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The relationships of social environment, discipline, and learning facilities with public senior high school students' biology interest and learning outcomes

Jusmarini Kadir [(1)] *, Yusminah Hala [(2)], Alimuddin Ali [(2)], Firdaus Daud [(2)], Hartono [(2)]

[(1)] Master Program in Biology Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Makassar, Makassar, South Sulawesi, Indonesia
[(2)] Department of Biology Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Makassar, Makassar, South Sulawesi, Indonesia

** Corresponding Author Email: jusmarinikadir.24013301021@student.unm.ac.id*

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Abstract

Learning interest and learning outcomes are important indicators of educational quality. This study aimed to analyze the relationships of social environment, learning discipline, and learning facilities with students' learning interest and learning outcomes. The novelty of this study lies in examining these three factors simultaneously in relation to both learning interest and learning outcomes in biology learning. A quantitative correlational approach was employed involving 269 grade XI students of public senior high schools in Sidrap Regency selected through area random sampling. Data were collected using questionnaires and documentation and analyzed using simple and multiple regression. The results showed that all independent variables had positive and significant relationships with learning interest and learning outcomes ($p < 0.05$). Learning discipline showed the strongest relationship with learning interest ($R^2 = 0.623$), while learning facilities had the strongest relationship with learning outcomes ($R^2 = 0.713$). Simultaneously, the three variables explained 41.4% of the variance in learning interest and 88.8% of the variance in learning outcomes. These findings highlight the importance of social, behavioral, and facility-related factors in supporting students' interest and achievement in biology learning.

Abstrak. *Minat belajar dan hasil belajar merupakan indikator penting kualitas pendidikan. Penelitian ini bertujuan menganalisis hubungan lingkungan sosial, disiplin belajar, dan fasilitas belajar dengan minat belajar serta hasil belajar siswa. Kebaruan penelitian ini terletak pada pengkajian ketiga faktor tersebut secara simultan terhadap minat belajar dan hasil belajar biologi siswa. Penelitian menggunakan pendekatan kuantitatif korelasional pada 269 siswa kelas XI SMA Negeri di Kabupaten Sidrap yang dipilih melalui teknik area random sampling. Data dikumpulkan menggunakan angket dan dokumentasi, kemudian dianalisis dengan regresi sederhana dan regresi berganda. Hasil penelitian menunjukkan bahwa seluruh variabel independen memiliki hubungan positif dan signifikan dengan minat belajar dan hasil belajar ($p < 0,05$). Disiplin belajar memiliki hubungan paling kuat dengan minat belajar ($R^2 = 0,623$), sedangkan fasilitas belajar memiliki hubungan paling kuat dengan hasil belajar ($R^2 = 0,713$). Secara simultan, ketiga variabel menjelaskan 41,4% variasi minat belajar dan 88,8% variasi hasil belajar. Temuan ini menunjukkan pentingnya faktor sosial, perilaku belajar, dan fasilitas pembelajaran dalam mendukung minat dan hasil belajar biologi siswa.*

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A. Introduction

Biology education plays a crucial role in developing scientific literacy and preparing students to understand living systems and environmental issues. Educational success is closely related to the effectiveness of instruction and the factors influencing students' learning processes (Artamevia et al., 2025; Barokah et al., 2024). However, biology is often considered a difficult subject because it requires students to understand abstract concepts and complex biological processes. Consequently, many students demonstrate low interest and engagement in learning biology, which can subsequently impact their learning outcomes (Putri et al., 2025). Therefore, enhancing student interest and learning outcomes remains a significant challenge in biology education.

Student interest and learning outcomes are influenced by various factors within the learning environment. The school social environment contributes to student interactions and learning experiences, which can support academic engagement and achievement (Shao et al., 2024; Wang et al., 2023). Learning discipline reflects students' responsibility, consistency, and commitment to learning activities and has been linked to academic success (Liu et al., 2025). Furthermore, learning facilities provide access to educational resources, learning media, and supporting infrastructure that facilitate effective learning experiences and contribute to student achievement (Andrade et al., 2024). Therefore, these factors are considered important in understanding student learning interests and learning outcomes.

The importance of these factors is reflected in global education data. According to the 2022 Program for International Student Assessment (PISA), approximately 25% of students in Indonesia reported difficulties learning effectively during lessons, 24% indicated they did not pay enough attention to teacher explanations, and approximately 41% studied in schools with limited educational resources (OECD, 2023). These findings indicate that factors related to the school's social environment, learning discipline, and learning facilities remain relevant issues in supporting student learning interest and learning outcomes. Furthermore, Biology learning continues to face challenges related to low student learning interest due to the abstract nature of the subject matter (Putri et al., 2025).

In the context of Biology education in Sidrap Regency, several challenges remain in supporting student learning interest and learning outcomes. Biology learning requires students to actively participate in discussions, observations, and practical activities to understand often abstract and complex concepts. However, differences in student learning discipline, the quality of social interactions within the school environment, and the availability and utilization of learning facilities can impact the effectiveness of the learning process. This condition shows that environmental and behavioral factors play an important role in shaping students' learning experiences and academic achievement.

Preliminary observations conducted at public senior high schools in Kabupaten Sidrap indicated that students' engagement in Biology learning remained relatively low. This condition was reflected in limited participation during classroom discussions, insufficient attention to teachers' explanations, and low involvement in practical activities. In addition, variations in students' learning discipline and the suboptimal utilization of learning facilities were observed. These conditions suggest that school social environment, learning discipline, and learning facilities may be related to students' learning interest and learning outcomes. Therefore, further investigation is needed to examine the relationships among these variables in the context of Biology learning.

Previous research has shown that the school social environment, learning discipline, and learning facilities are related to student engagement, learning interest, and academic achievement. Shao et al. (2024) emphasized the contribution of the school social environment to student engagement. Liu et al. (2025) reported that learning discipline is positively related to academic achievement. Andrade et al. (2024) found that adequate learning facilities support student learning interest and learning outcomes.

However, previous research has generally examined these variables separately and focused on limited educational outcomes. Research investigating the simultaneous relationship between school social environment, learning discipline, and learning facilities with students' learning interests and Biology learning outcomes is still limited. Furthermore, empirical evidence from public senior high schools in Indonesia, particularly in Sidrap Regency, is still scarce. This gap highlights the need for a more comprehensive investigation of these variables within a single research framework.

The novelty of this study lies in examining the simultaneous relationships of the school social environment, learning discipline, and learning facilities with both students' interest in learning and biology learning outcomes. Previous studies have primarily focused on individual variables or a single educational outcome, whereas this study integrates multiple learning factors and educational outcomes into a single analytical framework. The findings are expected to provide empirical evidence regarding the factors associated with students' interest in learning and achievement in Biology.

Therefore, this study aims to analyze the relationship between the school social environment, learning discipline, and learning facilities with students' learning interests and Biology learning

outcomes among class XI students of public senior high schools in Sidrap Regency.

B. Material and methode

This study used a quantitative approach with an ex-post facto design to analyze the relationship between social environment, learning discipline, and learning facilities with student interests and learning outcomes.

The study population consisted of all 11th-grade students enrolled in A-accredited public senior high schools in Sidenreng Rappang Regency during the 2025/2026 academic year, totaling 1,208 students. The sample size was determined using the Slovin formula, resulting in a sample of 269 students. Area random sampling was employed to select the participants. In this technique, A-accredited public senior high schools in Sidrap Regency were treated as sampling areas (clusters). Of the seven A-accredited public senior high schools included in the population, four schools were randomly selected as research areas, namely SMA Negeri 1 Sidrap, SMA Negeri 2 Sidrap, SMA Negeri 5 Sidrap, and SMA Negeri 7 Sidrap.

The sample size for each selected school was then determined proportionally according to the number of 11th-grade students in each school, resulting in 71 students from SMA Negeri 1 Sidrap, 130 students from SMA Negeri 2 Sidrap, 33 students from SMA Negeri 5 Sidrap, and 35 students from SMA Negeri 7 Sidrap. Subsequently, classes within each selected school were chosen through a lottery process, and all students in the selected classes were included as research participants until the required sample size was achieved. This procedure was intended to ensure that the sample adequately represented the characteristics of the population of 11th-grade students enrolled in A-accredited public senior high schools in Sidrap Regency.

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School social environment (X1) was measured using a questionnaire adapted from Elviana (2024). The indicators included student–teacher interaction, student–student interaction, student–staff interaction, and two-way communication during the learning process. Learning discipline (X2) was measured using a questionnaire adapted from Asmawati (2021), consisting of indicators of compliance with learning activities and responsibility in completing learning tasks. Learning facilities (X3) were measured using both a questionnaire and an observation sheet adapted from Aliyah and Puspitasari (2022). The indicators included the availability of biology laboratories, practical equipment and materials, learning media, and Biology learning resources. Learning interest (Y1) was measured using a questionnaire adapted from Sawitri (2023), consisting of indicators of enjoyment, participation, attention and concentration, and interest in Biology learning materials. Learning outcomes (Y2) were measured using biology achievement scores obtained from school documentation provided by biology teachers.

Data collection was conducted using questionnaires, observation, and documentation. The questionnaire was used to measure students' social environment, learning discipline, learning facilities, and learning interest using a 4-point Likert scale. A four-point Likert scale was used to minimize central tendency bias and encourage respondents to express a clear opinion toward each statement. Unlike a five-point scale, the four-point scale does not provide a neutral option, thereby reducing the tendency of respondents to select a middle category when they are uncertain. This approach was considered appropriate for obtaining more decisive responses regarding students' perceptions of school social environment, learning discipline, learning facilities, and learning interest.

Observation was conducted using an observation sheet to assess learning facilities, including biology laboratories, practicum equipment and materials, learning media, digital media, biology textbooks, and student worksheets (LKPD). Each indicator was assessed based on its availability and condition in supporting biology learning. Learning outcome data were obtained from students' report card grades.

The research instruments were tested for validity and reliability before use. Validity was assessed using the Corrected Item–Total Correlation method with a minimum criterion of 0.312. The results showed that all items in the school social environment, learning discipline, learning facilities, and learning interest instruments exceeded the required criterion and were therefore declared valid. The Corrected Item–Total Correlation values ranged from 0.317–0.645 for school social environment, 0.365–0.797 for learning discipline, 0.326–0.677 for facilities, and 0.404–0.831 for learning interest.

Reliability was assessed using Cronbach's alpha coefficient. The results showed Cronbach's Alpha values of 0.830 for school social environment, 0.904 for learning discipline, 0.842 for learning facilities,

and 0.915 for learning interest. Since all values exceeded the minimum criterion of 0.60, the instruments were considered reliable and demonstrated good internal consistency.

Data analysis techniques consisted of descriptive and inferential analysis. Descriptive analysis was used to describe the condition of each variable, while inferential analysis was used to test hypotheses using multiple linear regression.

Before conducting the hypothesis test, prerequisite analysis tests were first performed, including a normality test using the Kolmogorov-Smirnov test, a linearity test, and a multicollinearity test to ensure the data met the analysis assumptions. The coefficient of determination (R^2) was used to determine the extent of the independent variable's contribution to the dependent variable.

C. Results and discussion

Before hypothesis testing, prerequisite tests were first conducted to ensure that the data met the analysis assumptions. The prerequisite tests in this study included normality and linearity tests. The results of the assumption tests indicate that the data met the requirements for regression analysis.

Table 1 Residual normality test with Kolmogorov-Smirnov

Regression model	Sig.	Description
Model 1	0.829	Normally distributed
Model 2	0.291	Normally distributed

Table 2 Linearity test results

Variables	Sig. deviation from linearity	Description
Social environment – learning interest	0.066	Linear
Social environment – learning outcomes	0.330	Linear
Learning discipline – learning interest	0.565	Linear
Learning discipline – learning outcomes	0.882	Linear
Learning facilities – learning interest	0.940	Linear
Learning facilities – learning outcomes	0.798	Linear

Table 3 Multicollinearity test results

Variable	Tolerance	VIF
Social environment	0.687	1.455
Learning discipline	0.715	1.399
Learning facilities	0.825	1.212

Based on Table 1, the Kolmogorov-Smirnov significance values for both regression models were greater than 0.05, indicating that the data were normally distributed. Furthermore, as presented in Table 2, all significance values in the linearity test were greater than 0.05, indicating linear relationships between the independent and dependent variables. The multicollinearity test results shown in Table 3 revealed that all independent variables had tolerance values greater than 0.10 and Variance Inflation Factor (VIF) values lower than 10.00, indicating the absence of multicollinearity among the independent variables. Therefore, the regression models satisfied the assumptions required for further analysis

The descriptive analysis showed that social environment, learning discipline, learning facilities, and learning interest were categorized as moderate, whereas learning outcomes were categorized as high. This finding indicates that although the supporting factors examined in this study were not categorized as high, students were still able to achieve high academic performance.

One possible explanation is that learning outcomes are influenced not only by external factors but also by internal factors that were not examined in this study, such as cognitive ability, prior knowledge, learning strategies, and self-regulated learning skills. Students who possess effective learning strategies and a strong understanding of biological concepts may achieve satisfactory academic performance despite the moderate levels of social environment, learning discipline, learning facilities, and learning interest. This explanation is consistent with Wang and Xue (2022), who emphasized the importance of internal factors in supporting students' academic achievement.

In addition, learning outcomes may reflect the combined influence of multiple factors operating simultaneously. Factors such as teacher guidance, instructional quality, and classroom learning experiences may also contribute to students' academic achievement. Therefore, the high learning outcomes observed in this study may result from the interaction of various internal and external factors rather than being determined by a single factor alone. This finding is in line with previous studies reporting that learning outcomes are influenced by the

interaction of multiple supporting factors (Seran & Seragih, 2025; Hasan et al., 2024).

Relationship between variables and learning Interest

To determine the relationship between social environment and learning interest, learning discipline and learning interest, and learning facilities and learning interest separately, a simple regression analysis was conducted. The results of the simple regression analysis for each variable can be seen in Table 4 and Table 5. The results indicate that all variables have a positive and significant relationship with learning interest (Sig. < 0.05). Among the independent variables, learning discipline demonstrated the strongest relationship with learning interest, contributing 62.3%, whereas the school social environment and learning facilities contributed approximately 20% each.

This finding suggests that students who are able to regulate their learning activities, follow study schedules consistently, complete assignments on time, and adhere to learning rules are more likely to develop stronger learning interest. Disciplined learning behavior helps students maintain focus and engagement throughout the learning process, thereby fostering greater enthusiasm for learning activities.

Tabel 4 Descriptive statistics of research variables

Variable	Mean	Category
Social environment	64.88	Moderate
Learning discipline	67.53	Moderate
Learning facilities	61.97	Moderate
Learning interest	59.59	Moderate
Learning outcomes	89.19	High

Table 5 Simple regression analysis results of social environment, learning discipline, and learning facilities with learning interest

Variable	Beta	t	Sig.	R	R^2
Social environment	0.430	10.239	0.000	0.531	0.282
Learning discipline	0.594	24.294	0.000	0.789	0.623
Learning facilities	0.583	21.005	0.000	0.517	0.267

From a self-regulated learning perspective, disciplined students are better able to manage their learning activities, maintain concentration, and achieve their learning goals. Students with higher levels of discipline are also more likely to participate actively in classroom activities, pay attention to learning materials, and persist when facing academic challenges. These conditions strengthen students' interest and involvement in Biology learning.

The relatively smaller contributions of the school social environment and learning facilities may indicate that these factors function primarily as supporting conditions rather than direct determinants of students' learning interest. A positive social environment and adequate learning facilities can facilitate learning activities; however, students' interest is more strongly influenced by their personal learning behaviors and self-discipline. Even when social interactions and learning facilities are available, students may not necessarily develop high learning interest unless they possess the discipline required to engage actively in learning activities.

This finding is consistent with Hartawan et al. (2024), who reported that disciplined study habits help students maintain consistent involvement in learning activities. Similarly, Maramis et al. (2023) found that learning discipline contributes to students' enthusiasm and willingness to participate in classroom learning. Therefore, students with better learning discipline tend to demonstrate higher interest in Biology learning.

Relationship between variables and learning outcomes

To determine the relationship between the social environment and learning outcomes, learning discipline and learning outcomes, and learning facilities and learning outcomes separately, a simple regression analysis was conducted. The results of the simple regression analysis for each variable can be seen in Table 6.

Table 6 Simple regression analysis results of social environment, learning discipline, and learning facilities with learning outcomes

Variable	Beta	T	Sig.	R	R^2
Social environment	0.108	9.455	0.000	0.501	0.251
Learning discipline	0.132	15.783	0.000	0.695	0.483
Learning facilities	0.162	23.695	0.000	0.844	0.713

The results showed that social environment, learning discipline, and learning facilities were positively and significantly related to students' learning outcomes. Among these variables, learning facilities demonstrated the strongest relationship with learning outcomes among the variables examined individually. This finding suggests that the availability of adequate learning facilities may support students in understanding learning materials more effectively, particularly in biology learning, which involves observation activities, laboratory work, and the use of instructional media.

Adequate learning facilities enable students to gain more meaningful learning experiences through access to learning resources, instructional media, and other supporting facilities. These conditions may help students understand abstract biological concepts more concretely, thereby making the learning process more effective. This finding is consistent with Frameiliada et al. (2023), who reported that learning facilities help students understand learning materials more concretely. Furthermore, Ulya et al. (2025) and Ana et al. (2025) found that adequate learning facilities are associated with increased student motivation and engagement in the learning process.

Learning discipline also showed a positive relationship with learning outcomes. Students who maintain regular study habits, manage their study time effectively, and consistently complete academic tasks tend to achieve better learning outcomes. Learning discipline helps students maintain focus and engagement throughout the learning process, which may contribute to improved academic achievement. This finding is supported by Pratiwi et al. (2024), who emphasized the importance of consistent study habits in supporting academic performance. Similar findings were reported by Sainab (2023), Karno et al. (2023), and Fadhilah and Mukhlis (2023), who found that higher levels of learning discipline were associated with better learning outcomes.

The social environment also showed a positive relationship with students' learning outcomes. Supportive interactions with peers, teachers, and the school environment may create a conducive learning atmosphere that ports the learning process. A positive social environment can provide both academic and emotional support, which may encourage students to participate more actively in learning activities. This finding is in line with Anggreani and Putra (2026), who highlighted the importance of social interactions in supporting academic achievement. Similarly, Nathania et al. (2025) reported that positive social interactions were associated with greater student engagement in the learning process.

Simultaneous relationship of social environment, learning discipline, and learning facilities with learning interest

To examine the simultaneous relationship of social environment, learning discipline, and learning facilities with learning interest, multiple regression analysis was conducted. The results of the analysis are presented in Table 7.

The results of the multiple regression analysis showed that social environment, learning discipline, and learning facilities were simultaneously and significantly related to students' learning interest. These findings indicate that learning interest is associated with the simultaneous contribution of social environment, learning discipline, and learning facilities, suggesting that students' learning interest develops through the interaction of multiple supporting factors rather than a single factor alone. A supportive social environment may encourage students to participate actively in learning activities through positive interactions with teachers and peers. Learning discipline helps students develop consistent study habits, manage their learning activities effectively, and maintain engagement throughout the learning process. In addition, adequate learning facilities provide access to learning resources and instructional media that may support students' interest in learning.

Among the variables examined, learning discipline showed the strongest contribution to learning interest. This finding suggests that students who demonstrate greater consistency and responsibility in their learning activities tend to show higher levels of interest in learning. Disciplined learning behavior plays an important role in fostering students' engagement and interest in academic activities. Meanwhile, supportive social interactions may strengthen students' participation in learning (Lolong, 2024), and adequate learning facilities may enhance learning experiences that encourage greater interest in learning (Alif et al., 2020).

Table 7 Multiple regression results of social environment, learning discipline, and learning facilities with learning interest

Variable	B	R	R^2	F	Sig.
Constant	25.764				
Social environment	0.435				
Learning discipline	0.610	0.643	0.414	753.551	0.000
Learning facilities	0.258				

Table 8 Multiple regression results of social environment, learning discipline, and learning facilities with learning outcomes

Variable	B	R	R^2	F	Sig.
Constant	26.444				
Social environment	0.239				
Learning discipline	0.286	0.942	0.888	701.608	0.000
Learning facilities	0.419				

These findings are consistent with previous studies reporting that learning interest is influenced by the interaction of internal and external factors (Nainggolan, 2024). Similar findings were also reported by Aldya et al. (2025), who found that students' learning interest is associated with both individual and environmental factors. Theoretically, learning interest develops through the interaction between students' personal characteristics and the learning environment that supports the learning process. Furthermore, Johana and Hidayati (2023) emphasized that learning interest is shaped by the dynamic interaction between learners and their educational environment.

Simultaneous relationship of social environment, learning discipline, and learning facilities with learning outcomes

To examine the simultaneous relationship of social environment, learning discipline, anlearning facilities with learning outcomes, mutiple regression analysis was conducted. The results of the analysis are presented in Table 8.

The results of multiple regression analysis indicate that the social environment, learning discipline, and learning facilities are simultaneously and significantly related to student learning outcomes (Sig. < 0.05). The regression model produces an R value of 0.942, indicating a very strong relationship, while the coefficient of determination (R^2 = 0.888) indicates that 88.8% of the variance in learning outcomes can be explained by the combined contribution of these variables. These findings indicate that learning outcomes are related to the interaction of various factors operating together throughout the learning process, not just a single factor. A supportive social environment can provide academic and emotional support that encourages students to actively engage in learning activities. Discipline in learning helps students maintain consistent study habits, manage their learning activities effectively, and complete academic assignments responsibly. Furthermore, adequate learning facilities provide access to learning resources, instructional media, and practical learning experiences that can support students' understanding of biology concepts and academic achievement.

Among the variables studied, learning facilities showed the strongest relationship with learning outcomes. This finding suggests that adequate learning facilities can provide students with greater opportunities to access learning resources and participate more effectively in learning activities. Adequate learning facilities play a crucial role in supporting the learning process by providing access to learning resources, learning media, and learning experiences that facilitate student understanding of the subject matter (Alif et al., 2020). Furthermore, learning discipline is associated with better academic achievement through consistent study habits and effective learning management (Pratiwi et al., 2024), while a supportive social environment can create learning conditions that facilitate academic achievement (Rahayu, 2023).

These findings are consistent with previous studies reporting that learning outcomes are associated with the interaction of internal and external factors (Dewanti & Pramono, 2023; Mohammad & Didit, 2024). Similar to these studies, this study found that the social environment, learning discipline, and learning facilities are simultaneously associated with student learning outcomes. However, unlike many previous studies that examined these factors separately, this study analyzed them simultaneously and revealed that learning facilities showed the strongest relationship with biology learning outcomes among the variables studied. These findings provide additional evidence that learning facilities play a strategic role in supporting student academic achievement, particularly in biology learning, which requires access to laboratories, learning media, and practical learning resources. Theoretically, learning outcomes are shaped by the interaction of various internal and external factors that collectively support students' learning processes and academic development (Sukatmi, 2024).

The coefficient of determination for learning outcomes was substantially higher than that for learning interest. This finding suggests that the social environment, learning discipline, and learning facilities are more strongly related to variations in learning outcomes than variations in learning interest.

The lower coefficient of determination for learning interest suggests that much of its variance may be related to other factors not examined in this study, such as learning motivation, self-efficacy, personal interests, and emotional factors. Previous studies have shown that motivation and self-efficacy are important factors associated with student learning engagement and interest (Valenzuela-Penunuri et al., 2024).

In contrast, learning outcomes are more directly related to students' learning conditions and academic behavior, including discipline, access to learning facilities, and support from the social environment. Research also shows that motivation, self-efficacy, and learning-related factors are strongly associated with student academic achievement and learning outcomes (Basileo et al., 2024). Consequently, the social environment, learning discipline, and learning facilities are able to explain a greater proportion of the variance in learning outcomes than learning interests.

The findings of this study have important practical implications for educational practice. Schools should prioritize improving and optimizing learning facilities, particularly biology laboratories, instructional media, and learning resources, as these facilities demonstrate the strongest relationship with student learning outcomes. Teachers can support student academic achievement by promoting disciplined learning through structured learning activities, clear academic expectations, regular feedback, and consistent monitoring of student progress. Furthermore, fostering a supportive social environment through positive interactions between teachers and students and among peers can increase student engagement and participation in learning activities.

Implementing these strategies can contribute to improving the quality of biology learning, increasing student engagement in classroom activities and lab work, and strengthening academic achievement. Therefore, educational policies and school improvement programs should not focus solely on a single factor but should simultaneously address the social, behavioral, and facility aspects associated with the learning process. By integrating these factors into educational practice, schools can create more effective learning environments that support student academic development and long-term learning success.

D. Conclusion

The findings of this study indicate that social environment, learning discipline, and learning facilities were positively and significantly related to students' learning interest and learning outcomes, both individually and simultaneously. Learning discipline showed the strongest relationship with learning interest, whereas learning facilities demonstrated the strongest relationship with learning outcomes. Furthermore, the three variables jointly explained a greater proportion of variance in learning outcomes than in learning interest, suggesting that academic achievement is more closely associated with students' learning conditions and behaviors. These findings contribute to the understanding of the role of external and behavioral factors in supporting students' learning processes and academic development. Future studies are recommended to involve broader populations, additional variables, and different research designs to obtain a more comprehensive understanding of factors associated with students' learning interest and learning outcomes.

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