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BARRIERS TO RURAL SCHOOL STUDENTS' ACCESS TO MATHEMATICS EDUCATION IN MIZORAM

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ABSTRACT

Access to quality education remains a significant challenge for rural students, particularly in mathematics, due to socioeconomic, cognitive, and institutional barriers. This study examines the key obstacles hindering rural students' access to mathematics education, focusing on socioeconomic status (SES), learning resources and mathematical aptitude. Rural students often face resource limitations, including inadequate school infrastructure, fewer dedicated teachers, and limited access to technology, which disproportionately affects their learning outcomes. The study employs a comparative approach, examining secondary school students across various schools in both rural and urban to identify differences in SES, mathematical aptitude and academic performance in mathematics. A sample of 891 secondary school students was examined using standardized SES scale, mathematical aptitude tests, and academic performance records. It was found that there is a significant variation between urban and rural areas in SES, mathematical aptitude, and academic achievement in mathematics highlighting the role of environmental factors and availability of learning resources in shaping student performance in mathematics. The study also highlights a strong positive correlation between SES and academic achievement in mathematics, emphasizing the role of rural family background in shaping educational outcomes. Addressing these barriers is crucial for fostering equitable learning opportunities to mathematics education and creating future career prospects for rural students.

KEY WORDS: *Socio-Economic Status, Mathematical Aptitude, Academic Achievement, Rural Students.*

INTRODUCTION

Mathematics plays a critical role in the intellectual development of learners and serves as a foundational discipline for many fields of study and professional careers. Despite its importance, persistent challenges hinder the effective teaching and learning of mathematics across various educational levels and contexts. These challenges, often referred to as "barriers," are multifaceted and include cognitive, affective, socio-cultural, pedagogical, and systemic dimensions (Boaler, 2016; Schoenfeld, 2002). Understanding these barriers is essential for educators, policymakers, and curriculum developers to design effective interventions that promote mathematical literacy and equity in education.

One of the most widely documented barriers is rural schools struggle with inadequate infrastructure, teacher shortages, and socio-economic constraints that hinder effective mathematics learning. In India, while strides have been made to enhance educational access, significant disparities persist, particularly in rural regions. Mizoram, a northeastern state characterized by its hilly terrain and dispersed rural settlements, faces unique challenges in delivering quality mathematics education to its rural student population. Despite Mizoram's commendable full literacy state, rural students encounter multifaceted barriers that impede their access to effective mathematics education. These challenges encompass infrastructural deficits, such as inadequate school facilities lacking electricity, water, and sanitation, which adversely affect student attendance and learning outcomes (The Sentinel Assam, n.d.).

Academic achievement in mathematics is a critical indicator of educational quality and student preparedness for future academic and professional endeavours. Mathematics, as a foundational subject, plays a pivotal role in developing logical reasoning, problem-solving skills, and analytical thinking, which are essential for success in various fields (National Council of Educational Research and Training [NCERT], 2005). However, barriers in mathematics education often exist across regions due to variations in educational resources, teaching methodologies, socio-economic factors, and cultural influences (Mizoram Education Department, 2020). In the context of Mizoram, a state in Northeast India, understanding these barriers is crucial for addressing educational inequities and improving overall academic outcomes.

The performance of students in mathematics is influenced by a multitude of factors, including geographical region, which plays a significant role in shaping educational outcomes. In rural and remote regions, students often face challenges such as limited access to qualified teachers, inadequate school infrastructure, and a lack of learning materials, which can hinder their performance in mathematics (UNESCO, 2015). For instance, underdeveloped areas may have fewer opportunities for advanced mathematics training or extracurricular support, such as tutoring or access to digital learning tools. On the other hand, urban or developed areas, with better connectivity and resources, tend to provide students with more opportunities to excel academically (Khan & Sharma, 2020). Reardon (2016)

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argue that students from affluent areas often have access to private tutoring, extracurricular mathematics programs, and well-funded schools, while those from underprivileged areas may lack such opportunities. A study by Carnoy and Rothstein (2013) emphasized the role of geographical location in mathematics achievement and the study found that even within developed nations, disparities in educational outcomes exist between urban and rural regions. According to Mji and Makgato (2006), in some low-income areas, mathematics is perceived as a difficult subject, and there is a lack of confidence among students in their ability to succeed.

Socioeconomic Disparities and Access to Resources

Socioeconomic disparities significantly influence access to educational resources, particularly in rural areas where students often face systemic barriers to quality mathematics education. Research indicates that students from low-income rural communities frequently lack access to advanced curricula, qualified teachers, and technological tools compared to their urban counterparts (Lubienski, 2002; Howley et al., 2014). These disparities contribute to persistent achievement gaps in mathematics, limiting future academic and career opportunities for rural students (Reardon, 2011).

The intersection of geographic isolation and economic disadvantage exacerbates inequities in mathematics education. Rural schools often struggle with limited funding, teacher shortages, and inadequate infrastructure, further hindering students' ability to compete in STEM fields (Monk, 2007). Additionally, cultural and societal perceptions of education in rural communities may influence students' engagement and aspirations in mathematics (Battey & Leyva, 2016).

High poverty levels in rural Mizoram compel many students to prioritize household responsibilities over education, leading to increased absenteeism and dropout rates. Furthermore, the absence of parental support, often due to limited educational backgrounds, hampers students' motivation and ability to engage with mathematical concepts.

Addressing various issues regarding barriers to rural students in mathematics education requires a multifaceted approach that includes targeted policy interventions, enhanced teacher training, community engagement, and the integration of culturally relevant and innovative teaching methods. By understanding and breaking these barriers, stakeholders can foster equitable mathematics education that empowers rural students to succeed alongside their urban counterparts. increasing community and parental engagement has emerged as a powerful strategy to overcome these challenges. Research consistently demonstrates that parental involvement and community engagement is a key predictor of academic success. When parents and community members actively participate in students' learning processes, they contribute to a supportive educational ecosystem that can break down traditional barriers in mathematics education. Parents who are involved in their children's mathematical learning help demystify the subject, reduce anxiety, and build confidence, even if they do not possess advanced math skills themselves. Community-based support structures also play a critical role in addressing disparities in mathematics education. Partnerships between schools, local organizations, and community leaders can provide access to resources, mentorship, and real-world applications of mathematics. One of the most critical factors in improving mathematics education in rural areas is the professional development of teachers. Rural teachers often face professional isolation, limited access to training opportunities, and a lack of exposure to modern pedagogical practices (Mulkeen, 2005). To bridge this gap, it is essential to provide ongoing, context-sensitive, and accessible training programs that equip teachers with both content mastery and effective instructional strategies for mathematics.

Rationale of the Study

Mathematics is a core component of school curricula and a fundamental skill for academic and professional success. However, in rural regions such as those in Mizoram, students often face systemic and localized barriers that hinder their access to quality mathematics education. These barriers range from inadequate infrastructure and shortages of trained teachers to socio-economic disadvantages and linguistic challenges, all of which contribute to poor learning outcomes and widen the educational gap between rural and urban students.

Mizoram, despite its relatively high literacy rate, continues to struggle with educational equity, particularly in remote and underserved communities. Rural schools frequently operate under challenging conditions with limited teaching aids, insufficient technological support, and minimal opportunities for teacher training in subject-specific pedagogy. Moreover, many rural students come from economically disadvantaged families, where education may not be prioritized due to financial constraints or cultural expectations that prioritize labor or domestic responsibilities.

The need to explore these barriers in depth is both urgent and essential. While national policies and state-level initiatives aim to improve access to education, there is a lack of localized research that specifically examines the unique obstacles faced by rural students in Mizoram. Understanding these contextual factors is critical for designing targeted interventions that can enhance mathematics education in the region.

This study is therefore justified in its aim to investigate the multifaceted barriers rural students in Mizoram face in accessing quality mathematics education. By identifying the specific challenges from the perspectives of students, teachers, and education administrators, the study intends to contribute meaningful insights that can inform more inclusive and effective educational planning and policy at the state level. The findings may also serve as a foundation for future research and support the development of context-sensitive solutions that promote equity in mathematics education across rural areas

OBJECTIVES OF THE STUDY

1. To compare the academic achievement in mathematics between urban and rural secondary school students of Mizoram.
2. To compare the mathematical aptitude between urban and rural secondary school students of Mizoram.

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3. To compare the socio-economic status between urban and rural secondary school students of Mizoram.
4. To find out the relationship between academic achievement in mathematics and socio-economic status of secondary school students of Mizoram.
5. To find out the relationship between mathematical aptitude and socio-economic status of secondary school students of Mizoram.

NULL HYPOTHESES

1. There is no significant difference in academic achievement in mathematics between urban and rural secondary school students of Mizoram.
2. There is no significant difference in mathematical aptitude between urban and rural secondary school students of Mizoram.
3. There is no significant difference in socio-economic status between urban and rural secondary school students of Mizoram.
4. There is no significant relationship between academic achievement in mathematics and socio-economic status among secondary school students of Mizoram.
5. There is no significant relationship between mathematical aptitude and socio-economic status among secondary school students of Mizoram.

METHODOLOGY

Descriptive survey method was employed in the present study. The researcher has personally visited various schools in both rural and urban areas after getting permission from the school authority. Mathematical aptitude test (MAT) was administered to Class X students to find the mathematical aptitude of secondary school students. The researcher has developed mathematical aptitude test as a research tool to collect data. Marks obtained in mathematics subject by the students in the annual examination is considered as academic achievement in mathematics. Therefore, Class-IX annual examination result books was used as a source for collecting students' academic achievement in mathematics.

Population and Sample

The target population of the study was the secondary school students (Class X) of Mizoram. As such, all students in the urban and rural areas in Mizoram constituted the population of the study. For the present study, stratified random sampling technique was used for selection of sample. A sample of 150 students each from four districts (east, west, north and south regions) and 147 and 144 students from another two districts (central regions) was randomly selected which constituted 891 samples in total. The sample included students from both urban and rural schools for comparison.

ANALYSIS AND INTERPRETATION OF DATA

Analysis and Interpretation of data is carried out in accordance with the objectives of the study as follows:

Table 1

Comparison of Urban and Rural Secondary School Students in their Academic Achievement in Mathematics.

Groups	N	Mean	SD	MD	SE_D	t-value	Sig. Level
Urban	472	51.48	22.41	6.46	1.345	4.807	0.05
Rural	419	45.02	16.96				

As found in Table 1 that the t-value for academic achievement in mathematics of urban and rural students is 4.807. Since the calculated t-value is greater than the table value at 0.05 level of significance, the null hypothesis that there is no significance difference in the academic achievement in mathematics between urban and rural is rejected. It indicates that the academic achievement in mathematics of urban and rural students differs significantly. On comparing the mean scores, it was found that the mean of urban students is higher than the rural student which shows that urban secondary school student has higher academic achievement in mathematics than rural secondary school students.

Table 2

Comparison of Urban and Rural Secondary School Students in their Mathematical Aptitude.

Groups	N	Mean	SD	MD	SE_D	t-value	Sig. Level
Urban	472	10.47	4.47	2.436	0.271	8.965	0.05
Rural	419	8.03	3.51				

From Table 2 it can be seen that the t-value for mathematical aptitude of urban and rural students is 8.965. Since the calculated t-value is greater than the table value at 0.05 level of significance, the null hypothesis that there is no significant difference in the mathematical aptitude between urban and rural is rejected. It indicates that the mathematical aptitude of urban and rural students differs significantly. On comparing the mean scores, it was found that the mean of urban students is higher than the rural students which shows that urban student has higher mathematical aptitude than rural students.

Table 3

Comparison of Urban and Rural Secondary School Students in their Socio-economic Status.

Groups	N	Mean	SD	MD	SE_D	t-value	Sig. Level
Urban	472	38.39	9.60	5.94	0.60	9.804	0.05
Rural	419	32.45	8.33				

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As found in Table 3 the t-value for socio-economic status of urban and rural students is 9.804. Since the calculated t-value is greater than the table value at 0.05 level of significance, the null hypothesis that there is no significant difference in the socio-economic status between urban and rural is rejected. It indicates that the socio-economic status of urban and rural students differs significantly. On comparing the mean scores, it was found that the mean of urban students is higher than the rural student which shows that urban student has higher socio-economic status than rural students.

Table 4

Correlation between Academic Achievement in Mathematics and Socio-economic Status of Secondary School Student

N	Categories	Academic Achievement in Mathematics	Socio-economic Status
891	Academic Achievement in Mathematics	1	0.291*
	Socio-economic Status	0.291*	1

* means significant at 0.01 level

Table 4 shows the correlation between academic achievement in mathematics and socio-economic status among secondary school students. The calculated value of correlation is 0.291 and the p-value is smaller than 0.01 level of confidence. Thus, the null hypothesis that there is no significant relationship between academic achievement in mathematics and socio-economic status was rejected. Hence, there existed a positive and significant relationship between academic achievement in mathematics and socio-economic status among secondary school students in Mizoram. A positive correlation implies that the higher the socio-economic status, the higher the academic achievement in mathematics.

Table 5

Correlation between Mathematical Aptitude and Socio-economic Status of Secondary School Student

N	Categories	Mathematical Aptitude	Socio-economic Status
891	Mathematical Aptitude	1	0.367*
	Socio-economic Status	0.367*	1

* means significant at 0.01 level

Table 5 shows the correlation between mathematical aptitude and socio-economic status among secondary school students. The calculated value of correlation is 0.367 and the p-value is smaller than 0.01 level of confidence. Thus, the null hypothesis that there is no significant relationship between mathematical aptitude and socio-economic status was rejected. Hence, there existed a positive and significant relationship between mathematical aptitude and socio-economic status among secondary school students in Mizoram. A positive correlation implies that the higher the socio-economic status the higher the mathematical aptitude, and vice versa.

FINDINGS OF THE STUDY

1. Urban secondary school students have significantly higher academic achievement in mathematics than rural secondary school students.
2. Urban secondary school students have higher mathematical aptitude than rural secondary school students.
3. Urban secondary school students have higher socio-economic status than rural secondary school students.
4. It was found that there existed a positive and significant relationship between academic achievement in mathematics and socio-economic status of secondary school students in Mizoram.
5. It was found that there existed a positive and significant relationship between mathematical aptitude and socio-economic status among secondary school students in Mizoram.

DISCUSSION OF THE FINDINGS

A common perception is that urban students often have better academic performance, resulting in more job opportunities and higher social-economic status (Mohammadpour & Yon, 2024). Most of the research findings reveals that urban students performs better than rural students in mathematics. The finding of the present study is in align with the findings of Ali et al. (2024), Yadav (2024), Ahmed et al. (2020), and Pandey (2017), whose findings also showed that urban secondary school students outperform their counterpart rural students. The reason that urban students have higher academic achievement in mathematics than rural students may be attributed to different factors. One of the primary reasons is the difference in infrastructural facilities and educational resources. Urban schools tend to have better laboratory, smart classroom, access to qualified teacher, and tutoring program than rural schools. On the other hand, rural schools are lack of these resources, especially it has difficulties in attracting and retaining efficient and qualified teacher. Additionally, parents in urban areas tend to be more involved in their children's education due to greater awareness in academic career and educational pathway. Urban students also have more competitive learning environment that constantly motivated them to excel in their studies. By addressing these educational disparities, the Government, educationist and policy maker should take necessary measures

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to bridge the achievement gap by implementing targeted interventions.

The finding of the present study is in line with the finding of Gupta & Gehlawat (2013), Sonar and Patankar (2013) and Manikandan and Ambedkar (2022) whose findings also showed that the mathematical aptitude of urban secondary school students were higher than their rural counterparts. Cognitive science studies have shown that aptitude is innate and can be shaped and nurtured by environmental factors. Studies also shown that differences in mathematical abilities among people in different regions are not due to biological but environmental (Dehaene, 2011). The findings of the present study indicates that mathematical aptitude is not genetically linked to geographic location. Instead, differences in performance arise primarily due to environmental factors such as societal attitude toward mathematics, access to quality education and learning styles adopted. One possible explanation why the present study found rural students have lower mathematical aptitude could be because innate mathematical abilities of rural students were not developed and nurtured. Boaler (2016) highlights that students who engage deeply with mathematical concepts develop cognitive skills. The present study suggests that students in urban areas are more sincerely engaged in mathematical related activities and problem-solving tasks which develops their mathematical aptitude. However, rural students may lack to access all those educational resources and activities that urban student has enjoyed. The study also highlights the importance of nurturing innate mathematical abilities. Even if student possess high mathematical aptitude it needs to be developed and nurtured through various mathematical activities under the guidance of significant persons like educated parents, teachers, and brilliant classmate.

It is well known that socio-economic status (SES) plays a crucial role in students' academic success in general. The finding of the present study also holds considerable significant for mathematics education in Mizoram as it revealed mathematics as one of the important factors affecting academic achievement in mathematics. The findings of the study are similar with the findings of Hernandez (2014), Wang et al. (2014), Raju (2016), Pandey (2017), Ansah (2021) and Olsen (2021) who all have found a positive relationship between academic achievement in mathematics and SES. The findings of Brown (1991) and Lee and Borgonovi (2022) which shows no correlation between academic achievement in mathematics and SES is contradictory with the present finding.

In Mizoram where unequal educational opportunities exist between urban and rural areas (Lalrinmawii et al., 2021), SES play a significant role in shaping academic outcomes. Students from higher SES families often have better access to private tutoring, enrichment program, digital mathematical tools and schools equipped with advanced learning facilities which enhance their mathematical skills. Addressing these disparities through targeted interventions can promote equitable academic success for all students in Mizoram, regardless of their economic background. But the correlation between SES and academic achievement in mathematics is found to be 0.291, which is a weak correlation, factors other than SES may play more significant role in students' success in mathematics.

CONCLUSION

The study highlights significant disparities in mathematics education between rural and urban school students in Mizoram. It reveals that urban students consistently outperform their rural counterparts in both academic achievement and mathematical aptitude. Moreover, the study establishes a clear positive relationship between academic achievement in mathematics and socioeconomic status. Students from higher socioeconomic backgrounds tend to have greater support systems, access to educational materials, and opportunities for enrichment, all of which contribute to their success in mathematics. The gap between urban and rural students in mathematical performance can be attributed to several barriers faced by rural students, including limited access to qualified teachers, inadequate learning resources, poor infrastructure, and less exposure to competitive academic environments.

Despite these barriers, potential solutions such as teacher training programs, improved digital connectivity, community-based learning initiatives, and government interventions could help bridge the gap. Addressing these issues requires collaborative efforts from policymakers, educators, and local communities to ensure that rural students in Mizoram receive quality mathematics education, enabling them to compete on an equal footing with their urban counterparts.

Future research should explore the effectiveness of targeted interventions and the long-term impact of policy changes on rural mathematics education in Mizoram. By overcoming these barriers, Mizoram can foster a more inclusive and equitable education system that empowers all students to succeed academically.

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