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The Effect of Learning Attitudes and Study Habits on Students' Biology Learning Outcomes in Public Senior High Schools

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Abstract: This study aims to analyze the effect of learning attitudes and study habits on students' biology learning outcomes in Public Senior High Schools across Kendari City. This research employed a quantitative approach with an ex post facto design involving 185 eleventh-grade students selected through proportional random sampling. Data were collected using Likert-scale questionnaires and documentation, and analyzed using descriptive and inferential statistics. The results showed that learning attitudes, study habits, and biology learning outcomes were generally in the moderate category, with mean scores of 91.86, 89.29, and 70.28, respectively. The results of the inferential analysis showed that learning attitudes had a positive and significant effect on biology learning outcomes with a contribution of (20.9%); study habits had a positive and significant effect on biology learning outcomes with a contribution of (17.9%); and learning attitudes and study habits simultaneously had a significant effect on students' biology learning outcomes with a contribution of (21.1%), with learning attitudes as the more dominant variable.

Keywords: Biology; Learning attitudes; Learning outcomes; Students; Study habits

Introduction

Education plays an important role in human life. Some members of society still assume that education is entirely the responsibility of formal institutions, so support and guidance for children's learning development at home are often less than optimal. In fact, school is only one part of the educational process; education can also be obtained from the surrounding environment, family support, and the people around us (Limbong et al., 2025). Education is a strategic investment for national progress and a key factor in facing the global challenges of the 21st century (Adnyana et al., 2025). Indonesia, as a developing country with the fourth largest population in the world, faces major challenges in expanding access to education in order to achieve a high-quality and equitable education system.

Muttaqin et al. (2025) explain that although there has been significant improvement in access to education over the past decades, the quality of learning remains a major issue that must be addressed. This is reflected in the results of various international assessments, which show that Indonesian students' scientific literacy achievements are still below international standards.

Biology, as an integral part of science learning, has unique characteristics that require specific learning approaches. It studies life phenomena at various levels of organization, from molecular to ecosystem levels, requiring high levels of analytical, synthesis, and evaluative thinking skills (Sirajuddin et al., 2024). However, various internal factors, such as learning attitudes and study habits, greatly influence students' learning outcomes. Students who have positive attitudes toward biology tend to demonstrate better learning processes.

Among the internal factors that influence learning success, attitude and habits are two fundamental aspects. Before measuring their impact, previous studies have described the actual conditions of students in the field. Research by Hasan et al. (2024) on Grade XI science students described the profile of students' attitudes and

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biology learning outcomes as baseline data. After mapping this profile, statistical testing proved that there is a strong positive relationship between learning attitudes and biology achievement, with a significance level of 0.000 (Sig. < 0.05) and a contribution of 43.95%. Similar findings were also confirmed by Junita et al. (2024), showing that learning attitudes have a strong correlation (r = 0.663) with the improvement of high school students' biology learning outcomes.

In addition to attitudes, students' study habits also play a crucial role in determining biology learning outcomes. A descriptive study by Savitri et al. (2024) specifically analyzed the patterns of biology students' study habits in Grade XI at SMAN 3 Siak Hulu. Mapping such habits is essential, considering that consistent study routines form the foundation for understanding complex biological concepts. The importance of study habits was further confirmed by Berutu et al. (2018) in their study on high school students in Stabat City. They found a positive and significant influence of study habits on biology learning outcomes, with a significance value of p = 0.000 (p < 0.05). These findings indicate that well-developed learning attitudes and study habits are key determinants of students' academic success.

Despite the strong evidence from previous studies, preliminary observations conducted in several public high schools in Kendari City revealed contradictory phenomena, leading to several key problem identifications. First, at a macro level, the low quality of science learning, particularly biology, remains a real challenge at the school level. Second, in terms of achievement, there are disparities in biology learning outcomes among public high schools in Kendari, as well as among students within the same school. Observation data show that at SMA Negeri 9 Kendari, only 50% of students achieved the Minimum Mastery Criteria (MMC), with an average score of 75 and a score range of 62–88. At SMA Negeri 6 Kendari, the mastery percentage reached 80% (average score of 75). Meanwhile, SMA Negeri 1, SMA Negeri 2, and SMA Negeri 4 Kendari showed a mastery percentage of 90%, with average scores ranging from 80 to 89.

These disparities in academic achievement are strongly correlated with field findings indicating that some students have negative attitudes toward biology, such as lack of enthusiasm, low participation in classroom discussions, and the perception that biology is a difficult subject based on memorization. Furthermore, from a behavioral perspective, students' study habits are still ineffective; for example, students do not regularly review lessons at home, study inconsistently, rarely engage in comprehensive discussions, and are not consistent in taking notes or making summaries.

These issues related to learning attitudes and study habits are further complicated by the implementation of the Merdeka Curriculum, which has not yet been fully optimized. Many students remain passive, less proactive, and have not demonstrated independent learning patterns as required by student-centered learning approaches.

Moreover, there is still limited empirical evidence regarding the extent to which learning attitudes and study habits influence biology learning outcomes, particularly among public high school students in Kendari City. There is a significant gap in the achievement of the Minimum Mastery Criteria (MMC), ranging from 50% to 90% across schools. This sharp disparity aligns with observational findings that many students still exhibit low enthusiasm and irregular study habits in learning biology.

The clear gap between the ideal expectations of the curriculum and the reality in schools has created a research gap. Therefore, the novelty of this study lies in its attempt to directly measure the extent to which learning attitudes and study habits influence students' outcomes within schools that exhibit significant disparities in achievement levels. To scientifically examine this issue and identify appropriate solutions, the researcher considers it necessary to conduct a study entitled "The Influence of Learning Attitudes and Study Habits on the Biology Learning Outcomes of Public High School Students in Kendari City."

Method

This study employed a quantitative approach using an ex post facto research design. According to Sugiyono (2020), ex post facto research examines events that have already occurred and then investigates the factors that may have caused those events. This approach was chosen because the researcher did not manipulate the variables of learning attitudes and study habits, but instead examined existing factual data to determine their influence on students' biology learning outcomes. The research was conducted during the even semester of the 2025/2026 academic year in Kendari City, Southeast Sulawesi Province.

The research design illustrates the relationship among variables, where learning attitude (X1) and study habits (X2) function as independent variables, while biology learning outcomes (Y) serve as the dependent variable. The population of this study consisted of all public high school students in Kendari City during the 2025/2026 academic year, totaling 7,086 students across several schools. The sampling technique used was random sampling, which provides equal opportunities for each member of the population to be selected as a sample. The sample size was determined using the Taro

Yamane formula with an error tolerance of 0.04, resulting in a total sample of 575 students. However, this study specifically focused on Grade XI students, with a total population of 2,277 students. Based on proportional allocation, 185 students were selected as the research sample from five public high schools in Kendari City.

The variables investigated in this study included learning attitudes (X1), study habits (X2), and biology learning outcomes (Y). Learning attitude was operationally defined as students' evaluative responses toward biology learning, encompassing cognitive, affective, and conative aspects, measured through a questionnaire. Study habits were defined as consistent and repeated learning behaviors that support effective learning, measured through indicators such as study scheduling, note-taking, reviewing material, concentration, and task completion. Meanwhile, biology learning outcomes were defined as students' final scores in biology, obtained from official school records as secondary data, reflecting students' cognitive mastery of the subject.

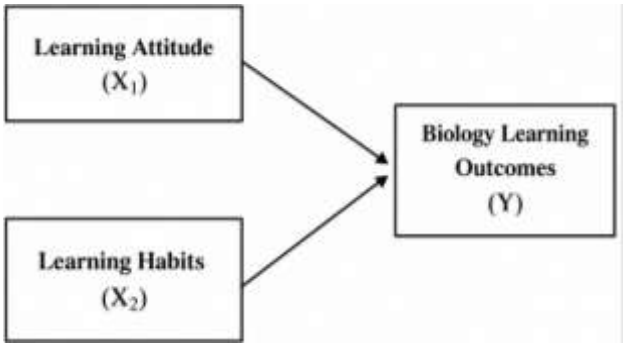

Figure 1. Research design

The research instruments consisted of questionnaires on learning attitudes and study habits, as well as documentation of biology learning outcomes. Both questionnaires were developed based on specific indicators and used a Likert scale with four response categories: strongly agree, agree, disagree, and strongly disagree. Positive and negative statements were scored differently according to established scoring procedures. The biology learning outcomes data were obtained from students' report card scores, ranging from 0 to 100. Data collection was conducted directly and classically, meaning that respondents filled out the questionnaires in person without intermediaries, and the process was carried out simultaneously within each class without altering existing classroom structures.

The data analysis techniques included descriptive and inferential statistical analyses. Descriptive analysis was used to present the distribution of data, including mean, median, mode, standard deviation, highest score, and lowest score, as well as to categorize the variables into very high, high, medium, low, and very low levels based on standard criteria. Prior to inferential analysis, the ordinal data obtained from the questionnaires were transformed into interval data using the Method of Successive Intervals (MSI).

Inferential statistical analysis was conducted to test the research hypotheses, preceded by normality and linearity tests using SPSS 21.0 for Windows. The analysis aimed to determine the relationships and effects among variables, both partially and simultaneously, using simple and multiple linear regression tests. Simple linear regression was used to examine the effect of each independent variable (learning attitude and study habits) on biology learning outcomes separately, while multiple linear regression was used to analyze the simultaneous effect of both independent variables on the dependent variable. Hypothesis testing was based on a significance level of $\alpha = 0.05$. If the significance value (Sig.) was less than 0.05, the result was considered significant; otherwise, it was not significant.

Result and Discussion

The findings of this study relate to the influence of learning attitudes and study habits on the biology learning outcomes of public senior high school students in Kendari City. The collected data were analyzed using Microsoft Excel and SPSS to obtain a descriptive overview and identify trends for each research variable. The results are presented in the form of statistical descriptions, including mean, standard deviation, minimum score, maximum score, and the distribution of categories for each variable.

Description of Students' Learning Attitudes in Public Senior High Schools in Kendari City

Based on the results of the descriptive statistical analysis of the learning attitude variable, it was found that from a total of 185 respondents, the average score of students' learning attitudes was 91.86, with a standard deviation of 8.55. The lowest score obtained was 72, while the highest score reached 116. This mean score indicates that, in general, students' learning attitudes fall into the moderate category. The relatively wide range of scores suggests variations in students' learning attitudes, where some students demonstrate high learning attitudes while others remain at lower levels. The moderate standard deviation indicates that the data distribution is neither highly homogeneous nor extremely varied, suggesting that students' learning attitudes are quite diverse but still within a reasonable range.

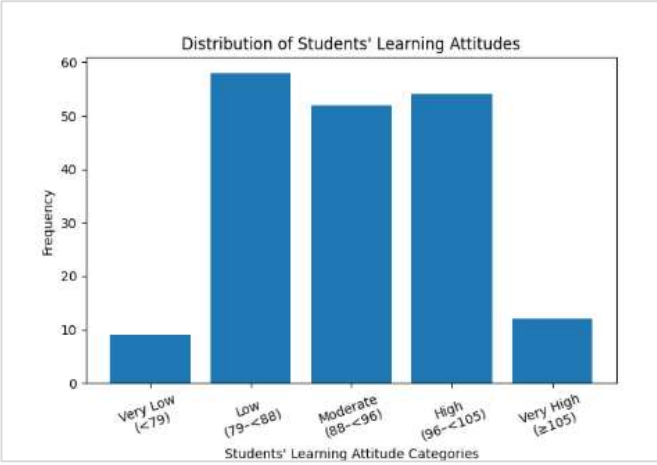

Figure 2. Frequency distribution of students' learning attitudes at State Senior High Schools across Kendari City

When viewed from the categorical distribution, students' learning attitudes show an interesting variation. The highest percentage falls into the low category (31%), followed by the high category (29%) and the moderate category (28%). Meanwhile, the very high category accounts for 6% and the very low category for 5%. Although the low category has the highest percentage, overall, 63% of students fall within the moderate to very high categories. This indicates that most students already possess fairly good learning attitudes, although there is still a group of students with low learning attitudes that require further attention. This condition suggests that efforts to improve learning attitudes are still necessary to achieve a more balanced distribution toward higher categories.

Description of Students' Study Habits in Public Senior High Schools in Kendari City

The results of the descriptive statistical analysis of the study habits variable show that, out of 185 respondents, the average score was 89.29 with a standard deviation of 10.06. The minimum score obtained was 64, while the maximum score reached 116. This mean value indicates that, in general, students' study habits fall into the moderate category. The fairly wide score range reflects variations in study habits among students, where some exhibit very good study habits, while others still demonstrate less effective ones. The moderate standard deviation suggests that these variations are noticeable but not extreme.

The categorical distribution of study habits reveals that the moderate category dominates with 44%, followed by the high category (23%) and the low category (22%). The very high category accounts for 9%, while the very low category represents only 2%. Overall, the majority of students fall within the moderate to very high categories, totaling 76%. This indicates that students' study habits are generally quite good, particularly in terms of consistency, reviewing material, and completing assignments. However, a portion of students still falls into the low category, highlighting the need for further guidance in developing more structured, consistent, and effective study habits.

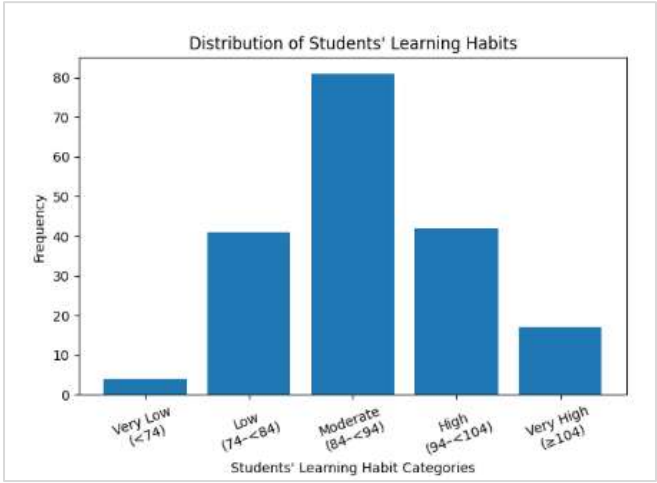

Figure 3. Frequency distribution of study habits of Senior High School Students in Kendari City

Description of Students' Biology Learning Outcomes in Public Senior High Schools in Kendari City

Based on the descriptive statistical analysis of the biology learning outcomes variable, the average score was 70.28 with a standard deviation of 6.35. The lowest score achieved by students was 51, while the highest score reached 85. This average score indicates that, in general, students' biology learning outcomes fall into the moderate category. The relatively narrow score range suggests that variations in learning outcomes among students are fairly homogeneous, meaning that most students' scores are not significantly different from the mean. The relatively small standard deviation further indicates that the distribution of scores is concentrated around the average, with no substantial gaps among students' performance levels.

In terms of categorical distribution, the highest percentage falls into the high category (36%), followed by the low category (29%) and the moderate category (28%). Meanwhile, both the very high and very low categories account for 3% each. Overall, 67% of students fall within the moderate to very high categories, indicating that most students have achieved relatively good biology learning outcomes. Nevertheless, there are still students in the low and very low categories, suggesting the need for improvements in the quality of instruction, both through enhanced teaching methods and strengthening internal student factors such as learning attitudes and study habits.

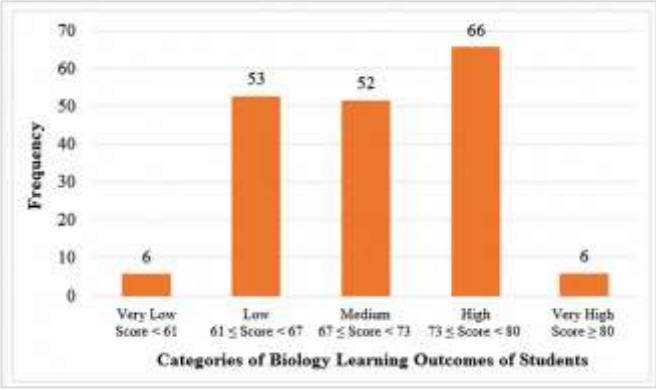

Figure 4. Frequency distribution of students' learning outcomes in Public Senior High Schools across Kendari City

In general, the descriptive results of the three variables indicate that students' learning attitudes, study habits, and biology learning outcomes are all within the moderate category. This suggests that these three aspects still have significant potential for improvement in order to achieve more optimal learning outcomes.

The Effect of Learning Attitudes on Biology Learning Outcomes of Public High School Students in Kendari City

The results of the simple regression analysis indicate that there is a relationship between learning attitudes and biology learning outcomes of public high school students in Kendari City. The correlation coefficient obtained falls into the moderate category, suggesting that learning attitudes have a fairly strong association with students' biology achievement. In addition, the coefficient of determination shows that learning attitudes contribute 20.90% to the variation in biology learning outcomes, while the remaining 79.10% is influenced by other factors beyond the variables examined in this study.

The significance test of the regression model demonstrates that the model used in this study is statistically significant. This means that learning attitudes have a real and measurable effect on students' biology learning outcomes. In other words, the more positive the students' learning attitudes, the higher their biology learning outcomes tend to be.

Based on the regression coefficient analysis, the regression equation indicates that every one-unit increase in learning attitude is followed by an increase in biology learning outcomes. The constant value in the equation represents the baseline level of learning outcomes when the learning attitude variable is held constant. Meanwhile, the positive regression coefficient reflects a direct and positive relationship between the two variables.

The results of the partial test (t-test) further strengthen these findings, as the significance value obtained is smaller than the predetermined significance level. This indicates that learning attitudes have a positive and significant effect on biology learning outcomes. Therefore, the hypothesis stating that learning attitudes influence biology learning outcomes is accepted.

The Effect of Study Habits on Biology Learning Outcomes of Public High School Students in Kendari City

The results of the simple regression analysis for the study habits variable show that there is a relationship between study habits and students' biology learning outcomes. The correlation coefficient falls within the moderate category, indicating that study habits have a meaningful relationship with biology achievement. The coefficient of determination reveals that study habits contribute 17.90% to the variation in biology learning outcomes, while the remaining 82.10% is influenced by other factors not examined in this study.

The significance test of the regression model indicates that the model is statistically significant. This implies that study habits have a real effect on students' biology learning outcomes. Thus, good and consistent study habits tend to improve students' achievement in biology.

The regression equation obtained shows that every one-unit increase in study habits leads to an increase in biology learning outcomes. The constant value represents the baseline level of learning outcomes when study habits are held constant, while the positive regression coefficient indicates a direct relationship between the two variables.

The results of the partial test (t-test) show that the significance value is smaller than the predetermined significance level. This means that study habits have a positive and significant effect on students' biology learning outcomes. Therefore, the hypothesis stating that study habits influence biology learning outcomes is accepted.

The Effect of Learning Attitudes and Study Habits on Biology Learning Outcomes of Public High School Students in Kendari City

The results of the multiple linear regression analysis show that, simultaneously, there is a relationship between learning attitudes and study habits with students' biology learning outcomes. The correlation coefficient indicates a moderate relationship, meaning that both independent variables together have a fairly strong association with biology learning outcomes. The coefficient of determination shows that learning attitudes and study habits jointly contribute 21.10% to the variation in biology learning outcomes, while the remaining 78.90% is influenced by other factors outside the research model.

The significance test of the multiple regression model shows that the model is statistically significant. This indicates that learning attitudes and study habits simultaneously influence students' biology learning outcomes. Therefore, the combination of positive learning attitudes and good study habits can support improvements in biology achievement.

The multiple regression equation indicates that if both learning attitudes and study habits are zero, then the biology learning outcome will be at a certain baseline level. Each increase in learning attitudes significantly increases biology learning outcomes, assuming study habits remain constant. On the other hand, an increase in study habits only contributes a relatively small increase in biology learning outcomes and is not statistically significant when analyzed simultaneously with learning attitudes.

The results of the partial test show that learning attitudes have a positive and significant effect on biology learning outcomes, while study habits do not show a significant effect in the multiple regression model. This indicates that although study habits have an effect individually, their influence becomes weaker when analyzed together with learning attitudes.

Based on the standardized beta coefficient values, learning attitudes have a more dominant influence compared to study habits on biology learning outcomes. This suggests that internal factors such as learning attitudes play a more important role in determining students' academic success than study habits.

Overall, the results of this analysis indicate that the alternative hypothesis is accepted, meaning that there is a significant simultaneous effect of learning attitudes and study habits on the biology learning outcomes of public high school students in Kendari City, with learning attitudes being the most dominant factor influencing learning outcomes.

Discussion

Based on the results of data analysis conducted both descriptively and inferentially, this section aims to provide an explanation of the research findings in accordance with the results obtained.

Description of Students' Learning Attitudes toward Biology in Public Senior High Schools in Kendari City

The results of the descriptive statistical analysis of students' learning attitudes toward biology in public senior high schools in Kendari City involved a sample of 185 respondents. Theoretically, learning attitude scores have a certain range depending on the number of items and the measurement scale used in the research instrument. The empirical data showed a minimum score of 72 and a maximum score of 116, indicating variation in students' learning attitudes in biology learning.

The mean score of learning attitudes was 91.86 with a standard deviation of 8.55. This average indicates that, in general, students' learning attitudes fall into the moderate category. The relatively small standard deviation suggests that the distribution of scores does not deviate far from the mean, although individual differences still exist. This condition indicates that most students already demonstrate a tendency toward positive attitudes in biology learning, but these attitudes are not yet optimal in terms of attention, interest, active involvement, and responsiveness to the material. Some students still show passive tendencies during learning, such as limited participation in discussions, lack of questioning, and low enthusiasm when teachers explain abstract biological concepts.

Theoretically, learning attitude refers to students' internal tendencies in accepting, responding to, and evaluating the learning process. In biology, learning attitudes are closely related to students' interest in natural phenomena, their ability to connect concepts with real-life situations, and their willingness to engage in scientific activities such as observation, experimentation, and data analysis. A moderate level of learning attitude indicates that students already have a sufficient level of acceptance toward biology but still require reinforcement through more contextual and interactive teaching strategies.

This finding is consistent with research by Sandika et al. (2018), which states that inquiry-based biology learning can improve students' scientific attitudes by encouraging curiosity, active involvement, and confidence in expressing opinions. Similarly, Kısoglu (2018) found that positive attitudes toward biology are closely related to learning motivation and academic persistence. Students with positive attitudes tend to maintain focus, show confidence in understanding scientific concepts, and demonstrate greater resilience when facing complex material.

Overall, these findings suggest that the moderate level of students' learning attitudes toward biology indicates the need for more engaging instructional innovations. Biology teachers should enhance the use of experiential methods, visual media, laboratory activities, and problem-based learning to foster students' interest and active participation.

Description of Students' Study Habits in Public Senior High Schools in Kendari City

The descriptive statistical analysis of students' study habits involved 185 respondents. Theoretically, study habit scores also have a defined range based on the instrument used. The empirical results showed a minimum score of 64 and a maximum score of 116,

indicating variation in how students manage their learning activities.

The mean score of study habits was 89.29 with a standard deviation of 10.06, indicating that students' study habits are generally in the moderate category. The moderate standard deviation suggests some variation among students, but not extreme differences. This finding shows that most students have relatively good study patterns, although they are not yet fully consistent in applying effective learning habits. These habits include reading learning materials, completing assignments, reviewing lessons before exams, and taking notes during learning. However, some students still lack regular study schedules, tend to study only before exams, and do not consistently review material independently at home.

In biology learning, study habits play a crucial role because biology requires not only memorization of scientific terms but also understanding relationships among concepts, biological processes, and their application in real life. Students with regular study habits generally find it easier to understand complex topics such as organ systems, metabolism, genetics, and ecology. Conversely, unstructured study habits can lead to difficulties in connecting related concepts, which negatively affects understanding.

This result aligns with Savitri et al. (2024), who found that students' study habits are generally adequate but still dominated by exam-oriented learning patterns rather than daily routines. Internationally, Onipede et al. (2025) also found that study habits have a direct relationship with academic performance, with students who maintain consistent study routines achieving higher academic outcomes.

Thus, the moderate level of study habits among students indicates that while a basic foundation exists, further reinforcement is needed. Teachers should encourage structured study routines, regular review of material, and the use of notes and practice exercises to improve students' understanding of biology.

Description of Students' Biology Learning Outcomes in Public Senior High Schools in Kendari City

The descriptive statistical analysis of biology learning outcomes included 185 students. Empirical data showed a minimum score of 51 and a maximum score of 85, indicating variation in students' academic achievement.

The mean score was 70.28 with a standard deviation of 6.35, indicating that students' biology learning outcomes fall into the moderate category. The relatively small standard deviation suggests that most students' scores are clustered around the average. This indicates that while students have achieved a sufficient level of mastery, learning outcomes are not evenly distributed. Some students have high achievement, while others still fall into the lower category.

Moderate learning outcomes suggest that students are generally able to understand basic biological concepts but still face difficulties with higher-order thinking topics such as organ system relationships, metabolism, genetics, and ecological analysis. Biology learning success depends not only on memorization but also on the ability to understand relationships among concepts.

These findings are consistent with Mustain et al. (2021), who found that biology learning outcomes are influenced by internal factors such as scientific attitudes and active engagement. Similarly, Sinaga et al. (2022) emphasized the importance of learning readiness and the ability to overcome learning difficulties, while Majid et al. (2024) highlighted the role of metacognitive skills in improving biology learning outcomes.

Overall, these findings suggest that although students' academic abilities are developing well, further improvement is needed through active learning strategies, visual media, and analytical exercises to deepen conceptual understanding.

The Effect of Learning Attitudes on Biology Learning Outcomes

Inferential analysis shows that learning attitudes have a positive and significant effect on biology learning outcomes. The significance value is below the established threshold, and the correlation coefficient indicates a moderate relationship. This means that more positive learning attitudes are associated with better biology learning outcomes.

Further analysis shows that students with higher learning attitude scores tend to have better study habits and higher academic achievement. Positive learning attitudes encourage active participation, attention to instruction, and stronger motivation to understand biological concepts.

However, variations were also observed, where some students with lower learning attitudes still achieved relatively high learning outcomes. This suggests that factors such as cognitive ability, prior knowledge, and external support also influence learning outcomes.

These findings are consistent with Mayasari et al. (2016), as well as Haka et al. (2025), who emphasize the role of positive attitudes in enhancing academic achievement through increased persistence, confidence, and engagement.

The Effect of Study Habits on Biology Learning Outcomes

The analysis indicates that study habits have a positive and significant effect on students' biology achievement. Students with good study habits tend to

obtain better academic results because they consistently engage in learning activities such as reviewing materials and taking notes. However, not all students with strong study habits achieve high academic performance, suggesting that study habits alone are insufficient without effective learning strategies and a solid conceptual understanding.

These findings are supported by the study conducted by Palennari et al. (2014), which concluded that study habits are an important factor influencing students' mastery of biological concepts and academic achievement. The findings are also consistent with the studies of Berutu et al. (2018), as well as Latifa et al. (2023), which emphasize the importance of discipline and independent learning. Zhao et al. (2023) also highlighted that self-management in learning is positively correlated with academic achievement.

The Effect of Learning Attitudes and Study Habits on Biology Learning Outcomes

The results of multiple regression analysis show that learning attitudes and study habits simultaneously influence biology learning outcomes, contributing 21.1% to the variation in outcomes. Students who demonstrate both positive attitudes and good study habits tend to achieve higher academic results.

However, variations in individual patterns indicate that learning outcomes are influenced by multiple interacting factors, including cognitive ability, learning strategies, and environmental support.

These findings are consistent with Savitri et al.(2024) and Ariyati et al. (2024), who highlight the importance of combining positive attitudes and structured learning habits.

In conclusion, improving biology learning outcomes requires not only effective teaching strategies but also the development of positive learning attitudes and consistent study habits. The better these two factors are developed, the higher the likelihood of achieving optimal biology learning outcomes.

Conclusion

Based on the results of this study, it can be concluded that education is not solely determined by formal schooling but is also significantly influenced by internal student factors, particularly learning attitudes and study habits. In the context of biology learning among public senior high school students in Kendari City, these two variables play an important role in shaping students' academic outcomes, although they are not the only determinants. Descriptively, students' learning attitudes, study habits, and biology learning outcomes were generally found to be in the moderate category. This indicates that, although students already possess a sufficient foundation for effective learning, there is still considerable room for improvement. The moderate level of learning attitudes suggests that students have begun to show positive responses toward biology, but their interest, engagement, and active participation are not yet optimal. Similarly, study habits are relatively adequate but still lack consistency, particularly in terms of maintaining regular study schedules, reviewing material, and independently reinforcing learning at home. These conditions ultimately contribute to biology learning outcomes that are also moderate, reflecting that students are able to understand basic concepts but still face challenges in higher-order thinking and complex material. Inferential analysis further reveals that learning attitudes have a positive and significant effect on biology learning outcomes. Students who demonstrate more positive attitudes toward biology such as interest, curiosity, and active engagement tend to achieve better academic results. This finding highlights the importance of affective factors in the learning process, where students' internal readiness and perception of the subject can directly influence their level of understanding and achievement. In addition, study habits were also found to have a positive and significant effect on biology learning outcomes when analyzed independently. Students who exhibit structured and consistent study behaviors such as reviewing lessons, taking notes, and completing assignments regularly tend to perform better academically. However, the findings also indicate that good study habits alone do not automatically guarantee high achievement, as their effectiveness depends on how well students understand and apply learning strategies. When learning attitudes and study habits are analyzed simultaneously, the results show that both variables together have a significant effect on biology learning outcomes. However, learning attitudes emerge as the more dominant factor compared to study habits. This suggests that internal motivation and positive perception toward learning play a more critical role in determining academic success than behavioral routines alone. While study habits support the learning process, their impact becomes less significant when combined with learning attitudes, indicating that attitudes may act as a driving force behind effective learning behaviors. Overall, the findings of this study emphasize that improving students' biology learning outcomes requires a holistic approach that goes beyond cognitive aspects. Efforts to enhance academic achievement should focus on fostering positive learning attitudes, such as increasing students' interest, motivation, and active participation, while simultaneously developing consistent and effective study habits. In addition, the relatively low contribution of these variables to learning outcomes indicates that other factors—such as cognitive

ability, teaching methods, learning environment, and family supportalso play substantial roles and should be considered in future research. In conclusion, the better the students' learning attitudes and the more consistent their study habits, the higher their potential to achieve optimal biology learning outcomes. Therefore, educators, schools, and stakeholders should work collaboratively to create engaging, student-centered learning environments that not only enhance knowledge acquisition but also strengthen students' attitudes and habits toward learning.

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