

ANALYZING THE INFLUENCE OF SOCIOECONOMIC AND EDUCATIONAL FACTORS ON STUDENT ACADEMIC ACHIEVEMENT

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Abstract

Academic achievement is a central indicator of educational success and is influenced by a range of socioeconomic and educational factors. Understanding these influences is essential for improving learning outcomes and addressing disparities in education. This study examines the impact of key socioeconomic and educational variables on student academic achievement using a quantitative, data-driven approach. A secondary dataset comprising 1,000 student records was analyzed, including variables such as parental level of education, lunch status, test preparation, gender, and race/ethnicity, along with performance in mathematics, reading, and writing. Descriptive statistics, correlation analysis, and multiple regression techniques were employed to identify patterns and determine the relative influence of these factors on academic performance. The findings indicate that students demonstrate moderate overall achievement, with reading scores slightly higher than mathematics and writing. Significant differences were observed across groups, with students receiving standard lunch, completing test preparation courses, and having higher parental education levels achieving better outcomes. Strong positive correlations were found among subject scores, supporting the use of a composite achievement measure. Regression analysis further revealed that lunch status and test preparation are the strongest predictors of academic performance, while parental education and gender also contribute meaningfully. The study highlights the importance of socioeconomic context and educational support in shaping student achievement and underscores the need for targeted, evidence-based educational interventions.

Keywords: Academic Achievement, Socioeconomic Status, Parental Education, Educational Support, Student Performance, Data-driven Analysis.

1. Introduction

Academic performance in students is generally considered one of the most successful indicators of education and the effectiveness of the institution. It has become a more significant issue to comprehend what factors affect academic performance in the global development of education and equity. Of these, socioeconomic status, parental engagement and education support systems have always been identified as key determinants of student achievement. The socioeconomic status (SES), specifically, is a key factor influencing the access to educational resources, learning conditions, and academic progress (Faiza and Daud, 2023).

The current literature has pointed to the continued role of socioeconomic disparities in determining student achievement. Economically advantaged students are more likely to achieve higher academic results because of the increased access to learning resources, secure learning conditions, and a safe family environment (Pajarillo-Aquino, 2019). In the same vein, Buthelezi (2024) pointed out that socioeconomic status greatly affects sustainable learning outcomes, which implies that economic disparities still form obstacles towards learning achievement. These differences tend to start at the early stages of the educational process of a child and may progress with time, resulting in the achievement gaps in the long-term perspective (Reardon and Portilla, 2016).

The education and parental involvement also play a part in the development of academic performance. The more educated parents are more likely to offer academic advice, offer higher expectations and establish conducive learning conditions to children. According to Budiongan *et al.* (2024), parental expectations and motivation are significant factors that affect student academic performance and thus family-related factors are important in the educational achievement. Moreover, parental engagement has been demonstrated to have a beneficial impact on the performance of students by strengthening learning behaviors and encouraging engagement (Wilder, 2023). Kwarteng *et al.* (2022) also stressed that parental involvement is a key factor in the context of addressing the socioeconomic background-academic performance gap.

In addition to socioeconomic and family-based reasons, student interest and self-management are also contributing issues to academic achievement. Engagement is the measure of the interest of students in learning activities and has been associated with better academic performance (Kahu and Nelson, 2018). Lei *et al.* (2018) also showed by meta-analysis that the academic achievement is closely linked with the level of student engagement. Besides this, Zhao *et al.* (2024) have also emphasized that self-management and self-efficacy are influential factors that determine performance among students, and therefore, external factors like socioeconomic status can be mediated by internal factors.

As technology has progressed, educational data mining and learning analytics have become effective tools in the analysis of student performance trends. These methods allow researchers to work with large volumes of data and discover significant predictors of academic success, which can be used to make evidence-based decisions in the field of education (Rabelo *et al.*, 2024). Also, an educational technological study has demonstrated that online learning spaces and interaction approaches can have a substantial impact on student achievement (Bond *et al.*, 2020). These transformations suggest that the application of information-based solutions should be taken into consideration to investigate the complexity of interrelationships among various factors affecting the level of academic performance.

Despite the extensive studies performed on the topic of academic achievement, the gap still exists that requires more profound studies that would take into consideration socioeconomic, educational, and demographic variables in one analytical framework. To a great extent, the literature that is available leans toward single variables, thus preventing a comprehensive picture of how various factors combine towards the determination of student outcomes. To address this gap, the current study will present systematic and scientific analysis of the joint influence of socioeconomic and educational factors on the academic performance of students. In particular, the research is aimed at investigating how academic performance is affected by socioeconomic status, how parental education and participation in student performance affect academic performance, how educational support, especially test preparation, impacts academic performance, and how one can identify key predictors of academic success through data-driven approach.

2. Methodology

2.1 Research Design

This research design applies a quantitative research design to find out the impact of socioeconomic and educational factors on the academic performance of students. This study should be performed quantitatively because this method will allow systematic measurement and statistical analysis of the correlation between several independent variables and the result of the academic performance. The design helps the identification of patterns, associations, and predictive relationships on the basis of numerical data, thus, supporting the evidence-based conclusions that can be applied to the development of education.

2.2 Population and Sample

The research applies a secondary dataset of 1,000 records of students, who represent various demographic and educational backgrounds (Seshapanpu, 2019). The dataset contains data pertaining to student factors, socioeconomic status, factors of educational support, and academic performance indicators. The sample size is big enough to have statistical reliability and variability, which facilitates a strong analysis and generalizable conclusions on the factors affecting student achievement.

2.3 Variables of the Study

2.3.1 Socioeconomic Variables

Socioeconomic variables in this study are the background conditions that might affect the academic performance of students. These variables are lunch status, parent level education and race/ethnicity. Status of lunch is a valuable proxy of

socioeconomic status, with students with middle and lower socioeconomic status being identified by their lunch status. The education level indicates the level of education in the home setting and is usually linked with the level of education offered to students in terms of academic support and encouragement to learn. Also, race and ethnicity are regarded as demographic variables that might reflect disparities in access and opportunity to education. These variables combined give a holistic picture of the wider social and economic context in which learning among students takes place.

2.3.2 Educational Variables

In this research, the educational variables are used to measure the variables of the academic support and the conditions of learning that can directly impact student performance. These are enrolment in a test preparation course and gender. The variable of test preparation course shows whether the student has undergone extra academic preparation that can help him/her better grasp the content of the subject and perform better in the exams. Gender is also a demographic variable, which would be used to analyze the possibility of potential variations in academic achievement patterns between male and female students. All the variables help in determining the role of educational exposure and the structured learning support in determining academic outcomes.

2.3.3 Academic Performance Variables

The main outcome variable in the given research is academic performance which is measured in terms of scores of students in mathematics, reading and writing. These subject specific scores are in-depth detailing of student success on various academic areas. Besides the scores of the subjects of the subjects, a general academic achievement score is calculated by averaging the mathematics, reading and writing scores. This aggregate measure gives a more detailed evaluation of students performance and allows to conduct a single analysis of the academic performance with reference to socioeconomic and educational variables.

2.4 Data Analysis Techniques

In order to test the interrelationships among the socioeconomic, educational, and academic performance variables, various statistical methods are used. The central features of the data are summarized using descriptive statistics, which involve the mean, standard deviation, and frequency distributions, which are used to give an idea of student performance and background features. To assess the direction and the strength of the relationships between independent variables and the academic achievement indicators, correlation analysis is made to determine important factors that relate to student performance. Moreover, there is the use of multiple linear regression analysis to identify the degree to which the socioeconomic and educational factors predict the academic achievement. This method allows identifying meaningful predictors and allows the researcher to eliminate the effects of other variables, which allows gaining a more profound insight into what factors lead to the academic success of students.

2.5 Ethical Considerations

The research is grounded on publicly available secondary data and there is no direct contact with human subjects. All the analyses are performed on anonymized data and no personalities are revealed. The study complies with the ethical principles since it considers only aggregated data and preserves confidentiality during the analysis.

3. Results and Analysis

3.1 Descriptive Statistics

Descriptive statistics were calculated to describe the essential features of the variables of academic performance and background factors that were taken into consideration in the study. Primary outcomes in academic achievement were measured with mathematics, reading and writing scores, and an overall academic achievement measure which was a mean of mathematics, reading and writing scores. The findings reveal that the students show moderate performances in terms of academic performance where reading scores are slightly better than mathematics and writing.

Table 1 finds that students achieve relatively higher in reading and mathematics is the lowest performing subject on average. The standard deviations of the variables indicate moderate variability that means that there is no uniformity in student performance and students are quite different across the sample.

In order to get a better insight into the distribution of academic achievement, students were grouped into performance levels using overall scores. The distribution shows that most of the students are moderate performing, with small percentages of both the low performing and high performing students.

Figure 1 shows the pattern of students in the various levels of academic performance. Most of the students (51.7) are the moderate performers with 28.5 being the low performers. High performance is relatively low in the dataset as only 19.8% of students perform highly.

Table 1. Descriptive Statistics of Key Variables

Variable	Mean	Std. Deviation	Minimum	Maximum
Math Score	66.09	15.16	0	100
Reading Score	69.17	14.60	17	100
Writing Score	68.05	15.20	10	100
Overall Academic Achievement	67.77	14.26	9	100

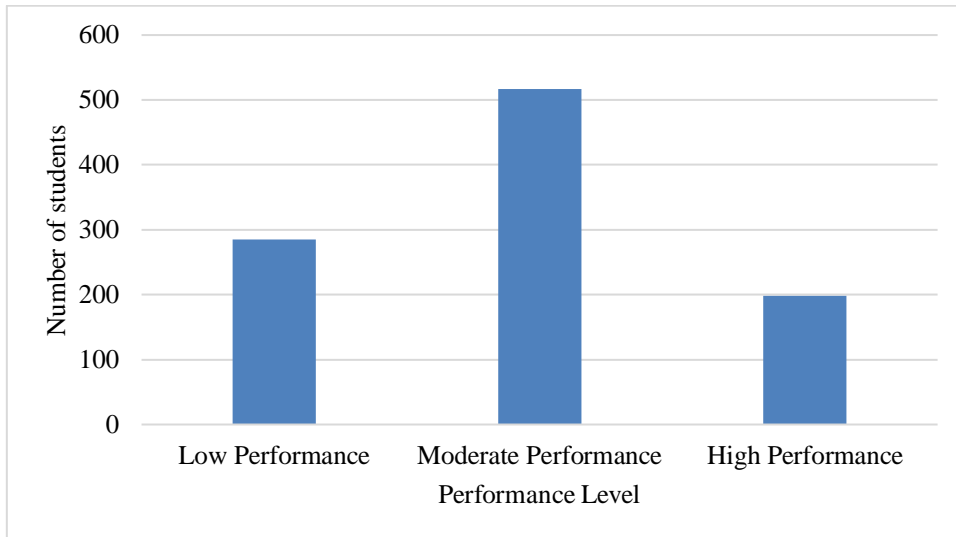


Figure 1. Distribution of Student Academic Achievement Levels

Additional descriptive analysis was performed to test the variation in academic achievement among major socioeconomic and educational factors.

Table 2 results demonstrate definite group differences. Women students perform better in their studies than the male students. There is a wide disparity between learners attending the regular lunch and free/reduced lunch and this shows the impact of socioeconomic factors. In the same vein, students who took a test preparation course record significantly better academic performance compared to those who did not, indicating the relevance of organized academic assistance. The trend shown in figure 2 shows that academic performance shows a steady upward trend with higher levels of parental education. The students with parents with a better education level have better academic results, which implies that family education level is a significant factor that influences the performance of students.

Table 2. Mean Overall Academic Achievement by Key Background Variables

Variable	Category	Mean Overall Score
Gender	Female	69.57
	Male	65.84
Lunch Status	Standard	70.84
	Free/Reduced	62.20
Test Preparation Course	Completed	72.67
	None	65.04

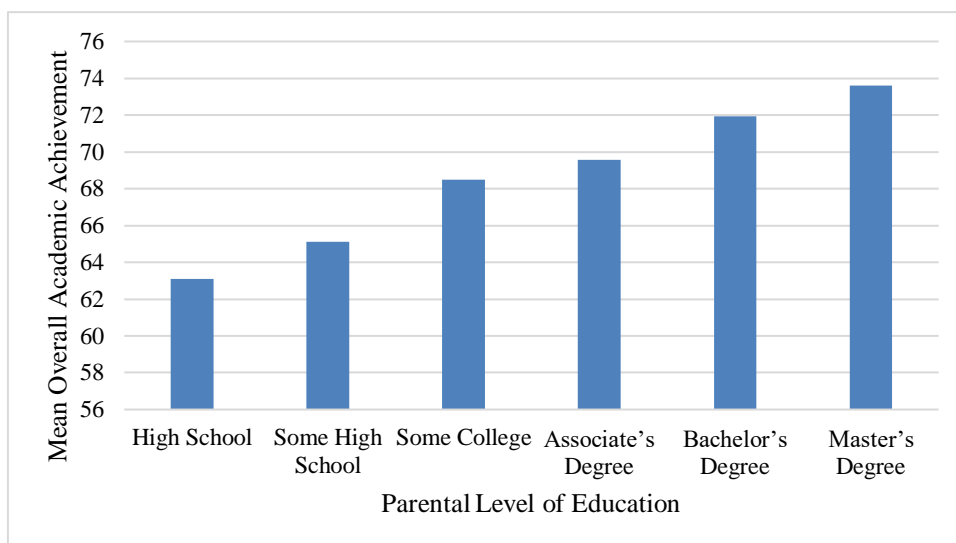


Figure 2. Academic Achievement by Parental Level of Education

3.2 Correlation Analysis

The correlation analysis was used to investigate the connection between academic performance variables. As the research has several subject-specific indicators of achievement, the correlation matrix gives a clue of the relationship between

performance in various academic areas.

Table 3 results show that the academic performance variables have strong positive correlations. Reading and writing scores show the highest correlation thus indicating that these two language-based skills are closely related. Mathematics has close ties with reading and writing as well. A high degree of correlation between the composite overall academic achievement score and all subject-specific scores indicates that this score is adequate as a single measure of student performance.

In order to investigate the interaction of major background variables further, the effects of the socioeconomic status and test preparation were considered jointly.

Figure 3 shows that students with both advantageous socioeconomic factors and those students who also are engaged in test preparation have the highest academic results. Conversely, economically disadvantaged students who have not been prepared to take the tests perform the worst. This tendency implies that various factors might not act alone to affect academic results but rather interact.

Table 3. Correlation Matrix of Academic Performance Variables

Variables	Math	Reading	Writing	Overall
Math	1.000	0.818	0.803	0.919
Reading	0.818	1.000	0.955	0.970
Writing	0.803	0.955	1.000	0.966
Overall	0.919	0.970	0.966	1.000

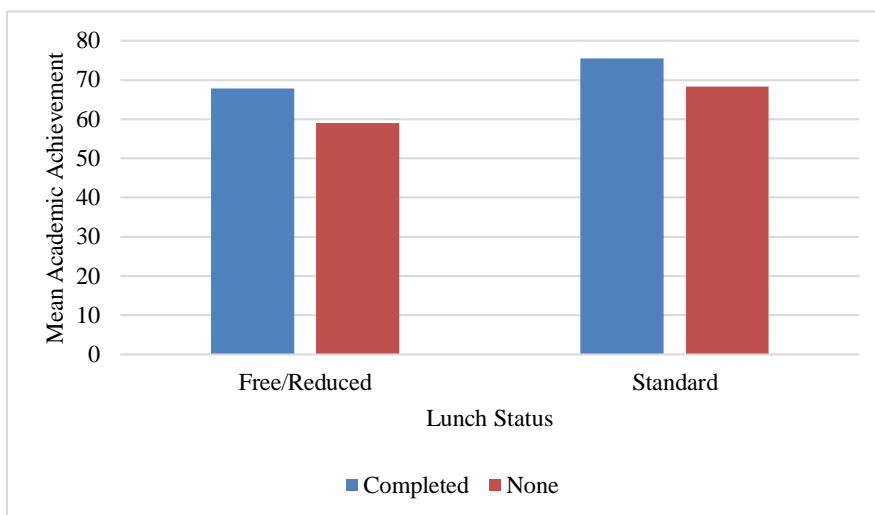


Figure 3. Combined Effect of Lunch Status and Test Preparation on Academic Achievement

3.3 Regression Analysis

A multiple linear regression analysis has been used to determine the effect of socioeconomic and educational factors on overall academic performance. Gender, race/ethnicity, parental level of education, lunch status, and test preparation course were used as predictors in the model.

As presented in Table 4, regression outcomes show that the model predicts about 24.2 percent of the variation in academic achievement implying that the model has a moderate predictive ability. Out of the predictors, the lunch status and the test preparation are the most influential. Students who eat normal lunch perform much better in school and students who did not take test preparation also perform much worse. Gender plays a major influence too with the male students recording lower scores on average than female students. Parental education is a factor that enhances academic achievement with better educational levels that come with better results. On the other hand, low levels of parental education are connected with lower levels of academic achievement.

Table 4. Regression Analysis Predicting Academic Achievement

Predictor Variable	Coefficient (β)	Std. Error	t-value	p-value
Intercept	66.94	1.88	35.61	0.000
Male	-3.72	0.82	-4.54	0.000
Standard Lunch	8.78	0.89	9.83	0.000
No Test Preparation	-7.64	0.82	-9.27	0.000
Master’s Degree (Parent)	4.09	1.84	2.23	0.026
High School (Parent)	-5.17	1.31	-3.94	0.000

Model Summary: R² = 0.242, Adjusted R² = 0.233, F = 26.30, p < 0.001

4. Discussion

The aim of the current research was to examine how socioeconomic and education factors affect the academic performance of students through a data-driven method. The outcomes show that access to academic support, socioeconomic status and parental education are some of the variables which are significant in the difference in student performance. These results are also consistent with the literature that is available and provide valuable information about the complexity of academic achievement.

Among the most noticeable results of this research, there is also a significant impact of socioeconomic status, which is the lunch status, on academic performance. Students who took normal lunch showed a much better academic performance than the students who were on free or reduced lunch. This result is consistent with the literature, as it has been repeatedly demonstrated that socioeconomic status is an important determinant of educational results. In an umbrella review, Tan (2024) highlighted that socioeconomic status has a very significant impact on student learning by exposing them to resources, educational opportunities, and favorable learning environments. Learners with higher socioeconomic statuses are also more likely to enjoy the stable learning environments, good nutrition, and availability of additional learning resources that help in enhancing their academic results. The results of this paper strengthen the stability of the problem of educational inequality and emphasize the necessity of specific measures to favor poor students.

The other important finding is the importance of the parental education in academic achievement. The findings show that there is a positive trend in the performance of the students as the level of parental education increases. The students whose parents have higher levels of education, including bachelors and masters are more likely to achieve higher academic performance as compared to the students whose parents have lower levels of education. This fact aligns with the results of Nja *et al.* (2022), who have found that parental socioeconomic status and educational background affect the academic and cognitive achievement of students via various mediators, such as home learning conditions and psychological support. It is widely believed that the more parents are educated, the higher their academic expectations, involvement in the education of children, and guidance, which are all beneficial in improving student performance.

The importance of parental involvement can also be justified by the results of the current research. The involvement of parents as an independent variable was not directly measured but the impact of parental involvement is captured by the parental education and other socioeconomic indicators. According to Sengonul (2022), parental engagement is a vital aspect of increasing the academic performance of children, especially under the condition of positive socioeconomic status. More educated parents will participate in more activities that will help in learning process and some of these activities include helping in homework, promoting academic discipline, and having positive attitude towards education. Correspondingly, Kwarteng *et al.* (2022) discovered that parental involvement has a strong impact on academic student achievement, especially in a setting with socioeconomic differences. The results of this study indicate that parental involvement is an intervening factor between socioeconomic status and academic success, and thus that it further strengthens the positive effects of good conditions and reduces certain negative effects.

The research also shows the significance of the support systems in education specifically taking part in test preparation classes. Students who attended test preparation courses performed much higher than those who did not. This result shows that formal academic support is critical in the enhancement of student performance. Although socioeconomic factors are a guiding factor, specific educational measures can be used to improve the learning outcomes through the provision of the skills and strategies required by a student to achieve academic success. The socioeconomic status-test preparation interaction in this study also gives the indication that students are at an advantage when there is both a good socioeconomic status and academic supports. It is in this light that educational policies that guarantee equal access to preparatory resources are required especially by the disadvantaged students.

There were also differences in the academic performance of both genders, with the female students on average performing better than the male students. The observation is in line with other educational studies that have shown that female students tend to perform better in language related courses as well as their academic performance. Even though gender did not form the main part of this research, the fact that it was used as a control variable gives more information regarding differences in performance. The differences could be explained by the fact that the observed differences can be associated with the study habits, motivation, and being involved in academic tasks, which have been investigated in the past studies. The regression analysis also supports the results by indicating that the socioeconomic and educational variables jointly account a significant percentage of variation in academic performance. Lunch status and test preparation were the most powerful predictors, which were then succeeded by parental education and gender. Such findings indicate that academic performance does not depend on any single aspect but on a combination of a number of variables that interact with one another. Bacsikai *et al.* (2024) agree with this view by noting that parental involvement and socioeconomic variables can affect student achievement in a general and differentiated manner, depending on the context and the interaction between the two variables. This opinion is supported by the results of this paper, which suggests that academic performance is complex and multi-dimensional.

In general, the findings of the research lead to the evolving body of knowledge that highlights the role of socioeconomic and educational variables in student outcomes. The outcome underlines the role of the policies that would address the problem of educational inequity by providing an additional aid to the students with disadvantaged backgrounds. Available educational programs, offered at reduced costs, provision of test preparation resources and activities that focus on enhancing parental engagement can play a critical role towards academic success. Further, the paper also highlights the necessity of introducing a holistic approach to learning that would consider both social and educational levels.

In conclusion, this paper has revealed that socioeconomic status, parent education and access to academic support has a great influence in the academic performance of students. The results are not only congruent with the existing research,

but provide practical recommendations to educators, policy makers, and education stakeholders who aim to achieve better education outcomes and create equity in education.

5. Conclusion

In this study, the socioeconomic and education determinants and their role in student academic performance have been explored in a data-driven manner. There is also a clear indication in the result that the background conditions and the educational support mechanisms significantly depend on the academic performance. Among the variables under analysis, one of the most important predictors of academic performance was the socioeconomic status, in terms of lunch status, and this highlights the persistence of economic inequalities on academic performance. Students with more privileged backgrounds performed higher as compared to students with lower economic backgrounds. Parental education was also found to be significant as well and the higher the educational level of parents is, the more the student performs better. This is the importance of the home education environment, the parental expectations, and the academic support provided by the families. In addition to this, the enrolment of test preparation classes had a high positive influence on the academic performance as a factor that supports the significance of systematic academic support in improving student performance. It was also discovered that academic achievement has not been determined by a particular factor but rather a combination of the impact of socioeconomic, educational, and demographic factors. These findings justify the need to have an integrated and holistic approach to education that will not only involve learning but also social dimension. On the policy front, the results indicate that one has to lessen the extent of inequality in education by availing equal access to learning resources and supporting systems. The intervention in the form of providing access to preparatory programs and parental engagement programs to the students with disadvantaged backgrounds can contribute to the improvement in academic performance. Overall, this research will be helpful in comprehending what can lead to the student achievement and assist in devising evidence-based strategies to enhance the performance and equity of education.

References

1. Bacsikai, K., Alter, E., Dan, B. A., Vályogos, K., & Pusztai, G. (2024). Positive or negative and general or differentiated effect? Correlation between parental involvement and student achievement. *Education Sciences, 14*(9), 941.
2. Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. *International journal of educational technology in higher education, 17*(1), 1-30.
3. Budiongan, K., Reyes, G. I., Liporada, K., Galo, M., & Bangeles, D. M. (2024). Socioeconomic status, parental expectations, and student motivation as predictors of academic performance of Grade 12 Senior High School students. *European Journal of Theoretical and Applied Sciences, 2*(4), 385-396.
4. Buthelezi, M. M. (2024). Impacts of Socioeconomic Status on Academic Achievements for Sustainable Learning. *International Journal of Learning and Teaching, 10*(3), 398-404.
5. Faiza, M., & Daud, S. (2023). The impact of socioeconomic status on academic achievement. *Journal of Social Sciences Review, 3*(2), 695-705.
6. Kahu, E. R., & Nelson, K. (2018). Student engagement in the educational interface: Understanding the mechanisms of student success. *Higher education research & development, 37*(1), 58-71.
7. Kwarteng, P., Asiamah, F., Twumasi, A. O., Nkansah, J. O., Issaka, J., & Afetorgbor, S. K. (2022). Parental involvement in the academic performance of students in Ghana: socioeconomic status. *Open Journal of Educational Research, 2*(3), 114-125.
8. Lei, H., Cui, Y., & Zhou, W. (2018). Relationships between student engagement and academic achievement: A meta-analysis. *Social Behavior and Personality: an international journal, 46*(3), 517-528.
9. Nja CO, Neji HA, Orim RE, Ukwetang JO, Ideba MA, Cornelius-Ukpepi B and Ndifon RA (2022) The socioeconomic rank of parents and students' academic and cognitive outcomes: Examining the physical, psychological and social mediators. *Frontiers in Education, 7*:938078.
10. Pajarillo-Aquino, I. (2019). The Socioeconomic status of students and its effects on their academic performance. *International Journal of Advanced Research in Management and Social Sciences, 8*(4), 308-325.
11. Rabelo, A., Rodrigues, M. W., Nobre, C., Isotani, S., & Zárata, L. (2024). Educational data mining and learning analytics: A review of educational management in e-learning. *Information Discovery and Delivery, 52*(2), 149-163.
12. Reardon, S. F., & Portilla, X. A. (2016). Recent trends in income, racial, and ethnic school readiness gaps at kindergarten entry. *AERA open, 2*(3), 2332858416657343.
13. Sengonul, T. (2022). A Review of the Relationship between Parental Involvement and Children's Academic Achievement and the Role of Family Socioeconomic Status in This Relationship. *Pegem Journal of Education and Instruction, 12*(2), 32-57.
14. Seshapanpu, J. (2019). *Students performance in exams* [Data set]. Kaggle. <https://www.kaggle.com/datasets/spscientist/students-performance-in-exams>
15. Tan, C. Y. (2024). Socioeconomic status and student learning: Insights from an umbrella review. *Educational Psychology Review, 36*(4), 100.
16. Wilder, S. (2023). Effects of parental involvement on academic achievement: a meta-synthesis. In *Mapping the field* (pp. 137-157). Routledge.

17. Zhao, Z., Ren, P., & Yang, Q. (2024). Student self-management, academic achievement: Exploring the mediating role of self-efficacy and the moderating influence of gender insights from a survey conducted in 3 universities in America. *arXiv preprint arXiv:2404.11029*.