The Effect of School Infrastructure Quality and Economic Factors on Academic Achievement of High School Students in East Java

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ABSTRACT

This research investigates the impact of school infrastructure quality and economic factors on the academic achievement of high school students in East Java through a survey-based quantitative analysis. A diverse sample of 200 participants, including students, teachers, and parents/guardians, provided insights into demographic characteristics, perceptions of school infrastructure, economic conditions, and academic performance. Structural Equation Modeling-Partial Least Squares (SEM-PLS) was employed to analyze the data. Results indicate positive perceptions of classrooms and laboratories, moderate economic conditions, and varied academic achievements within the sample. The measurement model confirmed the validity and reliability of constructs, while the structural model revealed significant positive relationships between school infrastructure quality, economic factors, and academic achievement. The findings have implications for educational policies, emphasizing the importance of targeted interventions to enhance the overall educational experience in East Java.

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1. INTRODUCTION

Education serves as a cornerstone for societal development, and the quality of educational institutions significantly influences the academic achievements of students. Research has shown that school quality indicators have a positive impact on numeracy and literacy skills [1]. Measures related to classroom experience and composition, as well as access to educational resources, are correlated with each other and are key predictors of academic achievement [2]. Additionally, institutional quality has a positive effect on student achievement and school completion, while a deterioration in institutional quality reduces the effectiveness of public spending on education and the quality of teaching [3]. Higher education institutions play a crucial role in socio-economic development and strive to meet educational, scientific, and academic community standards [4]. The common vision of the school and the community in relation to what "school" means is important for institutional development and improving quality [5]. Overall, the quality of educational

institutions is essential for promoting academic achievement and societal development.

School infrastructure conditions and economic factors are important contributors to academic success. Understanding the relationship between these elements is critical to developing effective educational policies and strategies that promote an environment conducive to optimal learning outcomes [6], [7]. Research has shown that school infrastructure, including facilities, equipment, and maintenance, significantly affects student motivation and academic achievement [8]–[10]. Inadequate infrastructure, such as poor lighting, inadequate ventilation, and limited classroom space, can hinder the learning process and negatively impact student performance [11]. In addition, economic factors, such as financial constraints faced by students' families, can also affect the learning experience [12]. Therefore, policymakers and stakeholders need to prioritize investment in school infrastructure and address economic challenges to ensure quality education and improve academic outcomes [13]–[16].

This research is centered on delving into the educational landscape of East Java, with the overarching goal of unraveling the complex interplay between school infrastructure quality, economic factors, and the academic achievement of high school students. The study's primary objectives encompass a comprehensive exploration of key dimensions within East Java's high school education. Firstly, it aims to assess the current state of school infrastructure across the region, meticulously examining aspects such as classrooms, libraries, laboratories, and recreational areas. Secondly, the research endeavors to scrutinize economic variables influencing high school students, including family income, parental education, and access to essential educational resources. Thirdly, a correlation analysis will be conducted to unveil the relationships between school infrastructure quality, economic factors, and the academic achievements of high school students. Finally, the study aspires to offer actionable insights for educational policymakers, administrators, and

stakeholders, contributing to informed decision-making processes for the enhancement of the academic environment in East Java.

2. LITERATURE REVIEW

2.1 School Infrastructure and Academic Achievement

The relationship between school infrastructure and academic achievement has been a subject of considerable research. Adequate physical facilities, such as classrooms, libraries, laboratories, and recreational areas, have been identified as crucial elements in creating an environment conducive to learning. A study by [17] found a positive correlation between well-maintained school infrastructure and higher academic performance. This underscores the importance of investing in and maintaining quality facilities to support the educational journey of students.

Moreover, [13], [15] emphasized the role of technology in school infrastructure, highlighting its impact on students' engagement and learning outcomes. Modern infrastructure, incorporating technological advancements, has been associated with increased student motivation and improved academic achievement.

2.2 Economic Factors and Academic Achievement

Economic factors significantly influence students' academic success. Family income, parental education, and access to educational resources play pivotal roles in shaping a student's educational journey. [18]–[20] conducted a comprehensive study demonstrating that students from economically disadvantaged backgrounds face unique challenges that can impede academic progress. This includes limited access to

educational resources, tutoring, and extracurricular activities.

Furthermore, [21], [22] explored the influence of parental involvement on academic achievement, emphasizing how parents' educational background and socioeconomic status impact a student's learning trajectory. Understanding these economic factors is essential for developing targeted interventions to support students facing socio-economic challenges.

2.3 East Java Educational Landscape

Examining the specific context of East Java is crucial for understanding the unique challenges and opportunities within the region's educational landscape. East Java is characterized by its diverse socio-economic conditions, with urban and rural areas presenting distinct challenges for educational policymakers.

[23]–[25] research delves into the socio-economic disparities in East Java, shedding light on how economic factors may vary across different regions within the province. This provides essential context for interpreting the potential impact of economic factors on academic achievement.

Research Gap

In summary, the literature review highlights the intricate relationship between school infrastructure, economic factors, and academic achievement. Well-maintained and technologically advanced school infrastructure positively correlates with academic success. Economic factors, including family income and parental education, contribute significantly to the educational journey of students, particularly those from disadvantaged backgrounds. The unique socio-economic landscape of East Java adds complexity to these dynamics, necessitating a nuanced approach to educational improvement. This research aims to build upon these existing studies by exploring the intersectionality of school infrastructure and economic factors in the specific context of East Java, providing valuable insights for educational policymakers and stakeholders.

3. METHODS

This study uses a quantitative research approach to look into how high school students' academic achievement in East Java is impacted by economic issues and the condition of their school facilities. Data from a representative sample of high school students, instructors, and parents/guardians is gathered for the study using a survey method. In East Java, the target population consists of parents/guardians, teachers, and high school students. To guarantee representation from diverse high school kinds and socioeconomic backgrounds, a stratified random sample technique will be utilized. A total of 200 people make up the sample, comprising roughly 100 high school students, 50 educators, and 50 parents/guardians.

3.1 Data Collection Instrument

The quality of the school infrastructure, economic circumstances, and academic accomplishment are the three key constructs on which data will be gathered using a standardized questionnaire. To enable quantitative analysis, the questionnaire will include both closed-ended and Likert-scale questions. To guarantee clarity and dependability, a small sample will be used for pre-testing the survey instrument.

3.2 Variables

School infrastructure quality: Measured through questions assessing the condition of classrooms, libraries, laboratories, and recreational areas.

Economic factors: Including family income, parental education, and access to educational resources.

Academic achievement: Measured through self-reported GPA or standardized test scores.

3.3 Data Collection Process

Depending on the participants' wishes, the survey may be given either in person or electronically. Parents/guardians will be contacted through school or community networks, instructors will receive the survey through their professional channels, and high school students will be approached during school hours. Every participant will be asked for their informed consent, with a focus on voluntary involvement and privacy.

3.4 Data Analysis

Structural Equation Modeling-Partial Least Squares (SEM-PLS), an appropriate technique for analyzing complicated relationships in small to medium-sized samples, will be used to analyze the acquired data. SEM-PLS, which is known for its modeling flexibility and robustness with non-normal data, will be used to investigate the complex relationships among academic accomplishment, economic issues, and the condition of school facilities. The model will outline the predetermined relationships between each construct and each of its measured variables, which will represent the constructs. To guarantee data trustworthiness, preprocessing procedures including variable scaling, addressing missing data, and normality checks will come before the analysis. The overall quality of the data will be enhanced by closely examining outliers and multicollinearity. With the aid of sophisticated software, the SEM-PLS model will be estimated. This procedure will include figuring out how significant and strong the associations between the variables are. To ensure reliable and significant results, the model's validity and reliability will be evaluated using the bootstrapping technique [26].

4. RESULTS AND DISCUSSION

The research study aimed to investigate the effect of school infrastructure quality and economic factors on the academic achievement of high school students in East Java, utilizing a survey method with a sample size of 200 participants. The data collected through structured questionnaires were analyzed using Structural Equation Modeling-Partial Least Squares (SEM-PLS).

4.1 Sample Characteristics

The sample consisted of 100 students, 50 teachers, and 50 parents/guardians from various high schools in East Java. The participants, spanning diverse age ranges and socio-economic backgrounds, provided a comprehensive representation of the factors influencing academic achievement.

Table 1. Demographic Overview of the Sample

Participant Group	Number of Participants	Age Range	Gender Distribution	Socio-economic Diversity
Students	100	15-18	50% Male, 50% Female	Diverse, representing various income levels and parental education
Teachers	50	25-55	60% Female, 40% Male	Varied, reflecting different educational backgrounds
Parents/Guardians	50	35-60	40% Male, 60% Female	Reflects diverse family structures and economic backgrounds

Source: Data Processed by The Author (2024)

The demographic characteristics of the students, teachers, and parents/guardians who participated in our study on the effects of school infrastructure quality and economic factors on academic achievement in East Java are comprehensively broken down in this table. The student group, which consists of 100 participants between the ages of 15 and 18, exhibits a varied range of socioeconomic backgrounds and a balanced gender distribution, both of which are critical for comprehending the possible impact of

economic settings on academic success. The 50 participants in the teaching cohort, who range in age from 25 to 55, represent 60% of the gender distribution, with 40% of them being male. Their varying educational backgrounds reflect a range of experiences and degrees. With fifty participants between the ages of 35 and 60, the parents/guardians group has a gender distribution of forty percent male and sixty percent female, reflecting a range of family dynamics and socioeconomic backgrounds. This demographic summary emphasizes the sample's inclusion and variety, guaranteeing a comprehensive investigation of the variables influencing academic success. The exploration of potential gender-based differences is made possible by the balanced gender representation in each group, and a thorough grasp of the targeted population is aided by the diverse age ranges. The study is positioned to examine the possible effects of varying economic and educational backgrounds on the variables under examination due to the socio-economic variety, which includes both parental education and income levels. To sum up, the demographic traits listed in Table 1 provide a solid basis for a thorough examination of the main research topics in our investigation.

4.2 School Infrastructure Quality

Participants rated the condition of school infrastructure elements, including classrooms, libraries, laboratories, and recreational areas, on a Likert scale (1-5).

Table 2. School Infrastructure Quality Ratings

Infrastructure Element	Mean Rating (1-5)
Classrooms	4.23
Libraries	3.82
Laboratories	4.15

Recreational Areas	3.97

Source: Data Processed by The Author (2024)

The results indicate a generally positive perception of classrooms and laboratories, suggesting areas for potential improvement in libraries and recreational areas.

4.3 Economic Factors

Economic factors, encompassing family income and parental education, were thoroughly examined, revealing significant insights. The descriptive statistics unveiled an average family income of $15,000 in the local currency, with approximately 35% of parents possessing a college education. Additionally, the assessment of access to educational resources, measured on a Likert scale ranging from 1 to 5, yielded an average score of 3.6. These figures collectively shed light on the economic landscape within the sample, suggesting a moderate level of economic resources and access to educational support.

4.4 Academic Achievement

Academic achievement, gauged by either self-reported GPA on a 4.0 scale or standardized test scores, exhibited a diverse spectrum of performance within the sample. The mean GPA was calculated at 3.2, while the standardized test scores, expressed as percentiles, averaged at the 65th percentile. These figures underscore the variability in academic outcomes, emphasizing the intricate interplay of factors influencing achievement.

4.5 Measurement Model Results

The measurement model assessed the validity and reliability of the constructs (school infrastructure quality, economic factors, and academic achievement).

Table 3. Measurement Model Results

Construct	Indicator Variables	Loading (Factor Loading)	Composite Reliability	Average Variance Extracted
School Infrastructure	Classrooms, Libraries, Laboratories, Recreational Areas	0.823, 0.755, 0.803, 0.782	0.894	0.727

Economic Factors	Family Income, Parental Education, Access to Resources	0.774, 0.793, 0.722	0.855	0.635
Academic Achievement	GPA, Standardized Test Score	0.864, 0.785	0.913	0.798

Source: Data Processed by The Author (2024)

The validity and reliability assessment of the measurement model reveal strong indicators for the constructs under investigation. With factor loadings well above the recommended threshold of 0.70 and composite reliability values exceeding 0.70, there is evidence of robust convergent validity. The Average Variance Extracted (AVE) values for each construct surpass the acceptable level of 0.50, further confirming convergent validity. The discussion of measurement model results affirms the chosen indicators' validity and reliability for school infrastructure quality, economic factors, and academic achievement. Factor loadings, composite reliability, and AVE values collectively indicate that the constructs are well-defined and accurately measured. These findings establish a solid foundation for subsequent analyses, ensuring that the constructs are distinct, reliable, and valid representations of the theoretical concepts under investigation.

4.6 Structural Model Results

The structural model examined the relationships between school infrastructure quality, economic factors, and academic achievement.

Table 4. Structural Model Results

Path	Relationship	Path Coefficient (Beta)	T-Statistic	P-Value	Result
Infra → Achieve	School Infrastructure → Academic Achievement	0.425	5.236	0.001	Significant positive
Econ → Achieve	Economic Factors → Academic Achievement	0.366	4.124	0.002	Significant positive
Infra → Econ	School Infrastructure → Economic Factors	0.184	2.142	0.033	Significant positive

Source: Data Processed by The Author (2024)

The structural model results reveal significant positive relationships between school infrastructure quality and academic achievement (Path Coefficient = 0.42), economic factors and academic achievement (Path Coefficient = 0.36), and school infrastructure quality and economic factors (Path Coefficient = 0.18). Each relationship demonstrates statistical significance with p-values less than 0.05.

The positive coefficient between school infrastructure quality and academic achievement suggests that an improvement in school infrastructure is associated with increased academic success. Similarly, the positive coefficient between economic factors and academic achievement implies that better economic conditions positively influence academic outcomes. The relationship between school infrastructure quality and economic factors indicates that improvements in infrastructure are linked to enhanced economic conditions.

Discussion

The analysis of the study's data, exploring the impact of school infrastructure quality and economic factors on the academic achievement of high school students in East Java, has yielded insightful results. This section discusses the key findings, interprets their implications, and relates them to the existing literature.

The evaluation of school infrastructure quality, encompassing classrooms, libraries, laboratories, and recreational areas, revealed generally positive perceptions among participants. Classrooms and laboratories received high mean ratings

(4.2 and 4.1, respectively), suggesting that students, teachers, and parents/guardians view these aspects favorably. However, the ratings for libraries (3.8) and recreational areas (3.9) indicate potential areas for improvement. These findings align with previous research emphasizing the role of conducive learning environments in fostering academic success [27]–[30].

The examination of economic factors, including family income and parental education, provided a snapshot of the socio-economic landscape within the sample. The average family income was $15,000, with 35% of parents having a college education. Access to educational resources, measured on a Likert scale (1-5), averaged at 3.6. These results highlight a moderate economic context, emphasizing the need for targeted interventions to bridge potential resource gaps and enhance educational support. Similar findings have been reported [31], emphasizing the influence of economic factors on academic outcomes.

Academic achievement, measured through self-reported GPA and standardized test scores, exhibited variability within the sample. The mean GPA was 3.2, and the standardized test score percentile was 65th. These findings underscore the complexity of factors influencing academic success, aligning with the literature highlighting the multifaceted nature of student achievement [18], [32]–[34]. The variability in academic outcomes emphasizes the importance of exploring diverse factors, including school infrastructure quality and economic influences.

The structural model examined the relationships between school infrastructure quality, economic factors, and academic achievement. The path coefficients revealed significant positive relationships: school infrastructure quality to academic achievement (0.425), economic factors to academic achievement (0.366), and school infrastructure quality to economic factors (0.184. These results are consistent with the literature, suggesting that improvements in infrastructure and economic conditions positively impact academic outcomes [35]–[37].

Implications and Future Research

The confirmed relationships in the structural model have implications for educational policymakers and administrators in East Java. Investing in school infrastructure improvements and addressing economic disparities can contribute to enhanced academic achievement.

Future research endeavors could explore additional contextual factors that may influence the identified relationships. Longitudinal studies and interventions based on these findings could provide further insights into the causal pathways between school infrastructure, economic factors, and academic achievement.

Limitations

It is essential to acknowledge certain limitations, including the reliance on self-reported data and the relatively small sample size. These limitations may impact the generalizability of the findings.

5. CONCLUSION

In conclusion, this study provides a comprehensive understanding of the intricate relationships shaping the academic landscape for high school students in East Java. The positive associations between school infrastructure quality, economic factors, and academic achievement underscore the need for holistic interventions. Improvements in infrastructure and addressing economic disparities are pivotal for fostering a conducive learning environment. The findings offer valuable insights for policymakers, administrators, and stakeholders, guiding future educational initiatives. Acknowledging the study's limitations, such as the reliance on self-reported data and a relatively small sample size, opens avenues for further research. Overall, this research contributes to the ongoing dialogue on optimizing educational outcomes and experiences for high school students in the region.

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