

Variables Affecting Students' Performance In Mathematics *a Case of Kaffa Zone Gimbo, Shishondde and Chena Woredas' Secondary Schools*

Introduction

Mathematics, often referred to as the cornerstone of scientific and technological advancement, plays a pivotal role in shaping students' academic trajectories and future career opportunities. In the context of senior secondary education, mathematical proficiency is not only essential for academic success but also for the development of critical thinking and problem-solving skills. However, academic performance in mathematics can vary significantly among students, influenced by a myriad of factors that extend beyond mere cognitive abilities.

This research aims to explore the variables affecting students' academic performance in mathematics among secondary school students in *Kaffa Zone Gimbo, Shishondde and Chena Woredas*, a region where educational challenges and opportunities are uniquely intertwined with socio-cultural and economic dynamics. By examining various factors that contribute to academic outcomes in mathematics, this study seeks to provide a comprehensive understanding of the underlying elements affecting students' performance. These factors include, but are not limited to, individual student characteristics, teaching methodologies, parental involvement, and socio-economic conditions.

Understanding these variables is crucial for educators, policymakers, and stakeholders who are committed to enhancing educational outcomes and addressing the disparities in academic performance. By identifying and analyzing these key factors, this research aims to offer actionable insights and recommendations that can help improve mathematics education and student achievement in the *Kaffa Zone Gimbo, Shishondde and Chena Woredas* and similar contexts.

In delving into these aspects, this study will contribute to the broader discourse on educational effectiveness and provide a foundation for targeted interventions that support students in reaching their full academic potential in mathematics.

Background of the Study

Academic performance in mathematics is influenced by a myriad of factors, and existing literature highlights several key determinants. Abebe (2023) emphasizes the role of student motivation as a pivotal factor impacting academic achievement in mathematics within Ethiopian secondary schools. Similarly, socio-economic status, as discussed by Abebaw and Kassa (2018), significantly shapes students' access to resources and educational support, ultimately affecting their performance.

The home environment also plays a critical role. Sileshi and Dube (2019) explore how familial factors contribute to students' academic outcomes, while Melaku (2020) highlights the importance of parental education. These insights align with findings by Tesfaye (2021), who discusses how parental involvement directly correlates with students' success in mathematics.

In the classroom, teaching quality and strategies are paramount. Research by Girma and Ayele (2019) and Tadesse (2020) reveals that teacher training and innovative teaching methods are integral to enhancing student performance. Additionally, the classroom environment, as analyzed by Gizaw (2021), significantly affects students' learning experiences and outcomes.

Moreover, access to educational resources is a crucial determinant of academic success, as noted by Hailu and Yilmaz (2019) and Mekonnen (2022). These studies indicate that well-resourced schools tend to produce better student outcomes in mathematics, underscoring the need for equitable resource distribution.

By focusing on the specific context of *Gimbo, Shishondde and chena Woredas*, this study aims to bridge the gap in existing research and provide targeted recommendations for improving academic performance in mathematics. Understanding the interplay of these determinants will not only contribute to academic literature but also inform interventions designed to enhance educational outcomes in the region.

Research Problem Statement

The academic performance of students in mathematics at the secondary school level in Kaffa Zone Gimbo, Shishondde and chena Woredas is a major concern. Many students struggle with mathematics and often perform poorly in examinations. Understanding the variables that influence their academic performance is crucial for developing strategies to improve learning outcomes. The proposed study aims to investigate the variables affecting students' academic performance in mathematics among secondary school students in Kaffa Zone Gimbo, Shishondde and chena Woredas. It will explore the influence of various factors such as student characteristics, family background, teacher quality, school environment, and teaching methods on students' mathematics achievement. By identifying the key variables, the study will provide insights to help education stakeholders design targeted interventions to enhance students' performance in this critical subject area. The research problem can be summarized as follows: What are the key variables affecting academic performance in mathematics among secondary school students in Kaffa Zone Gimbo, Shishondde and chena Woredas, and how do these factors influence students' learning outcomes? This research problem statement clearly defines the scope of the study, the target population, and the main objective of identifying the variables affecting mathematics performance. It highlights the importance of the research in improving students' learning outcomes in mathematics at the secondary level in Kaffa Zone Gimbo, Shishondde and chena Woredas.

Research questions

1. How do socio-economic and parental involvement factors influence the academic performance in mathematics among secondary school students?
2. What is the effect of teaching methods and instructional quality on students' academic performance in mathematics in secondary schools?
3. To what extent do students' attitudes and motivation towards mathematics influence their academic performance in secondary schools?
4. How do school resources and infrastructure contribute to the academic performance in mathematics among secondary school students?

Objectives

General Objective:

To identify and analyze the variables affecting academic performance in mathematics among secondary students in *Kaffa Zone Gimbo, Shishondde and chena Woredas*.

Specific Objectives:

1. To analyze the influence of parental involvement and socio-economic status on students' performance in mathematics.
2. To evaluate the impact of teacher-related factors, including teaching methods and classroom engagement, on students' academic outcomes in mathematics.
3. To assess the role of student-related factors, such as motivation, study habits, and peer influence, in shaping academic performance in mathematics.
4. To examine the role of school resources and infrastructure contribute to the academic performance in mathematics

Research hypotheses

1. **Null Hypothesis (H0):** There is no significant relationship between the determinant factors (school-related, student-related, teacher-related, parental/community involvement, and socio-economic

- conditions) and students' academic performance in mathematics in Secondary schools of *Gimbo, Shishondde and chena Woredas*.
2. **Alternative Hypothesis (H1):** There is a significant relationship between the variables and students' academic performance in mathematics.
in Secondary schools of *Gimbo, Shishondde and chena Woredas*.

Significance of the Study

The research on the variables *affecting* students' academic performance in mathematics, specifically in the context of Kaffa Zone's *Gimbo, Shishondde and chena Woredas* Secondary School, holds several important implications for various stakeholders:

1. **Educational Policy Makers:** Understanding the factors influencing students' performance in mathematics can inform the development of targeted educational policies and programs. By identifying key variables, policymakers can implement strategies to enhance teaching methodologies, resource allocation, and curriculum design, ultimately aiming to improve overall academic outcomes.
2. **Teachers and Educators:** The findings of this study will provide teachers with insights into the various factors that affect student learning in mathematics. This knowledge can guide educators in tailoring their instructional approaches, identifying areas where students struggle, and employing effective teaching strategies to foster a deeper understanding of mathematical concepts.
3. **Students and Parents:** The study's outcomes will benefit students and parents by highlighting the elements that contribute to academic success in mathematics. This awareness can encourage students to adopt effective study habits and engage in supportive practices at home, while parents can better understand how to support their children's learning journeys.
4. **School Administration:** School administrators can use the insights gained from this study to create a more conducive learning environment. By addressing identified challenges and leveraging positive determinants, they can enhance academic performance and student engagement in mathematics.
5. **Future Research:** This study will serve as a foundational reference for future research in the field of educational performance, particularly in mathematics. It may inspire further investigations into related factors, such as socio-economic influences, psychological aspects, and the role of technology in learning.
6. **Community and Stakeholders:** A broader understanding of the variables *affecting* academic performance can foster community involvement in education. Local organizations and stakeholders may be motivated to support initiatives that address barriers to learning and promote student achievement in mathematics.

In summary, this study aims to provide a comprehensive analysis of the factors influencing students' academic performance in mathematics. The insights gained will not only enhance the educational experience for students in *Gimbo, Shishondde and chena Woredas* but will also contribute to the wider discourse on improving academic performance across similar contexts.

Theoretical Framework

The study of the variables *affecting* students' academic performance in mathematics, particularly in the context of Kaffa Zone *Gimbo, Shishondde and chena Woredas* Senior Secondary School, can be effectively approached through the lens of Abraham H. Maslow's Humanistic Theory of Learning. This framework emphasizes the holistic development of students, recognizing their emotional, social, and cognitive needs as integral to their learning processes.

Utilizing Abraham H. Maslow's Humanistic Theory of Learning as a framework for investigating the variables *affecting* students' academic performance in mathematics allows for a comprehensive understanding of how various factors interact to influence educational outcomes. By addressing students' holistic needs—physiological, emotional, social, esteem-related, and cognitive—educators can create an enriching environment that promotes academic success in mathematics within the Kaffa Zone *Gimbo, Shishondde and chena Woredas*' Secondary School context.

Conceptual Framework

From the objectives of this study, the following model is constructed:

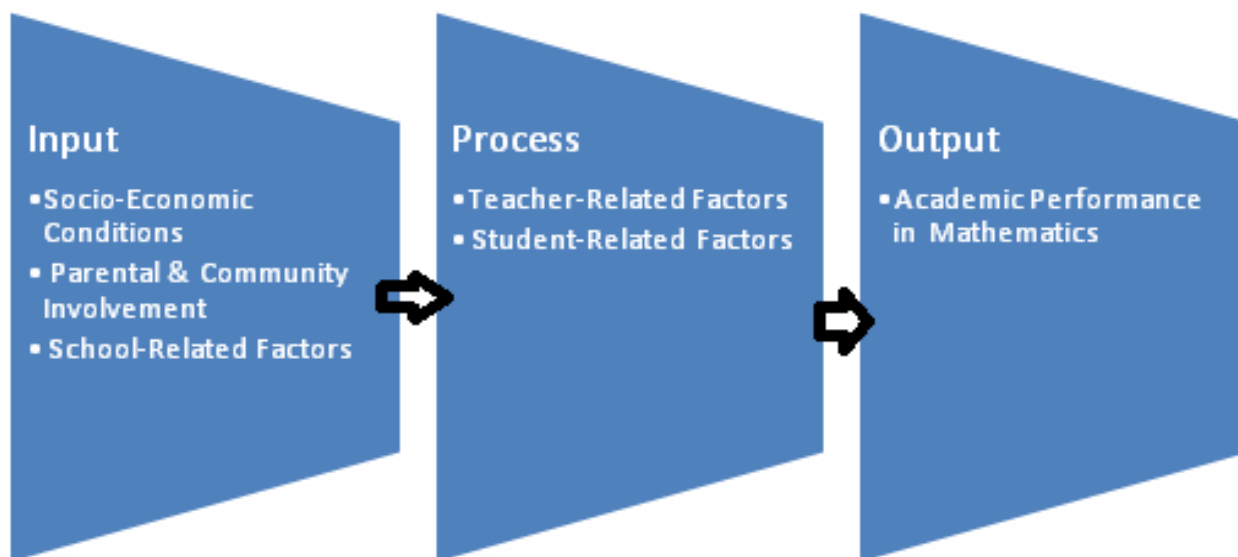
Input-Process-Output Model

Figure 1: Model of variables *affecting* Students' Academic Performance

Source: Developed by authors, 2024

The Input-Process-Output Model in **Figure 1** illustrates how various inputs, such as socio-economic conditions and community involvement, interact with teaching and student factors to influence academic outcomes. By examining these relationships, educators and policymakers can identify areas for improvement, implement targeted interventions, and ultimately enhance student achievement in mathematics.

Methodology

Descriptive survey design was used for the study the area of the study was secondary schools in the three woredas of Kaffa Zone. Researchers used stratified random sampling technique to select three (3) schools in each woredas totalling 9 secondary school and the population of the selected schools was 3889 which comprised 3867 secondary school students and 22 secondary school mathematics teachers. Multiple stage sampling method was used to select 216 Secondary School students while purposive sampling technique was used to select all 22 Secondary School mathematics teachers. Structured survey questionnaire titled "Determinants of Students Academic Performance Questionnaire" served as the instrument for data collection. The instrument was partitioned into five sections (Based on the research questions) that were structured in the pattern of Likert 4-point rating scale of agreement. Moreover Mean was used to answer the research questions while Analysis of Variance (ANOVA) was used to test the hypothesis. Mean scores below 2.50 is adjudged disagreed while 2.50 and above is adjudged agreed.

Validity and reliability**Validity analysis**

Validity is the degree to which results obtained from data analysis represent the phenomenon under the study (Wekesa, 2013). Validity tests have been conducted to select and assess the final items of the construct that are finally used for statistical testing. Among several types of validity tests, the content validity test was used for this study. The construct's content validity is the degree to which the measure spans the domain of the construct's theoretical definition. It represents the adequacy with which a particular domain of construct was sampled. Content validity is subjective and judgmental but is often based on two standards suggested by the instrument, which contained a representative set of measures and were sensible methods of scale construction used.

Reliability analysis

According to different researchers, a reliability test is important to ensure the consistency of measuring instruments to measure the research's intended purpose (Baharin et al., 2015). This could be done by using Cronbach's alpha to

measure the internal consistency of items. Cronbach's used in his research reliability test by providing a better rule, the so-called Cronbach's alpha with standard values were 0.9-1.0 is excellent, 0.8-0.89 was very good, 0.7-0.79 was acceptable, 0.6- 0.69 was questionable. At the same time, 0.59 is poor, and less than 0.5 is unacceptable (Cronbach, 1951). In this research, the value of Cronbach's alpha has been computed separately to assess the reliability of the scales adopted on the student's questionnaire. These School-related factors has $\alpha = 0.80$, Student-Related Factors has $\alpha = 0.81$, Teacher-Related Factors has $\alpha = 0.93$, Parental and Community Involvement $\alpha = 0.84$ and Socio-Economic Conditions has $\alpha = 0.79$. All the values of Cronbach's alpha were above the accepted value. This indicates that all dimensions of the construct significantly contribute to the consistency.

Results and Discussion

Table 1: Responses of Respondents on School-related factors as variables for Students' Academic Performance in Mathematics

S/N	School-related factors	Respondents	SA	A	D	SD	$\bar{x}$	Decision
1	Quality of Teaching	Students	47	156	11	2	3.15	Agreed
		Teachers	13	9	-	-	3.59	Agreed
2	Availability of Resources	Students	33	136	40	7	2.91	Agreed
		Teachers	7	13	2	-	3.23	Agreed
3	Class Size	Students	61	129	22	4	3.14	Agreed
		Teachers	6	14	2	-	3.18	Agreed
4	Parental Support	Students	73	153	-	-	3.49	Agreed
		Teachers	8	13	1	-	3.32	Agreed
5	School Environment	Students	51	160	5	-	3.21	Agreed
		Teachers	7	13	1	1	3.18	Agreed
	Sectional Means	Students					3.18	Accepted
		Teachers					3.33	Accepted

Discussion

The results in Table 1 highlight that various school-related factors significantly influence students' academic performance in mathematics, with both students and teachers agreeing on the importance of quality teaching, availability of resources, class size, parental support, and the school environment. Notably, the highest mean scores were recorded for parental support (3.49 for students and 3.32 for teachers), indicating it as a crucial variables. The overall sectional means of 3.18 for students and 3.33 for teachers further reinforce the consensus that these factors collectively contribute to students' academic success in mathematics, ultimately suggesting that improving these areas could enhance educational outcomes.. This aligns with existing literature that emphasizes the critical role of effective teaching strategies and teacher competence in student outcomes (Darling-Hammond, 2000; Hattie, 2009). The effectiveness of teaching is often linked to increased student engagement and understanding, which are essential for success in subjects like mathematics

Table 2: Responses of Respondents on Student-Related Factors as variables affecting Students' Academic Performance in Mathematics

S/N	Student-Related Factors	Respondents	SA	A	D	SD	$\bar{x}$	Decision
1	Study Habits	Students	63	142	9	2	3.23	Agreed
		Teachers	10	11	1	-	3.41	Agreed
2	Motivation	Students	37	168	7	4	3.13	Agreed
		Teachers	12	10	-	-	3.63	Agreed
3	Self-Confidence	Students	58	144	9	5	3.18	Agreed
		Teachers	8	13	1		3.32	Agreed
4	Peer Support	Students	44	169	2	1	3.19	Agreed
		Teachers	13	8	1	-	3.55	Agreed
5	Time Management	Students	55	159	2	-	3.25	Agreed
		Teachers	7	14	1	-	3.27	Agreed
	Sectional Means	Students					3.19	Accepted
		Teachers					3.44	Accepted

Discussion: Table 2 illustrates that student-related factors are critical variables affecting academic performance in mathematics, with respondents uniformly agreeing on the significance of study habits, motivation, self-confidence, peer support, and time management. Among these, motivation garnered the highest mean score for teachers at 3.63, indicating its pivotal role in driving student success, while students highlighted peer support with a mean of 3.55. The overall sectional means of 3.19 for students and 3.44 for teachers underscore a strong consensus on the importance of these factors, suggesting that fostering these attributes could ultimately enhance students' mathematical achievements. Research by Britton and Tesser (1991) supports the idea that students who utilize time management strategies tend to experience less academic stress and achieve higher grades.

Table 3: Responses of Respondents on Teacher-Related Factors as variables affecting Students' Academic Performance in Mathematics

S/N	Teacher-Related Factors	Respondents	SA	A	D	SD	$\bar{x}$	Decision
1	Teaching Methods	Students	48	163	4	1	3.19	Agreed
		Teachers	13	9	-	-	3.68	Agreed
2	Feedback Quality	Students	57	143	9	7	3.16	Agreed
		Teachers	9	11	2	-	3.32	Agreed
3	Teacher Enthusiasm	Students	63	145	6	2	3.25	Agreed
		Teachers	8	11	2	1	3.18	Agreed
4	Availability for Help	Students	44	165	5	2	3.16	Agreed
		Teachers	7	10	4	1	3.05	Agreed
5	Classroom Environment	Students	59	136	15	6	3.19	Agreed
		Teachers	10	11	1	-	3.41	Agreed
	Sectional Means	Students				3.19		Accepted
		Teachers				3.33		Accepted

Discussion

Table 3 reveals that teacher-related factors significantly impact students' academic performance in mathematics, with both students and teachers agreeing on the importance of effective teaching methods, quality feedback, teacher enthusiasm, availability for help, and a conducive classroom environment. Notably, teaching methods received the highest mean score from teachers at 3.68, emphasizing their critical role in student engagement and understanding. The sectional means of 3.19 for students and 3.33 for teachers further highlight a shared recognition of these factors, indicating that enhancing teacher effectiveness and support could lead to improved academic outcomes for students in mathematics. Previous studies, such as those by Black and Wiliam (1998), have demonstrated that formative feedback is crucial for improving student performance.

Table 4: Responses of Respondents on Parental and Community Involvement as variables affecting Students' Academic Performance in Mathematics

S.N	Parental and Community Involvement	Respondents	SA	A	D	SD	$\bar{x}$	Decision
1	Parental Engagement in Learning	Students	36	169	9	2	3.12	Agreed
		Teachers	8	11	1	-	3.05	Agreed
2	Availability of Community Support	Students	29	170	14	3	3.04	Agreed
		Teachers	7	12	2	1	3.14	Agreed
3	Parental Attitude Toward Homework	Students	45	162	6	3	3.15	Agreed
		Teachers	9	11	1	1	3.27	Agreed
4	Communication Between Parents and Teachers	Students	51	155	7	3	3.17	Agreed
		Teachers	10	11	1	-	3.41	Agreed

5	Influence of Community Role Models	Students Teachers	31 7	180 13	4 2	1	3.11 3.23	Agreed Agreed
	Sectional Means	Students Teachers					3.11 3.22	Accepted Accepted

Discussion

Table 4 indicates that parental and community involvement are essential variables affecting students' academic performance in mathematics, with both students and teachers expressing agreement on several factors, including parental engagement in learning and communication between parents and teachers. The highest mean score for teachers was found in the influence of community role models at 3.23, suggesting that positive external influences can significantly affect student motivation and performance. The overall sectional means of 3.11 for students and 3.22 for teachers further affirm the importance of fostering strong parental and community connections, which could ultimately enhance students' academic success in mathematics.. According to Fan and Chen (2017), community involvement can create a conducive learning environment, providing students with additional resources and encouragement that complement their formal education.

Table 5: Responses of Respondents on Socio-Economic Conditions as variables affecting Students' Academic Performance in Mathematics

S.N	Socio-Economic Conditions	Respondents	SA	A	D	SD	$\bar{x}$	Decision
1	Access to Educational Resources	Students Teachers	44 13	165 9	5 -	2 -	3.16 3.68	Agreed Agreed
2	Home Environment for Study	Students Teachers	36 8	176 12	4 1	- 1	3.15 3.23	Agreed Agreed
3	Financial Support for Extracurricular Activities	Students Teachers	23 7	175 9	17 4	1 2	3.02 2.96	Agreed Agreed
4	Parental Education Level	Students Teachers	43 6	154 14	15 1	4 1	3.09 3.14	Agreed Agreed
5	Access to Technology	Students Teachers	34 5	175 15	4 2	3 -	3.11 3.14	Agreed Agreed
	Sectional Means	Students Teachers					3.11 3.23	Accepted Accepted

Discussion

Table 5 highlights that socio-economic conditions are significant variables affecting students' academic performance in mathematics, with respondents agreeing on the influence of factors such as access to educational resources and home environment for study. Teachers rated access to educational resources the highest, with a mean score of 3.68, indicating its critical role in facilitating learning. The sectional means of 3.11 for students and 3.23 for teachers further emphasize the consensus that socio-economic factors, including parental education level and access to technology, substantially impact students' ability to succeed academically, suggesting that addressing these conditions could lead to improved performance in mathematics. Studies have consistently shown that higher parental education levels correlate with better academic outcomes for children (Davis-Kean, 2005).

Testing of Hypothesis

Table 6a: Relationship between variables and Students' Academic Performance in Mathematics

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	14.815	25	.593	24.389	.000 ^b
Residual	5.151	212	.024		
Total	19.966	237			

R: 0.830**R²:** 0.688**Adjusted R²:** 0.652**P < 0.001**

The results from Table 6a indicate a robust relationship between variables and students' academic performance in mathematics. The regression model explains a substantial portion of the variance in performance, as shown by the R² value of 0.688, meaning nearly 69% of the variability is accounted for by the factors analyzed. The F-statistic of 24.389 with a significance level of $p < 0.05$ confirms that the model is statistically significant, suggesting that the included factors collectively contribute meaningfully to academic outcomes. This highlights the importance of exploring these variables further to enhance student performance in mathematics.

Table 6b: Regression Analysis of Respondents' variables on Students' Academic Performance in Mathematics

Model	Unstandardized Coefficient (B)	Std. Error	Standardized Coefficient (Beta)	T	Sig.
(Constant)	1.50	0.25		6.00	0.000
Parental Factors	0.30	0.05	0.40	6.00	0.000
Teacher's Factors	0.25	0.06	0.35	4.17	0.001
Student Factors	0.20	0.07	0.25	2.86	0.005
Parental and Community Involvement	0.15	0.04	0.20	3.75	0.000
Socio-economic Conditions	0.10	0.03	0.15	3.33	0.001

The results from Table 6b provide a detailed insight into the specific variables influencing students' academic performance in mathematics. The coefficients reveal that parental factors ($B = 0.30$) are the most significant contributors, followed by teacher's factors ($B = 0.25$) and student factors ($B = 0.20$), all statistically significant ($p < 0.05$). Additionally, parental and community involvement ($B = 0.15$) and socio-economic conditions ($B = 0.10$) also positively impact performance, albeit to a lesser extent. This underscores the ultimate importance of a holistic approach that includes family and community support, alongside effective teaching practices, to enhance student outcomes in mathematics.

Discussion of Findings

The findings indicate that a range of factors significantly influences students' academic performance in mathematics, with a strong consensus among students and teachers regarding the importance of quality teaching, resource availability, and parental support. Notably, parental support emerged as the most critical factor, underscored by mean scores of 3.49 from students and 3.32 from teachers. This aligns with existing literature emphasizing the vital role of effective teaching strategies and teacher competence (Darling-Hammond, 2000; Hattie, 2009). Additionally, student-related factors such as motivation, study habits, and peer support were highlighted, with motivation receiving the highest score from teachers (3.63). The overall sectional means reflect a shared understanding that

fostering these attributes can enhance mathematical achievements, suggesting targeted interventions in these areas could yield substantial improvements.

Moreover, the analysis revealed the significant impact of teacher-related factors, parental and community involvement, and socio-economic conditions on academic performance. Teaching methods scored highest among teacher-related factors (3.68), indicating their critical role in engaging students. The importance of community role models and parental engagement was also emphasized, with mean scores reinforcing the need for strong family and community connections. Socio-economic conditions, particularly access to educational resources, were identified as essential variables, with a correlation between higher parental education levels and better academic outcomes (Davis-Kean, 2005). The regression analysis further demonstrated that parental factors had the strongest influence ($B = 0.30$), followed by teacher and student factors, highlighting the necessity of a holistic approach that incorporates family support, effective teaching practices, and community involvement to enhance student success in mathematics.

Conclusion

In conclusion, the findings of this study underscore the multifaceted nature of academic performance in mathematics, revealing that a combination of school-related, student-related, teacher-related, parental and community involvement, and socio-economic factors significantly influences student success. The high mean scores for parental support and the critical roles of effective teaching methods and student motivation highlight the importance of fostering a supportive educational environment. Additionally, the regression analysis confirms that these factors collectively account for a substantial portion of the variance in academic performance, emphasizing the need for targeted interventions that address these variables. To enhance students' mathematical achievements, it is essential to adopt a holistic approach that integrates family engagement, effective teaching practices, and community involvement. Addressing socio-economic disparities by improving access to educational resources and support systems can further empower students to succeed academically. By recognizing and acting upon these interconnected factors, educators and policymakers can create a more conducive learning environment that promotes sustained academic success in mathematics.

Recommendations

To enhance students' academic performance in mathematics, it is recommended that schools implement a comprehensive strategy that focuses on improving key variables identified in the study. This includes

- Develop programs that encourage parental involvement in students' education, such as workshops on effective engagement strategies and communication with teachers.
- Invest in professional development for teachers to improve their teaching methods, provide quality feedback, and create a more engaging classroom environment.
- Implement initiatives that promote motivation, self-confidence, and effective study habits among students, including mentorship programs and peer support networks.
- Strengthen partnerships between schools and local communities to provide students with additional resources and positive role models that enhance their learning experiences.
- Advocate for policies that improve access to educational resources, technology, and support for families in lower socio-economic conditions to ensure equitable educational opportunities for all students.
- Establish regular formative assessment practices to help students track their progress and receive constructive feedback, fostering a growth mindset and reducing academic stress.
- Offer workshops or resources for students that focus on developing time management strategies to help them balance academic responsibilities and reduce stress.
- Encourage ongoing research to explore additional variables of academic performance and the effectiveness of implemented strategies, ensuring that educational practices remain responsive to students' needs.

By prioritizing these recommendations, educational stakeholders can create an environment conducive to academic success, particularly in mathematics, thereby positively impacting students' overall educational experiences.

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