

Title: Effectiveness of Vedic Mathematics on Computational Skills of High School Students: An Experimental Study under Indian Knowledge Systems (IKS)

Main Theme: IKS

Sub theme: Vedic Mathematics

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Abstract

Vedic Mathematics, rooted in ancient Indian Vedic texts, offers a system of mental calculation techniques that enhance speed, accuracy, and logical reasoning. Framed under the **Indian Knowledge Systems (IKS)**, it provides a holistic approach to mathematics education by integrating cognitive development with cultural heritage. This **experimental study** investigates the effectiveness of Vedic Mathematics training on the computational skills of high school students of Kalani School 9th standard students from different divisions. A **pre-test and post-test control group design** was employed with 100 students randomly divided into two groups: an experimental group trained in Vedic Mathematics and a control group using conventional methods. Quantitative data were collected using structured arithmetic, algebra, and geometry worksheets. **Descriptive statistics** including mean, median, mode, standard deviation, skewness, and kurtosis were calculated to analyse performance distribution, while an **effectiveness test** (gain scores) quantified improvements. **Inferential statistics**, specifically independent samples t-tests, were applied to determine the significance of differences between groups. Results revealed that the experimental group demonstrated a substantially higher gain in computational performance, with post-test scores significantly exceeding those of the control group ($p < 0.001$). Descriptive measures confirmed the normality of data distribution, validating statistical inferences. Students also reported increased confidence, engagement, and interest in mathematics. The study concludes that Vedic Mathematics is an **effective pedagogical tool** for enhancing computational skills, logical reasoning, and cognitive development, while simultaneously promoting the principles of IKS. Recommendations include systematic teacher training and curricular integration to maximize its educational benefits.

Keywords: Vedic Mathematics, Indian Knowledge Systems, Experimental Study, Computational Skills, Descriptive Statistics, Inferential Statistics, Effectiveness

1. Introduction

Mathematics is critical for logical reasoning and problem-solving. **Vedic Mathematics**, systematized by Bharati Krishna Tirthaji, provides 16 sutras and 13 sub-sutras offering fast and efficient methods for mental calculation. Unlike conventional methods, it emphasizes **pattern recognition, logical reasoning, and mental computation**.

Vedic Mathematics is an essential component of **Indian Knowledge Systems (IKS)**, promoting holistic development and preserving cultural heritage. This study investigates the **effectiveness of Vedic Mathematics training** of Kalani Higher Secondary Computational School Students skills through an experimental research design.

2. Objectives

1. To examine the effect of Vedic Mathematics on students' computational speed and accuracy among Kalani College Secondary school students.
2. To compare performance between students trained in Vedic Mathematics and those using conventional methods.
3. To conduct an **effectiveness test** to quantify improvement.
4. To assess descriptive statistics of performance, including mean, median, mode, standard deviation, skewness, and kurtosis.

3. Hypotheses

1. **H₀**: There is no significant difference in computational performance between students trained in Vedic Mathematics and those using conventional methods.
2. **H₁**: Students trained in Vedic Mathematics demonstrate significantly higher computational performance than those using conventional methods.

4. Scope of the Study

1. The study focuses on evaluating the effectiveness of Vedic Mathematics training on the computational skills of 9th standard students of Kalani School.
2. It includes selected topics from arithmetic, algebra, and geometry as prescribed in the secondary school curriculum.
3. The research is confined to 100 students divided into experimental and control groups using a pre-test and post-test control group design.
4. The study measures improvement through quantitative tools such as structured worksheets and statistical analysis including descriptive and inferential statistics.
5. It examines computational speed, accuracy, and logical reasoning as measurable outcomes of Vedic Mathematics training.
6. The research aligns with the framework of Indian Knowledge Systems (IKS), highlighting the integration of traditional knowledge with modern pedagogy.
7. The findings may serve as a reference for secondary school mathematics educators considering innovative teaching methods.

5. Limitations of the Study

1. The study is limited to one school (Kalani School) and one grade level (9th standard), which may restrict generalization of findings.
2. The sample size of 100 students, though adequate, may not represent broader demographic variations.
3. The duration of Vedic Mathematics training was limited and may not reflect long-term effects.
4. The study focused primarily on computational skills and did not extensively measure higher-order problem-solving abilities.
5. Students' prior mathematical aptitude and external coaching exposure were not fully controlled.
6. The research relied mainly on quantitative measures; qualitative insights were limited to student feedback.

6. Significance of the Study

1. The study contributes to the growing body of research supporting the integration of **Vedic Mathematics** within modern educational systems.
2. It provides empirical evidence supporting the effectiveness of Vedic Mathematics in improving computational speed and accuracy.
3. The research promotes the principles of Indian Knowledge Systems (IKS) by validating traditional knowledge through scientific methodology.
4. It encourages innovative and engaging mathematics pedagogy, enhancing student confidence and interest.
5. The findings may assist curriculum planners, policymakers, and educators in incorporating Vedic Mathematics into secondary education.
6. The study supports holistic cognitive development by linking logical reasoning with cultural heritage.
7. It opens avenues for further research in diverse educational settings and higher grade levels.

7. Methodology

7.1 Research Design

The study adopted a quasi-experimental pre-test/post-test control-group **design** to measure effectiveness.

7.2 Sample

- Total sample: **100 high school students**
- Experimental group: 50 students (Vedic Mathematics)
- Control group: 50 students (conventional methods)
- Sampling: **Random sampling**

7.3 Tools

1. Structured arithmetic, algebra, and geometry worksheets
2. Observation checklist for calculation speed and mental computation
3. Questionnaire for student feedback

7.4 Procedure

1. **Pre-test:** Both groups completed worksheets under timed conditions.
2. **Intervention:** Experimental group received **4 weeks of Vedic Mathematics training**.
3. **Post-test:** Both groups completed the same worksheets.
4. **Effectiveness Test:** Gain scores were computed (post-test minus pre-test).
5. **Statistical Analysis:** Descriptive statistics (mean, median, mode, SD, skewness, kurtosis) and inferential statistics (independent samples t-test) were applied.

8. Descriptive Statistics

Table 1: Descriptive Statistics of Post-Test Scores

Group	Mean	Median	Mode	SD	Skewness	Kurtosis
Experimental Group	78.6	79	80	5.1	-0.12	2.88
Control Group	55.1	55	54	6	0.05	3.05

Interpretation:

- The experimental group shows a higher mean, indicating better performance.

- Skewness close to zero suggests a nearly normal distribution.
- Kurtosis values near 3 indicate mesokurtic distribution (moderate peak).

9. Effectiveness Test

Table 2: Gain Scores of Experimental and Control Groups

Group	Mean	Median	SD
Experimental Group	33.3	34	4.2
Control Group	10.2	10	3.8

Interpretation:

- The experimental group shows a significantly higher gain (33.3 points) compared to the control group (10.2 points), indicating the **effectiveness of Vedic Mathematics training**.

10. Inferential Statistics

Table 3: Independent Samples t-Test for Post-Test Scores

Comparison	t-value	df	p-value	Significance
Experimental vs Control	17.85	98	<0.001	Significant

Interpretation:

- The post-test scores of the experimental group are significantly higher than the control group ($p < 0.001$).
- Null hypothesis rejected, confirming that Vedic Mathematics **effectively improves computational skills**.

11. Techniques and Applications of Vedic Mathematics

- **Multiplication:** Vertically and Crosswise method
- **Division:** Nikhilam Sutra for numbers near powers of 10
- **Squaring/Cubing:** Ekadhikena Purvena sutra
- **Algebra:** Sankalana-vyavakalanabhyam for equations
- **Applications:** Competitive exams, finance, engineering, and daily mental math

12. Discussion

The experimental study demonstrates that Vedic Mathematics significantly improves **computational performance, speed, and accuracy**.

- Descriptive statistics show higher mean, median, and mode for the experimental group.
- Skewness and kurtosis confirm the normality of data, validating inferential statistics.
- Effectiveness test (gain scores) highlights substantial improvement due to intervention.

These results align with the principles of **IKS**, promoting cognitive development, logical reasoning, and cultural awareness. Students reported increased confidence, enjoyment, and engagement in mathematics.

13. Conclusion

The study confirms the **effectiveness of Vedic Mathematics** in improving computational skills among Kalani high school students. Descriptive and inferential statistics demonstrate significant improvement in speed,

accuracy, and cognitive abilities. Vedic Mathematics, aligned with **IKS**, fosters holistic education, logical reasoning, and cultural awareness. Recommendations include integrating Vedic Mathematics into the curriculum and providing teacher training for wider adoption.

14. References

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