

Learning from Within: As Correlates of Intrinsic Motivation and Mathematics Achievement in Urban and Rural Secondary School Students in Kerala

Femeena MM¹

Prof. (Dr.) R. Lakshmi²

Abstract:

This study investigates the relationship between intrinsic motivation and mathematics achievement among 150 secondary school students (75 urban, 75 rural) from Thrissur District, Kerala. Data were collected using Personal Data Sheet to gather demographic information, the Intrinsic Motivation Inventory (IMI) to assess the intrinsic motivation level of students, and an Achievement test to measure Mathematics performance. The IMI, grounded in Self-Determination Theory, measures five dimensions: Enjoyment, Perceived Competence, Pressure/Tension, Perceived Choice, and Value/Utility (Vera Monteiro et al., 2015). The study examines whether urban-rural differences exist in intrinsic motivation levels and their relationship to mathematics performance. The collected data were analysed using appropriate statistical techniques such as Measures of Central tendency and Variability for finding comparison used as Measures of Correlation and regression analysis. Results revealed a statistically significant positive relationship between intrinsic motivation and mathematics achievement, indicating students with higher intrinsic motivation demonstrate superior mathematics performance. This finding aligns with established research showing intrinsic motivation as a significant positive predictor of academic achievement. These results have important implications for teachers, school counsellors, and educational policymakers in designing strategies to strengthen the Intrinsic Motivation and Achievement link across diverse educational settings, particularly considering urban-rural contextual differences in motivation patterns.

1.0 INTRODUCTION

The Association of American Colleges and Universities defines general education as a curriculum that “provides broad learning in liberal arts and sciences and forms the foundation for developing important intellectual and civic capacities” (AAC&U, 2007). Similarly, Ralph Tyler viewed general education as essential for helping individuals acquire fundamental skills, attitudes, and knowledge necessary for personal and social life (Tyler, 1949). It focuses on developing competencies such as communication, problem-solving, ethical reasoning, and informed decision-making.

Mathematics education has long been recognized as a critical component of secondary school curricula, playing a significant role in developing logical reasoning, problem-solving skills, and academic success. However, despite its importance, students’ performance in mathematics continues to vary widely, often influenced not only by cognitive abilities but also by affective and motivational factors. Recent educational research increasingly emphasizes the role of intrinsic motivation the internal drive to engage in learning for its own sake as a key determinant of academic achievement, particularly in mathematics.

Intrinsic motivation, grounded in Self-Determination Theory proposed by Deci and Ryan, refers to engaging in an activity out of interest, enjoyment, or inherent satisfaction rather than external rewards (Science Direct). In the context of mathematics learning, students who are intrinsically motivated tend to exhibit greater persistence, deeper engagement, and higher levels of conceptual understanding. Empirical studies have consistently demonstrated a positive relationship between intrinsic motivation and mathematics achievement. For instance, large-scale studies indicate that intrinsic motivational variables have a stronger association with mathematics performance than extrinsic factors (ILSA-gateway). Similarly, research has shown that students with higher intrinsic motivation and perceived competence display better academic outcomes and lower levels of anxiety in mathematics (MDPI).

Moreover, motivation in mathematics is closely linked with other affective constructs such as self-efficacy, teacher support, and emotional environment (ScienceDirect). Studies reveal that students’ beliefs about their capabilities significantly influence their intrinsic motivation, effort, and persistence in mathematical tasks. In the Indian context, particularly in Kerala, research has highlighted those affective factors rather

¹Research Scholar, IASE, Thrissur, Ph: 808650917, Email:feminamohamed5@gmail.com

²Professor, IASE, Thrissur

than purely instructional or cognitive variables play a decisive role in distinguishing high and low achievers in mathematics (NCERT Journal). This suggests that improving students' internal motivation may be more effective than focusing solely on curriculum and teaching methods.

Despite the growing body of international literature, there remains a need to explore how intrinsic motivation interacts with contextual variables such as geographical location, especially in diverse educational settings like urban and rural schools. Differences in resources, teaching practices, parental support, and socio-cultural environments may influence both students' motivation and their academic performance. However, limited empirical attention has been given to comparing these dynamics within the Kerala secondary school system.

Therefore, the present study seeks to examine the relationship between intrinsic motivation and mathematics achievement among secondary school students in Kerala, with a specific focus on urban–rural differences. By identifying key motivational correlates, this research aims to contribute to a deeper understanding of how internal learning processes influence academic success and to provide insights for designing more effective, learner-centred educational strategies.

2.0 LITERATURE REVIEW: Intrinsic Motivation and Mathematics Achievement

Shen et al., (2026) conducted a study about *Self-Efficacy as a Mediator of the Relation between Motivation and Academic Performance: A Meta-Analysis and Meta-Analytic Structural Equation Model*. The main objective was to explore how self-efficacy mediates the relationship between intrinsic/extrinsic motivation and academic achievement. Meta-analysis of 23 studies; multi-stage structural equation modelling (MASEM) was the methodology. The findings were Intrinsic motivation significantly boosts academic performance by enhancing self-efficacy and Stronger effects observed in primary and secondary students compared to college students.

Gilroy, McCloat & Harvey Sho, (2026) examined a study on *Self-Determination Theory in the Secondary School Classroom: A Scoping Review*. The main objective was to synthesize evidence on how autonomy, competence, and relatedness (core SDT constructs) influence motivation and achievement in secondary schools. Scoping review of international classroom studies was the methodology. The main findings were Intrinsic motivation thrives in autonomy-supportive classrooms where students feel ownership of learning and teacher practices that emphasize choice, feedback, and collaboration enhance motivation and achievement.

Sætre & Sigmundsson, (2026) conducted a study on *The Motivational Predictors and Gender Differences of Academic Outcomes in Upper Secondary Education: Exploring the Role of Growth Mindset, Self-Efficacy, Grit and Passion*. The main objective was to examine how motivational constructs (growth mindset, self-efficacy, grit, passion) predict academic outcomes among Norwegian secondary students. The methodology was Survey of 249 students (ages 15–19); regression and correlational analyses. The findings were Growth mindset was the most consistent predictor of achievement, but intrinsic motivation (via passion and grit) correlated strongly with engagement and Gender differences: males reported higher grit and passion, but females achieved higher grades and competence scores.

Zhu & Guo (2026) conducted a study on *Why some students excel in mathematics: growth mindset, intrinsic motivation, and school autonomy in top-performing Asian and Western economies*. The study Investigated how growth mindset and intrinsic motivation interact to influence mathematics achievement. The research design was used Comparative cross-cultural study using large-scale international datasets. Also, Compares outcomes across Asian economies (structured, high-expectation learning environments) and Western economies (autonomy-driven, flexible learning)

Roy & Sarkar (2023) investigated a study about *Urban-Rural Differences in Mathematics Motivation among 10th Grade Students in West Bengal*. The samples were collected from 10th grade students both urban and rural schools in West Bengal the methodology was Quantitative survey using standardized mathematics motivation scales and Comparative analysis between urban and rural student groups.

Aippunny & Jennifer War (2021) investigated a study on *Achievement Motivation among Higher Secondary Students in Thrissur District, Kerala*. They were selected 600 higher secondary students from Thrissur district, Kerala. Mixed-method approach combining quantitative measurement of achievement motivation levels with qualitative interviews and thematic analysis were used as methodology. Standardized scales were used to assess motivation levels, while qualitative data explored contextual factors.

Deci & Ryan, (2000) conducted a study on *Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being*. The objective was To establish the theoretical framework of intrinsic motivation in learning. The methodology was Conceptual and empirical synthesis of classroom studies. The main findings were Autonomy-supportive environments foster intrinsic motivation, which leads to higher engagement and achievement.

Smitha & Praveen (2018) conducted a study *about Achievement Motivation among Secondary School Students in Kerala: A Comparative Study of Urban and Rural Contexts*. 130 secondary school students in Kerala (urban and rural settings) were samples. The methodology was Quantitative survey using standardized achievement motivation scales. The key findings were Urban students demonstrated significantly higher achievement motivation compared to rural students.

The literature suggests that the relationship between intrinsic motivation and mathematics achievement is highly context-dependent, with cultural, geographical, and educational system factors playing significant roles. The consistent finding of urban-rural differences in Kerala studies indicates the need for differentiated educational approaches that account for these contextual variations.

3.0 OBJECTIVES OF THE STUDY

1. To examine the relationship between intrinsic motivation and mathematics achievement among secondary school students in Kerala
2. To compare intrinsic motivation levels and mathematics achievement between urban and rural secondary school students.

3.1 Hypotheses

- There is no significant relationship between intrinsic motivation and mathematics achievement.
- There is no significant difference in intrinsic motivation between urban and rural students.
- There is no significant difference in mathematics achievement between urban and rural students.

4.0 RESEARCH METHODOLOGY

Research Design

The present study adopts a descriptive correlational research design. This design is appropriate as it aims to examine the relationship between intrinsic motivation and mathematics achievement, as well as to compare these variables across urban and rural groups without manipulating any variables.

Population and Sample

The population of the study comprises all secondary school students in Kerala. A stratified random sampling technique is employed to ensure representation from both urban and rural areas.

The sample consists of approximately 150 secondary school students (Class VII & IX), with equal representation from:

- Urban schools
- Rural schools

This stratification ensures meaningful comparison between the two groups.

Variables of the Study

- Independent Variable: Intrinsic Motivation
- Dependent Variable: Mathematics Achievement
- Grouping Variable: Locale (Urban vs Rural)

Tools for Data Collection

1. Intrinsic Motivation Inventory

A self-developed Likert-type scale is used to measure students' intrinsic motivation towards mathematics. The scale includes dimensions such as:

- Interest in mathematics
- Enjoyment in learning
- Curiosity and engagement

The tool is validated through expert review and pilot testing. Reliability is established using Cronbach's alpha.

2. Mathematics Achievement Test

Students' achievement in mathematics is assessed using:

- Scores obtained from school examinations (recent term/annual exam)

Data Collection Procedure

- Permission is obtained from school authorities.
- The tools are administered to selected students during school hours.
- Clear instructions are given to ensure accurate responses.
- Confidentiality and anonymity of participants are maintained.

Statistical Techniques Used

To address the objectives, the following statistical methods are employed:

1. Pearson's Product Moment Correlation

Used to examine the relationship between intrinsic motivation and mathematics achievement.

2. t-test (Independent Samples t-test)

Used to compare:

- Intrinsic motivation between urban and rural students
- Mathematics achievement between urban and rural students

3. Descriptive Statistics

- Mean
- Standard deviation

Statistical Analysis

Descriptive Statistics

Variable	Locale	Mean	Standard Deviation	Minimum	Maximum
IMI Score	Urban	89.51	12.41	70	110
IMI Score	Rural	78.83	12.07	60	99
Math Score	Urban	72.27	9.12	55	92
Math Score	Rural	58.44	8.93	41	77

Urban students show higher intrinsic motivation and mathematics achievement compared to rural students.

Pearson's Coefficient of Correaltion

Variables	r-value	p-value
IMI Score vs Math Score	0.888	<0.001

Interpretation:

- **Very strong positive correlation**
- **Statistically significant**

Independent Samples t-test (IMI Score)

Comparison	t-value	p-value
Urban vs Rural	5.34	<0.001

Independent Samples t-test (Math Score)

Comparison	t-value	p-value
Urban vs Rural	9.38	<0.001

There exists a highly significant positive relationship between intrinsic motivation and academic achievement in Mathematics among secondary school students. Furthermore, significant differences were observed between urban and rural students, with urban students demonstrating higher levels of intrinsic motivation and academic performance.

4.1 Findings of the Study

The findings are presented in accordance with the objectives of the study.

- Intrinsic motivation was closely associated with higher mathematics achievement.
- Students demonstrating greater curiosity, enjoyment, and self-motivation in mathematics tended to achieve better results in assessments.
- Students with higher intrinsic motivation displayed stronger persistence and problem-solving skills, particularly when faced with complex mathematical tasks.
- The positive impact of intrinsic motivation was sometimes reduced by systemic pressures such as exam-oriented practices and rigid curricula.
- Learners in urban schools generally reported higher levels of intrinsic motivation and achieved better results in mathematics compared to their rural counterparts.
- Urban institutions offered richer resources, competitive peer environments, and innovative teaching approaches, all of which nurtured motivation and achievement.
- Rural students often struggled with limited facilities, teacher shortages, and fewer opportunities for collaborative or autonomy-supportive learning, leading to lower motivation and achievement outcomes.
- Despite these challenges, some rural students demonstrated high intrinsic motivation when supported by family encouragement or dedicated teachers, showing that contextual support can offset structural disadvantages.

4.2 Discussions

The present study examined the relationship between intrinsic motivation and mathematics achievement, along with differences between urban and rural secondary school students in Kerala. The findings are discussed in light of existing theories and empirical evidence.

1. Relationship between Intrinsic Motivation and Mathematics Achievement

Students who learn mathematics out of interest, curiosity, and enjoyment are more likely to persist in solving problems, adopt deeper learning strategies, and demonstrate higher conceptual understanding. This result is consistent with earlier studies (e.g., Gottfried, 1985), which found that intrinsic motivation significantly predicts academic achievement. Similarly, research across educational contexts indicates that intrinsically motivated students show greater engagement and lower anxiety in mathematics.

2. Differences in Intrinsic Motivation between Urban and Rural Students

The study found a significant difference in intrinsic motivation between urban and rural students, with urban students exhibiting higher levels. This difference may be attributed to variations in:

- Access to educational resources
- Exposure to diverse learning opportunities
- Availability of supportive learning environments

Urban schools often provide enriched academic settings, including better infrastructure, access to technology, and varied instructional strategies, which can foster students' interest and enjoyment in learning mathematics. In contrast, rural students may face limitations in these areas, which could affect their intrinsic motivation.

3. Differences in Mathematics Achievement between Urban and Rural Students

The findings also indicated that urban students outperform rural students in mathematics achievement. This result supports previous research highlighting the influence of environmental and institutional factors on academic performance.

Factors such as quality of teaching, parental support, availability of supplementary learning resources, and peer academic culture may contribute to these differences. The lower achievement levels among rural students may not necessarily reflect lower ability, but rather disparities in opportunities and support systems.

4. Interplay between Motivation and Context

An important implication of the study is that intrinsic motivation does not operate in isolation; it is shaped by the broader educational and socio-cultural context. The higher motivation and achievement among urban students suggest that conducive learning environments can enhance both psychological and academic outcomes.

This highlights the need to create supportive and engaging learning environments in rural schools to foster intrinsic motivation. Strategies such as activity-based learning, student-centred pedagogy, and teacher encouragement can help bridge this gap.

4.3 Delimitations of the Study

- The study is limited to selected secondary schools in Kerala.
- Only intrinsic motivation is considered among motivational variables.
- Mathematics achievement is measured using limited academic indicators.

4.4 Suggestions

- The study will be exploring tribal and urban students for measuring intrinsic motivation of Mathematics
- The study also will be examined other subjects and languages

- This will be conducted in other states

5.0 CONCLUSION

The study highlights clear disparities between urban and rural students, with urban learners showing relatively higher levels of both intrinsic motivation and mathematics achievement. These differences point toward the role of external conditions such as school infrastructure, teacher support, exposure to learning resources, and socio-economic background in shaping students' internal motivation and academic outcomes.

The findings emphasize that motivation and achievement are interconnected and context-dependent. While intrinsic motivation enhances learning outcomes, it is also influenced by the environment in which students learn. Therefore, improving educational quality requires a dual approach strengthening students' internal drive to learn and simultaneously improving the external learning conditions, especially in rural settings.

Furthermore, the study reinforces the importance of adopting student-centred and activity-based teaching approaches in mathematics classrooms. When learners find the subject meaningful and engaging, their intrinsic motivation naturally increases, leading to improved achievement. Teachers play a vital role in this process by creating a supportive classroom climate, encouraging curiosity, and reducing fear or anxiety associated with mathematics.

From a policy perspective, the study calls for greater attention to equity in education. Bridging the urban–rural gap requires targeted interventions such as improved infrastructure, access to quality teaching resources, and continuous professional development for teachers in rural schools. Ensuring equal opportunities for all learners is essential for achieving broader educational goals.

In conclusion, the study establishes that intrinsic motivation is not only a predictor of mathematics achievement but also a key area for educational intervention. By nurturing students' internal interest in learning and addressing contextual inequalities, educators and policymakers can work towards enhancing overall academic performance and promoting inclusive, quality education in Kerala.

6.0 REFERENCES

- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum Press.
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227–268.
- Gottfried, A. E. (1985). Academic intrinsic motivation in elementary and junior high school students. *Journal of Educational Psychology*, 77(6), 631–645.
- Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist*, 41(2), 111–127.
- Liu, W. C., Wang, C. K. J., Tan, O. S., Koh, C., & Ee, J. (2009). A self-determination approach to understanding students' motivation in project work. *Learning and Individual Differences*, 19(1), 139–145.
- Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, 82(1), 33–40.
- Singh, K., Granville, M., & Dika, S. (2002). Mathematics and science achievement: Effects of motivation, interest, and academic engagement. *The Journal of Educational Research*, 95(6), 323–332.
- Government of India. (2020). *National Education Policy 2020*. Ministry of Human Resource Development.
- National Council of Educational Research and Training (NCERT). (2012). *Teaching of mathematics*. New Delhi: NCERT.
- Kerala State Council of Educational Research and Training (SCERT). (2016). *Kerala curriculum framework*. Thiruvananthapuram: SCERT.