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A STUDY ON THE EFFECTIVENESS OF THE VEDIC METHOD ON MULTIPLICATION FOR SIXTH-GRADERS

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Abstract: India, the saga of sacred land, has a high cultural heritage. The findings of Rishis in ancient India can show the path to the world. The knowledge of the Vedas and other ancient texts is an everlasting source of knowledge. Vedic Mathematics is one of such gifts of ancient India. It helps us to solve almost all mathematical problems with less time with only mental calculation. The need for paperwork is very less. In the modern competitive world, every fraction of a second is important in competitive Exams where power tests are used for mathematical and arithmetical aptitude, numerical and nonverbal reasoning. In this present study, the Vedic method of multiplication has been used as an independent variable in order to know the effect on the achievement of students in an experimental setting of 58 students of Class – VI and found that the Experimental group has performed far better than the Control group in Post-test.

Index Terms : *Vedic Mathematics, Multiplication, Teaching and Mathematics*

I. INTRODUCTION

The language in which Vedas were composed became too old in the later Vedic period. As a result, the Vedangas have emerged as an auxiliary in the field of Vedic studies. They are considered as sciences that help the people to understand and interpret the Vedas which are written centuries ago. The Vedangas were divided into six subjects such as phonetics (Śikṣā), grammar (Vyākaraṇa), etymology and linguistics (Nirukta), poetic meter (Chandas), rituals and rites of passage (Kalpa), timekeeping and astronomy (Jyotiṣa). The astronomy or Jyotiṣa Shastra is divided into three Skandas (means the big branch of a tree shooting out of the trunk) and Vedic mathematics is a part of that. It is named Vedic mathematics because the system of mathematics is discovered from ancient Vedic literature. The ancient Indian Rishis have mentioned 16 Sutras (Phrases) and thirteen sub-sutras in Sanskrit which enable us to solve all mathematical problems in easy 2 or 3 steps with less no pen and paperwork.

Though the origin of Vedic Mathematics is controversial but the discovery in the field of Calculation of numbers is very wonderful (Rani, U., 2014). The first printed book on Vedic Mathematics was published in 1965, written by Sri Bharati Krishna Tirtha Maharaja, the Shankaryacharya of the Puri. He passed away in 1960 and this book was published by his disciples posthumously and reprinted fifteen times (Rani, U., 2014). Bharti Krishna Tirtha had good knowledge of Vedas and mathematics as he was a brilliant scholar in all the subjects he studied, such as Sanskrit, Philosophy, English, Mathematics, History and Science. (Katgeri, A.V, 2017). He also admitted that sixteen sutras and thirteen sub-sutras in Sanskrit mention by him were not in parishishtas of Atharvaveda (Sthapathya-subveda) but they occur in his own parishishtas (appendix) and not any others (Shukla, K.S., 1991). Having a good knowledge of Vedas and Mathematics, Tirtha Maharaja has created the sutras and sub-sutras, so the title “Vedic mathematics" is not acceptable (Vasantha Kandasamy, W. B., 2006). The controversy of origin and manning is beyond this paper but the effect of it in teaching mathematics especially at the school level has been studied.

1.1 Review of related literature

In our Educational system, achievement tests are the keys to measure the progress of any student. Especially at the school level, power tests, are used in which the students are directed to answer the questions within a specific time limit. So time plays an important factor in any examination and if time can be saved in the calculation, it would be used to solve other problems. In the case of mathematics achievement tests, most of the students fail to solve the problem not due to ignorance but due to shortage of time and due to wrong calculation in basic mathematical operations like addition, subtraction, multiplication and division. The study of mathematics has been emphasized by many Education Commission. The education commission (1964-1966) recommended

mathematics as a compulsory subject for students at all school levels. The National Policy of Education (NPE-1986) stated "Mathematics could be considered as a medium to train a child to develop his thinking capacity, to develop his reasoning power, and to coherent logically". Mathematics is a branch of science that uses numbers and symbols and organized those using mathematical rules. It can create a moment of excitement for all students when they can solve a problem for the first time, find a solution that works best, or see hidden connections between numbers and systems. But the inappropriate process and methods of the teaching of mathematics create fear among students.

Information theory suggests that better information about a system reduces its entropy and increases the knowledge about that system (Singh. J., 1966). It was also found that Vedic mathematics algorithms lead to faster mental calculations, high-speed VLSI Arithmetic architectures can be derived from Vedic mathematics (Thapliyal, H., 2008). In the study, Vedic Mathematics and its application in computer arithmetic, it was found that the Vedic multiplication process performs better than Design Ware for cycle time (Bengali, S. 2011). From the study, on improving computational skill using Vedic Mathematics, it was found that using Vedic Mathematics, students' accuracy on calculation is high and considerably less time is taken by students than earlier (Indukuri, A., 2012). It is also found that Vedic mathematics is very effective than the traditional talk and chalk method, in relation to students' achievement in mathematics (Jiji, 2012). Extensive practice of Vedic math can definitely create interest in Mathematics among the children and helps to reduce their fairness towards the subject (Das, S, 2013). Vedic mathematics is found more effective in solving multiplication problems than traditional techniques used in schools (Sharma, 2014).

A considerable number of studies have been conducted on Vedic Mathematics and many pieces of literature also available on this topic but still, this method is not used as an alternate method of calculation in the schools of Odisha. So there is a need to explore this method furthermore especially at the elementary level, the present study is in hand.

1.2 **Objectives of the study** :-

The following are the objectives of the study

(a) To compare the Mean scores of the Control group and Experimental groups of the 6th grader after Pre-test.

(b) To compare the Mean scores of the Control group and Experimental groups of the 6th grader after Post-test.

(c) To compare the Mean scores of the Experimental group and Control group after the Post-test of 6th graders on the basis of gender.

(d) To compare the Mean scores of the Pre-test and Post-test of the Experimental group of the 6th grader.

(e) To compare the Mean scores of the Pre-test and Post-test of the Control group of the 6th grader.

1.3 **Hypotheses of the study** :-

The following Null hypotheses are formed for the present study -

(a) H_0 : There is no significant difference between Mean scores on the Multiplication Test of the Control group and the Experimental group of the 6th grader after the Pre-test.

(b) H_0 : There is no significant difference between Mean scores on the Multiplication Test of the Control group and Experimental groups of the 6th grader after the Post-test.

(c) H_0 : There is no significant difference between the Mean scores on the Multiplication Test of the Experimental group after the Post-test on the basis of gender.

(d) H_0 : There is no significant difference between the Mean scores on Multiplication Test of the Control group of 6th graders after the Post-test on the basis of gender.

(e) H_0 : There is no significant difference between the Mean scores of the Pre-test and Post-test of the Multiplication Test on the Experimental group.

(f) H_0 : There is no significant difference between the Mean scores of the Pre-test and Post-test of the Multiplication Test on the Control group.

1.4 **Delimitations of the study** :-

A Delimitation is some aspects or circumstance of the study that the researcher cannot control but beliefs may negatively affect the results of the study.

(a) The present study was delimited to 58 students of class – VI reading in the four selected schools of Raruan Block of Mayurbhanj district of Odisha only.
(b) The present study was carried on the basis of the achievement scores on the Multiplication Test of sampled 58 students of class VI.
(c) The present study is also delimited to multiplication up to three-digit numbers using conventional and Vedic method of multiplication.

II. DESIGNING OF THE STUDY

2.1 Population

The population for the present study is all the 6th graders (Class – VI) of Govt. primary school of Mayurbhanj district of Odisha.

2.2 Sample & Sampling

For the present study, 58 students (both Boys and girls) were randomly selected from the four Upper Primary schools of Raruan Block of Mayurbhanj district. The schools were selected using the purposive sampling (as the headmasters were very cooperative) method. Further, the students of each school were randomly (by blindfold method) assigned as the Control group and Experimental group. By this 28 students were selected as Control Group and 30 students were selected as Experimental group. The details of the sampling are given in table No. – 1.

Table No: 1 Sampling distribution of Experimental and Control group

Experimental			Control			Total
Boys	Girls	Total	Boys	Girls	Total	
19	11	30	15	13	28	58

2.3 Experimental design of the study :-

The design of any research is the most important part which leads all research to great success. As the present piece of research work falls under Experimental Research, True Experimental Design or Between Subjects Design has been followed. More specifically, Randomized Pre-test Post-test equivalent Group design was selected to know the exact effect of the Independent Variable, the Vedic Method of Multiplication. Though this design has some limitations like subject sensitization, the difference in cultural background, carryover effects and situational variable but most of the extraneous variables like history, maturation, differential selection of subjects, sensitization of pre-testing was controlled by randomization.

2.4 Procedure of the study

At the beginning of the study, after the selection of the sample (the students of Class - VI), they were randomly assigned to the Control group and Experimental group. Then a self-made Multiplication Test was administered as a Pre-test on both the groups (of students) in order to measure their pre-experimental achievement scores, the previous knowledge on multiplication. The experimental groups of different schools were given the treatment of independent variable i.e. they were taught multiplication through the Vedic method whereas the control groups of different schools were kept control i.e. they were taught by the regular conventional method of multiplication. As four different schools were selected, the Vedic method of Multiplication was taught to different groups in different school periods and this had been continued only for twenty schooling days. After the treatment was over, a self-made multiplication test as a Post-test was administered on both Control and Experimental group and scores were collected.

2.5 Research tools

For the present study, two self-made achievement tests on multiplication (Multiplication Test) have been used, one for Pre-test and the other for Post-test. There were 20 items in each, having the same difficulty level and almost in the same pattern. The content validity was found satisfactory by a group of experts consisting of teacher educators and mathematics primary school teachers. Only test-retest reliability was established and was found 0.71. The scoring keys of both the multiplication tests were simple, one mark for each correct response and zero mark for an incorrect response. The sum of the score of the total 20 items was considered as the final marks. As a power test, Twenty minutes is allowed for the students to complete the Pre-test and twenty minutes for Post-test. The scoring key for the Pre-test and Post-test is ranged from 0 to 20.

2.6 Variables of the present study

Generally variable refers to something liable to vary or change on account of something. A variable is a concept or construct possessing certain attributes liable to vary in terms of their quantitative or qualitative value from situation to situation (Mangal, S. K., 2013). Like any experimental research, the present study has the following variables

(a) **Independent variable:** Independent variable of experimental research is known for its independent existence and able to create consequential changes in the dependent variable. For the present study, the Vedic method of multiplication was used as the independent variable.

(b) **Dependent variable:** Dependent variable of experimental research is known for its dependable existence on the independent variable. It is the circumstance or characteristics that change, appear or disappear with the effect of the Independent variable.

It is the changes that result due to the independent variable. For the present study, the achievement of Sixth-graders in mathematics on multiplication in a specific time limit was used as the dependent variable.

(c) **Uncontrolled Variables:** Uncontrolled variables are those variables in experimental research which are beyond the control of the researchers. For the present study, socioeconomic status, self-concept, attitude, interest were uncontrolled variables.

(d) **Controlled Variable:** Controlled variables are those variables in experimental research that are within the control of the researchers. For the present study, classroom conditions, timing and average ages were uncontrolled variables.

III. ANALYSIS AND INTERPRETATION OF DATA

Analysis of data plays the most important role in any research work which provides a link between the data (whether qualitative or quantitative) the researcher has and the information or interpretation he can derive from his research data collected from different sources. In order to know the effectiveness of the Vedic method of multiplication over the traditional method, above mentioned null hypotheses would be tested for a two-tailed test using t-test for small sample by the formula $t = \frac{M_1 - M_2}{\sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}}$

3.1 Testing of Null hypothesis - No. 1

In order to test the null hypothesis No. 1 'There is no significant difference between Mean scores on Multiplication Test of the Control group and Experimental group of the 6th grader after Pre-test', t-test for small sample is used with the above-mentioned formula. The necessary values for calculation and t-value of the control group and experimental group are given in Table No. :2

Table No: 2 Necessary values for calculation and t-value of the control group and experimental group on Pre-test.

Name of the Group	N	Mean	S.D. (σ)	t-value (Calculated)	t-value (Table value)	*df*	Status of Null-hypothesis
Experimental Group	30	8.00	3.12	0.565	2.00 @0.05 level 2.66 @0.01 level	56	Failed to reject
Control Group	28	8.43	2.58				

From the above table, it was found that the calculated t-value 0.57 (or 0.565) is less than the table value at both 0.05 and 0.01 with *df* 56 ($N_1 + N_2 - 2$). So the null hypothesis could not be rejected at both levels of significance. This indicates that the difference between the Mean of the control and experimental groups is not statistically significant. So both the groups had performed similarly in respect of pre-test on multiplication knowledge.

3.2 Testing of Null hypothesis - No. 2

In order to test the null hypothesis No. 2, 'There is no significant difference between Mean scores on Multiplication Test of the Control group and Experimental groups of the 6th grader after Post-test', t-test for small sample is used with the same formula used for testing the null hypothesis - 1. The necessary values for calculation and t-value of the control group and experimental group are given in Table No. 3.

Table No: 3 Necessary values for calculation and t-value of the control group and experimental group on Post-test.

Name of the Group	N	Mean	S.D. (σ)	t-value (Calculated)	t-value (Table value)	*df*	Status of Null-hypothesis
Experimental Group	30	17.83	1.90	16.02	2.00 @0.05 level 2.66 @0.01 level	56	Rejected
Control Group	28	10.46	1.64				

From the above table, it was found that the calculated t-value (16.02) is higher than the table value at both 0.05 and 0.01 level of significance with *df* 56. So the null hypothesis is rejected at both levels of significance. This indicates that the difference between the Mean of the control and experimental groups is statistically significant at 0.05 and 0.01 levels of significance. The research hypothesis, there is a significant difference between the mean score of the experimental group and the control group on the Post-test may be accepted. So Experimental group having more mean value has performed better in the post-test. As other variables are constant for both the group, the change in the dependent variable (achievement in multiplication) is the result of the independent variable (Vedic method of multiplication). Thus it can be concluded that the Vedic method of multiplication is effective over the conventional method in terms of students' achievement in the Post-test.

3.3 Testing of Null hypothesis - No. 3

In order to test the null hypothesis No. 3 'There is no significant difference between the Mean scores on the Multiplication Test of the Experimental group after the Post-test on the basis of gender, the same formula has been used to calculate t-value. The necessary values for calculation and t-value of boys and girls of the experimental group on Post-test are given in Table No. :4

Table No. :4 Necessary values for calculation and t-value of boys and girls of the experimental group on Post-test

Experimental Group	N	Mean	S.D. (σ)	t-value (Calculated)	t-value (Table value)	*df*	Status of Null-hypothesis
Boys	19	17.63	1.89	0.77	2.05 @0.05 level 2.76 @0.01 level	28	Failed to reject
girls	11	18.18	1.85				

From the above table, it was found that the calculated t-value (0.77) is higher than the table value at both 0.05 and 0.01 level of significance with *df* 28 ($N_1 + N_2 -2$). So the null hypothesis could not be rejected at both levels of significance. This indicates that the difference between the Mean of the boys and girls of the Experimental groups is not statistically significant. It may be concluded that gender could not play any role in the Post-test of sixth graders on the Vedic method of multiplication.

3.4 Testing of Null hypothesis - No. 4

In order to test the null hypothesis No. 4 'There is no significant difference between the Mean scores on the Multiplication Test of the Control group of 6^{th} graders after Post-test on the basis of gender, the same formula has been used to calculate t-value. The necessary values for calculation and t-value of boys and girls of the control group on Post-test are given in Table No:5.

Table No :5 Necessary values for calculation and t-value of boys and girls of the control group on Post-test

Control Group	N	Mean	S.D.	t-value (Calculated)	t-value (Table value)	*df*	Status of Null-hypothesis
Boys	15	10.93	1.12	1.65	2.06 @0.05 level 2.78 @0.01 level	26	Failed to reject
Girls	13	9.92	1.94				

From the above table, it was found that the calculated t-value 1.65 is less than the table value at both 0.05 and 0.01 level of significance with *df* 26 ($N_1 + N_2 -2$). So the null hypothesis could not be rejected at both levels. This indicates that the difference between the Mean of the boys and girls of the Control group is not statistically significant. As the difference of means of boys and girls are not significant it may be concluded that gender could not play any role in the Control group on the Post-test of sixth graders on the Vedic method of multiplication.

3.5 Testing of Null hypothesis - No. 5

In order to test the null hypothesis No. 5 'There is no significant difference between the Mean scores of the Pre-test and Post-test on the Multiplication Test of the Experimental group, the same formula has been used to calculate t-value. The necessary values for calculation and t-value of pre-test and post-test of the Experimental group are given in Table No : 6.

Table No :6 Necessary values for calculation and t-value of pre-test and post-test of Experimental group.

Experimental Group	N	Mean	S.D.	t-value (Calculated)	t-value (Table value)	*df*	Status of Null-hypothesis
Pre-test	30	8.00	3.12	14.89	2.00 @0.05 level 2.66 @0.01 level	58	Rejected
Post-test	30	17.83	1.90				

From the above table, it was found that the calculated t-value (14.98) is higher than the table value at both 0.05 and 0.01 level of significance with *df* 58. So the null hypothesis is rejected at both levels. This indicates that the difference between the Mean of the Pre-test and Post-test of the experimental group is statistically significant. As the difference of mean is significant it may be concluded that students of the experimental group have performed better in post-test due to the implementation of independent variable, Vedic method of multiplication. This also indicates that the Vedic method of multiplication helped the experimental group to minimize their mistakes and get a better result.

3.6 Testing of Null hypothesis - No. 6

In order to test the null hypothesis No. 6 'There is no significant difference between the Mean scores of Pre-test and Post-test on Multiplication Test of the Control group', the same formula has been used to calculate t-value. The necessary values for calculation and t-value of pre-test and post-test of Control Group are given in Table No :7

Table No. : 7 Necessary values for calculation and t-value of pre-test and post-test of Control Group

Control Group	N	Mean	S.D.	t-value (Calculated)	t-value (Table value)	*df*	Status of Null-hypothesis
Pre-test	28	8.43	2.58	3.62	2.00 @0.05 level 2.66 @0.01 level	54	Rejected
Post-test	28	10.46	1.64				

From the above table, it was found that the calculated t-value (3.62) is higher than the table value at both 0.05 and 0.01 levels of significance with *df* 58. So the null hypothesis is rejected at both levels. This indicates that the difference between the Mean of the Pre-test and post-test of the Control group is statistically significant. As the difference of mean is significant it may be concluded that students of the experimental group have performed better. But the mean score is very less in comparison to the mean score of the experimental group. It may be concluded that by the use of the traditional method of multiplication students failed to minimize the common mistakes which can be avoided by the Vedic method of multiplication as shown in the case of the Experimental group.

IV. MAJOR FINDING OF THE STUDY

The following are the major findings of the study –

- The Mean scores of the Experimental and the Control were not significantly differ on the Pre-test on multiplication knowledge. So both the groups may be treated as equal on previous knowledge on multiplication.
- Vedic method of multiplication is effective over the conventional method in terms of students' achievement in the Post-test as shown on the Multiplication Test.
- Gender could not play any role in the Post-test of sixth graders on the Vedic method of multiplication. Boys and girls of Experimental had scored high in Post-test and the difference between the two means is not significant.
- This also indicates that the Vedic method of multiplication helped the experimental group to minimize their mistakes and get a better result.
- There was a significant positive modification in the result of students with Vedic method of multiplication on post-test.

4.1 Result Discussion

From the study, it was found that the Vedic method of multiplication is effective over the conventional method, in relation to the achievement of the students in mathematics. This finding is collaborated with the findings of many studies like on multiplication operation (Sharma, 2014); on multiplication (Ismail and Sivasubramniam, 2010); on square and square-root (Jiji, 2012), and on the effectiveness of the Vedic method in teaching mathematics (Shukla and Singh, 2014)

4.2 Conclusion

With Vedic mathematics, mathematics can be learned and mastered quickly and easily, and it can be transformed into a fun and enjoyable subject. Vedic method of calculation enables faster calculations and students can solve more problems in less time. It also enables students to understand the numbers and their operations and relationships in an interesting manner and can be remembered for a long time. It also helps in many modern competitive exams where power tests, logical reasoning, mathematical aptitude tests are used.

It can be concluded that the teachers should encourage the students to learn Vedic Mathematics. In the school curriculum, Vedic mathematics should be included especially at the elementary level as a supplementary subject to mathematics and some period should be allotted for practice the tricks. As a result, students will actively engage in problem-solving. The artistic abilities and talents of the students can also be developed by Vedic mathematics. It can undoubtedly create interest in mathematics among the students who have generally feared mathematics.

REFERENCES

[1.] *B.K.Tirthaji (1965). VEDIC MATHEMATICS OR Sixteen Simple Mathematical Formulae from the Vedas. Indologlcal Publishers & Booksellers, Delhi.*

[2.] Bawa, S.K., 2018. Developing Multiplication Skills using Vedic Aphorisms Embedded with Multimedia.

[3.] Bengali, S. (2011). Research on Vedic Mathematics and its application in Computer Arithmetic. Retrieved on 15 April 2013 from http://repository.lib.ncsu.edu/ir/bitstream/1840.16/7232/1/etd.pdf

[4.] Das, S. (n.d.).The History & Future of Vedic Maths. Retrieved on 12 June, 2013 from http://hinduism.about.com/od/vedicmaths/a/vedicmath_history_future.htm

[5.] Indukuri, A. (2012). Research on improving computational skill using vedic mathematic. Retrieved on 17 May 2013 from http://www.magicalmethods.com/FREE/EOVM_R_Apik.pdf.

[6.] Jiji, S., (2012) *A Study of Effectiveness of Teaching Vedic Mathematics on Students' Achievement.* Doctoral thesis, SJJT University, Jhunjhunu (Rajasthan). Retrieved March 23, 2015, from http://shodhganga.inflibnet.ac.in/handle/10603/21247.

[7.] Kaur, P., "Effect of Vedic Mathematics on Achievement in Relation to Intelligence". Retrieve from http://ccemohali.org/img/Ch%206%20Dr%20Parwinderjit.pdf

[8.] Kothari, D.S. (1966) *Report of the education commission 1964-1966 (Education and National Development)*. Delhi: Ministry of Education, GoI. Retrieved January 12, 2017 from https:// archive.org/details/Report ofTheEducationCommissi on1964-66D.S.KothariReport

[9.] Koul, L. (2009), Methodology of Educational Research, (4th Ed.) Vikash Publishing House Pvt. Ltd., New Delhi.

[10.] M.H.R.D. 1986. *National Policy on Education 1986*. Delhi.

[11.] Mangal, S.K. and Mangal, S. (2013) "Research Methodology in Behavioural Science" PHI Learning Pvt. Ltd, Delhi

[12.] Rani, U., (2014) Vedic Mathematics – A controversial origin but a wonderful discovery, Indian Journal of Applied Research, **Volume : 4, Issue : 1, Page No. 242-243**

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

[14.] Shukla, K.S., (1989) Vedic mathematics - The illusive title of Swamiji's book, Mathematical Education, Vol 5: No. 3, January-March.

[15.] Singh, J. (1966). *Great ideas in information theory, language, and cybernetics.* New York: Dover Publications.

[16.] Thapliyal, H. (2008). Vedic mathematics for faster calculation and high speed VLSI Airthmetic. Retrieved on 12 June, 2013 from http://www.csee.usf.edu/hthapliy/,Email:hthapliy@cse.usf.edu

[17.] Vasantha Kandasamy, W.B. and Smarandache, F., (2006) Vedic Mathematics:' Vedic 'or' Mathematics' -- A Fuzzy and Neutrosophic Analysis. *arXiv Mathematics e-prints*, pp.math-0611347.