tirtha developed Vedic Mathematics and wrote a number of treatises and books on religion, science, world peace, and

social issues. After hearing various issues raised by European scholars regarding mathematics in Vedas, he succussed to reconstruct the ancient mathematical systems known as Vedic Mathematic. Vedic Mathematic is a collection of methods for solving mathematical problems fast and simply. It consists of sixteen Sutras and thirteen Sub-Sutras that may be used to solve problems in algebra, conics, arithmetic, geometry, and calculus. Vedic Mathematics is a mental mathematical methodology [1][4][11]. In 1981, some British mathematician like Kenneth Williams, Andrew Nicholas and Jeremy Pickles expressed their interest in Vedic mathematics and delivered lectures on it in different places of London by extending the book of Jagadguru Shri Bharathi Krishna Tirtha [6][7][11]. Krishna Kanta Parajuliet al. also expressed new mathematical methods that are straight forwarded, modest, and one-line solutions to mathematical problems. Basic mathematical operations like as subtraction, addition, division, and multiplication may be done quickly and verified using Vedic principles, and the results can be obtained and checked in under a minute. Their article is exclusively focused on the unique pattern of Vedic Mathematics' basic operations [1-2][11]. On page 231 of "Vedic Metaphysics" Tirthaji states that 16 sutras, which were invented by him, are in connection with astronomy and this book also show the principles and laws behind mathematics and mathematical activity as it happens in the present [12]. These days, Vedic mathematics is being taught at school level and special attention is provided to students those who want to learn more about the subject. Vedic mathematics can be learnt with very little efforts and that also with in a very short span. even now, in the twenty first century, Vedic mathematics continues to be the centre of attention and many researches are carried out in multiple areas of Vedic maths of researchers [12].

3. Methodology:

The method of theoretical analysis of this paper is based on scientific papers, journals, books etc. An experiment was done with the students of upper primary level. First a preliminary test was conducted to check basic concepts of students regarding addition, subtraction, multiplication and division and performance data was preserved for analysis. Techniques of Vedic mathematics were adopted in their first class so that students can use the methods of Vedic mathematics in addition, subtraction, multiplication and divisions and thereafter more few classes were taken on the topics LCM, HCF, Square of a number, Cube of a number etc using methods of Vedic mathematics. After achievement of the techniques of Vedic mathematics, a test was conducted with 5 questions on each of the topics viz addition, subtraction, multiplication, division, LCM, HCF, Square, Cube, Square- root etc.

4. Research Objectives:

Most people think mathematics as abstract subject. Some students feel tension and anxiety toward mathematics. Day after day, some students suffer from fear of mathematics and it amounts to phobia in mathematics. From various researches [13], we came to know that so many students may have suffered from mathematics phobia due to the result of several negative experiences and perception in the past. It can be overcome by controlling anxiety, improving mathematics skills and developing positive attitude towards mathematics. In this context, introduction of methods of Vedic mathematics may reduce fear of mathematics from the mind of students. The aim of this paper is to examine whether introduction of Vedic mathematics in the curriculum of the academic institutions of India will be effective for students or not. Goal of this paper is to examine Whether Vedic mathematics may reduce the fear of maths from students or not.

5. Sample:

Table1: Data before and after the adoption of the methods of Vedic mathematics

Student's Sl. No.	Pre-achievement test					Post-achievement test								
	Questions on					Questions on								
	Add	Sub	Mult	Div	Question attempted	Add	Sub	Mult	Div	LCM	HCF	Sqr	cube	Question attempted
1	3/5	2/5	0/5	0/5	8/20	5/5	4/5	3/5	4/5	3/5	4/5	4/5	3/5	36/40
2	2/5	1/5	0/5	1/5	5/20	4/5	5/5	3/5	3/5	4/5	3/5	4/5	3/5	32/40

3	2/5	3/5	3/5	2/5	12/20	3/5	5/5	4/5	3/5	2/5	5/5	4/5	5/5	38/40
4	4/5	4/5	1/5	2/5	14/20	4/5	5/5	4/5	4/5	3/5	4/5	3/5	2/5	33/40
5	2/5	3/5	1/5	2/5	11/20	5/5	5/5	4/5	3/5	4/5	4/5	3/5	4/5	36/40
6	5/5	2/5	1/5	2/5	15/20	5/5	4/5	5/5	3/5	5/5	5/5	4/5	4/5	37/40
7	4/5	2/5	3/5	0/5	12/20	4/5	4/5	5/5	4/5	4/5	3/5	4/5	4/5	39/40
8	3/5	1/5	0/5	0/5	9/20	4/5	5/5	4/5	4/5	5/5	3/5	3/5	2/5	36/40
9	2/5	2/5	1/5	2/5	11/20	5/5	5/5	4/5	4/5	3/5	3/5	2/5	3/5	33/40
10	3/5	2/5	0/5	1/5	8/20	4/5	5/5	5/5	4/5	3/5	3/5	3/5	4/5	32/40
11	1/5	0/5	1/5	0/5	5/20	5/5	4/5	5/5	5/5	4/5	4/5	4/5	3/5	36/40
12	2/5	3/5	0/5	1/5	9/20	4/5	3/5	4/5	3/5	4/5	5/5	4/5	4/5	36/40
13	1/5	4/5	2/5	0/5	8/20	2/5	4/5	5/5	3/5	0/5	0/5	4/5	3/5	34/40
14	2/5	1/5	2/5	1/5	7/20	3/5	3/5	2/5	4/5	1/5	1/5	2/5	2/5	32/40
15	4/5	1/5	1/5	1/5	11/20	4/5	2/5	3/5	3/5	2/5	3/5	3/5	2/5	33/40
16	1/5	2/5	2/5	1/5	9/20	4/5	5/5	4/5	3/5	3/5	3/5	4/5	2/5	34/40
17	3/5	3/5	1/5	1/5	11/20	4/5	3/5	3/5	4/5	3/5	1/5	3/5	2/5	31/40
18	2/5	2/5	3/5	3/5	13/20	4/5	4/5	5/5	2/5	3/5	3/5	4/5	5/5	37/40

** Add: Addition, Sub: Subtraction, Mult: Multiplication, Div: Division, LCM: Least Common Multiple, HCF: Highest Common Factor, Sqr: Square of a number, Cube: Cube of a number. In all columns except answer attempted, Data type 3/5 refers 3 correct answers out of 5 questions and other data refer similar meanings. In the columns of answer attempted, data type 8/20 refers 8 answers attempted out of 20 questions.

6. Analysis of the sample data:

Table 2: Percentage of data collected from experiment

Student's Sl. No.	Pre-achievement test		Post-achievement test	
	Percentage of total score (a)	Percentage of question attempted (x)	Percentage of total score (b)	Percentage of question attempted (y)
1	25	40	75	90
2	20	25	72	80
3	50	60	78	95
4	55	70	72	83
5	40	55	80	90
6	50	75	90	92
7	45	60	80	98
8	20	45	83	90
9	35	55	72	83
10	30	40	78	80

11	10	25	85	90
12	30	45	78	90
13	35	40	53	85
14	30	35	45	80
15	35	55	55	83
16	30	45	70	85
17	40	55	61	76
18	50	65	76	93

6.1 Case study-1: (Research Question#1: Is there any improvement in performance after the adoption of techniques of Vedic mathematics?)

Hypotheses:

Null Hypothesis (H_0): There is no difference between the Score at Pre-achievement Test and Score at Post-achievement Test groups with respect to the dependent variable.

Alternative Hypothesis (H_1): There is difference between the Score at Pre-achievement Test and Score at Post-achievement Test groups with respect to the dependent variable.

Table 3: Descriptive statistics (Mean and Standard Deviation)

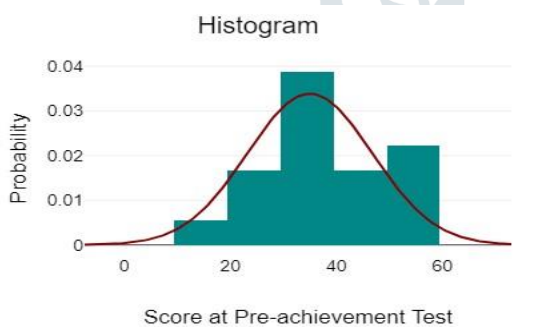|	N	Mean	Std. Deviation	Std. Error Mean
Score at Pre-achievement Test	18	35	12.13	2.86
Score at Post-achievement Test	18	72.39	11.82	2.79

Graphical representations:

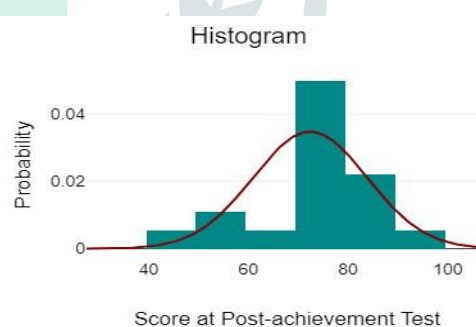**Fig-1 Normal Distribution of data collected from pre-achievement test**

Fig-2 Normal Distribution of data collected from post-achievement test

Statistical results of case study-1: A two-tailed t-test for independent samples (equal variances assumed) showed that the difference between Score at Pre-achievement Test and Score at Post-achievement Test with respect to the dependent variable was statistically significant, $t(34) = -9.37$, $p = <.001$, 95% confidence interval [-45.51, -29.27]. Thus, the null hypothesis is rejected. The results of the descriptive statistics show that the Score at Pre-achievement Test group has lower values for the dependent variable ($M = 35$, $SD = 12.13$) than the Score at Post-achievement Test group ($M = 72.39$, $SD = 11.82$). So, introduction of Vedic mathematics helps students to improve their skills. Comparing the graphical representations (Fig1 & Fig2), it is also clear that chance of better score at examinations after adoption of methods of Vedic mathematics is high than score at examination held before adoption of Vedic mathematics.

6.2   Case study-2: (Research question#2: Is there any improvement in attempt of the questions at examination after application of the methods of Vedic mathematics?)

Null Hypothesis ($\mathcal{H}_0$): There is no difference between the Percentage of attempt of the questions at Pre-achievement Test and Percentage of attempt of the questions at Post-achievement Test groups with respect to the dependent variable.

Alternative Hypothesis ($\mathcal{H}_1$): There is difference between the Percentage of attempt of the questions at Pre-achievement Test and Percentage of attempt of the questions at Post-achievement Test groups with respect to the dependent variable.

Table 4: Descriptive statistics (Mean and Standard Deviation)

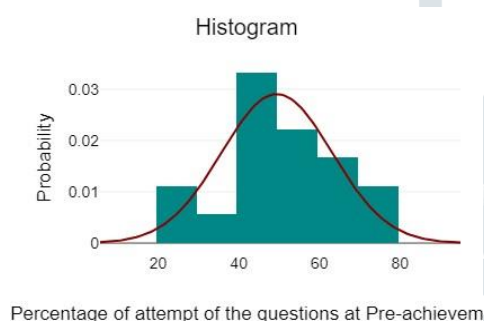|	N	Mean	Std. Deviation	Std. Error Mean
Percentage of attempt of the questions at Pre-achievement Test	18	49.44	14.13	3.33
Percentage of attempt of the questions at Post-achievement Test	18	86.83	6.01	1.42

Graphical representations:

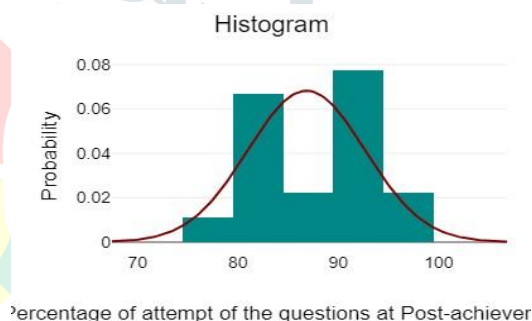**Fig-3 Normal Distribution of data collected from pre-achievement test**

Fig-4 Normal Distribution of data collected from post-achievement test

Statistical results of case study-2:

A two-tailed t-test for independent samples (equal variances not assumed) showed that the difference between Percentage of attempt of the questions at Pre-achievement Test and Percentage of attempt of the questions at Post-achievement Test with respect to the dependent variable was statistically significant, $t(22.96) = -10.33$, $p = <.001$, 95% confidence interval [-44.88, -29.9]. Thus, the null hypothesis is rejected. The results of the descriptive statistics show that the Percentage of attempt of the questions at Pre-achievement Test group has lower values for the dependent variable ($M = 49.44$, $SD = 14.13$) than the Percentage of attempt of the questions at Post-achievement Test group ($M = 86.83$, $SD = 6.01$). After introduction of Vedic mathematics, Students attempted more questions than before the introduction of Vedic mathematics. It is also established from graphical representations (Fig-3 & Fig 4) that students attempted more questions than before.

6.3   Case Study-3 (Regression Analysis)

The objective of this study is to develop a validated set of logistic linear regression models to predict Overall Performance after introduction of Vedic mathematics. The dependent variable (namely, Y) of this regression model is overall performance after introduction of Vedic mathematics. The independent variables (namely, X1, X2) of the regression model are as follows:

X1: Score at Post-achievement test

X2: Percentage of attempt of Questions at Post-achievement test

We set four predictions in respect of the dependent variable (Y). Overall performance grade of Y was taken as A, B, C and D for (X1≥ 80 & X2>90), (70 ≤X1< 80 & X2> 80), (50≤X1<70 & X2 > 70), and (X1< 50 & X2> 60) respectively. Logistic regression analysis was performed to examine the influence of Score at Post-achievement test (X1) and Percentage of attempt of Questions at Post-achievement test(X2) on variable Overall Performance after introduction of Vedic mathematics (Y) to predict the value "A".

Regression Models for Predicting Overall Performance after introduction of Vedic mathematics:

The multivariate linear regression technique was employed to develop this predictive model based on the experimental dataset. The mathematical formula of the predictive model is expressed as:

$$Y = 20.09\ X1 + 0.11\ X2 - 1597.27$$

The multiple linear regression calculator uses the least squares method to determine the regression coefficients optimally. The regression coefficients can then be used to interpret how the independent variables affect the dependent variable.

Table-5: Coefficients of regression analysis

	Coefficient B	Standard error	z	p	Odds Ratio	95% conf. interval
Score at Post-achievement test (X1)	20.09	6865.71	0	.998	5306062 73.7	0 - Infinity
Percentage of attempt of Questions at Post-achievement test(X2)	0.11	1620.9	0	1	1.12	0 - Infinity
Constant	-1597.27	551636.29	0	.998		

Statistical results of case study-3:

Calculated Value of $Chi^2(2)$ is 21.27. The coefficient of the variable score at post-achievement test (X1) is b = 20.09, which is positive. This means that an increase in score at post-achievement test (X1) is associated with an increase in the probability that the dependent variable is "A". The coefficient of the variable percentage of attempt of questions at post-achievement test(X2) is b = 0.11, which is positive. This means that an increase in percentage of attempt of questions at post-achievement test(X2) is associated with an increase in the probability that the dependent variable is "A". Logistic regression analysis shows that the model as a whole is significant $(Chi^2(2) = 21.27, p < .001, n = 18)$. Influence of the variables (score after introduction of Vedic mathematics and number of questions attempted) is found to predict overall performance of the students in mathematics.

7. Conclusions:

Undoubtedly, mathematics is most important subject in the school level curriculum. Due to lack of several reasons, students fail to grow their interest in mathematics and gradually it leads to the problem of phobia. In this paper, it has been established that after introduction of Vedic mathematics, students attempt more question than before and students perform better score. Most of the student increase the number of attempt the questions in examination which proves that students feel interest in mathematics than before and definitely the methods of Vedic mathematics help them to remove fear from their mind. To overcome the mathematics phobia, it is needed to adopt the methods of Vedic mathematics immediately in the school curriculum so that fear of mathematics may be reduced from students.

References:

[1] Solanki V., A review paper on Vedic Mathematics, IJIREM, ISSN:2350-0557, Volume-8, Issue-6, November 2021.

[2] Kumar Niranjan, An online article "Why new India needs to learn Vedic mathematics", The Daily Guardian, https://thedailyguardian.com/why-new-india-needs-to-learn-vedic-mathematics/

[3] S. Resic, Adin Lemo,Vedic Mathematics, Vedic Mathematics, Human, Volume 5, Issue 2, 2015

[4] Koch LA. Scholarly Research Journal's is licensed Based on a work,2017; (45269)

[5] Shukla AK, Shukla RP, Singh AP. A Comparative Study of Effectiveness of Teaching Mathematics through Conventional & Vedic Mathematics Approach. Educ Quest- An Int J Educ Appl Soc Sci. 2017;8(3):431.

[6] Williama , K. , Discover Vedic Mathematics Skelmersdale: Inspiration Books (1984)

[7] Prasad KK., An Empirical study on Role of Vedic Mathematics in Improving the Speed of Basic Mathematical Operations, IJMIE, ISSN: 2249-0558, Volume 6, Issue 1.

[8] Lester Meyers, High-Speed Mathematics, Van Nostrand, New York,1947

[9] Dhaval, B.(2015) Vedic Mathematics Made Easy, New Delhi: Jaico Publishing House.

[10] Parajuli kk. Basic Operations on Vedic Mathematics: A study on Special parts. Nepal J Math Sci.2020; 1:71-6

[11] Halder I, Bridge between Vedic mathematics and mathematics in digital era, JETIR, ISSN: 2349-5162, Vol-10, Issue 6, Page no. ppd552-d556, June 2023.

[12] Joshi DR, Vedic Mathematics in Modern Era, IJRSML, ISSN: 2321-2853, Vol.5, Issue:6, June 2017

[13] Kunwar R, Mathematics Phobia: Causes, Symptoms and Ways to Overcome, Ijcrt, Volume 8, Issue 8 August 2020, Issn: 2320-2882