IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Relationship Between Mathematics Achievement And Family Environment Of Secondary School Students

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Abstract: This study investigates the relationship between mathematics achievement and the family environment of secondary school students, as well as the influence of varying levels of family environment on mathematics achievement. The primary aim of the research is to examine the relationship between students' performance in mathematics and their family environment and to compare the mathematics achievement of students across different levels of family environment to test the stated hypotheses. The Family Environment Scale developed by Harpreet Bhatia and N.K. Chadha was used to assess the family environment of students. Mathematics achievement was measured using students' academic scores in mathematics, as recorded in school records. The sample comprised 210 Class IX students selected from a varied schools (government, private aided and unaided) in Bengaluru Urban District. Data analysis was conducted using Karl Pearson's Product Moment Coefficient of Correlation and one-way ANOVA (F-test), followed by Scheffe's Post Hoc Analysis where the F-value was found to be significant. The statistical analysis was carried out using SPSS software and MS Excel, with significance levels set at 0.05 and 0.01. The findings of the study provide valuable knowledge into how the family environment influences students' achievement in mathematics. The correlation analysis revealed a significant positive relationship between mathematics achievement and the family environment. Additionally, the ANOVA results indicated a significant difference in mathematics achievement among students with varying levels of family environment. Students from a high-quality family environment scored significantly higher in mathematics compared to those from moderate or low family environments. This may be attributed to the fact that a conducive and supportive family environment plays a crucial role in enhancing students' performance in mathematics.

Index Terms - Family Environment, Mathematics, Achievement, Secondary School Students.

1. INTRODUCTION

Mathematics is a core academic discipline that not only enhances logical thinking and problem-solving abilities but also plays a pivotal role in students' academic and career progression. Despite its importance, many students in India face challenges in achieving consistent success in mathematics. Several factors, both academic and non-academic, contribute to this issue-among which the family environment plays a crucial role.

The family environment includes the emotional, social and intellectual support that students receive at home and it significantly impacts their motivation, learning behavior and academic performance. In the Indian context, the family often serves as the primary socializing agent, especially during the formative years. Research has shown that supportive family dynamics, such as parental involvement, educational aspirations, open communication and a structured home setting, positively correlate with better academic performance in mathematics (Chandra & Azimuddin, 2013; Kaur & Kaur, 2017).

Studies conducted in various parts of India have consistently emphasized the role of family factors in shaping students' academic outcomes. Like, a study by Joshi (2020) revealed that students who receive consistent encouragement, monitoring and emotional support from their families tend to perform significantly better in subjects like mathematics. Similarly, Singh and Misra (2016) reported that a positive family climate, including shared responsibilities and clear expectations, enhances students' academic motivation and performance. Given the diversity in socio-economic backgrounds, parenting styles and cultural expectations across Indian households, it becomes essential to explore how different levels of family environment affect students' mathematics achievement. Understanding this relationship helps educators, parents and policymakers implement strategies that foster supportive home environments to improve learning outcomes.

2. REVIEW OF RELATED LITERATURE

Review of related literature plays a crucial role in any research study as it provides a foundation for understanding what has already been explored in the field and highlights areas where further research is needed. In the perspective of academic achievement, family environment has consistently emerged as a vital factor influencing students' performance, emotional well-being and behavioral development. This review examines recent studies that focus on the relationship between family environment and academic achievement, particularly in mathematics, as well as associated psychological aspects such as emotional intelligence and anxiety. It helps in identifying the gaps in knowledge and justifying the need for the present study.

2.1 Studies Related to Mathematics Achievement and Family Environment

Numerous studies have confirmed the role of a supportive and positive family environment in promoting academic excellence among students. For instance, Padir (2025) examined the relationship between family environment, social anxiety disorder and emotional intelligence and found that students from positive family backgrounds demonstrated lower anxiety and higher emotional intelligence. This indirectly supports better academic functioning, including in subjects like mathematics.

Sattanathan & Sundari (2024) explored the link between family environment and academic achievement among higher secondary students and found a significant positive correlation. Students who experienced more cohesive and supportive family environments tended to perform better academically. Similarly, Chacko & Goswami (2024) conducted a comparative study to analyze how family environments (categorized as high, middle and low) influenced educational achievement. They confirmed that students from high-quality family environments performed significantly better.

Seema & Sunita (2023) highlighted the combined influence of family environment and psychological well-being (PWB) on academic achievement among adolescents. Their results showed a strong correlation among these variables and regression analysis confirmed that family environment and PWB accounted for nearly 30% of the variance in academic scores. Zhao & Zhao (2022) used a large-scale longitudinal approach to study how family environment, peer interaction and educational expectations influence achievement. Their findings emphasized that family environment has both direct and mediated effects on academic success through the quality of peer interactions.

Further, Periasamy & Jayarani (2021) and Samita (2021) provided regional perspectives from Telangana and Punjab, respectively. These studies reaffirmed the significance of family environment and also noted how school-related variables and demographic differences such as urban-rural background can influence this relationship. Raviprasad & Pushpa (2024), however, found no significant difference in family environment based on gender and type of school, suggesting that in some contexts, family influence may be uniformly distributed across such variables.

2.2 Overview of Studies

Overall, the reviewed literature clearly points to a consistent pattern: a positive family environment enhances students' emotional stability, reduces anxiety, improves emotional intelligence and promotes better academic performance. Most studies employed standardized tools such as the Family Climate Scale and used rigorous statistical methods including ANOVA, t-tests and regression analysis. The findings were consistent across diverse geographical areas, school types and socio-economic backgrounds, thereby validating the robustness of this relationship.

2.3 Research Gap

Although the studies reviewed provide strong evidence of the importance of family environment in academic achievement, several gaps remain. First, very few studies have specifically examined the combined influence of family environment on mathematics achievement - a core subject with unique cognitive demands. Secondly, while some research has explored emotional and psychological correlates such as emotional intelligence or anxiety, these are rarely analyzed in conjunction with academic performance in a single integrated model. Furthermore, most studies either focus on general academic achievement or specific psychological variables, but not both in relation to mathematics. The existing literature also lacks a comprehensive exploration of how family environment influence performance in mathematics among secondary school students, particularly in the Indian context. Therefore, the present study is timely and necessary as it seeks to bridge this gap by examining how family environment relate to mathematics achievement among secondary school students and it aims to contribute valuable knowledge that informs educators, policymakers and parents in fostering environments conducive to mathematical learning and overall academic success.

3. SIGNIFICANCE OF RESEARCH

This study is significant because it highlights how the family environment - often overlooked in discussions on academic success substantially influences students' performance in mathematics. In the Indian educational context, where family involvement varies widely across socio-economic and cultural lines, identifying how and to what extent family factors contribute to academic achievement guide efforts to improve both teaching practices and parental engagement. The findings helps teachers understand the background of students better, assist parents in creating a more conducive learning environment at home and inform policymakers in designing inclusive educational policies that consider home-based support as a key component of student development.

4. STATEMENT OF THE PROBLEM

The identified topic for the present research is:

"Relationship between Mathematics Achievement and Family Environment of secondary school students"

5. OBJECTIVES OF THE STUDY

The following objectives were considered for present examination:

1. To find out the significant relationship between mathematics achievement and family environment.
2. To investigate the significant differences in mathematics achievement among students with different levels of family environment.

6. RESEARCH HYPOTHESES

The following null hypotheses are considered for the present research:

1. There is no significant relationship between Mathematics Achievement and Family Environment.
2. There is no significant difference in the Mathematics Achievement of secondary school students with different levels of family environment.

7. METHODOLOGY

This study investigates the relationship between mathematics achievement and the family environment of secondary school students, as well as the influence of varying levels of family environment on mathematics achievement. The primary aim of the research is to examine the association between students' performance in mathematics and their family environment and to compare the mathematics achievement of students across different levels of family environment to test the stated hypotheses. The Family Environment Scale developed by Harpreet Bhatia and N.K. Chadha was used to assess the family environment of students. Mathematics achievement was measured using students' academic scores in mathematics, as recorded in school records. The sample comprised 210 Class IX students selected from a varied schools (government, private aided and unaided) in Bengaluru Urban District. Data analysis was conducted using Karl Pearson's Product Moment Coefficient of Correlation and one-way ANOVA (F-test), followed by Scheffe's Post Hoc Analysis where the F-value was found to be significant. The statistical analysis was carried out using SPSS software and MS Excel, with significance levels set at 0.05 and 0.01.

8. ANALYSIS OF DATA

8.1 Correlation Results

Table-1: Shows correlation results between Mathematics Achievement and Family Environment scores.

Variables considered	Number	df (N-2	Mean	Standard Deviation
Dependent Variable: Mathematics Achievement	210	208	77.442	16.789
Independent Variable: Family Environment			219.014	14.366
Obtained 'r' Value and Significance level.			0.139*	

N=210; df=208; *Sig. at 0.05 level (0.138)

Table-1 presents the correlation analysis between family environment and mathematics achievement scores among 210 secondary school students. The mean mathematics achievement score was found to be 77.442 with a standard deviation of 16.789, indicating a moderate level of performance with some variation among the students. The mean score for the family environment variable was 219.014, with a standard deviation of 14.366, suggesting a fairly consistent perception of family environment across the sample.

The Pearson correlation coefficient (r) obtained between the two variables is 0.139, which is statistically significant at the 0.05 level (critical value = 0.138 for df = 208). This indicates a significant positive correlation between family environment and mathematics achievement. In simple terms, this means that students who reported a more supportive and positive family environment tended to achieve higher scores in mathematics.

Although the correlation is not very strong, it is meaningful and suggests that the family environment does play a contributing role in students' academic performance in mathematics. The positive direction of the correlation implies that as the quality of the family environment improves, students' achievement in mathematics also tends to increase. This finding supports the view that the home setting, including emotional support, communication and academic encouragement, can positively influence students' learning outcomes in mathematics.

8.1.2 One-ANOVA Results

Table-2: Shows ANOVA results on Mathematics Achievement of students having different levels of family environment.

SH Levels	N	Mean	Std. Dev.	Source	Sum of Squares	df	Mean Squares	F Value
Low	10	59.900	17.361	Between Group	3659.040	2	1829.520	6.85**
Moderate	183	77.874	16.210	Within Group	55254.774	207	266.931	
High	17	83.117	17.164	Total	58913.814	209		

Table value for 0.01 level is (df 2 and 207) 4.71 **Significant at 0.01 level

Table 2 presents the results of a One-Way Analysis of Variance (ANOVA) conducted to examine the differences in mathematics achievement among students with different levels of family environment-categorized as low, moderate and high. The sample includes 210 students, distributed across the three family environment groups: Low (N = 10), Moderate (N = 183) and High (N = 17). The mean mathematics achievement score for students with low family environment was 59.900, while students with moderate family environment had a mean score of 77.874 and those with high family environment had the highest mean score of 83.117. This trend clearly shows that as the level of family environment improves, the average performance in mathematics also increases. The F-value obtained from the ANOVA test is 6.85, which is greater than the critical F-value of 4.71 at the 0.01 significance level for degrees of freedom (df) 2 and 207. This indicates a statistically significant difference in mathematics achievement across the three groups of family environment at the 0.01 level. Therefore, we can conclude that family environment has a significant impact on students' mathematics achievement.

Table-2.1: Scheffe's Post Hoc Analysis on Mathematics Achievement scores of school students having different levels of family environment.

Different Levels of Family Environment			Mean Difference (MD)	Critical Difference (CD)
Low	Moderate	High		
59.900	77.874	-	17.974*	13.083
-	77.874	83.117	5.243	10.214
59.900	-	83.117	23.217*	16.055

*Significant at 0.05 level.

To further identify which specific groups differed, a Scheffe's Post Hoc Analysis was conducted (as shown in Table 2.1). The comparison between students from low and moderate family environments revealed a mean difference (MD) of 17.974, which is greater than the critical difference (CD) of 13.083, indicating a significant difference at the 0.05 level. Similarly, the difference between low and high family environment groups was 23.217, which also exceeds the CD of 16.055, confirming another significant difference. However, the difference between the moderate and high family environment groups was 5.243, which is less than the critical difference of 10.214, indicating that this particular difference is not statistically significant.

Thus, the post hoc results suggest that:

- Students from low family environments perform significantly poorer in mathematics than those from moderate or high family environments.
- While students from high family environments perform better than those from moderate family environments, the difference is not statistically significant.

These findings reinforce the importance of a supportive and enriched family environment in enhancing students' academic success, particularly in mathematics. Students from more favorable home environments-characterized by emotional support, academic guidance and positive communication-tend to perform significantly better than those from unsupportive or less structured families.

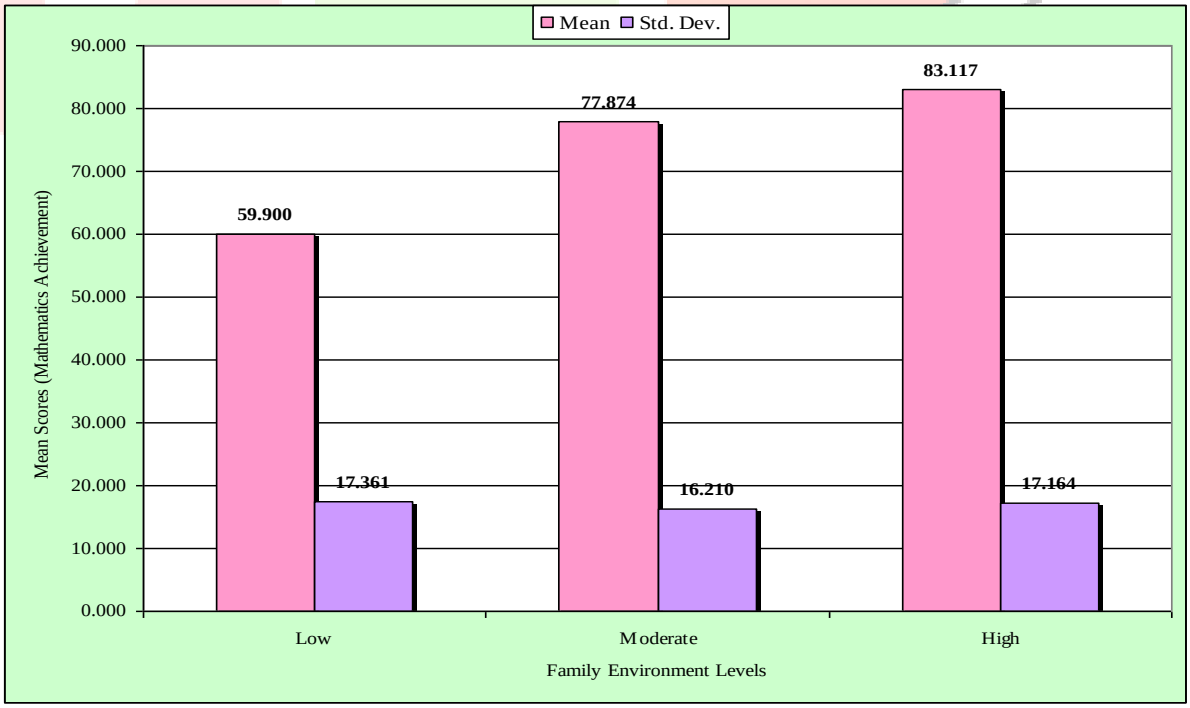

Fig.1: Bar graph shows comparison of mathematics achievement of students from different levels of family environment.

9. FINDINGS OF THE STUDY

The present study was conducted to explore the relationship between mathematics achievement and the family environment of secondary school students. The findings revealed a significant positive correlation between family environment and mathematics achievement, suggesting that students who experience a more supportive and structured family environment tend to perform better in mathematics. Additionally, One-Way ANOVA results indicated a significant difference in mathematics achievement among students belonging to different levels of family environment. Specifically, students from high and moderate family environments scored significantly higher in mathematics compared to those from low family environments. The Scheffe's Post Hoc Analysis confirmed that the difference in mathematics achievement was statistically significant between students from low and moderate as well as low and high family environments, whereas the difference between moderate and high family environments was not statistically significant.

10. DISCUSSION OF RESULTS

The results of the study align with existing research, which emphasizes the influence of the family environment on students' academic performance. A positive and supportive family environment fosters emotional well-being, academic motivation and confidence, all of which are critical to achieving success in mathematics. The significant positive correlation found in this study is supported by earlier Indian studies such as those by Kaur & Kaur (2017) and Singh & Misra (2016), which indicated that parental involvement, communication and home learning resources are key predictors of academic achievement. The significant differences observed across different levels of family environment also highlight the disparities in academic performance that can arise from differences in home support. Students from low family environments may lack the guidance, resources or encouragement necessary to excel in mathematics, thus reflecting lower scores. These findings highlight the need to address inequalities in family support to bridge the academic achievement gap.

11. CONCLUSION

Based on the findings, it is concluded that family environment plays a significant role in shaping students' achievement in mathematics at the secondary school level. A conducive home environment, characterized by emotional support, encouragement, academic monitoring and availability of resources, positively influences mathematics performance. Students from high and moderate family environments were found to perform better than those from low family environments. Thus, improving the quality of students' family environments contribute to enhancing their academic outcomes, especially in subjects that demand cognitive engagement and regular practice like mathematics.

12. EDUCATIONAL IMPLICATIONS

The study has several important educational implications. Firstly, teachers and schools should be made aware of the influence of the family environment on students' achievement. They can design interventions and guidance programmes for parents to help them support their children more effectively. Secondly, parental involvement programmes and regular parent-teacher interactions can be initiated to improve communication between school and home. Schools may also consider counseling sessions for students from less supportive family backgrounds to provide them with the emotional and academic support they may lack at home. Additionally, policy-level measures could be introduced to ensure inclusive support systems for students from disadvantaged family environments.

13. SUGGESTIONS FOR FURTHER RESEARCH

While the current study provides useful information, it opens avenues for further research. Future studies can explore the relationship between specific dimensions of family environment (such as parental education, discipline style and emotional climate) and achievement in mathematics. Comparative studies across rural and urban contexts or between different schools types (government, private aided, unaided schools) could provide more detained findings. Additionally, researchers may investigate the influence of family environment on students' achievement in mathematics. Long studies could also help understand how family environment influences academic growth over time.

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