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A Study on Teaching and Learning Methods and Students Performance In Mathematics at Secondary Level in Telangana

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Abstract
The present study investigates the relationship between teaching and learning methods and students' academic achievement in mathematics at the secondary school level in Telangana. A descriptive and quantitative research design was employed, with data collected from a sample of 200 secondary school students from government and private schools in the Rangareddy district. A self-constructed and validated Student Perception Questionnaire was used alongside actual achievement scores applying both descriptive and inferential statistics including t-tests and Pearson's correlation. The findings revealed that students generally held a positive perception of teaching and learning methods, especially student-centered strategies such as group work, use of visual aids, and encouragement to ask questions. However, less emphasis was reported on innovative methods like role-play, field-based activities, and digital tools. Students expressed moderately high levels of engagement and understanding, particularly in topics like geometry and algebra. While girls and private school students scored slightly higher on average, these differences were not statistically significant. A moderate and statistically significant positive correlation was found between students' perceptions of teaching methods and their mathematics achievement. The study concludes that effective, engaging, and well-supported teaching strategies enhance students' academic performance. It recommends the integration of innovative practices, improved access to teaching resources, and strengthened teacher training programs. The findings have significant implications for policymakers, educators, and curriculum planners aiming to improve mathematics instruction at the secondary level

Keywords: *Teaching and Learning Methods, Students, Performance, Mathematics, Secondary Level, Gender Government Schools, Private Schools, and Type School.*

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I. Introduction

Education is the essence of early civilization and it is the light that shows mankind the right direction to surge. The purpose of education is not just making a student literate but also to develop innovative thinking with self-sufficiency and knowledge ability from childhood. Education is a process, may motivate children to think, reason, comprehend, analyze and bring out their hidden knowledge. Education nurtures cognitive abilities, skills and attitude to make life worth living. It brings about the complete development of one's individuality and helps to adjust and adopt their self to their environment. Education modifies behaviour and attitude in a way that is beneficial for the society and the world.

Education is a process that may motivate children to think, reason, comprehend, analyze and bring out their hidden knowledge. Education nurtures cognitive abilities, skills and attitude to make life worth living. Education is a process of human enlightenment and empowerment aiming at achieving a better and higher quality of life. The main aim of education is to develop harmonious personality of the learner. Education makes pupils fit to live in the ever changing world. Education develops the individual like a flower which spreads its fragrance all over the environment.

Globally, education systems have shifted from traditional teacher-centered instruction (TCM) to student-centered learning (SCL) methodologies to improve learner engagement and academic performance (Lall, 2010). By the 1980s, many countries had already begun integrating SCL approaches into mathematics education (Lambros, 2002), aiming to foster conceptual understanding and problem-solving skills. However, in several developing nations, including India, the full implementation of these progressive pedagogies has remained inconsistent, often resulting in continued underperformance in mathematics. In international assessments such as PISA (Programme for International Student Assessment) and TIMSS (Trends in International Mathematics and Science Study), countries like Singapore, Japan, and South Korea consistently outperform others due to a strong cultural emphasis on mathematics, innovative teaching practices, and a focus on mastery learning (Mullis et al.,

2012; OECD, 2013; Leung, 2006). In contrast, India's performance in mathematics, especially among secondary school students, has remained modest, highlighting the urgent need to revisit teaching methodologies and align them with global best practices (NCERT, 2019). Mathematics, as a discipline, is central to logical reasoning, critical thinking, and technological advancement. It plays a key role in shaping the intellectual foundation of students and is instrumental in national development. According to Adedayo (2017), mathematics helps learners structure data systematically and enhances their problem-solving ability. Similarly, Ale and Lawal (2010) noted that the effectiveness of mathematics teaching directly impacts a country's economic progress. In India, mathematics has long been a core subject in school curricula. The National Curriculum Framework (NCF 2005) and the National Education Policy (NEP 2020) emphasize the importance of making mathematics education more meaningful and accessible by adopting activity-based, inquiry-driven pedagogies. However, despite these recommendations, many mathematics classrooms, particularly in rural and semi-urban regions of states like Telangana, continue to rely on lecture-based, rote-learning techniques. New education policy (NEP 2020) development of Integrated /holistic Curriculum NEP 2020 recommends that the Mathematics curricula should aim for holistic development of learners, equipping them with the above mentioned 21st century skills, reduction in curricular content to enhance essential learning and critical thinking and greater focus on experiential learning. Students will have increased flexibility and choice of subjects so that they choose their own paths according to their talents and interests.

This contributes to students' disinterest in the subject and poor performance in assessments. The low achievement levels in mathematics have been a matter of concern for educators, policymakers, and parents alike. Studies have identified various contributing factors, including lack of teaching resources, overcrowded classrooms, teacher absenteeism, limited pedagogical training, and a rigid examination system (Mazana et al., 2019; Kitta, 2004). Moreover, motivational issues, insufficient classroom interaction, and low student-teacher engagement further deteriorate learning outcomes in mathematics.

Mathematics

Mathematics is a creation of human mind concerned chiefly with ideas, processes and reasoning. It is much more than Arithmetic, more than Algebra more than Geometry. Also it is much more than Trigonometry, Statistics, and Calculus. Mathematics includes all of them. Primarily Mathematics is a way of thinking, a way of organizing a logical proof. As a way of reasoning, it gives an insight into the power of human mind, so this forms a very valuable discipline of teaching-learning programmes of school subjects everywhere in the world of curious children. So the pedagogy of Mathematics should be very carefully built at different levels of school education

Mathematics is the mother of all sciences. It is the most important subject in human life. It cannot be possible to maintain daily living without mathematics. Each country has their own mathematical languages, terms, symbols, counting systems etc. In every sphere of life mathematics is used to a great extent. Mathematics is used to satisfy the essential requirements of any individual. It helps to think rationally and logically and to solve problems with diversified nature. It is not a subject that deals with the numbers only, but it helps to improve our creativity that helps to find out best possible solution of the problems. It is generally stated that mathematics is abstract in nature. To acquire knowledge in mathematics, one should devote concentrated efforts fully to the subject. To learn mathematics requires patience and practices. Mathematics is considered the backbone of all sciences. Our social progress, life style, daily living and different types of amenities depends on the development of modern technologies. On the other hand, unprecedented technological advancement largely depends on mathematics. Mathematical skills are very useful to success in the fields of technology, science and most of the social science subjects. Mathematics is also used for common purposes, like Marketing, Accounting, making family budget, maintaining daily expenditure etc.

Considering the necessity of mathematics, the subject is compulsory in all classes from primary to secondary levels. Hence learning mathematics is compulsory for all the students up to class X. However, the report published in the third "International mathematics and science study" indicates that the aptitude of students in mathematics in modern technological globalized era is declining. Therefore, adequate measure should be taken for mathematics education at the primary and secondary levels.

Efforts by the Indian government, such as the Rashtriya Madhyamik Shiksha Abhiyan (RMSA), Samagra Shiksha Abhiyan, and DIKSHA (Digital Infrastructure for Knowledge Sharing), have aimed to strengthen mathematics teaching through digital platforms, teacher training, and curriculum reforms. Yet, significant gaps remain in implementation, especially in government schools of Telangana. Aristotle defined mathematics as the science of quantity. Mathematics is the science that draws necessary conclusions (Benjamin Peirce, 1870). Mathematics is the classification and study of all possible patterns (Walter Warwick Sawyer, 1955

According to International Dictionary of Education, "Mathematics is a science of magnitude and number. Mathematics is the process of defining ideas, words, which we have to use to describe the world,

understanding the simple universal rules which have been discovered by those before us, connecting facts, events and learning logical methods of combining the simple rules to understand and predict complex phenomena."

The word 'Mathematics' is used in two distinct and different senses, i.e. one as a method used to solve the problems of quantity, space, order etc. and the second as a set of laws or generalizations of truth that are discovered. Different dictionaries and mathematicians defined mathematics differently. Some of definitions are given below:

According to Oxford Dictionary (1986) Mathematics is the science of measurement, quantity and magnitude. According to Locke (1682) "Mathematics is the way to settle in the mind of children a habit of reasoning. According to White (1916) Behind the artisan is the chemist, behind the chemist is the physicist; behind the physicist is a mathematician. Courant and Robbins (1941) have expressed their views about the nature of mathematics in beautiful words, Mathematics as an expression of the human mind reflects the active will, the contemplative reason, and the desire for aesthetic perfection. Its basic elements are logic and intuition, analysis and construction, generality and individuality.

The Quality of Teaching and Learning

Teaching and learning are at the heart of a school's work. The relationship between teaching and learning is a complex one but the quality of teaching bears directly on the effectiveness of pupils' learning. The following lines highlight important aspects of teaching and learning: relationships, responses, teaching, the assessment of the pupils' work and planning. It is possible that all the characteristics of high quality outlined in some of these sections will be present in a single mathematics lesson. It is more likely that they will be observed over a number of lessons and in a variety of classes; equally, the shortcomings identified below may be present in a single mathematics lesson, or may be observed in a sequence of lessons and in a variety of classes. No two individuals are alike. Some may be bright, others average and some others dull. Since man is a product of heredity and environment, the answer lies with either of these factors or with both.

According to I.P. Guilford "General mental ability as measured by intelligence test and the primary abilities taken separately, show development with age during childhood and youth and decline after passing middle age. There is some sex difference some favouring males and some females. A balance would probably show that the two sexes are equal for general abilities".

Mathematical Achievement

Mathematical achievement plays an important role in the attainment of harmonious development of a student. Mathematical achievement refers to the degree or level of success or proficiency attained in mathematics. Mathematical achievement is the outcome of general and specific learning experiences. It is actually the competency shown by a student in the subjects, which he has learnt in the educational institutions. Mathematics is not just for the gifted and talented. Each and every pupil needs to work for mathematical achievement. It is important to note that mathematics is not just arithmetic. Besides numbers and number operations, due importance must be given to shapes, spatial understanding, patterns, measurement and data handling. The curriculum must explicitly incorporate the progression that learners make from the concrete to the abstract while acquiring concepts (National Curriculum Framework, 2005).Hence, learning of mathematics and a student's performance in mathematics has an undeniable significance in academics.

Students' achievement in mathematics in secondary school has a significant effect on their performance in college (Ismail and Awang, 2008).There are several factors which affect academic achievement in mathematics, some of these factors are cognitive ability, problem solving ability (Bhat, 2014), teaching strategy, involvement of parents, pupil's self-concept, motivation, sex difference, pupil's attitude towards mathematics (Kaur, 2011 & Rao, 2014), study habits, anxiety etc.

Statement of the Problem

The study is entitled as "**A Study on Teaching and Learning Methods and Student Performance in Mathematics at Secondary Level in Telangana"**

Objectives of the study

1. To identify the teaching and learning methods used in mathematics instruction in secondary schools.
2. To assess students' perceptions of how these teaching and learning methods affect their learning engagement and understanding of mathematics.
3. To evaluate the availability and utilization of teaching-learning resources and their influence on students' academic performance in mathematics.
4. To study the level of mathematical achievement of students.
5. To analyze the relationship between teaching and learning methods and students' mathematical achievement

Hypotheses of the Study

1. There is a significant difference in the mathematical achievement of students with respect to gender.
2. There is a significant difference in the mathematical achievement of students with respect to school type school.
3. There is a significant positive relationship between teaching and learning methods and students' mathematical achievement.

II. Method of the Study

The present study employed a descriptive survey method to investigate the teaching and learning methods in mathematics and their relationship with student academic performance at the secondary school level in Telangana. This method was chosen as it allows for the collection of detailed information from a large group of respondents, helping to assess existing conditions, practices, and perceptions. The research aimed to identify the instructional strategies employed in mathematics classrooms, examine students' perceptions of these methods, evaluate the availability and utilization of teaching-learning resources, and explore their influence on students' mathematical achievement. Data were collected using a self-constructed and validated Student Perception Questionnaire along with final examination marks in mathematics for academic achievement.

Sample of the Study

From the defined population, a sample of 200 secondary school students was selected using the stratified random sampling technique to ensure proportionate representation across key strata such as school management type (government and private) and gender (boys and girls). The sample consisted of 100 students from government schools and 100 from private schools, with 100 boys and 100 girls distributed evenly across both categories. This sampling approach helped in achieving balanced data for comparative analysis and provided a reliable basis for studying students' perceptions and performance in relation to teaching and learning methods in mathematics.

Tools of the study

1. **Student Perceptions Questionnaire on Teaching and Learning Methods:** Developed and validated by researcher himself
2. **Academic Achievement:** The investigator has taken annual mathematics examination marks to assess the academic achievement of secondary school students.

Statistical techniques for the study

1. The independent samples t-test was employed to assess the presence of a statistically significant difference between the means of two groups.
2. To determine the relationship between two variables, Carl Pearson's Product Moment Correlation was employed.

III. Analysis and interpretation of data

Descriptive Analysis

In this section, the researcher analyzes the data collected from the sample using a self-constructed tool the Student Perception Questionnaire on Teaching and Learning Methods in Mathematics. The data are presented in the form of tables, followed by their interpretation, in order to draw relevant findings and support the overall discussion. This section aims to provide a clear understanding of secondary school students' perceptions of the teaching and learning methods practiced by their mathematics teachers.

Table 1: Mean and Standard Deviation of Teaching and Learning Methods Items (1–15)

S. No.	Teaching and Learning Method	Mean	Std. Deviation
1	My teacher uses group work to help us solve math problems.	4.15	0.87
2	We explore problems on our own before the teacher gives explanations.	3.82	0.96
3	Games and quizzes make math more interesting in class.	3.75	1.01
4	We use role-play to act out math-related situations or problems.	3.21	1.14
5	My teacher explains math with the help of pictures, diagrams, or models.	4.05	0.89
6	Teaching in my math class is connected to daily life situations.	3.92	0.94
7	We do hands-on activities like measuring or using shapes to learn concepts.	3.60	1.08
8	I am encouraged to ask questions freely in math class.	4.10	0.91
9	My teacher uses smart boards, videos, or digital tools during math teaching.	3.45	1.12
10	Different teaching methods are used to help everyone understand math better.	4.18	0.83
11	The teacher changes the way of teaching based on students' responses.	3.88	0.97
12	Math class includes discussions and teamwork.	3.80	1.03
13	I have done math projects or activities in groups.	3.54	1.06

14	We sometimes learn through real objects or field activities.	3.29	1.15
15	The teacher gives us math challenges or puzzles that we solve as a team.	3.70	1.01
	Overall Average	**3.76**	

The data in Table 1 reveals that students moderately agree that a variety of teaching and learning methods are being used in mathematics classrooms at the secondary level. The overall mean score of 3.76 suggests a generally positive perception, although some methods appear to be implemented more consistently than others. Among the highest-rated teaching practices are the use of varied instructional approaches to enhance understanding (M = 4.18), incorporation of group work to solve problems collaboratively (M = 4.15), encouragement of student questioning (M = 4.10), and the use of visual aids such as diagrams and models (M = 4.05). On the other hand, methods such as role-play (M = 3.21), learning through real-life objects or field-based activities (M = 3.29), and the use of digital tools like smart boards (M = 3.45) received comparatively lower ratings. These findings indicate that while student-centered strategies like group collaboration and interactive questioning are fairly common, more innovative instructional methods such as gamification, experiential learning, and the integration of educational technology are less frequently applied. This points to a need for enhanced teacher training and resource support, especially in under-resourced and government-run schools, to enable wider adoption of diverse and modern teaching techniques.

Table 2: Mean and Standard Deviation of Students' Perceptions of Learning Engagement and Understanding Items (16–25)

S. No.	Learning Engagement and Understanding	Mean	Std. Deviation
16	I feel confident answering oral math questions in front of others.	3.60	0.98
17	Learning methods help me express new ideas in solving problems.	3.85	0.89
18	Teaching strategies in class have improved my creativity in math.	3.78	0.92
19	I can visualize and understand geometry better because of how it is taught.	3.91	0.85
20	Algebraic concepts are easier to understand because of the way lessons are explained.	3.82	0.90
21	The activities used in class help me prepare for tests and exams.	4.01	0.84
22	I enjoy learning math because the methods are interesting.	3.94	0.87
23	I pay more attention in class when we do hands-on or group tasks.	4.08	0.79
24	My scores in math have improved because of the way we learn in class.	3.88	0.91
25	The teaching in math class motivates me to study more at home.	3.73	0.95
	Overall Average	**3.86**	

The results in Table 2 indicate a positive perception among students regarding the impact of teaching and learning methods on their engagement and understanding of mathematics. The overall mean score of 3.86 reflects a moderately high level of agreement with the perception statements, suggesting that students generally find these instructional approaches beneficial. Among the highest-rated items are increased attention during hands-on or group activities (M = 4.08), the usefulness of class activities in preparing for exams (M = 4.01), enjoyment of learning mathematics due to engaging methods (M = 3.94), and improved ability to visualize and understand geometry (M = 3.91). Although still rated positively, lower mean scores were observed for students' confidence in answering oral math questions (M = 3.60) and motivation to study math at home (M = 3.73). These findings highlight that student engagement tends to rise when interactive, student-centered teaching methods are employed. However, there remains a need for additional instructional strategies aimed at boosting students' confidence in active classroom participation and fostering independent learning habits outside the classroom.

Table 3: **Students' Perceptions on Availability and Utilization of Teaching-Learning Resources (Items 26–30)**

Item No.	Availability and Utilization of Teaching-Learning Resources	Mean	Standard Deviation
26	Teaching materials (like charts, flashcards, and models) are used in class.	3.85	0.91
27	There are enough math learning aids available in the school.	3.63	0.94
28	My school provides a good environment to learn mathematics.	3.89	0.96
29	I feel supported by my teacher in learning difficult math topics.	4.02	0.85
30	The way we learn math helps me develop logical thinking.	4.10	0.83
Overall		**3.90**	**0.90**

The data in Table 3 shows students' perceptions regarding the availability and utilization of teaching-learning resources in mathematics instruction. The overall mean score of 3.90 suggests that students generally agree that adequate teaching-learning resources are available and effectively used in their classrooms. Among the items, the highest-rated was "The way we learn math helps me develop logical thinking" (M = 4.10), followed by "I feel supported by my teacher in learning difficult math topics" (M = 4.02). These responses indicate a strong appreciation for teacher guidance and the role of instruction in promoting cognitive skills. However, the lowest-rated item was "There are enough math learning aids available in the school" (M = 3.63),

pointing to potential gaps in infrastructure and material support in certain schools. Overall, while students value the support and instructional approaches provided, there is a clear indication that physical resources such as charts, flashcards, and models should be improved to further enhance teaching and learning effectiveness in mathematics classrooms.

Table 4: Students' Achievement Scores in Mathematics

Group	N	Mean	Std. Deviation	% of Mean
Total	200	**62.30**	**12.91**	41.53

The data in Table 4 presents the descriptive statistics of students' mathematics achievement based on their final examination scores, evaluated out of 100 marks. The overall mean score for the total sample of 200 secondary school students is 62.30, with a standard deviation of 12.91, indicating a moderate level of academic achievement in mathematics.

Differential Analysis

This section presents the differential analysis conducted to test the formulated hypotheses and to examine whether there are significant differences in students' academic achievement with respect to selected demographic variables such as gender, and type of school management. For this purpose, the independent sample t-test was used to compare the means between two groups and determine whether the observed differences are statistically significant. The results of the differential analysis are presented in tables, followed by interpretation, findings, and discussion for each hypothesis.

Hypothesis 1: There is a significant difference in the mathematical achievement of students with respect to gender.

Table 5: Comparison of Students' mathematical achievement with Respect to Gender

Variable	Group	N	Mean	Std. Deviation	t-value	p-value
Gender	Boys	100	61.42	13.25	-0.899	0.370
	Girls	100	63.18	12.57		

From the above table an independent samples t-test was conducted to determine whether a significant difference exists in mathematics achievement between boys and girls. The results indicated that the mean score for boys was 61.42 with a standard deviation of 13.25, while girls had a slightly higher mean score of 63.18 with a standard deviation of 12.57. The computed t-value was -0.899, and the associated p-value was 0.370. Since the p-value is greater than the conventional significance level of 0.05, the result is not statistically significant. Therefore, it can be concluded that there is no significant difference in mathematics achievement between boys and girls in the sample hence stated hypothesis there is a significant difference in the mathematical achievement of students with respect to gender id rejected. Although the mean score of girls is marginally higher, this difference does not have statistical relevance, suggesting that gender does not play a meaningful role in determining mathematics performance among secondary school students in this context.

Hypothesis 2: There is a significant difference in the mathematical achievement of students with respect to Type of school.

Table 6: Comparison of Students' mathematical achievement with Respect to Type of school

Variable	Group	N	Mean	Std. Deviation	t-value	p-value
Type of school	Government	100	60.75	13.62	-1.795	0.074
	Private	100	63.85	12.11		

An independent samples t-test was conducted to examine whether there is a significant difference in mathematics achievement between students from government and private secondary schools. The results revealed that students from government schools had a mean score of 60.75 with a standard deviation of 13.62, while students from private schools had a higher mean score of 63.85 with a standard deviation of 12.11. The calculated t-value was -1.795, and the associated p-value was 0.074. Since the p-value (0.074) is greater than the standard significance level of 0.05, the difference in mathematics achievement between the two school types is not statistically significant at the 5% level hence stated hypothesis there is a significant difference in the mathematical achievement of students with respect to Type of school is rejected. However, it is close to significance, suggesting a potential trend where private school students may perform slightly better than their government school counterparts.

Correlation analysis

Table 7: Correlation Between Perception of Teaching and Learning Methods and Mathematics Achievement (N = 200)

Variables	N	Mean Perception Score	Mean Achievement Score	r-value	Sig. (2-tailed)
Teaching & Learning Methods vs. Achievement	200	112.34	62.30	**0.461**	**.000**

The Pearson correlation analysis reveals a moderate positive relationship between students' perceptions of teaching and learning methods and their actual performance in mathematics, with a correlation coefficient of r = 0.461. This value suggests that as students' positive perceptions of the instructional methods increase, their academic performance in mathematics also tends to improve. Moreover, the p-value of .000 indicates that this correlation is statistically significant at the 0.05 level, confirming that the observed relationship is not due to random chance. These results imply that when students view their classroom experiences as engaging, supportive, and effective, it has a meaningful impact on their achievement. Therefore, the hypothesis stating that effective teaching and learning methods are associated with better student performance in mathematics is strongly supported by the data. This finding highlights the importance of adopting student-centered, interactive instructional strategies to enhance learning outcomes.

IV. Conclusion

The present study aimed to explore the relationship between teaching and learning methods and student performance in mathematics among secondary school students in Telangana, with a particular focus on students' perceptions of these instructional practices. Based on data collected from 200 students (100 boys and 100 girls) across government and private schools in Rangareddy district, the study found that most students generally perceive teaching and learning methods in mathematics positively. Strategies such as group work, visual aids, and encouragement to ask questions were especially appreciated for improving engagement and understanding. However, innovative practices like role-play, field-based learning, and digital tool integration were less frequently reported, indicating areas that need greater attention in instructional design.

The study also revealed that students' engagement and understanding increased when interactive and student-centered methods were used. Despite some infrastructural gaps particularly in government schools students reported feeling supported by teachers in learning complex topics. Academic achievement in mathematics was found to be moderate, with girls and private school students performing slightly better than boys and government school students respectively. Nonetheless, these differences were not statistically significant. Importantly, a moderate and statistically significant positive correlation was observed between students' perceptions of teaching methods and their actual achievement, confirming that effective teaching strategies contribute meaningfully to improved academic outcomes. In summary, the findings affirm the need to adopt more interactive, resource-rich, and student-centered approaches in mathematics teaching. Systematic efforts to enhance teacher training, improve resource availability, and incorporate innovative methods can significantly boost both student engagement and academic performance across different school settings.

Educational Implications

1. **Promotion of Student-Centered Pedagogy:** The study highlights that methods like group work, questioning, and use of visual aids improve engagement and understanding. Hence, mathematics teachers should be encouraged and trained to adopt more student-centered and interactive instructional strategies in daily classroom practices.
2. **Need for Innovative Teaching Practices:** Low ratings for role-play, field-based learning, and digital tools suggest a gap in implementing innovative methods. Curriculum developers and education departments should support teachers with resources and training to integrate these practices meaningfully into mathematics instruction.
3. **Enhancement of Teaching-Learning Resources:** Students, especially in government schools, reported inadequate access to teaching aids like charts, models, and flashcards. Schools must be better equipped with teaching-learning materials, and provisions should be made to ensure equitable access across school types.
4. **Teacher Training and Professional Development:** The positive correlation between student perception and achievement emphasizes the importance of teacher effectiveness. Regular training sessions and workshops should be conducted to enhance pedagogical competencies in handling abstract mathematical concepts.
5. **Use of Feedback for Instructional Improvement:** Students' perceptions can serve as a valuable feedback mechanism for teachers. Schools should incorporate periodic student feedback to refine instructional methods and ensure alignment with learners' needs.

6. **Policy Support for Equitable Learning:** Although performance differences between private and government school students were not statistically significant, the trend favors private institutions. Policymakers must focus on strengthening instructional quality in government schools through targeted programs and support mechanisms.
7. **Incorporation into Teacher Education Curricula:** The findings can inform teacher training institutes about the effectiveness of various teaching methods and the importance of student perception. This can guide pre-service teacher training programs to incorporate more practical and student-focused modules.
8. **Encouragement of Reflective Practices:** Teachers should be encouraged to reflect regularly on their classroom strategies and student outcomes. Reflective teaching practices can bridge the gap between instructional intent and student learning outcomes.

Suggestions for Further Studies

1. Future studies can include a larger and more diverse sample across multiple districts or states to improve generalizability of the findings.
2. Comparative studies may be conducted between urban and rural schools to explore contextual differences in teaching-learning methods and mathematics achievement.
3. A similar study may be undertaken focusing on specific teaching methods (e.g., problem-based learning, flipped classroom, or ICT-integrated instruction) to measure their individual effectiveness in mathematics.
4. Further research could explore the longitudinal impact of teaching-learning methods on students' performance over multiple academic years.
5. Studies involving teacher perspectives and classroom observations can be included to triangulate student perception data with actual classroom practices.
6. Researchers may conduct intervention-based studies to implement and assess the impact of specific student-centered strategies (like gamification or real-life application tasks) on learning outcomes.
7. A follow-up study can investigate the role of home environment, parental involvement, and peer influence in supporting mathematics achievement alongside classroom methods.
8. Future research could examine correlations between teacher training, resource availability, and student academic outcomes, particularly in under-resourced government schools.

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