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Patron
Prof. R. G. Kothari

Chief Editor
Prof. Jignesh B. Patel
Mo. 9429429550
drjigp@gmail.com
ctefeduinspire@gmail.com

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Assessing the Middle Stage Students' Interest in Mathematics in Schools of Bargarh District, Odisha

Raj Ballav Panda
NCERT Doctoral Fellow,
Faculty of Education, Banaras Hindu University, Varanasi, Uttar Pradesh, India
Email: rajballavpanda.bhu@gmail.com, ORCID: https://orcid.org/0009-0001-6809-0722

Meenakshi Singh, Professor
Faculty of Education, Banaras Hindu University, Varanasi, Uttar Pradesh, India
Email: meenakshi.edu@bhu.ac.in, ORCID: https://orcid.org/0009-0003-9455-7554

Abstract

The primary objective of this study is investigate the level of interest in mathematics among middle stage students in the Bargarh district of Odisha and to examine the influence of gender, location, and type of school on their interest. Employing a descriptive survey design, data were collected from 352 students in Classes VI to VIII using a self-developed and validated Mathematics Interest Scale and data were analyzed using descriptive statistics and independent samples t-test. The findings show a moderate level of interest in mathematics, with the highest interest in cognitive engagement and the lowest interest in behavioral and extracurricular involvement. Also, there is significant gender difference in the interest, with boys showing greater interest, while location and school type had no significant impact. The findings suggest the implementation of gender-sensitive pedagogies, engaging homework practices, and enrichment activities for extracurricular participation.

Keywords: Interest in Mathematics, Joyful Learning, Mathematics Education, Middle Stage Students

Introduction

Mathematics, as a school subject, not only develops problem solving skills, logical reasoning and analytical thinking, but also recognized for its utilitarian value in individual and societal advancement. Its necessity extends beyond the boundaries of the classroom to real-life applications, especially in the context of the 21st-century digital transformation and

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knowledge society (Firdaus et al., 2015; Duma et al., 2024). Despite its significance, mathematics is often perceived as a disliked, challenging and unapproachable subject by many learners, which unfavorably affects their efficacy, motivation, engagement, and performance (Aguilar, 2021; Lara et al., 2025).

At the middle stage of education (Classes VI to VIII), students begin to form more lasting attitudes towards school subjects. This stage contributes as a critical transition period where abstract mathematical concepts are introduced, and foundational competencies are solidified (Krapp, 2002; Şen & Koyunlu Ünlü, 2020). Nurturing a perpetual interest in mathematics during this phase is important to ensure learners' long-term engagement and academic success in the subject (Renninger & Hidi, 2021).

National educational assessments indicate that a significant population of students in India, particularly in remote areas, demonstrates low learning outcomes in mathematics. Reports by the ASER Centre published in the year 2017, 2019, and 2023 highlight noticeable gaps in students' ability to perform basic arithmetic operations even in higher grades. These trends raise concerns about students' declining interest and emotional disengagement from the subject as indicated in ASER report 2024 and NAS report 2022. Addressing students' interest is therefore not only an academic priority but also an essential component of broader educational reforms recommended in the National Education Policy 2020 and the National Curriculum Framework for School Education 2023, which stress on implementation of joyful, experiential, and meaningful learning strategies.

Interest is a key motivational factor that influences how students engage with, persist in, and perform in mathematics learning (Schiefele, 1991; Harackiewicz & Hulleman, 2010). According to Hidi and Renninger's (2006) four-phase model, interest evolves through triggered situational interest to well-developed individual interest. Students with high interest are more likely to participate actively in mathematical tasks, enjoy problem-solving, and pursue mathematics-related careers (Grigg et al., 2018; Wong & Wong, 2019). On the other hand, lack of interest is a major predictor of underachievement and math anxiety (Ukobizaba et al., 2021; Abid & Noori, 2023).

Several studies have explored factors that influence mathematical interest, including teacher behavior (Aguilar, 2021), gender and socio-cultural expectations (Bala, 2023), perceived relevance (Leyva et al., 2022), and classroom practices (Amarlal et al., 2023). However, much of this research has focused on urban or high-performing school settings. There remains a dearth of contextual studies from semi-urban and rural areas, where students face unique infrastructural, pedagogical, and socio-emotional challenges (Das & Kapoor, 2025).

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This study is particularly relevant in view of findings that cognitive curiosity about mathematical content often does not translate into behavioral engagement such as homework completion or participation in extracurricular math activities (Anigbo, 2016; Chand et al., 2021). Understanding the multi-dimensional nature of interest—spanning emotional, cognitive, behavioral, and co-curricular domains—can offer nuanced insights for pedagogical intervention (Arthur et al., 2022; Zain & Rahayu, 2023).

This study contributes to the understanding of student interest in mathematics in a relatively unexplored region of India. By using a validated scale to measure interest across four dimensions—behavioral, cognitive, emotional, and extracurricular participation—the study offers comprehensive insights into how interest manifests among middle stage students (Janakiraman & Stanley, 2018; Kleespies et al., 2024). It further examines demographic disparities, thus equipping educators and policymakers with evidence-based data to promote inclusive and interest-driven mathematics instruction. As student interest has been shown to mediate achievement, motivation, and long-term academic choices (Boadu & Boateng, 2024; Geng et al., 2024), the findings hold practical implications for curriculum planning, classroom practices, and teacher training.

Review of Literature

Interest in mathematics is a vital factor of students' motivation that influences their learning engagement, performance, and long-term academic career journey. Grigg et al. (2018), adopting a social cognitive perspective, emphasized that mathematical interest is closely connected to students' self-efficacy and future aspiration. Research by Ufer et al. (2017) further pointed out that students' interest varies based on the context and understanding of mathematics across different domains.

Middle-stage students i.e., learners of grade 6 to 8, depending on instructional approaches and classroom context, often exhibit varying interest levels (Høgheim & Reber, 2015; Şen & Koyunlu Ünlü, 2020). The declining interest in mathematics during the middle years often results in decreased participation in higher-level mathematics and careers in STEM field (Ryan et al., 2022; Leyva et al., 2022). Leyva et al. (2022) highlighted that students' perception of the relevance of mathematics to real-life and future aspirations significantly shapes their interest.

It is evident from the reviewed literature that a range of factors that influence students' interest in mathematics. Zain and Rahayu (2023) reported several reasons of low interest in mathematics, including monotonous teaching styles and lack of contextual relevance. Technology-driven interventions have been found to positively affect students' interest and

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performance in mathematics (Wong & Wong, 2019; Yeh et al., 2019). Stoyanova et al. (2018) found that gamified learning strategies, integrated with students' learning styles, can enhance interest and reduce anxiety in mathematics classrooms.

Abid and Noori (2023) highlighted that effective instructional practices, teacher encouragement, curriculum design, and school environment are some of the factors that influence students' interest in mathematics. Amarlal et al. (2023) found that emotional engagement, student motivation, and positive classroom environment are the contributing factors for maintaining interest in mathematics. Arthur et al. (2022) reported that the integrating the history of mathematics and its evolution, and peer learning contributed to enhancing students' interest.

Connecting mathematics lessons to real-life contexts, providing choice and personalization in mathematical problems are found to be instrumental in student engagement and increasing interest (Høgheim & Reber, 2015; Rellensmann & Schukajlow, 2017). Azmidar et al. (2017) and D'Mellow (2025) emphasized the importance of interactive and student-centered pedagogies in sustaining mathematical interest over time. Pathuddin et al. (2025), Zheng et al. (2025), and Boadu and Boateng (2024) found that time management, resilience, and self-control significantly affect students' mathematics interest and performance.

Literature show mixed findings regarding the influence of gender on interest in mathematics. Bala (2023) and Sharma (2014) found no significant difference in mathematical interest among high school and middle school male and female students, respectively. But a slightly higher interest among male students was reported by Anigbo (2016), attributing it to socio-cultural beliefs that portray mathematics as more suitable for boys.

Şen and Koyunlu Ünlü (2020) reported that urban students exhibit higher interest in mathematics compared to the students of rural area, due to availability of better infrastructure and resources. Roche et al. (2021) found similar results stating that resourceful learning environments promote low-achieving learners' interest and engagement in marginalized rural settings.

Ubebe et al. (2024) found that private school students often report higher levels of interest, possibly due to smaller class sizes, more dynamic teaching methods, and greater parental support. Kihwele and Mkomwa (2023) showed that targeted interventions such as the "King and Queen of Mathematics" competition can foster significant interest even in government schools, indicating the potential for institutional change.

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Literature Gap and Need for the Present Study

While existing literature has extensively explored existing status and various factors influencing students' interest in mathematics, there exists a observable gap in region-specific investigations—particularly within the Indian context and at the middle stage education. Limited research has explored the interplay of gender (boys vs. girls), school location (rural vs. urban), and school type (government vs. private) in shaping mathematical interest, especially in Bargarh district of Odisha, demanding a region-specific or localized investigation to understand how these demographic and institutional variables influence students' interest in mathematics. The present study, therefore, aims to address the following problem: What is the current level of interest in mathematics among middle stage students in the Bargarh district of Odisha, and how do demographic variables such as gender, location, and school type influence it?—thereby contributing to more evidence-based pedagogical and policy interventions at the grassroots level.

Objectives of the Study

To answer the above question, the study was designed with the following objectives:

1. To determine the overall level of interest in mathematics among middle stage students.
2. To analyze different aspects of students' interest in mathematics.
3. To examine differences in students' interest based on:
   a. Gender (male vs. female),
   b. Location (urban vs. rural),
   c. Type of school (govt. vs. private).

Hypotheses of the Study

Based on the objectives, the following null hypotheses were formulated:

- H_{01}: There is no significant difference in students' interest in mathematics with respect to gender.
- H_{02}: There is no significant difference in students' interest in mathematics with respect to location.
- H_{03}: There is no significant difference in students' interest in mathematics with respect to type of school.

Methodology

This study employed a descriptive survey design to examine the level of students' interest in mathematics and to explore gender–, location–, and school–type–based differences in interest.

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Sample and Sampling Technique

The sample comprised 352 students from eight schools having class VI to class VIII, located in rural and urban areas of Bargarh Block, Bargarh district, Odisha. The schools were selected using a simple random sampling technique.

Tool used for Data Collection

Data were collected using the Mathematics Interest Scale, developed and validated by the researchers for this study. Initially comprising 35 items, the scale was refined based on expert validation, resulting in the deletion of 8 items. A pre-tryout was conducted with 10 students to ensure clarity and readability of items. Following modifications, a pilot test was administered to a sample of 50 students, and item analysis was performed. Items with an inter-item correlation of ≥ 0.30 were retained, resulting in a final scale of 20 items, grouped into four dimensions:

1. Behavioral Engagement in Homework and Assignments,
2. Cognitive Engagement with Mathematical Content,
3. Emotional Engagement and Enjoyment in Mathematics,
4. Participation in Math-related Extracurricular Activities.

The scale employed a three-point Likert format: Agree (3), Undecided (2), and Disagree (1), with all items positively worded. The reliability of the final scale was established through Cronbach's alpha, which yielded a coefficient of 0.803, indicating good internal consistency.

Data Collection Procedure

The finalized scale was administered during school hours with prior permission from school authorities and informed consent from participants. Although the tool was administered to all the students present on the day of data collection (around 400), the forms with complete responses (=352) were considered for final analysis.

Statistical Techniques used for Data Analysis

The collected data were analyzed using descriptive statistics (mean, standard deviation, range) to assess the overall level of interest, and an independent samples t-test was conducted to examine statistical differences in interest levels across gender, location, and type of schools.

Results

The analysis aimed to provide a comprehensive understanding of learners' interest in mathematics, while also examining the significant difference in the interest score across gender, location, and type of schools.

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Table 1: Students' Interest in Mathematics

SL	Statements	Mean	SD
01	I find mathematics topics fascinating and engaging.	2.69	0.67
02	I am enthusiastic about tackling mathematics homework assignments.	1.72	0.93
03	I am eager to demonstrate my mathematics skills during examinations.	1.98	0.94
04	I enjoy participating in mathematics clubs or teams.	1.84	0.94
05	I enjoy learning new mathematical concepts.	2.24	0.92
06	I find satisfaction in solving mathematics problems for homework.	2.03	0.93
07	I look forward to mathematics examinations as a chance to show what I've learned.	2.15	0.91
08	I am interested to take part in mathematics competitions.	1.98	0.95
09	I am excited to discuss mathematics related ideas with others.	2.13	0.92
10	I enjoy working on challenging math homework tasks.	1.95	0.94
11	I feel excited about preparing for math examinations.	2.11	0.92
12	I look forward to mathematics related extracurricular events.	2.02	0.95
13	I look forward to math lessons in class.	2.04	0.93
14	I feel motivated to complete my mathematics homework on time.	2.13	0.93
15	I take pleasure in reviewing for mathematics examinations.	2.16	0.91
16	I find it exciting to work on mathematics projects or presentations.	1.99	0.95
17	I often seek out additional mathematics resources for fun.	2.02	0.93
18	I often experiment with different methods to solve mathematics homework problems.	2.03	0.94
19	I find mathematics examinations to be a stimulating challenge.	2.04	0.92
20	I feel motivated to engage in mathematics related co-curricular activities outside of class.	1.99	0.95
	Overall	2.06	0.92

Table 1 presents the mean score and standard deviation of students' responses to statements in the tool measuring their interest in mathematics. The overall mean score was found to be 2.06 (SD = 0.92), demonstrating a moderate level of interest among middle-stage students within the studied population.

The highest mean score was observed for the statement – *"I find mathematics topics fascinating and engaging"* (M = 2.69, SD = 0.67), indicating that learners often find mathematical content intellectually appealing. On the other hand, the lowest mean was reported for the statement – *"I am enthusiastic about tackling mathematics homework assignments"* (M = 1.72, SD = 0.93), indicating lower motivation for completing mathematics homework.

Statements under the aspect – enjoyment and emotional engagement in mathematics (e.g., "*I look forward to mathematics examinations*" or "*I enjoy learning new mathematical*

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concepts") exhibit moderate agreement, with mean values ranging from 2.03 to 2.24. Statements regarding extracurricular involvement (e.g., "*I enjoy participating in mathematics clubs*" and "*I am interested to take part in mathematics competitions*") yielded lower scores (M < 2.00), indicating relatively limited interest in mathematics related activities outside the classroom.

These findings suggest that while students show some interest or enthusiasm for learning mathematical concepts, their engagement decreases in completion of homework, and/or participating in competitions, or extracurricular activities.

Table 2: Aspects of students' perception and distribution of items with score in each

Aspects of Interest in Mathematics	Item No.	Mean
Behavioral Engagement in Homework and Assignments	2, 6, 10, 14, 18	1.97
Cognitive Engagement with Mathematical Content	1, 5, 9, 13, 17	2.22
Emotional Engagement and Enjoyment in Mathematics	3, 7, 11, 15, 19	2.09
Participation in Math-related Extra- curricular Activities	4, 8, 12, 16, 20	1.96

Table 2 categorizes the 20 items into four key aspects of interest in mathematics: behavioral engagement, cognitive engagement, emotional engagement, and extracurricular participation. *Cognitive Engagement with Mathematical Content* has the highest average score (M = 2.22), indicating that students tend to intellectually appreciate and show curiosity about math concepts. *Emotional Engagement and Enjoyment* followed (M = 2.09), suggesting that students have a generally positive emotional attitude toward mathematics. *Behavioral Engagement in Homework and Assignments* (M = 1.97) and *Participation in Math-related Extracurricular Activities* (M = 1.96) had the lowest means, showing relatively less involvement in practical and co-curricular tasks.

These results suggest a cognitive-emotional interest in mathematics that does not consistently translate into behaviors like regular homework completion or extracurricular participation.

Table 3: Descriptive Statistics of Students' Interest in Mathematics

N	Mean	SD	Min	Max
352	41.236	6.154	28	58

Table 3 provides a summary of overall scores on the mathematics interest scale. The sample size was N = 352, with a mean score of 41.24 (SD = 6.15), and scores ranging from 28 to 58. The data reflects a moderate level of overall interest in mathematics, consistent with findings in Table 1. The range also shows variability in individual student interest levels.

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Table 4: Level of Students' Interest in Mathematics

Level	Range	N	%
Low	28 to 34	47	13.35
Moderate	35 to 47	248	70.45
High	48 to 58	57	16.19

Table 4 shows the level of students' interest in mathematics. Students' scores on the interest scale were categorized into three levels: low, moderate, and high on the basis of M±SD formula. The majority of students (n = 248, 70.45%) demonstrated a moderate level of interest in mathematics. A smaller proportion (n = 57, 16.19%) exhibited a high level of interest, while a minority of students (n = 47, 13.35%) have a low level of interest in the subject. These findings indicate that a general but not deeply enthusiastic interest in mathematics. Only a small proportion showed high interest, indicating room for interventions to increase positive attitudes and engagement.

Independent samples t-test was conducted to examine whether there was a statistically significant difference in mathematics interest scores with respect to students gender (male vs. female), location (urban vs. rural) and type of schools (government vs. private), whose results are illustrated in Table 5 to 7, respectively.

Table 5: Comparison of Interest in Mathematics with respect to Gender

Gender	N	M	SD	t	Sig.
Male	168	41.97	6.36	2.151	0.032
Female	184	40.57	5.89		

Table 5 indicates that male students (n = 168, M = 41.97, SD = 6.36) reported slightly higher interest scores than female students (n = 184, M = 40.57, SD = 5.898). This difference was found to be statistically significant, $t(350) = 2.151$, $p = 0.032$. Based on these results, the null hypothesis stating that there is no significant difference in interest in mathematics between male and female students is rejected. The findings suggest that gender does have a statistically significant influence on students' interest in mathematics, with male students showing slightly greater interest than their female counterparts.

Table 6: Comparison of Interest in Mathematics with respect to Location

Location	N	M	SD	t	Sig.
Urban	183	41.37	5.59	0.413	0.680
Rural	169	41.09	6.73		

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Table 6 indicates that urban students (n = 183, M = 41.37, SD = 5.59) reported slightly higher interest scores than rural students (n = 169, M = 41.09, SD = 6.726). However, this difference was not statistically significant, $t(350) = 0.413$, $p = 0.680$. Therefore, the null hypothesis stating that there is no significant difference in interest in mathematics between urban and rural students is retained. The findings suggest that location of the students does not play a statistically significant role in influencing students' interest in mathematics within the studied population.

Table 7: Comparison of Interest in Mathematics with respect to Type of School

School Type	N	M	SD	t	Sig.
Private	164	41.43	5.35	0.543	0.587
Govt.	188	41.07	6.79		

Table 7 shows that private school students (n = 164, M = 41.43, SD = 5.349) reported slightly higher scores compared to government school students (n = 188, M = 41.07, SD = 6.789). However, the difference was not statistically significant, $t(350) = 0.543$, $p = 0.587$. Therefore, the null hypothesis is retained, suggesting that type of school does not significantly affect students' interest in mathematics within the studied group.

Discussion

The present study investigated the level of interest in mathematics among middle stage students in Bargarh district and compared the mean scores across the demographic variables—gender, location, and type of school. The findings revealed that while the overall interest in mathematics among students was moderate, distinct patterns emerged across different dimensions of interest and demographic groups.

Firstly, the moderate overall mean score (M = 2.06) indicates that students neither strongly enjoy nor completely disengage from mathematics. This aligns with the findings of Şen and Koyunlu Ünlü (2020), who observed similar patterns of moderate interest among Grades 7 and 8 students. In the present study, cognitive engagement—reflecting students' intellectual curiosity and appreciation for mathematical concepts—was the highest among the four dimensions, while behavioural engagement in homework and participation in extracurricular activities were the lowest. This suggests a disconnect between students' intellectual liking for the subject and their practical engagement, that aligns with the findings of Chand et al. (2021) and Amarlal et al. (2023). These results highlight the need for more engaging homework practices and meaningful extracurricular activities to bridge this gap.

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The significant gender difference observed in interest level, with boys scoring slightly higher than female students, was supported by the findings from Sharma (2014) and Bala (2023), who also noted higher mathematical interest among boys. Possible explanations include gendered expectations, self-confidence levels, and variations in classroom participation, as discussed by Aguilar (2021). This suggests that gender-sensitive pedagogical strategies are essential to support female students' sustained interest in mathematics, particularly through confidence-building classroom interactions and inclusive participation structures.

On the other hand, the study found no significant difference in mathematical interest with respect to location (urban vs. rural). Although mean scores showed a marginal advantage for urban students, the difference was statistically insignificant. This contradicts earlier assertions by Anigbo (2016) and ASER Centre (2017, 2023), which reported location-based disparities in engagement and outcomes. A possible explanation for the lack of significance in the present context may be the relatively comparable facilities and teacher quality in selected schools within the Bargarh Block, suggesting some degree of parity in educational access. Nonetheless, targeted interventions are still warranted to ensure that rural students receive equal opportunities for enriched mathematics learning.

Similarly, no significant difference was found between government and private school students in terms of interest levels. This challenges conventional perceptions, supported by D'Mellow (2025), that private school students generally demonstrate higher engagement due to better resources. The findings of the current study suggest that when instructional quality is relatively uniform, institutional affiliation may not necessarily determine student interest. This is supported by Zain and Rahayu's (2023) assertion that the nature of pedagogy and teacher-student interactions are significant than school type in shaping interest.

The findings support the notion that interest in mathematics is a multifaceted construct influenced by both personal and contextual factors (Arthur et al., 2022; Abid & Noori, 2023). While demographic variables like gender show some influence, cognitive-emotional engagement plays a larger role, reinforcing the importance of designing curricula and pedagogies that nurture curiosity, enjoyment, and purposeful participation across all student groups.

Implications of the Study

The findings of this study have significant implications for mathematics education at the middle stage, particularly in semi-urban and rural contexts such as Bargarh district. The moderate level of overall interest in mathematics and the discrepancies among its dimensions

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call for targeted and multi-pronged interventions from educators, curriculum developers, and policymakers.

1. Designing Pedagogy That Promotes Cognitive and Emotional Engagement

Given that students displayed higher cognitive interest but lower behavioural and extracurricular engagement, teachers should capitalize on students' intellectual curiosity by using strategies that evoke positive emotions and foster deeper understanding. Approaches such as inquiry-based learning, real-life problem solving, and use of mathematical games or storytelling, can bridge the gap between intellectual appeal and practical involvement (Høgheim & Reber, 2015; Fitzmaurice et al., 2021). Promoting emotional engagement through personalized, enjoyable, and contextually relevant examples may further enhance motivation and sustained interest (Renninger & Hidi, 2021).

2. Gender-Sensitive Teaching Approaches

The study found that male students demonstrated significantly higher interest in mathematics compared to female students. This directs to the need for gender-responsive teaching strategies that foster confidence and reduce anxiety among girls. Providing equitable opportunities for participation, offering positive reinforcement, and showcasing female role models in mathematics can help challenge stereotypes and nurture mathematical self-efficacy among girls (Aguilar, 2021; Bala, 2023). Teachers should be trained to recognize unconscious gender biases and adopt inclusive pedagogical practices.

3. Strengthening Homework Practices and Extracurricular Opportunities

Low levels of behavioural engagement with homework and minimal participation in math-related extracurricular activities indicate the need to rethink how such tasks are structured. Homework assignments should move beyond routine drill and be designed to stimulate curiosity, creativity, and independent thinking (Amarlal et al., 2023). Schools should also create supportive environments for math clubs, competitions, and project-based activities, especially in rural and government schools, to encourage active student participation and peer-assisted learning (Arthur et al., 2022; Kihwele & Mkomwa, 2023).

4. Focusing on Instructional Quality over Institutional Labels

The absence of significant differences in students' interest based on location and school type suggests that when teaching quality and resources are comparable, demographic factors may play a lesser role. Therefore, efforts should focus on strengthening instructional quality across all schools through continuous professional development, mentoring, and collaborative teaching practices (Zain & Rahayu, 2023; D'Mellow, 2025). School leaders should foster a

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culture of reflective practice and innovation to make mathematics learning more engaging and effective.

5. Policy and Curriculum-Level Interventions

Educational policies should recognize the nuanced nature of mathematical interest and integrate interest development as a curricular goal. The National Education Policy (Ministry of Education, 2020) and NCFSE (NCERT, 2023) emphasize joyful and competency-based learning, and this study reinforces the urgency of translating these aims into classroom practices. Curriculum frameworks should encourage interdisciplinary and real-world applications of mathematics that resonate with students' lives and aspirations (Leyva et al., 2022; Boadu & Boateng, 2024).

Conclusion

This study explored the level of interest in mathematics among middle stage students in Bargarh district, Odisha, and examined the influence of gender, location, and school type. The findings revealed a moderate overall interest, with students showing stronger cognitive engagement but lower behavioural and extracurricular involvement. While gender emerged as a significant factor—with boys expressing higher interest—location and school type did not significantly influence interest levels. These results underscore the multifaceted nature of mathematical interest and highlight the importance of gender-sensitive teaching, engaging homework practices, and enriched learning environments. The study affirms that student interest is shaped more by instructional quality and pedagogical relevance than by demographic characteristics alone. Future educational efforts should focus on designing classroom experiences that nurture curiosity, motivation, and meaningful participation in mathematics.

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