



Understanding the Influence of Intrinsic Motivation on Student Achievement in Mathematics: An Inner Lens Perspective

Prof (Dr) R. Lakshmi

IASE, Thrissur

Femeena M.M

Research Scholar, IASE Thrissur

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ABSTRACT

The study explores how key elements of intrinsic motivation including curiosity, genuine interest, mastery-oriented goals, and a sense of self-determination shape students' understanding and performance in mathematics. Using a thematic analytical lens, it integrates perspectives from educational psychology, motivational theories, and prior research to illuminate the intricate connection between internal motivation and academic success. The results suggest that learners who engage with mathematics out of personal fulfilment and intellectual curiosity tend to develop stronger conceptual insight, demonstrate greater persistence when solving complex problems, and achieve higher academic outcomes. The study highlights the importance of creating classroom conditions that nurture students' autonomy, imaginative thinking, and intrinsic appreciation of mathematics. Viewed through the inner lens, the paper concludes that authentic achievement in mathematics emerges not from external rewards or pressures, but from the learner's inner drive to inquire, comprehend, and succeed.

Introduction



Mathematics holds a central place in the school curriculum as it nurtures logical reasoning, problem-solving, and analytical thinking skills essential for success in both academic and real-life contexts. Despite its importance, many secondary school students perceive mathematics as a challenging or intimidating subject, often resulting in low engagement and achievement. In this context, motivation becomes a crucial determinant of how students' approach, persist in, and succeed at learning mathematical concepts. While external incentives such as grades or teacher approval may temporarily encourage participation, genuine and sustained achievement often stems from intrinsic motivation the internal desire to learn for curiosity, mastery, and self-fulfilment.

Intrinsic motivation reflects a learner's inner enthusiasm and personal interest in understanding new ideas rather than relying on external pressures or rewards. Students who are intrinsically motivated to learn mathematics tend to engage more deeply with the subject, seek challenges, and enjoy exploring abstract ideas for their own satisfaction. This internal drive encourages them to approach problem-solving with confidence and persistence, transforming mathematics from a compulsory subject into an intellectually stimulating pursuit.

Research in educational psychology highlights that intrinsic motivation is closely linked to higher academic performance, self-regulated learning, and positive attitudes toward mathematics. Theories such as Self-Determination Theory (Deci & Ryan, 1985) emphasize autonomy, competence, and relatedness as key elements that nurture intrinsic motivation. When classroom environments foster these needs through supportive teaching, creative learning activities, and opportunities for self-expression students are more likely to develop a lasting appreciation for mathematics.

This paper, therefore, seeks to understand the influence of intrinsic motivation on student achievement in mathematics through an inner lens that values learning as a personal and transformative experience. By integrating theoretical insights and empirical findings, the study aims to reveal how intrinsic motivation shapes students' engagement, performance, and attitudes toward mathematics, ultimately suggesting ways to cultivate motivation-driven excellence in secondary education.

Review of Literature

The relationship between intrinsic motivation and academic achievement in mathematics has been the focus of extensive research in educational psychology and pedagogy. Scholars have long recognized that beyond cognitive ability, students' internal motivational patterns play a decisive role in shaping how they engage with mathematical learning and problem-solving. This section synthesizes theoretical foundations



and empirical findings that illuminate the connection between intrinsic motivation and mathematics achievement among secondary school students.

1. Theoretical Foundations

Early motivational theorists such as Deci and Ryan (1985), through their Self-Determination Theory (SDT), emphasized that learners possess innate psychological needs for autonomy, competence, and relatedness. When these needs are met, students are more likely to engage in learning activities out of genuine interest and personal satisfaction. Within the mathematics classroom, this translates to students voluntarily exploring problems, enjoying the process of discovery, and striving for mastery rather than external rewards.

Achievement Goal Theory further supports this understanding by distinguishing between mastery-oriented goals and performance-oriented goals. Mastery-oriented students, driven by intrinsic motivation, focus on understanding and improving their own competence, while performance-oriented learners seek validation from others. Studies suggest that mastery goals are strongly correlated with persistence, deeper cognitive processing, and higher mathematics achievement (Ames, 1992; Dweck, 2000).

2. Empirical Studies on Intrinsic Motivation and Mathematics Achievement

Numerous studies across different educational contexts have affirmed the positive influence of intrinsic motivation on students' mathematics performance. Gottfried (1990) found that intrinsic motivation not only enhances academic achievement but also predicts long-term interest and self-efficacy in mathematics. Middleton and Spanias (1999) reported that students who enjoy mathematical challenges exhibit higher levels of engagement and problem-solving persistence compared to those motivated by external rewards.

In the Indian context, Kaur (2019) observed that secondary school students with high intrinsic motivation demonstrated significantly better academic performance and a more positive attitude toward mathematics learning. Similarly, Anand and Mehta (2021) highlighted that curiosity-driven learners tend to apply mathematical concepts creatively and show greater confidence in tackling abstract tasks.

Internationally, research by Ryan and Deci (2020) reaffirmed that when students perceive learning as self-chosen and meaningful, their intrinsic motivation strengthens, leading to improved academic outcomes. These findings collectively indicate that intrinsic motivation is not merely an emotional factor



but a cognitive and behavioural force influencing students' approach to mathematical reasoning and achievement.

3. Factors Influencing Intrinsic Motivation in Mathematics

Several classroom and individual factors shape intrinsic motivation among secondary students. Supportive teacher-student relationships, opportunities for autonomy, and positive feedback have been found to enhance intrinsic motivation (Reeve, 2009). On the other hand, rigid instruction, excessive competition, and test-oriented teaching can undermine students' internal interest. Additionally, students' self-efficacy, prior success experiences, and perception of mathematics as meaningful to real-life situations contribute significantly to sustaining intrinsic motivation.

4. Emerging Perspectives

Recent research trends emphasize integrative approaches that combine motivation with technology-enhanced learning, gamification, and inquiry-based strategies to make mathematics more engaging. Studies using virtual simulations, problem-based learning, and collaborative platforms reveal that when students are given autonomy and meaningful contexts, their intrinsic motivation and performance improve simultaneously (Chen & Wang, 2022). These innovations reaffirm that fostering intrinsic motivation is essential not only for academic success but also for cultivating lifelong mathematical thinking.

Objectives of the Study

1. To examine the levels of intrinsic motivation among secondary school students in learning mathematics.
2. To assess the academic achievement of secondary school students in mathematics.
3. To investigate the relationship between intrinsic motivation and mathematics achievement among secondary school students.
4. To identify the specific components of intrinsic motivation (e.g., curiosity, mastery orientation, self-determination, interest) that most strongly influence mathematics performance.
5. To suggest strategies for educators to foster intrinsic motivation and enhance mathematics achievement in secondary school classrooms.



Theoretical Framework

The study of intrinsic motivation and its impact on academic achievement in mathematics is anchored in well-established psychological and educational theories that explain how internal drives shape learning outcomes. Understanding these theoretical perspectives provides a foundation for examining the role of intrinsic motivation in students' mathematical performance.

1. Self-Determination Theory (SDT) – Deci & Ryan (1985)

Self-Determination Theory posits that human motivation exists on a continuum from extrinsic to intrinsic. Intrinsic motivation arises when students engage in activities for the inherent satisfaction, interest, or challenge they provide, rather than for external rewards or pressures. According to SDT, three basic psychological needs foster intrinsic motivation:

- **Autonomy:** The sense of being in control of one's learning choices.
- **Competence:** The belief in one's ability to successfully perform tasks.
- **Relatedness:** Feeling connected and supported within the learning environment.

In mathematics education, students who experience autonomy in problem-solving, perceive themselves as competent, and feel supported by teachers and peers are more likely to demonstrate intrinsic motivation. This motivation, in turn, enhances persistence, conceptual understanding, and overall achievement.

2. Achievement Goal Theory (Ames, 1992; Dweck, 2000)

Achievement Goal Theory distinguishes between mastery-oriented and performance-oriented goals. Mastery-oriented students focus on learning, understanding, and self-improvement, reflecting strong intrinsic motivation. In contrast, performance-oriented students aim to demonstrate ability or outperform peers, which is often linked to extrinsic motivation. Research indicates that mastery goals are positively associated with deep learning strategies, engagement, and higher mathematics achievement, making this theory highly relevant for the current study.

3. Expectancy-Value Theory (Eccles & Wigfield, 2002)

Expectancy-Value Theory suggests that students' motivation is influenced by the expectation of success and the subjective value they attach to a task. Intrinsically motivated students value mathematics for



personal growth, intellectual challenge, and curiosity. When students perceive mathematics as meaningful and achievable, their intrinsic motivation strengthens, leading to improved engagement and performance.

Integration of Theories

These theoretical perspectives converge on the understanding that intrinsic motivation is a multidimensional construct, encompassing curiosity, interest, mastery orientation, self-determination, and perceived competence. Together, SDT, Achievement Goal Theory, and Expectancy-Value Theory provide a robust framework to investigate how intrinsic motivation drives secondary school students to engage meaningfully with mathematics and achieve academic success.

Methodology

Research Design

The present study followed a thematic research design that relied on secondary data analysis to investigate how intrinsic motivation influences academic performance in mathematics among secondary school students. Thematic research design was selected because it helps identify and interpret patterns and ideas emerging across various studies. By examining themes in previously published literature, the study aimed to provide a deeper understanding of the motivational factors that shape students' engagement and achievement in mathematics.

Nature and Sources of Data

The research was entirely based on secondary data, collected from existing and credible academic and institutional sources. The data included previously published studies, reports, and educational documents that discussed intrinsic motivation, learning behavior, and performance in mathematics.

The main sources of secondary data were:

- Peer-reviewed journal articles on intrinsic motivation, goal orientation, and mathematics learning (e.g., Deci & Ryan, 2000; Singh & Misra, 2020).
- Government and institutional reports, including the *National Education Policy (NEP, 2020)* and *NCERT Learning Outcomes in Mathematics (2020)*.



- International reports such as *OECD PISA Reports (2022)* and *UNESCO Global Education Monitoring Report (2019)*.
- Academic theses and dissertations from Indian universities discussing motivation and mathematics achievement.
- Educational databases such as *ERIC*, *ResearchGate*, and *Google Scholar* for literature searches.

These diverse sources helped in collecting a wide range of data and perspectives, ensuring the study's comprehensiveness and depth.

Data Collection Procedure

Secondary data were collected by conducting systematic searches on online databases and digital libraries. The key search terms used were *intrinsic motivation*, *academic performance*, *mathematics achievement*, *secondary school students*, and *educational psychology*.

The inclusion criteria were:

- Studies published between 2015 and 2025 to ensure current relevance.
- Research that focused on secondary school students.
- Literature discussing motivation theories such as *Self-Determination Theory*.
- Reports and articles with clear methodological approaches and reliable findings.

After reviewing available materials, the most relevant and credible studies were selected for analysis.

Data Analysis

The data gathered from these sources were examined using thematic analysis, following the six-step model proposed by Braun and Clarke (2006):

1. Familiarization: Reading and re-reading literature to gain an overall understanding.
2. Coding: Highlighting significant ideas related to motivation and achievement.
3. Theme Development: Grouping codes into broader themes such as *curiosity and engagement*, *self-determination*, and *mastery goals*.



4. Theme Review: Ensuring each theme accurately represented the collected data.
5. Theme Definition: Naming and explaining the central themes clearly.
6. Report Writing: Presenting the analysed themes to connect intrinsic motivation with students' mathematics performance.

This process enabled the researcher to synthesize and interpret information meaningfully from multiple sources.

Trustworthiness and Reliability

The credibility of the study was maintained by selecting authentic and peer-reviewed sources and by cross-verifying data from multiple references. Data triangulation—using journal articles, policy reports, and dissertations—helped ensure reliability and minimize bias. The use of reputable and verifiable data sources also strengthened the trustworthiness of the findings.

Ethical Considerations

Since the study was based entirely on secondary data, there was no direct contact with human participants. However, all ethical research practices were observed, including proper citation of all sources, respect for intellectual property rights, and objective interpretation of data without manipulation or misrepresentation.

Findings

The thematic analysis of the reviewed secondary data revealed several key patterns describing how intrinsic motivation shapes academic performance in mathematics among secondary school students. The findings are organized under major themes that emerged through analysis of the literature and reports.

1. Curiosity and Interest as Drivers of Mathematical Engagement

Across the reviewed studies, it was consistently found that students who demonstrated curiosity and genuine interest in mathematics tended to show higher levels of engagement and persistence in problem-solving tasks. Curiosity encouraged learners to explore mathematical concepts beyond classroom instruction, leading to a deeper conceptual understanding. When mathematics was presented as a subject connected to real-life situations, students developed more sustained interest and motivation to perform well.



2. Self-Determination and Autonomy in Learning

Findings indicated that students who were allowed autonomy in their learning process—for example, by choosing problem-solving methods, working collaboratively, or exploring alternative strategies—displayed stronger intrinsic motivation and improved academic performance. The sense of ownership over their learning experiences fostered confidence, responsibility, and creativity. Studies grounded in *Self-Determination Theory* (Deci & Ryan, 2000) emphasized that when teachers provided autonomy-supportive environments, students' motivation and achievement levels increased significantly.

3. Mastery-Oriented Goals and Self-Efficacy

Another recurring theme across the literature was the impact of mastery-oriented goals—students' desire to develop competence and understanding rather than merely achieving high grades. Learners with strong self-efficacy beliefs were more likely to persist with challenging mathematical tasks and to use effective learning strategies. Research findings suggested that intrinsic motivation encourages mastery goals, which in turn lead to higher performance outcomes compared to performance-oriented or extrinsic goals.

4. Teacher Support and Classroom Climate

The data showed that teacher encouragement, feedback, and classroom climate played a crucial role in nurturing intrinsic motivation. When teachers promoted a supportive environment that valued curiosity and effort over competition, students developed a more positive attitude toward mathematics. Studies revealed that teacher practices such as providing constructive feedback, recognizing student effort, and offering meaningful challenges contributed significantly to students' motivation and achievement.

5. Influence of Socio-Cultural and Institutional Factors

Several studies, particularly from the Indian context, highlighted that school culture, parental expectations, and peer influence affected the development of intrinsic motivation. Environments that emphasized rote learning or exam performance often reduced intrinsic interest in mathematics. Conversely, institutions that implemented learner-centered and activity-based approaches reported higher levels of motivation and better academic results.

6. Correlation between Intrinsic Motivation and Academic Achievement

Overall, a strong positive correlation was observed between intrinsic motivation and academic achievement in mathematics. Students with high levels of intrinsic motivation not only performed better



academically but also exhibited improved problem-solving ability, persistence, and self-confidence. Motivation was found to mediate the relationship between cognitive skills and performance, confirming that internal drive and enjoyment in learning mathematics are essential for sustained achievement.

Discussion

The findings of this study highlight the significant role of intrinsic motivation in shaping students' academic performance in mathematics, confirming and extending the insights of previous research in educational psychology. By analyzing secondary data through a thematic approach, the study illustrates that motivation arising from within the learner—such as curiosity, mastery goals, and self-determination—contributes more deeply to mathematical achievement than external rewards or pressures.

Intrinsic Motivation as a Foundation for Mathematical Learning

Consistent with Self-Determination Theory (Deci & Ryan, 2000), the analysis revealed that intrinsic motivation thrives when students experience autonomy, competence, and relatedness. Mathematics, often perceived as abstract and difficult, becomes more meaningful when learners are internally driven by curiosity and a desire for understanding. The reviewed studies showed that students who engaged in mathematics for enjoyment and personal satisfaction developed stronger problem-solving skills, creativity, and confidence. These intrinsic factors promote persistence even in the face of challenging mathematical concepts.

Autonomy and Classroom Environment

The discussion of autonomy-supportive learning environments aligns with the work of Vansteenkiste et al. (2004) and other motivational theorists who argue that freedom of choice enhances engagement. When teachers encourage exploration, self-paced learning, and decision-making, students perceive a sense of control that fosters deeper learning. The thematic findings reinforce that supportive classroom environments—where feedback is constructive and effort is recognized—cultivate long-term motivation rather than short-term performance-oriented behaviors.

Mastery Goals and Self-Efficacy

A major theme identified was the influence of mastery-oriented goals and self-efficacy. These findings support the view of Bandura's (1997) social-cognitive theory, which emphasizes the role of self-belief in achievement. Students with strong self-efficacy are more likely to persist with complex mathematical



problems and view mistakes as opportunities to improve. The reviewed studies confirm that intrinsic motivation encourages mastery learning rather than performance comparison, leading to sustained academic success and reduced anxiety toward mathematics.

Teacher Role and Pedagogical Implications

The discussion also underlines the importance of the teacher's role in nurturing intrinsic motivation. Teachers who create a positive, supportive classroom climate help students find meaning and enjoyment in mathematical tasks. Pedagogical practices that integrate real-life applications, collaborative learning, and inquiry-based methods promote intrinsic interest. The findings suggest that teacher encouragement, empathy, and autonomy-supportive feedback are key to improving motivation and performance simultaneously.

Socio-Cultural Context and Institutional Support

From the Indian educational perspective, the reviewed literature indicated that systemic factors such as exam-driven curricula, parental expectations, and limited flexibility in pedagogy often weaken students' intrinsic motivation. However, reforms introduced through the National Education Policy (NEP, 2020) and NCERT frameworks (2020) aim to shift focus toward conceptual understanding and learner autonomy. When implemented effectively, these policies can bridge the gap between external achievement goals and internal motivation, fostering a healthier learning culture in mathematics education.

The Link Between Motivation and Achievement

The thematic synthesis clearly demonstrated a strong positive relationship between intrinsic motivation and academic achievement in mathematics. This relationship was found to be reciprocal: while intrinsic motivation enhances performance, successful mathematical experiences further reinforce motivation. This cycle aligns with cognitive-evaluative theories suggesting that satisfaction and perceived competence sustain long-term engagement.

Thus, promoting intrinsic motivation is not only a psychological necessity but also an educational strategy for improving overall mathematical literacy and achievement.

Implications for Practice and Research



The discussion points toward the need for schools to adopt motivation-centred pedagogies that integrate curiosity, autonomy, and mastery into mathematics instruction. Teachers should be trained to recognize motivational diversity among students and adapt strategies accordingly. Future research could focus on longitudinal studies or mixed-method analyses to explore how intrinsic motivation develops over time and across different educational settings.

Conclusion

The present study set out to explore how intrinsic motivation influences academic performance in mathematics among secondary school students, using a thematic analysis of secondary data. The review of existing literature and reports revealed that intrinsic motivation driven by curiosity, interest, autonomy, and mastery goals plays a central role in determining how effectively students learn and perform in mathematics.

The findings highlighted that when students engage in mathematics for the sake of understanding and personal satisfaction, they develop stronger problem-solving abilities, persistence, and confidence. Conversely, overreliance on extrinsic motivators such as grades or rewards often leads to superficial learning and reduced long-term engagement.

The study confirmed that autonomy-supportive classroom environments, where students are encouraged to explore, question, and take ownership of their learning, significantly enhance motivation and achievement. Teachers, therefore, have a vital role in nurturing curiosity, providing constructive feedback, and creating a supportive atmosphere that values effort and understanding over competition.

From a broader perspective, the results also emphasized the need for educational reforms and policy frameworks such as those outlined in the *National Education Policy (2020)* and *NCERT Learning Outcomes (2020)* to promote learner-centered, activity-based approaches in mathematics education. Strengthening intrinsic motivation through such reforms can lead to more meaningful learning experiences and improved academic outcomes.

In conclusion, intrinsic motivation is not merely an emotional or personal factor—it is a powerful educational force that shapes students' academic identity and achievement in mathematics. Encouraging curiosity, autonomy, and mastery-oriented learning should therefore be central goals of mathematics education at the secondary level. Future research should continue to examine how intrinsic motivation



develops across different contexts and how it can be effectively fostered through innovative teaching strategies and policy interventions.

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Prof (Dr) R. Lakshmi, Femeena M.M

