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THE INFLUENCE OF SELF-EFFICACY AND SCIENTIFIC LITERACY ON LEARNING MOTIVATION IN BIOLOGY LEARNING AMONG GRADE XI STUDENTS OF MAN ENREKANG

PENGARUH *SELF-EFFICACY* DAN LITERASI SAINS TERHADAP MOTIVASI BELAJAR DALAM PEMBELAJARAN BIOLOGI PESERTA DIDIK KELAS XI MAN ENREKANG

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Abstract

This study aimed to analyze the influence of self-efficacy and scientific literacy on the learning motivation of Grade XI students at MAN Enrekang in biology learning. This research employed a quantitative approach with an ex post facto design. The sample consisted of 91 students selected through proportional sampling. The research instruments included a self-efficacy questionnaire, a learning motivation questionnaire, and a scientific literacy test. Data were analyzed using descriptive statistics and multiple linear regression analysis. The results showed that students' self-efficacy was in the moderate-to-good category, learning motivation was in the good category, and scientific literacy was at the basic proficiency level. Inferential analysis revealed that self-efficacy had a significant effect on learning motivation with a contribution of 32.9%, whereas scientific literacy showed a low contribution of 1.5%. Simultaneously, self-efficacy and scientific literacy accounted for 34.8% of learning motivation. These findings indicate that self-efficacy is a more dominant factor in enhancing students' learning motivation compared to scientific literacy. Therefore, strengthening self-efficacy through instructional strategies that support self-confidence, mastery experiences, and positive learning environments should become an important concern in biology learning.

Penelitian ini bertujuan untuk menganalisis pengaruh *self-efficacy* dan literasi sains terhadap motivasi belajar peserta didik kelas XI MAN Enrekang pada pembelajaran biologi. Penelitian ini menggunakan pendekatan kuantitatif dengan desain ex post facto. Sampel penelitian berjumlah 91 peserta didik yang dipilih menggunakan teknik proportional sampling. Instrumen penelitian terdiri atas angket *self-efficacy*, angket motivasi belajar, dan tes literasi sains. Data dianalisis menggunakan statistik deskriptif dan regresi linear berganda. Hasil penelitian menunjukkan bahwa *self-efficacy* peserta didik berada pada kategori cukup hingga baik, motivasi belajar berada pada kategori baik, sedangkan literasi sains berada pada tingkat kemahiran dasar. Analisis inferensial menunjukkan bahwa *self-efficacy* berpengaruh signifikan terhadap motivasi belajar dengan kontribusi sebesar 32,9%, sedangkan literasi sains memberikan kontribusi rendah sebesar 1,5%. Secara simultan, *self-efficacy* dan literasi sains memberikan kontribusi sebesar 34,8% terhadap motivasi belajar. Temuan ini menegaskan bahwa *self-efficacy* merupakan faktor yang lebih dominan dalam meningkatkan motivasi belajar dibandingkan dengan literasi sains. Oleh karena itu, penguatan *self-efficacy* melalui strategi pembelajaran yang mendukung kepercayaan diri, pengalaman keberhasilan, dan lingkungan belajar yang positif perlu menjadi perhatian dalam pembelajaran biologi.

Article Information

Keywords
Biology learning; learning motivation; scientific literacy; self-efficacy

Kata Kunci:
Literasi sains; motivasi belajar; pembelajaran biologi; *self-efficacy*

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A. INTRODUCTION

Education is essentially a lifelong process and plays an important role in developing individual potential so that individuals are able to live their lives optimally (Rahman et al., 2022). In the educational process, learning motivation is one of the main factors that determine students' success in achieving learning objectives. Learning motivation is understood as internal and external drives that generate enthusiasm, persistence, and direction in an individual's learning behavior to achieve certain goals (Kurnia et al., 2024). Learning motivation can originate from intrinsic factors within the individual as well as extrinsic factors influenced by the surrounding environment (Elvira et al., 2022). Students who have high learning motivation tend to demonstrate active participation, perseverance, and the ability to persist in facing learning difficulties.

In biology learning, learning motivation plays an important role because biology content does not only require the ability to memorize concepts, but also the ability to understand scientific phenomena, think critically, and solve problems. Low learning motivation can cause students to be less active in the learning process, less confident in expressing their opinions, and less optimal in understanding biology concepts. Therefore, supporting factors are needed to enhance students' learning motivation, one of which is self-efficacy.

Self-efficacy is an individual's belief in their ability to complete tasks and face certain challenges (Bandura, 1997). Self-efficacy plays an important role in determining how a person thinks, acts, and persists when facing difficulties. Students with high self-efficacy tend to be more confident, persistent, and put greater effort into completing learning tasks compared to students with low self-efficacy. Conversely, students with low self-efficacy tend to give up easily, doubt their abilities, and avoid academic challenges (Putri & Fadhilah, 2023). Self-efficacy is also closely related to learning motivation because belief in one's abilities can encourage students to be more active and optimistic in achieving learning success (Damayanti & Alwi, 2024). Research by Regina et al. (2024) shows that self-efficacy has a positive relationship with students' motivation to learn biology (Intan Regina Fatimah Az-Zahra & Nurul Fauziah, 2024). Self-efficacy has a strong influence on students' learning motivation. Students' confidence in facing the learning process can be enhanced through good support and communication from teachers. This indicates that students with high self-efficacy tend to have higher learning motivation in the learning process (Rivai et al., 2021).

Besides self-efficacy, scientific literacy is also an important aspect in biology learning. Scientific literacy is an individual's ability to understand scientific concepts, explain phenomena scientifically, and use scientific evidence in decision-making (OECD, 2023). Scientific literacy is needed so that students are able to connect scientific concepts with everyday life and develop critical thinking skills toward various scientific problems. Students with good scientific literacy tend to understand learning materials more easily and are able to solve problems rationally. Scientific literacy can also help students build confidence in learning because they are able to understand and apply the concepts being studied (Awalina et al., 2024).

However, scientific literacy does not always have a direct effect on students' learning motivation. Learning motivation is not only influenced by cognitive abilities, but also by affective factors, the learning environment, and prior learning experiences (Ishida & Sekiyama, 2024). Therefore, the relationship between scientific literacy and learning motivation still needs to be further investigated, especially in biology learning at the madrasah aliyah level

Based on interviews with a biology teacher conducted on January 10, 2025, at MAN Enrekang, it was found that students' learning motivation in biology learning varies. Only about 20% of students show high learning motivation, while most of the others tend to be less active

and less enthusiastic during the learning process. In addition, the teacher also stated that students still rarely ask questions, are hesitant when answering questions, and even feel unable to complete tasks independently. This condition indicates that students' self-efficacy still needs to be improved. From the aspect of scientific literacy, the teacher explained that the assessment so far has focused more on biology learning outcomes and has not specifically measured students' scientific literacy skills. As a result, the effect of scientific literacy on learning motivation has not yet been clearly identified.

Research on self-efficacy and learning motivation has been widely conducted; however, most studies tend to focus on the relationship between self-efficacy and learning outcomes or academic achievement. Meanwhile, studies examining the simultaneous effect of self-efficacy and scientific literacy on students' learning motivation in biology learning, especially at the madrasah aliyah level, are still limited. Therefore, this study is important to provide an overview of the influence of self-efficacy and scientific literacy on the learning motivation of Grade XI students at MAN Enrekang in biology learning. The results of this study are expected to serve as a consideration in designing learning strategies that are able to increase learning motivation through strengthening self-efficacy and developing students' scientific literacy.

A. METHOD

This study used a quantitative approach with an ex post facto design. The ex post facto design was used because the study aimed to determine the effect of independent variables on the dependent variable without providing direct treatment to the research subjects (Permadi et al., 2020). The research was conducted at Madrasah Aliyah Negeri (MAN) Enrekang with Grade XI students in the 2024/2025 academic year.

The population in this study consisted of all Grade XI students at MAN Enrekang. The research sample consisted of 91 students selected using a proportional sampling technique, so that each class had a proportional chance of being included in the research sample. This technique was used to ensure that the sample could more evenly represent the characteristics of the population.

The research instruments consisted of a self-efficacy questionnaire, a scientific literacy test, and a learning motivation questionnaire. The self-efficacy questionnaire was developed based on the dimensions of self-efficacy, which include magnitude (level of task difficulty), strength (strength of belief), and generality (the extent of belief across various situations) (Bandura, 1997). he questionnaire was constructed using a five-point Likert scale, namely strongly agree, agree, neutral, disagree, and strongly disagree.

The scientific literacy instrument was a test developed based on the PISA scientific literacy indicators, namely the ability to explain scientific phenomena, interpret scientific data and evidence, and evaluate and design scientific investigations (OECD, 2019). Meanwhile, the learning motivation questionnaire was developed based on learning motivation indicators, which include persistence in learning, perseverance in facing difficulties, interest in learning, learning independence, and goal-oriented learning (A.M Sadirman, 2008). All the instruments used have undergone validity and reliability tests.

The data obtained were then analyzed using descriptive and inferential statistics. Descriptive statistical analysis was used to describe the levels of students' self-efficacy, scientific literacy, and learning motivation. Meanwhile, inferential statistical analysis was used to test the effect of self-efficacy and scientific literacy on learning motivation using multiple linear regression analysis. Before hypothesis testing, assumption tests were conducted, including tests

of normality and linearity. All data analysis processes were carried out using SPSS version 25 (Ghozali, 2018).

B. RESULTS AND DISCUSSION

RESEARCH RESULTS

1. Overview of Students' Self-Efficacy

The descriptive analysis results show that the self-efficacy of Grade XI students at MAN Enrekang falls within the moderate to good category. Of the 91 students, the highest score was 60 and the lowest score was 27, with a mean score of 43.71 and a standard deviation of 7.12. The categorization results of students' self-efficacy are presented in Table 1.

Table 1. Students' Self-Efficacy Categorization

Category	Frequency	Percentage
Poor	22	24,17%
Fair	38	41,75%
Good	26	28,57%
Very Good	5	5,49%

Based on Table 1, most students fall into the fair category with a percentage of 41.75%. These results indicate that students' self-efficacy still needs to be improved so that students become more confident in facing tasks and challenges in biology learning.

2. Overview of Students' Scientific Literacy

The descriptive analysis results show that the scientific literacy skills of Grade XI students at MAN Enrekang are at the basic proficiency level. The highest score obtained by students was 52 and the lowest score was 6, with a mean of 34.02 and a standard deviation of 12.04. The categorization of students' scientific literacy skills is presented in Table 2.

Table 2. Students' Scientific Literacy Proficiency Level

Proficiency level	Frequency	Percentage
Needs assistance	13	14,29%
Basic	42	46,15%
Proficient	28	30,77%
Skilled	8	8,79%

Based on Table 2, the majority of students are at the basic proficiency level with a percentage of 46.15%. This indicates that students' ability to explain scientific phenomena, interpret data, and use scientific evidence still needs to be improved.

3. Overview of Students' Learning Motivation

The descriptive analysis results show that the learning motivation of Grade XI students at MAN Enrekang is in the good category. The highest learning motivation score was 90 and the lowest score was 42, with a mean of 67.15 and a standard deviation of 10.30. The categorization of students' learning motivation is presented in Table 3.

Table 3. Students' Learning Motivation Categorization

Category	Frequency	Percentage
Very Poor	4	4,39%
Poor	21	23,07%
Fair	25	27,47%

Good	30	32,96%
Very Good	11	12,08%

Based on Table 3, most students fall into the good category with a percentage of 32.96%. These results indicate that students have fairly good persistence and interest in learning in biology learning

4. The Effect of Self-Efficacy and Scientific Literacy on Learning Motivation

Before conducting inferential analysis to determine the effect of self-efficacy and scientific literacy on learning motivation, assumption tests were first carried out, namely tests of normality and linearity. The normality test using Kolmogorov–Smirnov showed that all variables had significance values greater than 0.05, indicating that the data were normally distributed. In addition, the results of the linearity test showed a significance value of 0.000 < 0.05, which means that the relationship between self-efficacy and scientific literacy with learning motivation is linear. Thus, the data met the requirements for multiple linear regression analysis. The results of the regression analysis are presented in Table 4.

Table 4. Regression Analysis Results

Variable	R	R Square	F	Sig.	Description
Self-Efficacy → Learning Motivation	0,573	0,329	43,550	0,000	Significant
Scientific Literacy → Learning Motivation	0,123	0,015	1,369	0,245	No Significant
Self-Efficacy dan Scientific Literacy → Learning Motivation	0,590	0,348	23,485	0,000	Significant

Based on Table 4, self-efficacy has a significant effect on learning motivation with a contribution of 32.9%. Meanwhile, scientific literacy contributes only 1.5% and does not have a significant effect on learning motivation. Simultaneously, self-efficacy and scientific literacy contribute 34.8% to students' learning motivation. These results indicate that self-efficacy plays a more dominant role than scientific literacy in increasing the learning motivation of Grade XI students at MAN Enrekang.

DISCUSSION

1. Overview of Students' Self-Efficacy

The results of the study show that the self-efficacy of Grade XI students at MAN Enrekang is in the fair to good category. These findings indicate that most students already have confidence in their ability to complete biology learning tasks, although there are still students who show doubt in facing academic challenges. Students with good self-efficacy tend to be more confident, active in learning, and able to persist when facing learning difficulties. Conversely, students with low self-efficacy tend to give up easily and lack confidence in their own abilities.

According to Bandura (1997), Self-efficacy is an individual's belief in their ability to organize and carry out the actions required to achieve a goal. High self-efficacy encourages individuals to have greater persistence, effort, and resilience in facing academic challenges. The findings of this study are in line with research by Firmansyah (2018), which shows that self-efficacy plays an important role in increasing students' engagement and biology learning outcomes. In addition, research by Regina et al. (2024) also shows that students with high self-confidence tend to have better learning motivation compared to students with low self-efficacy.

The results of this study indicate that students' self-efficacy needs to be continuously strengthened through learning experiences that provide opportunities for success, teacher support,

and a positive learning environment. Strengthening self-efficacy is important because belief in one's own abilities can influence how students perceive tasks, deal with obstacles, and maintain effort in learning.

2. Overview of Students' Scientific Literacy

The results of the study show that the scientific literacy skills of Grade XI students at MAN Enrekang are at the basic proficiency level. This condition indicates that students are able to understand basic science concepts, but are not yet optimal in explaining scientific phenomena, interpreting data, and using scientific evidence to solve problems. The low level of scientific literacy skills may be influenced by a learning process that is still oriented toward content mastery and memorization rather than the application of scientific concepts in real-life contexts.

OECD (2023) explains that scientific literacy is not only related to conceptual mastery, but also to the ability to use scientific knowledge to make rational decisions in everyday life. Therefore, scientific literacy requires contextual, investigative, and problem-solving-oriented learning. The findings of this study are in line with the PISA 2022 report, which shows that the scientific literacy skills of students in Indonesia are still below the OECD average, particularly in the ability to interpret data, explain scientific phenomena, and use scientific evidence in problem-solving (OECD, 2023). In addition, research by Awalina et al. (2024) shows that low scientific literacy among students can be influenced by a learning process that has not fully provided learning experiences based on scientific investigation and problem-solving.

Furthermore, research by Awalina et al. (2024) states that a learning approach that provides direct experience and scientific thinking activities can improve students' scientific literacy skills. The low level of scientific literacy in this study indicates the need for innovation in biology learning that places greater emphasis on investigative activities, data analysis, and scientific problem-solving so that students become more accustomed to thinking scientifically.

3. Overview of Students' Learning Motivation

The results of the study show that students' learning motivation is in the good category. This indicates that most students have fairly good interest and enthusiasm in participating in biology learning. Students with high learning motivation tend to be more active in learning, show persistence in completing tasks, and demonstrate a desire to achieve good learning outcomes.

"According to Sardiman (2007), learning motivation is the overall driving force within students that triggers learning activities and provides direction for those activities. Learning motivation is an important factor because it influences the intensity of students' engagement in the learning process. The findings of this study are also supported by research by Tuan et al. (2005), which shows that science learning motivation is closely related to students' engagement in the learning process, particularly in learning persistence, interest in science, and confidence in completing scientific tasks. Students with high motivation tend to be more active in exploring concepts and show better engagement in biology learning.

However, there are still a small number of students with low learning motivation. This condition may be influenced by a lack of self-confidence, low interest in biology learning, and insufficient enjoyable learning experiences. Therefore, teachers need to create a more interactive and contextual learning environment so that students' learning motivation can be optimally improved.

4. The Effect of Self-Efficacy and Scientific Literacy on Learning Motivation

The results of the analysis show that self-efficacy has a significant effect on learning motivation with a contribution of 32.9%. These results indicate that the higher the students' self-efficacy, the higher their learning motivation. Students who are confident in their abilities tend to be more optimistic, active, and persistent in facing learning difficulties.

These findings are in line with Bandura's (1997) theory, which states that self-efficacy influences individuals' choice of actions, level of effort, persistence, and resilience in facing challenges. Students who have confidence in their abilities are more likely to engage in learning and maintain their effort to achieve academic success.

The results of this study are also consistent with Greco et al., (2022), who found that self-efficacy is positively correlated with students' learning motivation and academic engagement (Greco et al., 2022). Another study by Regina and Fauziah also showed that self-efficacy has a positive relationship with students' motivation to learn biology. Thus, self-efficacy can be considered an important psychological factor that plays a role in increasing students' learning motivation (Intan Regina Fatimah Az-Zahra & Nurul Fauziah, 2024).

Furthermore, the results of the test on the effect of scientific literacy on learning motivation show that scientific literacy has a very low and insignificant effect on learning motivation. This indicates that students' cognitive ability to understand scientific concepts and processes has not directly increased their learning motivation. Learning motivation is not only influenced by academic ability, but also by affective factors, the learning environment, instructional methods, and social support.

These findings are consistent with Ishida and Sekiyama (2024), who stated that the direct relationship between academic ability and learning motivation tends to be weak when it is not supported by adequate psychological and environmental factors. In addition, students with good scientific literacy do not necessarily have high interest and enthusiasm for learning if the learning process does not provide meaningful and engaging learning experiences (Ishida & Sekiyama, 2024).

The low contribution of scientific literacy to learning motivation may also be caused by a learning process that still focuses on achieving grades and completing assignments rather than developing scientific thinking skills. As a result, students do not fully perceive scientific literacy as a need that can enhance their engagement in biology learning.

The simultaneous test results show that self-efficacy and scientific literacy have a significant effect on learning motivation with a contribution of 34.8%. However, self-efficacy has a more dominant contribution compared to scientific literacy. This indicates that psychological factors in the form of self-belief have a greater influence on learning motivation than students' cognitive abilities.

These findings strengthen the study by Digo and Disca (2025), which showed that self-efficacy and academic ability are positively related to learning motivation, but self-efficacy is the stronger factor in influencing students' learning engagement (Digo & Disca, 2025). This result is also consistent with Bandura's (1997) social cognitive theory, which emphasizes that individuals' beliefs in their capabilities influence their choice of actions, effort, persistence, and resilience in facing academic challenges (Bandura, 1997). Students with high self-efficacy tend to be more optimistic, active in learning, and able to maintain their motivation even when facing difficulties.

These findings are supported by Schunk (1991), who stated that self-efficacy is directly related to academic motivation because students who believe in their abilities show higher and more consistent learning effort in achieving learning goals (Schunk, 1991). In addition, Linnenbrink and Pintrich (2003) explained that self-efficacy plays an important role in increasing

student engagement, learning persistence, and the use of more effective learning strategies (Linnenbrink & Pintrich, 2003). Usher and Pajares (2008) also showed that mastery experiences, social support, and positive feedback are the main sources of self-efficacy development, which in turn enhance students' learning motivation (Usher & Pajares, 2008).

In the context of science learning, Ainley and Ainley (2011) found that students' emotional engagement and self-confidence in science learning contribute to sustained interest and learning motivation (Ainley, 2011). Similar findings were also reported by Tuan et al. (2005), who stated that science learning motivation is influenced by internal factors, especially students' self-belief in understanding concepts and completing scientific tasks (Tuan et al., 2005). Research by Greco et al. (2022) further supports these findings by showing that self-efficacy is positively correlated with academic engagement, learning resilience, and students' ability to cope with academic pressure (Greco et al., 2022).

Although scientific literacy simultaneously contributes to learning motivation, its influence is relatively lower than that of self-efficacy. This indicates that students' cognitive abilities are not sufficient to enhance learning motivation without being accompanied by self-belief. Students with good academic ability do not necessarily show high learning motivation if they lack confidence in facing learning tasks. Therefore, improving learning motivation in biology learning is not only achieved through strengthening scientific literacy, but also through developing students' affective and psychological aspects, particularly self-efficacy.

The findings of this study indicate that teachers need to apply learning strategies that are not only focused on conceptual mastery, but also able to build students' self-confidence through success experiences, collaborative learning, positive feedback, and a supportive learning environment. Thus, strengthening self-efficacy can be a strategic approach to increasing students' learning motivation and engagement in biology learning.

C. CONCLUSION

This study shows that self-efficacy plays a more dominant role than scientific literacy in influencing students' learning motivation in biology learning. Although students' scientific literacy is at a basic level and does not have a significant direct effect on learning motivation, self-efficacy is proven to encourage students to be more confident, active, and persistent in facing academic challenges. Simultaneously, self-efficacy and scientific literacy contribute to learning motivation; however, the psychological aspect in the form of belief in one's own abilities is the most determining factor in building students' learning engagement. These findings confirm that improving the quality of biology learning is not sufficient if it only focuses on strengthening cognitive abilities and mastery of scientific concepts, but must also be directed toward developing affective aspects through learning strategies that can foster self-confidence, provide successful learning experiences, and create a supportive learning environment. Thus, strengthening self-efficacy can be one of the strategic approaches to increasing students' learning motivation and engagement in science learning at school.

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