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Child-Centric Action Research on the Effectiveness of Vedic Mathematics Learning Package for 8th Standard Students

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Abstract: ***Mathematics is one of the most important subjects in school education because it develops logical thinking, analytical ability, and problem-solving skills among students. However, many students experience difficulty in performing calculations and understanding mathematical concepts through traditional teaching methods. Innovative teaching strategies are therefore required to make mathematics learning more effective and engaging. The present study aimed to examine the effectiveness of a Vedic Mathematics learning package in improving the mathematical achievement of 8th standard students. A child-centric action research approach was adopted using a quasi-experimental design with experimental and control groups. The sample consisted of 52 students of 8th standard from Shree Ved International School, Gandhinagar, divided equally into an experimental group (26 students) and a control group (26 students). The experimental group was taught using a learning package based on Vedic Mathematics techniques for 30 days, while the control group received instruction through traditional teaching methods. An achievement test was administered as a post-test to measure computational ability, numerical ability, and problem-solving ability. The collected data were analysed using mean, standard deviation, and t-test. The results revealed that students in the experimental group demonstrated improved computational speed and significantly higher scores in numerical ability and problem-solving ability compared to the control group. The findings indicate that the Vedic Mathematics learning package is an effective instructional strategy for improving students' mathematical achievement. The study suggests that incorporating Vedic Mathematics techniques into classroom teaching can enhance students' interest and performance in mathematics.***

Keywords: Vedic Mathematics, action research, mathematical achievement, computational ability, numerical ability, problem-solving ability.

I. INTRODUCTION

Mathematics plays a vital role in school education and everyday life. It is considered a fundamental subject that develops logical reasoning, analytical thinking, and problem-solving skills among learners. In modern education systems, mathematical knowledge is essential for understanding scientific concepts and technological advancements. Despite its importance, many students find mathematics difficult and develop anxiety toward the subject.

One of the major reasons for students' difficulties in mathematics is the traditional method of teaching, which often emphasizes lengthy procedures and memorization rather than conceptual understanding. As a result, students may lose interest in the subject and struggle to perform mathematical calculations effectively. Therefore, educators have increasingly emphasized the need for innovative and learner-centered teaching methods that can make mathematics learning more engaging and meaningful.

One such innovative approach is Vedic Mathematics, which is based on ancient Indian mathematical principles. Vedic Mathematics provides simple and efficient techniques for solving mathematical problems. These techniques are derived from a collection of sixteen sutras and thirteen sub-sutras, which offer shortcuts and mental strategies for performing calculations quickly and accurately.

The use of Vedic Mathematics techniques can help students develop mental calculation skills, computational speed, and confidence in mathematics. By simplifying complex calculations, these techniques make mathematics more interesting and accessible for learners. In recent years, educators have shown increasing interest in incorporating Vedic Mathematics into classroom teaching. However, systematic research studies examining the effectiveness of Vedic Mathematics learning packages at the school level are limited.

The present study attempts to address this gap by developing a child-centric learning package based on Vedic Mathematics techniques and examining its effectiveness in improving the mathematical achievement of 8th standard students.

II. NEED AND SIGNIFICANCE OF THE STUDY

Many students experience difficulties in mathematics due to the complexity of calculations and lack of effective learning strategies. Traditional teaching methods often fail to address students' individual learning needs and may not encourage active participation.
Vedic Mathematics provides an alternative approach that simplifies calculations and promotes mental mathematics. The use of such techniques can improve students' computational speed and enhance their confidence in solving mathematical problems.
The present study is significant as it introduces a structured learning package based on Vedic Mathematics for 8th standard students. The study examines the effectiveness of this learning package in improving students' mathematical achievement, particularly in computational ability, numerical ability, and problem-solving skills. Furthermore, it promotes child-centric and activity-based teaching approaches, which help make mathematics learning more engaging, meaningful, and effective for students in the classroom. The findings of this study may help teachers adopt innovative teaching strategies that enhance students' interest and performance in mathematics.

III. OBJECTIVES OF THE STUDY

The study was conducted with the following objectives:

1) To prepare a learning package on Vedic Mathematics for 8th standard students.
2) To compare the mean scores on the achievement of mathematics of two groups of students to be taught through Vedic mathematics and Traditional methods of teaching.
3) To examine the effectiveness of the learning package in improving computational ability.
4) To examine the effectiveness of the learning package in improving numerical ability.
5) To determine the effectiveness of the learning package in improving problem-solving ability.

IV. HYPOTHESES OF THE STUDY

The following hypotheses were formulated for the study:

1) H_{01}: There is no significant difference in the mean scores of experimental & control groups.
2) H_{02}: There is no significant difference in the time taken to complete the computational ability test between the students of the experimental group and the control group.
3) H_{03}: There is no significant difference in computational ability scores between students taught through the Vedic Mathematics learning package and those taught through traditional methods.
4) H_{04}: There is no significant difference in numerical ability scores between students in the experimental and control groups.
5) H_{05}: There is no significant difference in problem-solving ability scores between students in the experimental and control groups.

V. RESEARCH METHODOLOGY

A. *Research Design*

The study employed a quasi-experimental research design with two groups:
• Experimental group
• Control group
The experimental group was taught using the Vedic Mathematics learning package, while the control group was taught using the traditional teaching method.

B. *Population*

The population of the study consisted of all 8th standard students studying in secondary schools of Gandhinagar city.

C. *Sample*

The sample consisted of 52 students of 8th standard from Shree Ved International School, Gandhinagar.
The students were divided into:
Experimental group – 26 students
Control group – 26 students
The groups were equalized using the 7th standard mathematics marks of the students.

D. Tools Used

The following tools were used in the study:

1) Learning Package on Vedic Mathematics
2) Achievement Test in Mathematics

The achievement test consisted of 60 items covering various mathematical topics.

VI. PROCEDURE OF THE STUDY

The study was conducted in the following stages:

1) Permission was obtained from the school authorities.
2) Students were selected and divided into experimental and control groups.
3) The groups were equalized using the 7^{th} standard mathematics marks.
4) The experimental group was taught through the Vedic Mathematics learning package for 30 days.
5) The control group was taught through traditional teaching methods.
6) After the completion of the instructional period, a post-test was administered to both groups.
7) The scores obtained by students were analysed using statistical techniques.

VII. DATA ANALYSIS

The collected data were analysed using appropriate statistical techniques to interpret the results effectively. The mean was calculated to determine the average performance of students, while the standard deviation was used to measure the variability of scores. The t-test was applied to determine the significance of differences between the experimental and control groups.

A. Objective 2

To compare the mean scores on the achievement of mathematics of two groups of students to be taught through Vedic mathematics and Traditional methods of teaching.

Hypothesis 1

H_{01}: There is no significant difference in the mean scores of experimental & control groups.

Table 4.1
Comparison of Post-Test Scores of Experimental and Control Groups

Group	N	Mean	Standard Deviation	t-value
Experimental Group	26	41.54	10.78	2.29
Control Group	26	32.27	17.57	

*Table Value at 0.05 is 1.96

Interpretation

Table 4.1 shows the comparison of post-test scores of the experimental and control groups. The experimental group obtained a higher mean score (41.54) than the control group (32.27). The calculated t-value (2.29) is greater than the table value (1.96) at the 0.05 level of significance. Therefore, the difference is significant and the Vedic Mathematics learning package positively improved students' mathematical achievement.

B. Objective 3

To examine the effectiveness of the learning package in improving computational ability.

H_{02}: There is no significant difference in the time taken to complete the computational ability test between the students of the experimental group and the control group.

Table 4.2
Comparison of Time Taken in Computational Ability Test

Group	N	Mean	Standard Deviation	t-value
Experimental Group	26	10.69	3.01	3.03
Control Group	26	13.04	2.57	

*Table Value at 0.05 is 1.96

Interpretation
Table 4.2 compares the time taken by the experimental and control groups to complete the computational ability test. The experimental group took less time (Mean = 10.69) than the control group (Mean = 13.04). The calculated t-value (3.03) is greater than the table value (1.96) at the 0.05 level, indicating that Vedic Mathematics significantly improved students' computational speed.

H_{03}: There is no significant difference in computational ability scores between students taught through the Vedic Mathematics learning package and those taught through traditional methods.

Table 4.3
Comparison of Computational Ability Scores

Group	**N**	**Mean**	**Standard Deviation**	**t-value**
Experimental Group	26	12.04	5.23	1.22
Control Group	26	9.96	6.90	

*Table Value at 0.05 is 1.96

Interpretation
Table 4.3 shows the comparison of computational ability scores of the experimental and control groups. The experimental group obtained a higher mean score (12.04) than the control group (9.96). However, the calculated t-value (1.22) is less than the table value (1.96) at the 0.05 level. Therefore, the difference is not statistically significant, though the experimental group performed slightly better.

C. Objective 4
To examine the effectiveness of the learning package in improving numerical ability.
H_{04}: There is no significant difference in numerical ability scores between students in the experimental and control groups.

Table 4.4
Comparison of Numerical Ability Scores

Group	N	Mean	Standard Deviation	t-value
Experimental Group	26	16.69	3.04	2.85
Control Group	26	12.85	6.17	

*Table Value at 0.05 is 1.96

Interpretation
Table 4.4 shows the comparison of numerical ability scores of the experimental and control groups. The experimental group obtained a higher mean score (16.69) than the control group (12.85). The calculated t-value (2.85) is greater than the table value (1.96) at the 0.05 level. Therefore, the difference is statistically significant, indicating that the Vedic Mathematics learning package improved students' numerical ability.

D. Objective 5

To determine the effectiveness of the learning package in improving problem-solving ability.

H_{05}: There is no significant difference in problem-solving ability scores between students in the experimental and control groups.

Table No. 4.5
Comparison of Problem-Solving Ability Scores

Group	N	Mean	Standard Deviation	t-value
Experimental Group	26	12.81	3.81	2.60
Control Group	26	9.46	5.35	

*Table Value at 0.05 is 1.96

Interpretation

Table 4.5 compares the problem-solving ability scores of the experimental and control groups. The experimental group obtained a higher mean score (12.81) than the control group (9.46). The calculated t-value (2.60) is greater than the table value (1.96) at the 0.05 level of significance. Hence, the difference is statistically significant, indicating that the Vedic Mathematics learning package improved students' problem-solving ability.

VIII. MAJOR FINDINGS OF THE STUDY

The major findings of the study are as follows:

1) Students taught through the Vedic Mathematics learning package performed better than students taught through traditional methods.
2) The experimental group completed computational tasks in less time compared to the control group.
3) The experimental group demonstrated significantly higher numerical ability than the control group.
4) Students in the experimental group also showed better problem-solving ability.
5) The results indicate that the Vedic Mathematics learning package improved students' mathematical achievement.

IX. DISCUSSION

The findings of the study clearly indicate that the Vedic Mathematics learning package contributed positively to students' mathematical achievement. The use of simplified computational techniques helped students perform calculations more quickly and accurately.

The improvement in numerical ability and problem-solving ability suggests that the learning package helped students develop a better understanding of mathematical concepts.

These findings support previous research studies which indicate that alternative computational methods can enhance students' mathematical performance and confidence.

The results therefore highlight the potential of Vedic Mathematics as an effective supplementary teaching strategy in school mathematics.

X. EDUCATIONAL IMPLICATIONS

The findings of the study have important implications for mathematics education.

1) Educational authorities may consider introducing Vedic Mathematics techniques into school curricula.
2) Teachers can use these techniques to make mathematics learning more interesting and effective.
3) Students can benefit from improved computational speed, better numerical ability, and increased confidence in mathematics.

XI. CONCLUSION

The present study examined the effectiveness of a Vedic Mathematics learning package for 8th standard students. The results showed that students taught through the learning package demonstrated improved computational speed and significantly higher numerical and problem-solving abilities. The findings suggest that incorporating Vedic Mathematics techniques into classroom teaching can enhance students' mathematical learning. Therefore, Vedic Mathematics can serve as an effective instructional strategy for improving mathematical achievement at the school level.

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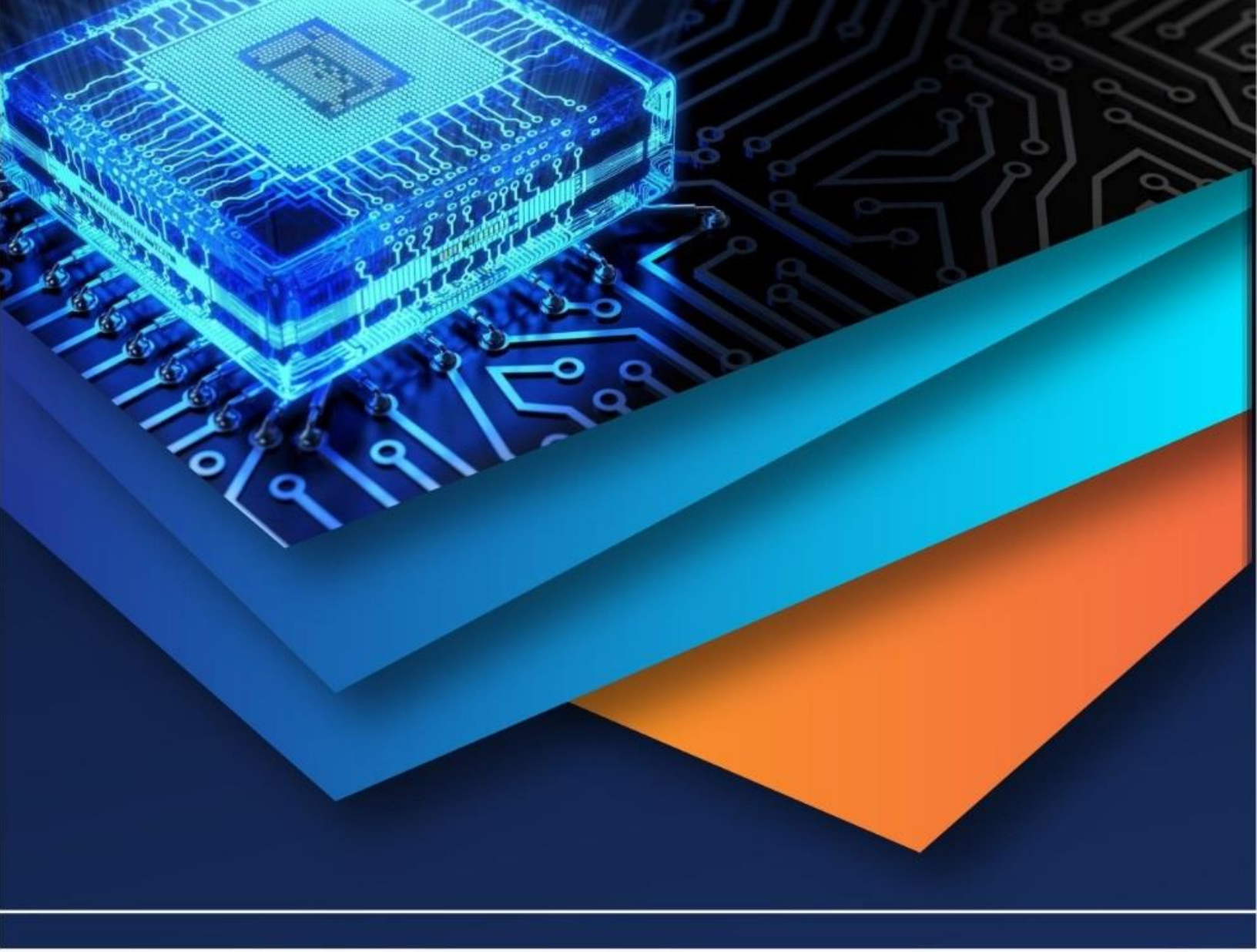

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