



The Influence of Emotional Intelligence, Learning Independence, and Learning Motivation on Science Learning Outcomes of Junior High School Students in State Schools

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Abstract: This study examined the direct and indirect effects of emotional intelligence and independent learning on science learning outcomes through learning motivation among public junior high school students in Kendari. The study employed a quantitative ex post facto design. The population consisted of all public junior high school students in Kendari City during the 2025/2026 academic year. A sample of 194 eighth-grade students from six public junior high schools was selected using proportional random sampling. Data were collected through Likert-scale questionnaires measuring emotional intelligence, independent learning, and learning motivation, while science learning outcomes were obtained from end-of-semester summative assessment scores. Data were analyzed using descriptive statistics and path analysis. The descriptive findings showed that students' emotional intelligence, independent learning, and learning motivation were generally at a moderate level, whereas science learning outcomes were categorized as high. Path analysis revealed that emotional intelligence did not significantly affect learning motivation ($p = 0.113$). In contrast, independent learning had a significant positive effect on learning motivation ($\beta = 0.766$). Regarding science learning outcomes, neither emotional intelligence ($\beta = -0.027$) nor independent learning ($\beta = 0.129$) showed significant direct effects. However, learning motivation significantly influenced science learning outcomes ($\beta = 0.352$). The indirect effect of emotional intelligence on learning outcomes through motivation was 0.040, while the indirect effect of independent learning through motivation was 0.270. These results indicate that learning motivation plays a key mediating role in enhancing science achievement. Overall, independent learning and learning motivation contribute more substantially to students' science learning outcomes than emotional intelligence among public junior high school students in Kendari.

Keywords: Emotional intelligence; Independent learning; Learning motivation; Learning outcomes; Science

Introduction

Learning is an activity that can occur both consciously and unconsciously in every individual, resulting in a transformation from not knowing to knowing, from being unable to walk to being able to walk, and from illiteracy to literacy, and so on (Parwati et al., 2023). Therefore, from early developmental stages,

humans have been trained to learn various things. This also applies to students in educational institutions, whose primary obligation is to acquire knowledge. However, the process of acquiring knowledge does not always occur automatically, as learning success is influenced by various factors.

The success of students' learning requires certain attitudes so that learning activities can achieve optimal

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results. In an effort to understand the complexity of factors influencing learning outcomes, educational experts have identified several important variables, including emotional intelligence, learning independence, and learning motivation (Uno, 2016). One factor that has increasingly gained attention is emotional intelligence (emotional quotient).

Emotional intelligence is an individual's ability to effectively recognize, understand, manage, and control both their own emotions and those of others (Goleman, 2015). According to Rahman et al. (2024), emotional intelligence is an individual's ability to recognize, understand, manage, and express their own emotions, as well as to respond to the emotions of others appropriately. This intelligence encompasses emotional awareness, self-control, empathy, social relationship skills, and an inner drive to achieve specific goals.

Therefore, achieving high learning outcomes cannot rely solely on intellectual ability; students must also possess emotional intelligence. Emotional intelligence also plays a crucial role in determining students' potential to acquire practical skills needed in learning science (Nursari & Idris, 2020). This is in line with the study by Basri & Daud (2022) conducted on eighth-grade students of public junior high schools in Benteng District, Selayar Islands Regency, which found a positive relationship between emotional intelligence and science learning outcomes, indicated by an R value of 0.384. The t-test result of 4.792 further confirmed that the correlation is significant. Thus, emotional intelligence has a direct and significant effect on learning outcomes.

Emotional intelligence not only contributes to learning outcomes but also plays an important role in fostering consistent learning motivation. Based on Giawa (2022) study on eighth-grade students of SMP Negeri 2 Aramo, emotional intelligence and learning motivation are closely related, with a correlation coefficient of 0.430 and a determination value of 18.49%. This indicates that emotional intelligence contributes 18.49% to students' learning motivation. The study concluded that emotional intelligence has a direct and significant influence on learning motivation.

Another aspect that needs attention in supporting learning outcomes is students' learning independence. Learning independence is an essential requirement for students to achieve satisfactory results, as learning activities are fundamentally the responsibility of the students themselves (Putri et al., 2023). It provides a strong foundation for achieving academic success, particularly in science subjects at the junior high school level (Samsudin, 2019).

Samsudin (2019) study on ninth-grade students of public junior high schools in Telagasari District, Karawang, showed a significant effect of learning independence on science learning outcomes, with Sig =

0.000 and tcount = 3.742 greater than ttable = 1.67. These results indicate that learning independence has a direct and significant influence on science learning outcomes.

According to Asrori (2020), factors influencing learning independence include exogenous and endogenous factors. Endogenous factors originate within the individual and include physiological and psychological aspects such as interest, talent, motivation, and intelligence. Since these factors come from within the students themselves, they are easier to manage and are assumed to influence learning independence. One key internal factor is learning motivation.

This is supported by Martiani et al. (2024), whose study on seventh-grade students in Mare District, Bone Regency, showed that learning independence directly affects learning motivation, with an R Square value of 0.233 (23.3%). This indicates that learning independence contributes significantly to students' motivation.

Learning motivation is the third factor that plays a central role in determining learning outcomes. According to Fernando et al. (2024), learning motivation refers to students' tendency to engage in learning activities driven by the desire to achieve the best possible outcomes. Motivation is seen as a mental drive that activates, directs, and sustains learning behavior.

This aligns with Nuriani et al. (2025), whose study on eighth-grade students in Majene Regency found that learning motivation has a significant effect on learning outcomes (significance value $0.000 < 0.05$), with a direct influence of 0.363. Thus, learning motivation directly and significantly affects biology learning outcomes.

The interaction between emotional intelligence, learning independence, and learning motivation creates a complex synergy in influencing learning outcomes. Students with high emotional intelligence tend to manage stress and academic pressure better, which enhances their learning independence. High learning independence encourages students to be more proactive and responsible, thereby increasing intrinsic motivation. Strong motivation, in turn, sustains consistent learning efforts, ultimately improving learning outcomes.

Several studies have demonstrated positive relationships among these variables and learning outcomes. Nurdin (2022) found that learning independence significantly influences science learning outcomes ($p = 0.006 < 0.05$). Martiani et al. (2024) also showed that learning independence indirectly affects learning outcomes through motivation. Similarly, Mulyadi et al. (2025), using the Sobel test ($p\text{-value} = 0.0000001 < 0.05$), found that emotional intelligence indirectly influences science learning outcomes through learning motivation.

Despite these findings, comprehensive studies examining the simultaneous influence of emotional

intelligence, learning independence, and learning motivation on science learning outcomes—especially among junior high school students across Kendari City—remain limited. Most previous studies have examined these factors partially or in different subject contexts. Understanding their interaction is essential for developing more effective and comprehensive learning strategies.

Preliminary observations conducted in public junior high schools across Kendari City revealed significant differences in students' emotional intelligence, learning independence, motivation, and science learning outcomes. For example, at SMP Negeri 5 Kendari, the average score was 79.00, with 62.86% of students achieving mastery. However, there was considerable variation in ability levels, with some students still struggling significantly. Observations also showed that some students easily gave up, lacked emotional control, and demonstrated low initiative in independent learning.

In other schools, such as SMP Negeri 10 Kendari, learning outcomes were relatively better, with 95% of students achieving the minimum competency criteria, although some still depended heavily on teacher guidance. Similar patterns were observed in other schools, indicating the need to strengthen emotional intelligence, learning independence, and motivation.

Interviews with science teachers further confirmed that students with strong emotional intelligence tend to manage difficulties better, demonstrate higher motivation, and show greater initiative in learning. Conversely, students with low independence tend to be passive and less prepared. Teachers emphasized the importance of learning strategies that not only focus on mastering science content but also develop students' emotional and motivational aspects.

Based on these findings, this study is important to provide a comprehensive understanding of the influence of emotional intelligence, learning independence, and learning motivation on science learning outcomes among junior high school students in Kendari City. The results are expected to contribute both theoretically to educational research and practically to the development of more effective science learning strategies.

Method

This study employed a quantitative approach with an ex post facto research design, which examines events that have already occurred and then investigates the factors that influence those events. This approach was chosen because the variables under study emotional intelligence, learning independence, learning motivation, and science learning outcomes occur

naturally without any experimental treatment by the researcher. The study was conducted in the even semester of the 2025/2026 academic year across all public junior high schools in Kendari City, Southeast Sulawesi Province.

The population of this study consisted of all students from public junior high schools in Kendari City, totaling 3,559 students across grades VII, VIII, and IX. However, the study focused specifically on eighth-grade students, with a population of 1,288 students from six schools. The sampling technique used was random sampling, ensuring that each member of the population had an equal chance of being selected. The sample size was determined using the Taro Yamane formula with an error tolerance of 0.04, resulting in a total sample of 532 students. Furthermore, using proportional allocation, a specific sample of 194 eighth-grade students was obtained, distributed across the six public junior high schools in Kendari City.

The research design applied a descriptive correlational model with path analysis, aiming to determine both direct and indirect effects among variables. The independent variables were emotional intelligence (X_1) and learning independence (X_2), the intervening variable was learning motivation (Y), and the dependent variable was science learning outcomes (Z). Conceptually, the design illustrates that emotional intelligence and learning independence influence learning motivation and, both directly and indirectly, affect science learning outcomes.

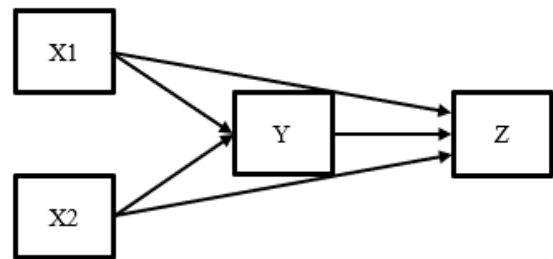


Figure 1. Research design

Structurally, the design can be explained as follows: emotional intelligence (X_1) and learning independence (X_2) have a correlational relationship (r_{12}), and both exert direct effects on learning motivation (Y) through path coefficients ρ_{YX_1} and ρ_{YX_2} . Furthermore, emotional intelligence (X_1), learning independence (X_2), and learning motivation (Y) simultaneously influence science learning outcomes (Z) through path coefficients ρ_{ZX_1} , ρ_{ZX_2} , and ρ_{ZY} , with each endogenous variable also affected by error terms (ε_1 and ε_2). Thus, two structural equations are formed in this study. The first equation explains that learning motivation is influenced by emotional intelligence and learning independence,

while the second equation shows that science learning outcomes are influenced by emotional intelligence, learning independence, and learning motivation.

The variables in this study consisted of four components: emotional intelligence as the first independent variable, learning independence as the second independent variable, learning motivation as the intervening variable, and science learning outcomes as the dependent variable. Emotional intelligence is defined as the ability to recognize, manage, and utilize one's own emotions as well as understand others' emotions. Learning independence refers to students' ability to manage their own learning processes autonomously. Learning motivation is an internal drive that directs individuals toward achieving learning goals, while learning outcomes refer to students' cognitive achievements measured through science test scores.

The research instruments consisted of questionnaires using a Likert scale to measure emotional intelligence, learning independence, and learning motivation. The questionnaires were structured as closed-ended statements with four response options: strongly agree, agree, disagree, and strongly disagree, including both positive and negative statements. Meanwhile, data on learning outcomes were obtained from students' cognitive science test scores documented by subject teachers.

Data collection techniques involved distributing questionnaires directly to the students selected as research samples and collecting documentation of their learning outcomes. Prior to use, the research instruments were validated by experts to ensure their validity and reliability.

The research procedure was conducted in three stages: preparation, implementation, and completion. The preparation stage included literature review, proposal development, and consultation with academic supervisors. The implementation stage involved instrument development and validation, distribution of questionnaires, and collection of learning outcome data. The completion stage included data processing, data analysis, drawing conclusions, and preparing the research report.

Data analysis consisted of descriptive and inferential statistical analyses. Descriptive analysis was used to describe the levels of emotional intelligence, learning independence, learning motivation, and learning outcomes using categorical classifications based on mean and standard deviation. Inferential analysis was used to test the research hypotheses, beginning with prerequisite tests such as normality and linearity tests. After meeting these assumptions, hypothesis testing was conducted using path analysis to determine direct and indirect effects among variables. Path coefficients obtained from regression analysis were

used to determine the magnitude of each variable's contribution, with a significance level of less than 0.05 indicating a statistically significant effect. Thus, this study is able to explain the complex structural relationships among emotional intelligence, learning independence, learning motivation, and students' science learning outcomes.

Result and Discussion

Based on the research problems previously formulated, this study examines the relationship between emotional intelligence, learning independence, and learning motivation on science (IPA) learning outcomes of junior high school students in Kendari City. Data analysis was conducted using both descriptive and inferential statistical approaches to obtain a general overview and to identify relationships among the variables studied. Based on the descriptive analysis presented in Table 1 it was found that out of 194 respondents, the mean score of emotional intelligence was 89.37, learning independence was 92.64, learning motivation was 92.75, and science learning outcomes were 79.34. The median and mode values for each variable were relatively close to the mean, indicating that the data distribution tends to be normal without extreme deviations. The relatively wide range between minimum and maximum scores for each variable also reflects the diversity in students' abilities and characteristics.

Table 1. The result the levels of emotional intelligence, learning independence, learning motivation, and learning outcomes using categorical classifications

Variable	Mean	Median	Mode	Min	Max
Emotional Intelligence	89.37	89	87	68	120
Learning Independence	92.64	93	95	70	119
Learning Motivation	92.75	92	92	69	113
Science Learning Outcomes	79.34	80	80	33	97

More specifically, emotional intelligence among students was mostly in the moderate category, accounting for 44.84%, followed by the high category at 18.56% and the low category at 22.68%. This indicates that most students have a fairly good ability to manage their emotions, although a small proportion still falls into very low and very high categories. For learning independence, the distribution was also dominated by the moderate category (39.17%), followed by the high category (25.26%) and the low category (22.16%). This suggests that most students have an adequate level of independent learning skills, although these have not yet reached an optimal level.

Furthermore, learning motivation was also predominantly in the moderate category (39.17%), followed by the high category (25.77%) and the low category (21.65%). This condition indicates that students' motivation is relatively good but still needs improvement to reach a consistently high level. In contrast, science learning outcomes showed a different pattern, with the high category dominating at 47.94%, followed by the very high category at 31.44%. This suggests that, overall, students' learning outcomes are already good, although a small number of students still fall into the low and very low categories.

Before hypothesis testing, prerequisite analyses were conducted, including normality and linearity tests. The results of the normality test indicated that all data were normally distributed, as the Shapiro-Wilk significance values were above 0.05. Meanwhile, the linearity test showed that the relationships between emotional intelligence, learning independence, and learning motivation with learning outcomes were linear, as evidenced by the significance values of deviation from linearity (0.186; 0.215; and 0.947), all of which were greater than 0.05. Therefore, all assumptions for regression analysis were met, and hypothesis testing could be carried out.

The inferential analysis revealed that, partially, emotional intelligence did not have a significant effect on learning motivation, with a significance value of 0.088 (> 0.05). In contrast, learning independence had a highly significant effect on learning motivation, with a significance value of 0.000 (< 0.05) and a beta coefficient of 0.766, indicating a strong relationship. Simultaneously, these two variables explained 74.4% of the variance in learning motivation, which falls into a strong category. The regression equation further indicates that learning independence contributes more substantially than emotional intelligence in enhancing students' motivation.

In the analysis of science learning outcomes, it was found that emotional intelligence and learning independence did not have a significant direct effect, with significance values of 0.818 and 0.399 (> 0.05), respectively. However, learning motivation was found to have a significant effect on science learning outcomes, with a significance value of 0.007 (< 0.05) and a beta coefficient of 0.352. This indicates that learning motivation is a key factor that directly influences students' academic achievement.

Simultaneously, emotional intelligence, learning independence, and learning motivation together explained only 19.9% of the variance in science learning outcomes, indicating that other factors outside the scope of this study also play a role. The regression equation shows that learning motivation provides the largest

contribution among the variables in improving learning outcomes.

In addition, path analysis revealed that indirect effects were stronger than direct effects. Emotional intelligence had an indirect effect on learning outcomes through learning motivation of 0.040, which was greater than its direct (negative) effect. Similarly, learning independence had an indirect effect of 0.270, which was significantly higher than its direct effect of 0.129. This finding indicates that learning motivation functions as an effective mediating variable in linking emotional intelligence and learning independence to science learning outcomes.

Overall, the results of this study demonstrate that learning motivation is the most influential variable affecting science learning outcomes. Learning independence plays a crucial role in enhancing motivation, while emotional intelligence contributes indirectly through motivation. Therefore, efforts to improve students' learning outcomes should focus on strengthening learning motivation, supported by the development of learning independence and emotional intelligence.

Discussion

Based on the results of the research data analysis that has been conducted, this discussion section is intended to provide a comprehensive explanation of the findings, both from descriptive statistical analysis and inferential statistical analysis, concerning the variables of emotional intelligence, learning independence, learning motivation, and science learning outcomes of junior high school students in public schools across Kendari City.

Description of Students' Emotional Intelligence

The results of the descriptive statistical analysis indicate that, in general, the emotional intelligence of junior high school students in Kendari City is categorized at a moderate level. This is evidenced by the mean score of 89.37. A more detailed examination of the frequency distribution table shows that the majority of students, namely 87 individuals (44.84%), fall within the interval range of 84.99 to 92.75, which is classified as moderate. These quantitative findings suggest that most students have begun to develop basic capacities in recognizing and managing their emotions; however, these abilities have not yet been fully optimized across various situations.

This moderate level of emotional intelligence implies that students are generally capable of responding to emotional dynamics within the school environment in a relatively stable manner. Nevertheless, they remain vulnerable when faced with higher academic pressure. For instance, students may be able to

regulate their emotions during social interactions with peers, yet they may easily experience frustration, anxiety, or loss of focus when dealing with science subjects that require analytical and mathematical reasoning. This condition highlights the importance of teachers' roles in creating a learning environment that not only focuses on cognitive knowledge transfer but also provides opportunities for students to develop emotional regulation skills.

Previous studies support the importance of emotional intelligence in science learning. Sitiman (2021), through an ex post facto study, found a highly significant positive relationship between emotional intelligence and science learning outcomes, with a correlation coefficient of 0.492 and a contribution of 24.2%. Similarly, Dewi & Suniasih (2022) found that emotional intelligence significantly influenced students' ability to absorb science material, contributing 31.9% to the variation in learning outcomes. These findings emphasize that academic achievement in science is not solely determined by intellectual intelligence (IQ), but is also strongly influenced by emotional intelligence (EQ).

Although the average emotional intelligence score remains at a moderate level, the presence of students in high (18.56%) and very high (9.28%) categories indicates variability within the classroom that can positively influence peer dynamics. Therefore, strengthening emotional intelligence is essential to help students manage academic stress effectively and improve overall science learning outcomes.

Description of Students' Learning Independence

The descriptive analysis also shows that students' learning independence is generally at a moderate level, with a mean score of 92.64. The largest group of students (39.17%) falls within the moderate category, specifically in the interval range of 87.69 to 96.59. This indicates that students have demonstrated initiative, discipline, and responsibility in their learning processes, although these behaviors are not yet consistently practiced in all situations.

This moderate level reflects a natural psychological transition phase among junior high school students. Some students are able to organize their study schedules, preview science materials before class, and complete assignments independently. However, they are still susceptible to distractions, such as gadgets, and may occasionally procrastinate. In science learning, independence is crucial, as students are required to explore additional resources, observe natural phenomena, and conduct simple experiments independently.

Empirical studies support these findings. Nurdin (2022) found a significant positive effect of learning independence on science achievement, while Candra

(2024) reported a strong correlation ($r = 0.564$) between independent learning behaviors and science performance. These results confirm that self-regulated learning plays a critical role in improving academic outcomes.

However, the existence of students in low (22.16%) and very low (7.73%) categories indicates the need for improvement. Teachers are encouraged to shift from teacher-centered approaches to more student-centered models such as Project-Based Learning and Inquiry-Based Learning to enhance students' independence.

Description of Students' Learning Motivation

The analysis shows that students' learning motivation is also at a moderate level, with a mean score of 92.75. The majority of students (39.17%) fall within the moderate category. This indicates that while students possess a basic willingness to participate in learning activities, their enthusiasm has not yet reached an optimal level.

Students with moderate motivation tend to complete assignments and attend classes, but their initiative to deepen understanding often depends on external encouragement. In science learning, strong motivation is essential due to the complexity of the material. Without sufficient motivation, students are more likely to give up when facing challenging concepts.

Research findings by Nuriani et al. (2025) and Nursari & Idris (2020) confirm that learning motivation has a significant positive effect on science achievement, with contributions reaching over 30%. These findings reinforce the idea that motivation serves as a primary driving force in learning activities.

Description of Science Learning Outcomes of Junior High School Students in Kendari City

Based on the results of the descriptive statistical analysis, the science (IPA) learning outcomes of junior high school students across Kendari City are generally categorized as high. This achievement is evidenced by the average (mean) score of 79.35 obtained by the students. When examined through the frequency distribution, the majority of students—93 individuals (47.94%)—fall within the score interval of 75 to 84, which is classified as the high category. In addition, 61 students (31.44%) successfully reached the very high category. These data indicate that, overall, students in these schools have been able to effectively absorb and understand science learning materials.

The high category of learning outcomes reflects the success of the learning process that has taken place. This level of achievement suggests that students are not merely memorizing concepts, but are also capable of applying their understanding when responding to evaluation instruments. The attainment of high science

learning outcomes is not coincidental; rather, it is the result of an accumulation of various supporting factors. These include the active role of teachers in delivering instructional materials, as well as the readiness of internal factors within students, such as emotional intelligence, learning independence, and learning motivation.

The fact that internal factors significantly determine high science learning outcomes is supported by empirical research conducted by Putri et al. (2023) at SMPN 33 Makassar. In this quantitative study, it was found that students' science learning outcomes were strongly influenced by their level of learning independence. The statistical test results showed a significance value of 0.001 ($p < 0.05$) and a coefficient of determination (R^2) of 0.421. This means that 42.1% of students' success in achieving high science scores is determined by how independently they manage their time and daily learning activities.

In addition to independence, emotional stability and learning motivation are also key determinants of high learning outcomes. This is supported by research conducted by Basri & Daud (2022) on eighth-grade students in the Selayar Islands. The study concluded that, simultaneously, emotional intelligence and learning motivation have a positive and highly significant effect on science learning outcomes. The results of multiple regression analysis in their study showed a significant F-value, with a combined contribution of 48.6% to students' cognitive science achievement.

Thus, it can be concluded that the high level of science learning outcomes (mean score of 79.35) among junior high school students in Kendari City is the result of cognitive processes supported by their psychological readiness. However, there are still students categorized as moderate (14.95%), low (4.12%), and very low (1.55%). These groups require special attention through academic guidance and personalized approaches. Continuous evaluation and improvement of teaching methods are necessary to ensure an equitable quality of science education across all schools.

The Direct Effect of Emotional Intelligence on Learning Motivation

Based on statistical testing using path analysis, the findings indicate that emotional intelligence does not have a significant direct effect on students' learning motivation. This is evidenced by a significance value of 0.088 ($p > 0.05$) and a t-value of 1.717, which is lower than the critical value. These results clearly reject the initial hypothesis and demonstrate that the level of a student's emotional intelligence does not directly determine their motivation in learning science.

This lack of significance can be explained through students' psychological conditions. As shown in the descriptive data, most students have moderate levels of emotional intelligence. At this level, students are able to recognize and manage basic emotions, such as controlling anger and maintaining social relationships. However, this level of emotional regulation is not strong enough to transform into proactive internal motivation for learning complex science material. Science learning motivation requires curiosity and intellectual interest, not merely emotional stability.

The Direct Effect of Emotional Intelligence on Science Learning Outcomes

Similarly, path analysis results also indicate that emotional intelligence does not have a significant direct effect on science learning outcomes. This is shown by a significance value of 0.818 ($p > 0.05$) and a very small negative standardized beta coefficient (-0.027). These findings suggest that the ability to regulate emotions does not directly contribute to students' cognitive achievement in science. This is reasonable considering that science learning outcomes measure cognitive abilities such as understanding, analyzing, and applying concepts. Emotional intelligence operates in the affective domain. Therefore, without concrete learning efforts, emotional skills alone cannot improve academic performance.

The Direct Effect of Learning Independence on Students' Learning Motivation

Based on the results of path analysis (Model I), it was empirically found that learning independence has a direct, positive, and highly significant effect on students' learning motivation. This conclusion is supported quantitatively by the probability (significance) value of 0.000, which is far below the standard threshold of 0.05 ($p < 0.05$). In addition, the standardized beta coefficient obtained is remarkably high, at 0.766. This statistical value clearly indicates that the higher the level of learning independence possessed by students, the greater and more substantial the increase in their motivation to learn science.

This strong influence can be explained from the perspective of educational psychology. Learning independence reflects students' ability to regulate themselves (self-regulation), including planning study schedules, seeking additional learning resources, and completing tasks without constant supervision or instruction from teachers. When students gain autonomy over their learning process, they develop a stronger sense of responsibility. This sense of ownership naturally fosters intrinsic motivation, which drives students to engage in learning activities not merely out

of obligation or fear of punishment, but out of genuine interest and a desire to master the subject matter.

Empirical evidence supporting the strong causal relationship between learning independence and motivation at the junior high school level is consistent with findings by Fauziah et al. (2021). In their quantitative study involving students at SMPN 6 Garut, they found a linear relationship between these two variables. Specifically, 77.7% of students demonstrated moderate learning independence, accompanied by 79.6% showing moderate levels of learning motivation. These findings confirm that students who exhibit independent learning behaviors tend to develop corresponding levels of motivation compared to those who are more passive.

In the context of science learning in junior high schools across Kendari City, independent learners tend to be better prepared to receive instructional material. Before teachers explain topics such as the digestive system or basic physics laws, these students often take the initiative to read textbooks or search for relevant information online. This prior preparation reduces confusion during classroom instruction. As a result, their sense of understanding enhances their confidence, which in turn increases their enthusiasm and motivation to actively participate in discussions and laboratory activities.

Based on this analysis, it can be concluded that learning independence serves as a fundamental foundation for the development of student motivation. Considering the magnitude of its influence ($\beta = 0.766$), science teachers are encouraged not only to focus on knowledge transfer but also to actively cultivate students' independence. Instructional strategies such as project-based learning or portfolio-based assignments, which require students to explore solutions independently, have proven effective in fostering independent learning habits. These practices ultimately lead to a significant increase in students' motivation in the classroom.

The Direct Effect of Learning Independence on Science Learning Outcomes

In contrast to its strong effect on motivation, the results of statistical testing (Model II) reveal that learning independence does not have a significant direct effect on students' science learning outcomes. This conclusion is based on a significance value of 0.399, which exceeds the threshold of 0.05 ($p > 0.05$), and a relatively small standardized beta coefficient of 0.129. This empirical finding indicates that independent behaviors such as organizing study schedules or maintaining discipline in note-taking are not sufficient to directly improve students' cognitive evaluation scores in science without the presence of mediating factors.

This lack of direct significance can be logically understood by examining the nature of learning outcomes. Science achievement at the junior high school level primarily measures cognitive abilities, including conceptual understanding, critical thinking, and analytical skills. A student may demonstrate high learning independence for example, consistently studying at home according to a schedule but without strong motivation or genuine interest in the subject matter, the information learned is unlikely to be effectively stored in long-term memory. In this sense, independence represents the structure or "container" of learning behavior, whereas cognitive understanding requires meaningful engagement driven by motivation.

This finding is supported by research conducted by Samsudin (2019), which examined the combined effects of learning independence and motivation on science achievement. The study demonstrated that these variables operate simultaneously in influencing learning outcomes. It emphasizes that independent study habits alone are insufficient unless accompanied by strong motivational drives toward the subject matter.

In practice, it is often observed that some students diligently complete science assignments due to external obligations rather than internal curiosity. As a result, when faced with slightly modified questions during examinations, they struggle to provide correct answers. This phenomenon aligns with the statistical findings of this study, where the direct path from learning independence to learning outcomes is not significant.

In conclusion, learning independence alone does not have sufficient power to directly enhance science learning outcomes. It must first be transformed into strong learning motivation in order to influence academic performance. This finding has important implications for educators: assigning independent study tasks is not enough; teachers must ensure that such activities genuinely stimulate students' curiosity and motivation toward science.

The Direct Effect of Learning Motivation on Science Learning Outcomes

The results of multiple regression analysis (Model II) indicate that learning motivation has a direct, positive, and significant effect on students' science learning outcomes. This is evidenced by a significance value of 0.007 ($p < 0.05$) and a standardized beta coefficient of 0.352. These results clearly demonstrate that any increase in students' motivation will directly lead to an improvement in their science achievement scores.

This direct influence can be explained by the fundamental role of motivation as the driving force behind cognitive activity. Highly motivated students tend to exhibit better focus and concentration during the

learning process. When confronted with complex or abstract science materials, they are more persistent and willing to seek solutions, ask questions, and invest additional time in understanding the concepts. These behaviors directly contribute to improved performance in evaluations.

This finding is consistent with studies by Nurhidaya et al. (2024) and Afni et al. (2022), which confirm that motivation significantly influences academic achievement. Their results show that strong internal drive is essential for optimal learning outcomes.

Given the demanding nature of science subjects, which require analytical thinking and problem-solving, motivation plays a crucial role in sustaining students' engagement. Students who consistently achieve high scores are typically those who actively participate in practical activities, take detailed notes, and engage in discussions—behaviors that reflect high motivation.

Thus, learning motivation can be considered a critical predictor of academic success. Teachers must design meaningful and contextually relevant learning experiences to maintain students' curiosity and ensure consistently high achievement in science.

The Indirect Effect of Emotional Intelligence on Learning Outcomes through Motivation

The path analysis results indicate that the indirect effect of emotional intelligence on science learning outcomes through motivation is relatively small, with a coefficient of 0.040. Although this value is greater than the direct negative effect (-0.027), it remains weak due to the non-significant relationships in both the emotional intelligence–motivation path and the emotional intelligence–learning outcomes path.

This suggests that emotional intelligence alone cannot effectively influence learning outcomes, even when mediated by motivation. Students with moderate emotional intelligence may be able to regulate emotions and interact socially, but this does not necessarily translate into increased motivation to learn science or improved academic performance.

This finding aligns with Afni et al. (2022), who reported that affective variables often require additional cognitive or environmental support to significantly impact learning outcomes.

The Indirect Effect of Learning Independence on Learning Outcomes through Motivation

The analysis reveals a crucial finding regarding learning independence. While its direct effect on learning outcomes is not significant ($p = 0.399$), its indirect effect through motivation is substantial, with a coefficient of 0.270. Since both the independence–motivation and motivation–outcomes paths are significant, a full mediation effect occurs. This means

that learning independence influences science achievement only through learning motivation. Independent behaviors must first foster motivation before they can impact cognitive outcomes. This phenomenon is supported by previous studies, including Putri et al. (2023) and Fauziah et al. (2021), which highlight that self-regulated learning enhances motivation, which in turn improves academic performance. In classroom practice, independent students often prepare in advance, leading to greater confidence and engagement. This readiness increases intrinsic motivation, which ultimately enhances learning outcomes. Therefore, improving science achievement requires strategies that promote learning independence as a foundation for developing strong motivation. Once motivation is established, it will significantly enhance students' academic performance.

Conclusion

Based on the results of this study, it can be concluded that emotional intelligence, learning independence, and learning motivation have different roles in influencing the science learning outcomes of junior high school students in Kendari City. Descriptively, emotional intelligence, learning independence, and learning motivation were generally categorized at a moderate level, while students' science learning outcomes were categorized as high, indicating that factors outside this research model may also contribute substantially to academic achievement. Inferential analysis showed that emotional intelligence does not have a significant direct effect on either learning motivation or science learning outcomes, while learning independence does not have a significant direct effect on learning outcomes. However, learning independence has a significant direct effect on learning motivation, and learning motivation has a significant direct effect on science learning outcomes, making motivation the main variable influencing students' academic achievement in this model. In addition, learning motivation was only proven to mediate the effect of learning independence on learning outcomes, whereas it did not mediate the effect of emotional intelligence because the relationship between emotional intelligence and motivation was not significant. Therefore, efforts to improve students' science learning outcomes should prioritize strengthening learning independence as a basis for increasing learning motivation. Future research is recommended to examine other variables outside this model, such as teaching methods, learning environment, parental support, or cognitive ability, in order to better explain the factors contributing to students' high academic achievement.

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Author Contributions

Conceptualization, methodology, software, formal analysis, investigation, data curation, writing—original draft preparation, visualization, A.S.P.N. and M.P.; validation, resources, project administration, writing—review and editing, supervision, M.A., F.D., and H.H. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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