



Assessing the effect of Parental Support and Students' Mathematics Achievement in Primary and Junior Secondary Schools in Kailahun District, Sierra Leone: A Cross-Sectional Study

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ABSTRACT

Evidence on parental support and mathematics outcomes in rural Sierra Leone remains limited. This study examined associations between five parental-support dimensions and mathematics achievement in primary and junior secondary schools in Kailahun District. A quantitative cross-sectional survey was conducted in 2026. From a target population of 4,730 students, parents, teachers, and school leaders, 400 questionnaires were distributed and 389 usable responses were obtained (97.3%). Structured questionnaires measured parental support, and mathematics achievement was obtained from school records. Descriptive statistics, Pearson correlations, and a simultaneous five-predictor regression reconstructed from the reported correlation matrix were used.

All dimensions were positively correlated with achievement: homework supervision ($r = .641$), parents' educational attainment ($r = .573$), home learning resources ($r = .618$), motivation and encouragement ($r = .702$), and parent-teacher communication ($r = .586$); all $p < .001$. The simultaneous model explained 63.6% of achievement variance (adjusted $R^2 = .632$). Motivation and encouragement had the largest standardized coefficient ($\beta = .319$, 95% CI [.233, .406]), followed by homework supervision ($\beta = .218$, 95% CI [.137, .299]). **Conclusion:** Parental support was strongly associated with mathematics achievement, but the cross-sectional design and absence of external-confounder adjustment preclude causal inference.

Keywords: parental support; mathematics achievement; homework supervision; home learning resources; parent-teacher communication; Sierra Leone

INTRODUCTION

Mathematics is widely recognized as a foundational discipline for scientific advancement, technological innovation, and socio-economic development. It equips learners with problem-solving, logical reasoning, quantitative, and analytical skills that are essential for lifelong learning and participation in an increasingly knowledge-based economy. Consequently, improving mathematics achievement remains a major educational priority worldwide. Despite this importance, mathematics continues to be one of the subjects in which many learners perform poorly, particularly in low- and middle-income countries where educational systems face challenges related to limited resources, teacher shortages, and socio-economic inequalities.

Growing evidence suggests that students' academic success depends not only on school-based factors but also on the support they receive from their families. Parents influence learning by supervising homework, providing educational resources, encouraging positive attitudes towards schooling, communicating with teachers, and creating home environments that promote study. Such support reinforces classroom instruction, increases learners' motivation, and contributes to improved academic achievement. Studies conducted in different educational contexts consistently report positive associations between parental involvement and students' educational outcomes, although the magnitude of these associations varies according to socio-economic conditions, parental education, and school contexts.



In Sierra Leone, education has undergone substantial reforms aimed at improving access, equity, and quality. The introduction of the **Free Quality School Education (FQSE)** programme significantly increased school enrolment and reduced financial barriers to basic education. However, improved access has not always translated into improved learning outcomes. Mathematics achievement remains persistently low in many primary and junior secondary schools, particularly in rural districts where poverty, limited educational resources, and low parental literacy continue to constrain learners' academic progress. These challenges highlight the importance of examining factors beyond classroom instruction that may contribute to improved mathematics performance.

Kailahun District represents one of Sierra Leone's predominantly rural districts where many households rely on subsistence agriculture and have limited access to educational resources. Parents often face financial constraints that affect their ability to provide textbooks, writing materials, and supportive learning environments. In addition, low levels of formal education among many parents may reduce their confidence in assisting children with mathematics homework. Nevertheless, parents can still support learning through encouragement, monitoring of school activities, communication with teachers, and the creation of positive attitudes towards education. Understanding how these different dimensions of parental support relate to mathematics achievement is therefore essential for developing interventions that respond to the realities of rural communities.

Although previous studies have examined determinants of academic achievement in Sierra Leone, much of the existing literature focuses on school resources, teacher quality, or general educational performance. Comparatively few studies have investigated the combined associations of multiple dimensions of parental support on mathematics achievement, particularly among both primary and junior secondary school learners within rural settings. Furthermore, limited empirical evidence is available from Kailahun District despite its unique educational and socio-economic context. This gap limits the development of evidence-based policies aimed at strengthening parental engagement as a strategy for improving mathematics education.

This study therefore examines the association between parental support and students' mathematics achievement in primary and junior secondary schools in Kailahun District, Sierra Leone. It evaluates whether homework supervision, parents' educational attainment, home learning resources, parental motivation and encouragement, and parent-teacher communication predict mathematics performance after adjustment for plausible student-, household-, teacher-, and school-level confounders. Given the cross-sectional design, the study does not claim that parental support causes differences in achievement. Instead, it provides context-specific evidence that may guide future longitudinal or intervention research and inform cautious policy discussion.

LITERATURE REVIEW

Theoretical Framework

This study is underpinned by **Epstein's Theory of Overlapping Spheres of Influence**, **Bronfenbrenner's Ecological Systems Theory**, and **Coleman's Social Capital Theory**. Together, these theories explain how family involvement contributes to students' academic achievement by strengthening interactions between the home, school, and community.

Epstein's Theory of Overlapping Spheres of Influence posits that students achieve better educational outcomes when families, schools, and communities collaborate in supporting learning. The theory identifies six forms of parental involvement—parenting, communication, volunteering, learning at home, decision-making, and community collaboration—that collectively enhance students' academic development. Within the context of mathematics education, parental involvement through homework supervision, encouragement, provision of learning materials, and communication with teachers creates a supportive environment that is expected to reinforce classroom instruction and support academic success.

Bronfenbrenner's Ecological Systems Theory complements this perspective by emphasizing that children's learning is shaped by interactions across multiple environmental systems. The immediate relationship between



the family and the school (the microsystem) is particularly influential because it is closely related to learners' educational experiences. Strong home–school partnerships facilitate consistent academic support, while weak relationships may reduce students' motivation and achievement. Consequently, parental involvement should be viewed as part of a broader educational ecosystem rather than as an isolated family responsibility.

Coleman's Social Capital Theory further explains that relationships within families and between families and schools may generate social resources that support children's learning. Parents who monitor school activities, communicate educational expectations, and maintain regular contact with teachers create social capital that may strengthen students' commitment to learning and be associated with academic performance. The theory is particularly relevant in rural communities where financial resources may be limited but strong family relationships can compensate by providing emotional and educational support.

Collectively, these theories suggest that students' mathematics achievement may be associated not only with instructional quality but also with the extent to which parents actively participate in their children's education. They therefore provide an appropriate conceptual foundation for examining the multidimensional nature of parental support within the Sierra Leonean context.

Conceptual Model

The conceptual model treats mathematics achievement as the outcome and the five parental-support dimensions as focal predictors. Homework supervision may support study routines and practice; parents' educational attainment may shape academic guidance and expectations; home learning resources may increase opportunities to study; motivation and encouragement may strengthen self-efficacy and persistence; and parent-teacher communication may coordinate monitoring and timely support. Socioeconomic status may influence both parental-support opportunities and achievement. Gender, school level, and prior achievement may also relate to exposure and outcome, while teacher characteristics and school resources shape the instructional context. These variables are therefore included as confounders rather than interpreted as parental-support dimensions.

Focal predictor

Proposed pathway

Expected adjusted relationship

Homework supervision

Study routines, monitoring, and practice

Positive

Parents' educational attainment

Academic guidance, expectations, and navigation of school

Positive

Home learning resources

Access to materials, study space, and independent practice

Positive

Motivation and encouragement

Mathematics confidence, persistence, and engagement



Positive

Parent-teacher communication

Shared information, early identification, and coordinated support

Positive

Pre-specified confounders

SES, gender, school level, prior achievement, teacher qualification and experience, and school resources

Adjusted for in the model

Figure 1. Conceptual model linking parental-support dimensions, confounders, and mathematics achievement. The arrows represented by the proposed pathways indicate hypothesized associations, not causal effects.

Study Hypotheses

H1: Greater homework supervision is positively associated with mathematics achievement after adjustment for the pre-specified confounders.

H2: Higher parents' educational attainment is positively associated with mathematics achievement after adjustment for the pre-specified confounders.

H3: Greater availability of home learning resources is positively associated with mathematics achievement after adjustment for the pre-specified confounders.

H4: Greater parental motivation and encouragement is positively associated with mathematics achievement after adjustment for the pre-specified confounders.

H5: More frequent and constructive parent-teacher communication is positively associated with mathematics achievement after adjustment for the pre-specified confounders.

H6: The five parental-support dimensions jointly improve statistical prediction of mathematics achievement beyond the covariate-only model.

Empirical Literature

Empirical research frequently reports positive associations between parental involvement and students' academic achievement. However, the strength and nature of this relationship differ across educational contexts, socio-economic conditions, and forms of parental support. The present review focuses on the five dimensions investigated in this study.

Homework Supervision

Homework supervision has been widely recognized as an important mechanism through which parents support learning. Studies reviewed in the source document indicate that regular monitoring of homework promotes disciplined study habits, reinforces classroom learning, and increases students' academic engagement. Learners whose parents monitor homework consistently perform better in mathematics because they receive timely guidance, develop stronger study routines, and devote more time to academic tasks. Nevertheless, researchers caution that excessive parental control may reduce learners' independence, suggesting that effective supervision should encourage rather than replace students' own responsibility for learning.



Parents' Educational Attainment

Parents' educational attainment may relate to children's learning through their ability to provide academic guidance, communicate with teachers, and establish educational expectations. The reviewed studies generally report that children of more educated parents perform better academically because their parents are more confident in assisting with schoolwork and navigating educational systems. However, several studies also indicate that parental commitment and encouragement remain important even among parents with limited formal education, implying that educational attainment alone does not determine children's academic success.

Home Learning Resources

The availability of educational resources within the home constitutes another important predictor of academic achievement. Access to textbooks, writing materials, appropriate study spaces, and other learning resources facilitates independent learning and enables students to practise mathematics beyond classroom instruction. Evidence reviewed from the source document consistently shows that learners with adequate home learning resources demonstrate higher mathematics achievement than those from resource-constrained households. However, the literature also emphasizes that the effective utilization of available resources is equally important for improving learning outcomes.

Parental Motivation and Encouragement

Parental encouragement contributes to students' academic success by strengthening motivation, confidence, and persistence. The reviewed literature indicates that learners who receive praise, emotional support, and positive academic expectations from their parents are more likely to develop favorable attitudes towards mathematics and demonstrate higher levels of achievement. Emotional encouragement is particularly valuable because it promotes resilience and sustained engagement even when learners encounter academic challenges.

Parent–Teacher Communication

Effective communication between parents and teachers strengthens school–family partnerships and enables coordinated support for students' learning. Studies consistently report that regular communication regarding academic progress, attendance, homework, and behavioral issues contributes positively to learners' mathematics achievement. Schools that maintain strong communication channels with families generally experience higher levels of parental participation and improved educational outcomes. Nevertheless, rural schools often encounter barriers such as limited parental availability, long travel distances, and communication constraints that reduce the frequency of meaningful parent–teacher interaction.

Research Gap

Although substantial evidence supports the positive relationship between parental involvement and students' academic achievement, several gaps remain within the existing literature. First, many previous studies have focused on general academic performance rather than mathematics achievement specifically. Second, much of the available evidence originates from developed countries, limiting its applicability to the educational realities of rural communities in Sierra Leone. Third, relatively few studies have simultaneously examined homework supervision, parents' educational attainment, home learning resources, parental motivation, and parent–teacher communication within a single analytical framework. Finally, empirical research focusing on Kailahun District remains limited despite the district's unique socio-economic and educational characteristics.

The present study addresses these gaps by examining the adjusted associations of five parental-support dimensions with mathematics achievement among primary and junior secondary learners in Kailahun District. It evaluates the dimensions simultaneously and accounts for major observed confounders. The study's cross-sectional evidence can identify promising predictors and inform future research, but it cannot establish temporal order or causal effects.



METHODOLOGY

Research Design

This study employed a quantitative cross-sectional analytical survey design. Parental-support measures, covariates, and the focal mathematics achievement measure were assembled for the same study period. The design is appropriate for estimating prevalence, associations, and statistical prediction without manipulating the school environment. However, it does not establish that parental support preceded achievement and cannot rule out reverse directionality or residual confounding. Accordingly, all estimates are interpreted as associations rather than causal effects.

Study Area

The study was conducted in **Kailahun District**, located in the Eastern Province of Sierra Leone. Kailahun District shares international borders with the Republic of Guinea to the north and the Republic of Liberia to the east and south, while it borders Kenema District to the west. The district headquarters is Kailahun Town, and the district comprises several chiefdoms, including Kissi Teng, Kissi Kama, Kissi Tongi, Luawa, Malema, Mandu, Upper Bambara, Lower Bambara, Jawei, and Penguia.

Kailahun District is predominantly rural, with agriculture serving as the principal source of livelihood for most households. The majority of residents engage in subsistence farming, cultivating crops such as rice, cocoa, coffee, cassava, and vegetables. Although agriculture contributes significantly to household income, many families experience seasonal economic fluctuations that affect their capacity to provide educational support for their children.

The district has a diverse educational landscape comprising government, government-assisted, mission, and private schools offering primary, junior secondary, and senior secondary education. Following the introduction of the Free Quality School Education (FQSE) programme, school enrolment has increased considerably. Nevertheless, many schools continue to face challenges such as shortages of qualified mathematics teachers, inadequate instructional materials, overcrowded classrooms, and limited educational infrastructure. Parental educational attainment in many rural communities remains relatively low compared with urban districts. Some parents have limited formal education and may therefore encounter difficulties in supervising mathematics homework or assisting children with complex mathematical concepts. Additionally, economic responsibilities associated with farming and trading often reduce the time available for active parental involvement in children's education.

Despite these challenges, communities in Kailahun District demonstrate strong cultural values that emphasise collective responsibility for children's welfare and education. Parent-Teacher Associations (PTAs), School Management Committees (SMCs), community leaders, and local education authorities play important roles in supporting school improvement initiatives. These characteristics make Kailahun District an appropriate setting for examining how parental support influences students' mathematics achievement.

The selection of Kailahun District is further justified by the limited empirical research conducted on parental involvement and mathematics achievement within this rural context. Findings from the study are expected to contribute valuable evidence for improving educational policy and practice not only in Kailahun but also in other rural districts of Sierra Leone with similar socioeconomic characteristics.

Population, Sample, and Sampling

The target population comprised 4,730 participants: 1,250 Primary 5–6 pupils, 1,050 junior secondary students, 95 mathematics teachers, 35 head teachers/principals, and 2,300 parents/guardians. Schools were stratified by school level and geographical area. Learners were selected randomly, mathematics teachers and school leaders purposively, and parents/guardians systematically from school records.

Of 400 questionnaires distributed, 389 were usable, giving an overall response rate of 97.3%. The achieved



sample comprised 117 primary pupils, 116 junior secondary students, 118 parents, 28 mathematics teachers, and 10 head teachers. The manuscript did not report participant-group invitation counts; group-specific response rates therefore cannot be calculated.

Participant group	Target population	Usable responses
Primary 5–6 pupils	1,250	117
Junior secondary students	1,050	116
Parents/guardians	2,300	118
Mathematics teachers	95	28
Head teachers/principals	35	10
Total	4,730	389

Source: Field survey data (2026).

Data Collection Instruments

Data were collected using structured questionnaires and students' mathematics achievement records. Separate questionnaires were administered to pupils, junior secondary school students, parents, mathematics teachers, and head teachers. The instruments measured five dimensions of parental support: homework supervision, parents' educational attainment, home learning resources, parental motivation and encouragement, and parent–teacher communication. Students' mathematics achievement was assessed using school achievement records to provide an objective measure of academic performance.

Validity and Reliability

The research instruments were subjected to expert review to establish **content validity**, ensuring that questionnaire items adequately represented the study variables. A pilot study was conducted prior to the main survey, and the internal consistency of the questionnaire was assessed using **Cronbach's alpha**. The reliability coefficients obtained for the study constructs met acceptable standards, indicating that the instruments were suitable for data collection.

Data Collection Procedures

Approval to conduct the study was obtained from the relevant educational authorities and participating schools. Respondents were informed about the objectives of the research, assured of confidentiality, and invited to participate voluntarily. Questionnaires were administered directly by the researcher, while mathematics achievement records were obtained from school authorities with the necessary permission. Completed questionnaires were checked for completeness before coding and analysis.

Data Analysis

After data collection, the completed instruments were checked, coded, organized, and analyzed using SPSS Version 26. Descriptive statistics—including frequencies, percentages, means, and standard deviations—were used to summarize respondents' demographic characteristics and questionnaire responses. The results were presented in tables for easy interpretation.

Pearson product–moment correlation examined the strength and direction of bivariate associations. A simultaneous standardized multiple-regression model was reconstructed from the reported predictor correlation matrix and predictor–outcome correlations ($n = 389$). This model controls for the other four parental-support dimensions but not for external confounders. All hypotheses were tested at $\alpha = .05$. Because the design was cross-sectional, results were interpreted as associations and predictions rather than causal effects.

Ethical Considerations

The study complied with accepted ethical standards for educational research. Participation was voluntary, info-

informed consent was obtained from all respondents, and confidentiality and anonymity were maintained throughout the study. The information collected was used exclusively for academic purposes, and respondents were informed of their right to withdraw from the study at any stage without any adverse consequences. Permission to conduct the research was obtained from the relevant educational authorities before data collection commenced.

RESULTS

Response and Participant Characteristics

Of 400 questionnaires distributed, 389 were usable (97.3%). The sample included 205 males (52.7%) and 184 females (47.3%). Parents represented 30.3% of respondents, primary pupils 30.1%, junior secondary students 29.8%, mathematics teachers 7.2%, and head teachers 2.6%.

Descriptive Findings

Parental-support dimension	Mean	SD	Interpretation
Homework supervision	3.98	0.87	High
Parents' educational attainment	3.88	0.86	High
Home learning resources	3.68	0.94	High
Motivation and encouragement	4.16	0.78	High
Parent-teacher communication	3.82	0.91	High

Source: Field survey data (2026).

Mathematics records classified 16.2% as excellent, 35.2% as good, 31.9% as average, 12.6% as below average, and 4.1% as poor.

Correlation Analysis

All five dimensions were positively associated with achievement (all $p < .001$). Motivation and encouragement had the strongest bivariate relationship ($r = .702$), followed by homework supervision ($r = .641$), home resources ($r = .618$), parent-teacher communication ($r = .586$), and parents' educational attainment ($r = .573$).

Variable	1	2	3	4	5	6
1. Homework supervision	1					
2. Parents' education	0.481	1				
3. Home resources	0.526	0.544	1			
4. Motivation/encouragement	0.603	0.512	0.578	1		
5. Parent-teacher communication	0.495	0.463	0.518	0.547	1	
6. Mathematics achievement	0.641	0.573	0.618	0.702	0.586	1

Note. $n = 389$. Correlations involving achievement are significant at $p < .001$ (two-tailed). Source: Field survey data (2026).

Simultaneous Multiple Regression

The five-predictor model explained 63.6% of the variance in mathematics achievement ($R^2 = .636$; adjusted $R^2 = .632$; $F(5, 383) = 134.1$, $p < .001$). All coefficients were positive and significant. The model controls only for the other parental-support dimensions; socioeconomic status, gender, school level, prior achievement, teacher characteristics, school resources, and school clustering were not available for adjustment.



Predictor	Standardized β	SE	95% CI	t	p
Homework supervision	0.218	0.041	[.137, .299]	5.29	<.001
Parents' educational attainment	0.147	0.039	[.070, .224]	3.74	<.001
Home learning resources	0.16	0.042	[.077, .242]	3.8	<.001
Motivation and encouragement	0.319	0.044	[.233, .406]	7.28	<.001
Parent–teacher communication	0.152	0.04	[.075, .230]	3.85	<.001

Note. Coefficients were reconstructed from the correlation matrix reported in the source manuscript.

DISCUSSION

All five dimensions were positively associated with mathematics achievement. Motivation and encouragement retained the largest unique coefficient, consistent with the view that positive expectations and emotional support may strengthen confidence and persistence. Homework supervision also retained a substantial coefficient, suggesting that study routines and monitoring contribute information beyond the other support dimensions.

Home resources, parent–teacher communication, and parents' education remained significant after accounting for the other parental-support dimensions. The comparatively smaller coefficient for parental education suggests that formal schooling is not the only route through which parents can support learning. Parents with limited education may still encourage effort, monitor attendance and homework, provide structure, and communicate with teachers.

The results are compatible with Epstein's home–school partnership framework, Bronfenbrenner's ecological account, and Coleman's social-capital perspective. They do not prove the proposed mechanisms: higher achievement may elicit parental support, and unmeasured household and school characteristics may influence both support and achievement.

LIMITATIONS

- The cross-sectional design does not establish temporal order or causation.
- Questionnaire responses may be affected by recall and social-desirability bias.
- Exact fieldwork months, school count, and construct-specific reliability coefficients were not reported.
- The reconstructed regression controls only for the five support dimensions, not external confounders.
- The linkage of mathematics records to the mixed respondent groups requires clarification against the original dataset before journal submission.
- School clustering and sampling weights could not be incorporated from the summary data.

CONCLUSION

Parental support was positively associated with mathematics achievement among participants from primary and junior secondary schools in Kailahun District during 2026. Together, the five dimensions explained 63.6% of the reported variation in achievement. Motivation and encouragement had the largest standardized coefficient, followed by homework supervision; parents' education, home resources, and parent–teacher communication also contributed unique predictive information.



The results identify promising areas for school–family collaboration but do not show that increasing support will cause achievement to improve. Longitudinal studies and evaluated interventions are required to establish temporal order, address confounding, and determine which strategies are effective in rural Sierra Leone.

RECOMMENDATIONS

- Schools should pilot structured parent–teacher communication and mathematics-focused parent workshops with clear monitoring indicators.
- Teachers should provide practical homework guidance that helps parents monitor routines without completing learners’ work.
- Government and partners should improve access to textbooks, writing materials, safe study spaces, and community learning centres.
- Community leaders and school management committees should promote encouragement, regular attendance, and constructive home–school relationships.
- Future studies should use longitudinal or experimental designs, baseline achievement measures, clustered analysis, and adjustment for relevant student, household, teacher, and school factors.

DECLARATIONS

Ethics and Consent

Administrative approval was obtained from relevant education authorities and participating schools in 2026. Participation was voluntary, confidentiality and anonymity were maintained, and informed consent was obtained. Consent and assent procedures for pupils followed applicable institutional and school requirements. A formal ethics-committee name and approval reference were not reported and should be inserted before submission if available.

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Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

All authors contributed to the conception and development of the manuscript, reviewed the final version, and approved it for submission. Roles should be verified and expanded using the target journal’s preferred Credit format before submission.

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