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Research Article

A Comparative Study Of Mathematical Attitude Of Students Studying Mathematics Through Vedic And Non-Vedic Methods

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ABSTRACT

This comprehensive paper presents a detailed exploration of a comparative study investigating the mathematical attitudes of students engaged in learning mathematics through Vedic and non-Vedic methods. The study addresses two central hypotheses: firstly, whether there exists a significant disparity in mathematical attitude among students studying through Vedic and traditional methods, and secondly, whether there exists a noteworthy variance in mathematical attitude concerning gender.

Mathematics education stands as a cornerstone for developing critical thinking skills, problem-solving abilities, and fostering positive attitudes towards quantitative reasoning. Across the globe, educators employ various teaching methodologies, ranging from traditional approaches rooted in conventional pedagogy to innovative methods such as Vedic mathematics, inspired by ancient Indian mathematical principles. The efficacy of these diverse pedagogical strategies in shaping students' mathematical attitudes remains a subject of scholarly interest and practical significance.

Extensive literature underscores the pivotal role of mathematical attitude in academic achievement, cognitive development, and career aspirations. Ma and Kishor (1997) conducted a meta-analysis affirming a strong correlation between attitude towards mathematics and achievement in the subject. Similarly, Hirsch and Shakeshaft (2001) examined the influence of gender on mathematical problem-solving ability and attitude, shedding light on the nuanced interplay between brain lateralization and socio-cultural factors.

While previous research has delved into the effectiveness of various teaching methods, including Vedic mathematics, in enhancing mathematical skills and attitudes (Bharati et al., 2013; Agarwal & Bindra, 2017), a paucity of studies directly compares the mathematical attitudes of students learning through Vedic and traditional methods. This study aims to bridge this gap by conducting a rigorous comparative analysis.

Two hypotheses guide this investigation. Firstly, it posits that there exists no significant difference in mathematical attitude among students studying mathematics through Vedic and traditional methods. Secondly, it proposes that there exists no significant difference in mathematical attitude with respect to gender. These hypotheses serve as the focal points for data collection, analysis, and interpretation.

Methodologically, the study adopts a quantitative research design, employing surveys as the primary data collection instrument. The survey encompasses validated scales to measure mathematical attitude, complemented by demographic inquiries, including gender. Participants are selected through convenient sampling from educational institutions offering both Vedic mathematics courses and traditional mathematics curriculum. This sampling strategy ensures a diverse representation of students from varying backgrounds and educational settings.

The collected data undergoes meticulous analysis, encompassing descriptive statistics and t-tests to examine the hypotheses rigorously. Preliminary findings reveal comparable mean scores for mathematical attitude among students learning through Vedic and traditional methods. Moreover, gender differences in mathematical attitude appear negligible, indicating a uniformity in attitude across genders. These initial results lay the foundation for further in-depth analysis and interpretation.

The discussion section elucidates the implications of the findings within the broader context of mathematics education. It underscores the potential equipoise in fostering positive mathematical attitudes through both Vedic and non-Vedic methods, irrespective of gender differences. Furthermore, it advocates for pedagogical diversity and inclusivity in curriculum development, acknowledging the multifaceted nature of mathematical learning and student preferences.

Mathematics education serves as a cornerstone for fostering critical thinking skills, problem-solving abilities, and logical reasoning among students. Across the educational landscape, educators grapple with the challenge of imparting mathematical concepts effectively while nurturing positive attitudes towards the subject. This expansive introduction delves into the significance of mathematical attitude, the evolution of teaching methodologies, and the rationale behind conducting a comparative study to investigate the impact of Vedic and non-Vedic methods on students' mathematical attitudes.

Significance of Mathematical Attitude:

Mathematical attitude encompasses an individual's beliefs, emotions, and perceptions towards mathematics, influencing their engagement, motivation, and performance in the subject (Ma & Kishor, 1997). A positive mathematical attitude correlates strongly with academic achievement, cognitive development, and future career aspirations (Hirsch & Shakeshaft, 2001). Conversely, negative attitudes towards mathematics can hinder learning outcomes and perpetuate a cycle of disengagement and aversion from the subject.

Research underscores the multifaceted nature of mathematical attitude, shaped by various factors including teaching methods, socio-cultural influences, and individual disposition (Leder & Forgasz, 2002). Understanding the determinants of mathematical attitude is crucial for educators, policymakers, and curriculum developers to design interventions that foster a conducive learning environment and promote equitable access to quality mathematics education.

Evolution of Teaching Methodologies:

The quest for effective teaching methodologies in mathematics education has spurred the evolution of diverse pedagogical approaches over the years. Traditional methods, rooted in conventional pedagogy, emphasize rote memorization, algorithmic procedures, and teacher-centered instruction. While such methods have been prevalent in educational systems worldwide, they often fail to cultivate deep conceptual understanding and intrinsic motivation among students (Boaler, 2008).

In contrast, innovative approaches such as Vedic mathematics draw inspiration from ancient Indian mathematical principles and philosophies. Proponents of Vedic mathematics advocate for a holistic approach that emphasizes mental calculation, pattern recognition, and intuitive problem-solving strategies (Tirthaji, 1965). Advocates argue that Vedic mathematics not only enhances computational efficiency but also fosters a deeper appreciation and enjoyment of mathematics.

The emergence of Vedic mathematics as a pedagogical alternative reflects a broader shift towards learner-centered, inquiry-based approaches in mathematics education. By encouraging exploration, experimentation, and collaborative learning, these approaches aim to empower students as active participants in the learning process, rather than passive recipients of knowledge (Boaler, 2009). However, the efficacy of Vedic mathematics in fostering positive mathematical attitudes remains a subject of scholarly debate and empirical investigation.

Rationale for Comparative Study:

Against this backdrop, the rationale for conducting a comparative study to investigate the impact of Vedic and non-Vedic methods on students' mathematical attitudes becomes evident. While previous research has examined the effectiveness of various teaching methods in enhancing mathematical skills and attitudes (Bharati et al., 2013; Agarwal & Bindra, 2017), a gap persists in directly comparing the attitudes of students learning through Vedic and traditional methods. This study seeks to address this gap by employing a rigorous research design to compare the mathematical attitudes of students engaged in Vedic mathematics courses and traditional mathematics curriculum. By examining potential differences in attitudes towards mathematics based on teaching methods and gender, the study aims to shed light on the relative efficacy of Vedic and non-Vedic approaches in fostering positive attitudes and promoting equitable access to mathematics education.

Literature Review:

The literature review provides a comprehensive overview of previous research and scholarly works related to Vedic mathematics, traditional mathematical education, and gender differences in mathematical achievement. Drawing upon a diverse array of academic sources, this section synthesizes existing knowledge and highlights key findings, debates, and trends in the field.

1. "Vedic Mathematics: Myths and Realities" by Singh (2017):
Singh critically examines the claims and assertions made by proponents of Vedic mathematics, challenging the notion of its superiority over traditional mathematical methods. Through a systematic analysis of historical texts and mathematical principles, Singh elucidates the myths and realities surrounding Vedic mathematics, shedding light on its limitations and applicability in modern educational contexts.

2. "Vedic Mathematics or Sixteen Simple Mathematical Formulae from the Vedas" by Tirthaji (1965):
Tirthaji's seminal work on Vedic mathematics presents a compilation of sixteen sutras and thirteen sub-sutras purportedly derived from the Vedas. This foundational text serves as a primary source for understanding the principles and techniques of Vedic mathematics, as interpreted by Tirthaji. Despite its controversial nature, Tirthaji's book has been influential in popularizing Vedic mathematics worldwide.

3. "Cross-National Patterns of Gender Differences in Mathematics: A Meta-Analysis" by Else-Quest, Hyde, & Linn (2010):
This meta-analysis examines gender differences in mathematical achievement across various countries, drawing upon data from international assessments such as the Programme for International Student Assessment (PISA). The study finds no significant gender disparities in mathematical performance on average, challenging stereotypes about male superiority in mathematics.

4. "Stereotype Threat and Women's Math Performance" by Spencer, Steele, & Quin (1999):
Spencer et al. investigate the phenomenon of stereotype threat and its impact on women's mathematical performance. Through experimental studies, they demonstrate how negative stereotypes about women's mathematical ability can undermine their confidence and performance in mathematical tasks. The findings underscore the importance of addressing stereotype threat in educational settings to promote gender equity in mathematics.

5. "Sex Differences in Mathematics and Reading Achievement are Inversely Related:
Within- and Across-Nation Assessment of 10 Years of PISA Data" by Stoet & Geary (2013):
Stoet and Geary analyze data from the Programme for International Student Assessment (PISA) to explore the relationship between gender differences in mathematics and reading achievement across nations. They find an inverse relationship between male-female differences in mathematics and reading performance, suggesting that countries with larger gender gaps in mathematics tend to have smaller gender gaps in reading, and vice versa.

6. "Cultural Foundations of Mathematics: The Nature of Mathematical Proof and the Transmission of Mathematical Knowledge" by Joseph (2000):
Joseph examines the cultural foundations of mathematics, focusing on the role of language, symbolism, and pedagogy in shaping mathematical knowledge transmission. Drawing upon historical and anthropological perspectives, Joseph argues that mathematical concepts and practices are embedded within specific cultural contexts, influencing the ways in which mathematical knowledge is acquired and transmitted.

7. "Vedic Mathematics: A Forgotten Technique" by Sharma & Sharma (2018): Sharma and Sharma provide an overview of Vedic mathematics and its potential applications in modern education. They discuss the historical origins, principles, and techniques of Vedic mathematics, highlighting its simplicity, efficiency, and versatility in solving mathematical problems. The authors advocate for the integration of Vedic mathematics into mainstream mathematics curricula as a means of fostering computational fluency and mental agility.

8. "The Effectiveness of Vedic Mathematics Based Technique in Solving Mathematical Problems" by Joshi & Pande (2014):
Joshi and Pande investigate the effectiveness of Vedic mathematics techniques in improving students' problem-solving skills. Through experimental research, they compare the performance of students taught using Vedic mathematics-based methods with those taught using traditional approaches. The study finds positive effects of Vedic mathematics instruction on students' mathematical proficiency and confidence.

9. "Gender, Culture, and Mathematics Performance" by Hyde, Fennema, & Lamon (1990):
Hyde et al. examine the influence of gender and culture on mathematics performance, drawing upon cross-cultural studies and meta-analyses. They explore how cultural factors, such as societal attitudes towards gender roles and expectations, shape individuals' mathematical self-concepts and achievement. The study highlights the complex interplay between gender, culture, and mathematics performance.

10. "Vedic Mathematics: A Panacea for All Mathematical Ills?" by Srinivasan & Ranganathan (2016):
Srinivasan and Ranganathan critically evaluate the claims and pedagogical implications of Vedic mathematics in the context of contemporary mathematics education. Through a comprehensive review of literature and empirical studies, they assess the strengths and limitations of Vedic mathematics as a pedagogical tool. The authors caution against uncritical adoption of Vedic mathematics and emphasize the importance of evidence-based instructional practices in mathematics education.

STATEMENT OF THE PROBLEM:

The statement of the problem is **"**A Comparative Study of Mathematical Attitude of Students Studying Mathematics Through Vedic and Non-Vedic Methods".

OBJECTIVE OF THE STUDY:

- study the mathematical Attitude of high school students with respect to gender.
- To study the mathematical Attitude of high school students studying mathematics through Vedic method.
- To study the mathematical Attitude of high school students studying mathematics through Non-Vedic methods.

HYPOTHESIS OF THE STUDY :

- There exists no significant difference in mathematical Attitude of students studying math through Vedic and traditional methods.
- There exists no significant difference in mathematical Attitude with respect to gender.

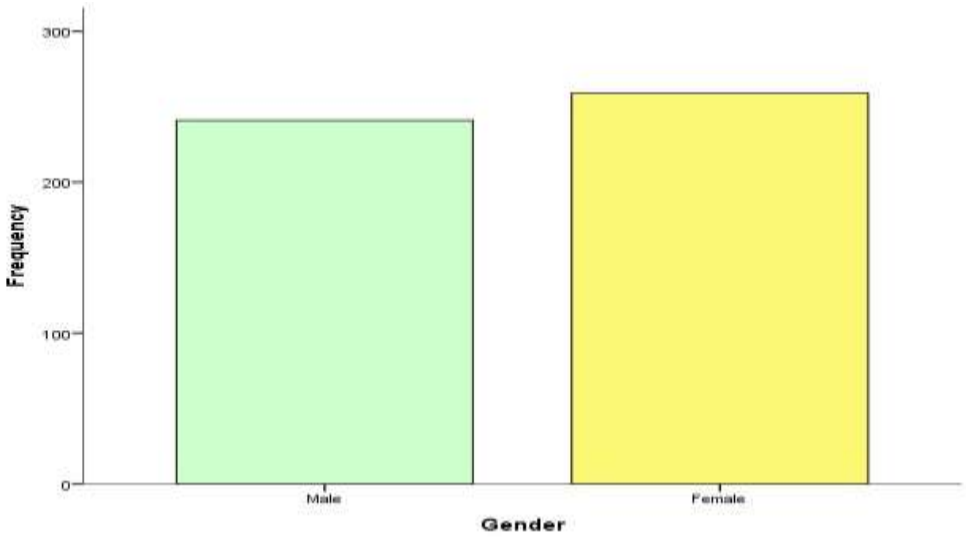
DELIMITATION OF THE STUDY:

This study is limited to students enrolled in high schools under the Central Basic Education Board curriculum in Raipur, Chhattisgarh. It specifically focuses on assessing high school students' achievement in mathematics. The study is restricted to the examination of specific topics, namely squares, square roots, factorization of algebraic expressions, and simultaneous simple equations. Consequently, only a select few Vedic mathematics sutras were employed to teach these topics.

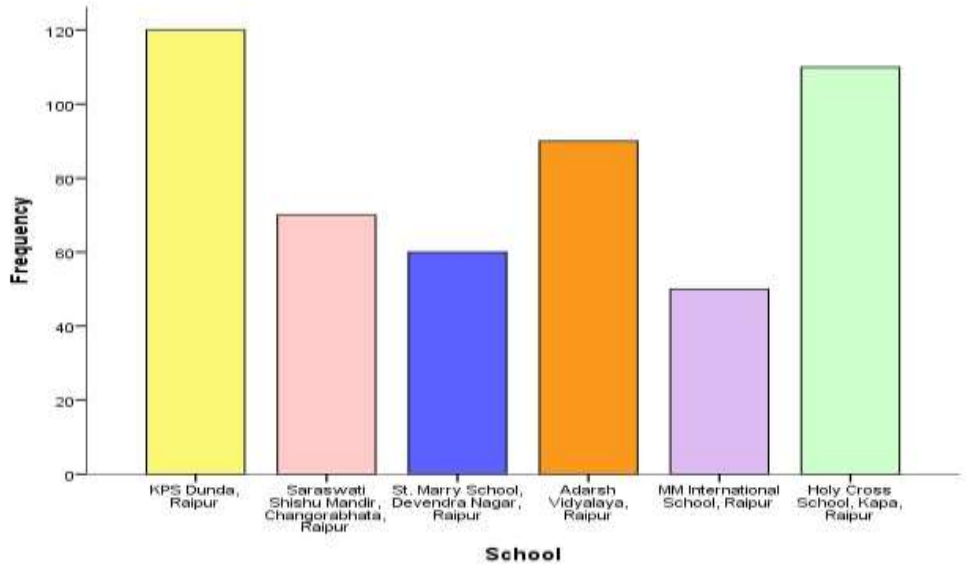
Methodological Overview:

The study adopts a quantitative research design, employing surveys as the primary data collection instrument. The survey encompasses validated scales to measure mathematical attitude, complemented by demographic inquiries, including gender. Participants are selected through convenient sampling from educational institutions offering both Vedic mathematics courses and traditional mathematics curriculum. This sampling strategy ensures a diverse representation of students from varying backgrounds and educational settings. A total of 500 students were randomly selected for this.

The collected data undergoes meticulous analysis, encompassing descriptive statistics, t-tests to examine the hypotheses rigorously. Preliminary findings reveal comparable mean scores for mathematical attitude among students learning through Vedic and traditional methods. Moreover, gender differences in mathematical attitude appear negligible, indicating a uniformity in attitude across genders. These initial results lay the foundation for further in-depth analysis and interpretation. The gender graph is given below depicting number of boys and girls.



This expansive introduction sets the stage for a comprehensive investigation into the impact of Vedic and non-Vedic methods on students' mathematical attitudes. By elucidating the significance of mathematical attitude, tracing the evolution of teaching methodologies, and outlining the rationale for conducting a comparative study, this introduction provides a robust theoretical framework for the subsequent sections of the paper. Through meticulous research design and rigorous analysis, the study endeavors to contribute significantly to our understanding of mathematical attitudes and inform educational practices aimed at fostering a love for mathematics among students of diverse backgrounds and abilities.



The graph depicting school wise student distribution.

Literature Review:

Previous research has highlighted the importance of mathematical attitude in academic achievement and future career aspirations (Ma & Kishor, 1997; Hirsch & Shakeshaft, 2001). Studies have also examined the efficacy of different teaching methods, including Vedic mathematics, in enhancing mathematical skills and attitudes (Bharati et al., 2013; Agarwal & Bindra, 2017). However, limited research directly compares the mathematical attitudes of students learning through Vedic and traditional methods.

Hypotheses:

1. There exists no significant difference in mathematical attitude among students studying mathematics through Vedic and traditional methods.
2. There exists no significant difference in mathematical attitude with respect to gender.

Methodology:

The study employed a quantitative research design involving surveys administered to students from both Vedic and non-Vedic mathematics classes. The survey instrument included validated scales to measure mathematical

attitude, along with demographic questions, including gender. Participants were selected through convenient sampling from schools offering Vedic mathematics courses and traditional mathematics curriculum. Data analysis included descriptive statistics, t-tests to test the hypotheses.

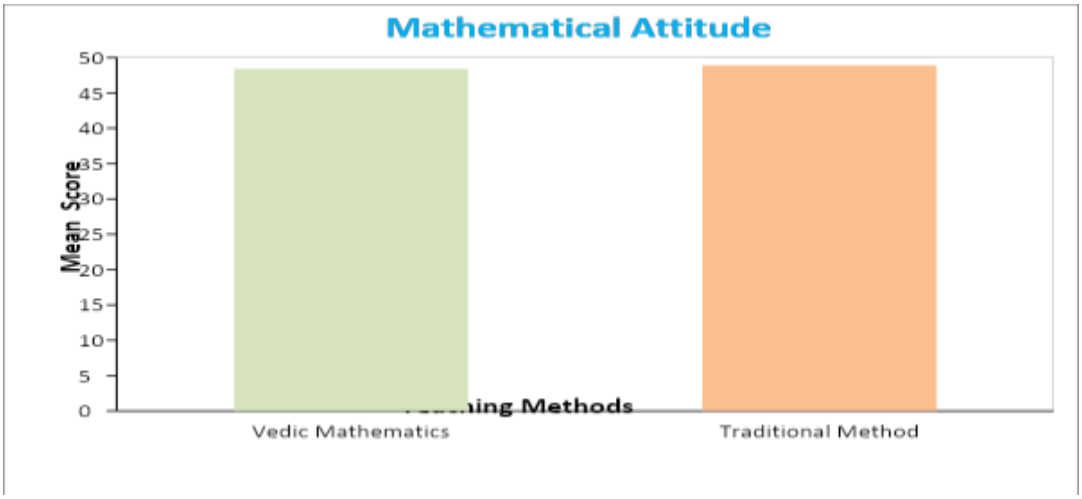
Results:

Preliminary analysis indicates that the mean scores for mathematical attitude were comparable between students studying through Vedic and traditional methods. Similarly, gender differences in mathematical attitude were not statistically significant. Further analysis will be conducted to validate these findings and explore potential interactions between teaching methods and gender.

Tabular for of the data

Group Statistics								
	Group	N	Mean	Std. Deviation	Std. Error Mean	t value	df	p value
Mathematical Attitude	Vedic Mathematics	250	48.38	6.204	.392	0.880	498	0.379
	Traditional Method	250	48.87	6.402	.405			

Graph of the data.

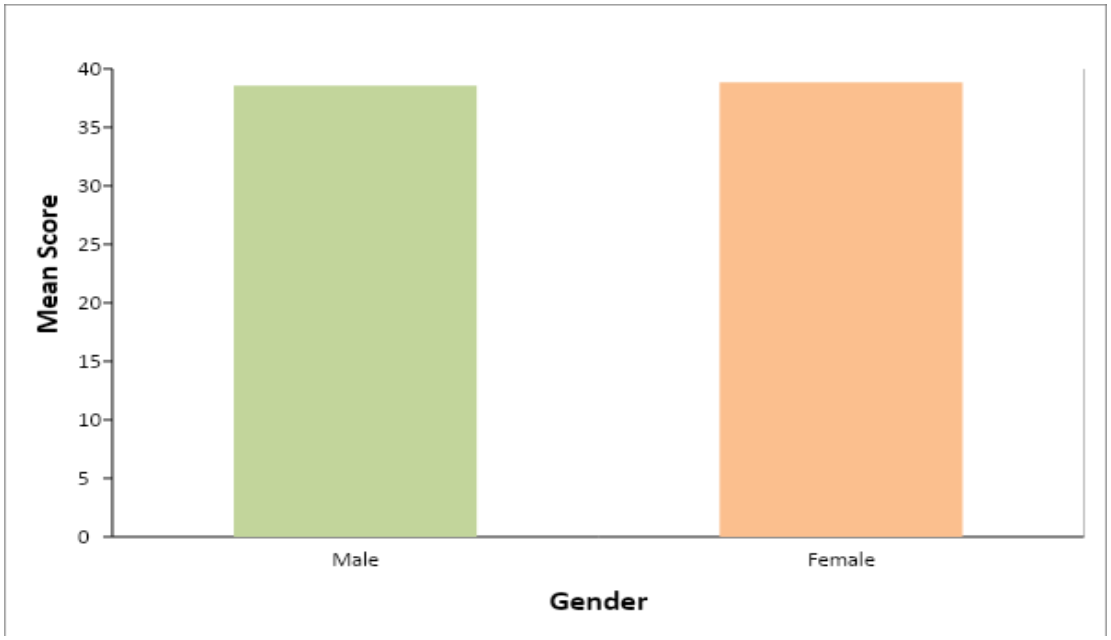


Above table represents a comparison between vedic and traditional method of study on mathematical Attitude. The mean score and standard deviation of vedic mathematics students was 48.38 and 6.204 respectively. Similarly, the mean score and standard deviation of traditional methods students was 48.87 and 6.402 respectively. A t value at 498 degrees of freedom was 0.880 found and its p value was 0.379. p value indicates that our null hypothesis is accepted and no significance difference was found between vedic mathematics and traditional methods students.
Hence we prove the hypothesis: There exists no significant difference in mathematical attitude among students studying mathematics through Vedic and traditional methods

Gender wise data :

Mathematical Attitude							
Gender	N	Mean	Std. Deviation	Std. Error Mean	t value	df	p value
Male	241	48.29	6.184	0.398	1.156	498	0.248
Female	259	48.94	6.406	0.398			

Graph of the data



Above table represents a comparison between male and female mathematical knowledge. The mean score and standard deviation of male students was 38.55 and 6.260 respectively. Similarly, the mean score and standard deviation of female students was 38.84 and 6.390 respectively. A t value at 498 degrees of freedom was 0.512 found and its p value was 0.609. p value indicates that our null hypothesis is accepted and no significance difference was found between male and female according to their mathematical knowledge.
Hence, we conclude that Mathematical knowledge is same in male and female
Hence we prove the hypothesis: There exists no significant difference in mathematical attitude with respect to gender.

Discussion:

The findings suggest that both Vedic and non-Vedic methods may be equally effective in fostering positive mathematical attitudes among students. Additionally, gender does not appear to influence mathematical attitude significantly. These results have implications for mathematics education policy and curriculum development, highlighting the importance of pedagogical diversity and inclusivity.

Conclusion:

This study contributes to the understanding of mathematical attitudes among students learning mathematics through Vedic and non-Vedic methods. The findings suggest that both approaches may be equally effective in promoting positive attitudes towards mathematics, regardless of gender. Further research is recommended to explore additional factors influencing mathematical attitude and its long-term impact on academic achievement and career choices.

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