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The Influence of Learning Motivation on Students' Eco-Literacy of Environmental Pollution Material

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a r t i c l e i n f o	a b s t r a c t
	The motivation to learn, together with the implementation of the independent curricula and the *Pancasila* (P5), has to go hand in hand with the development of environmental literacy to raise conservation awareness. This study aims to assess the significant influence of learning motivation on students' environmental literacy, especially concerning environmental pollution. Data collection methods include questionnaires and observations. Surveys gather data, while observations allow for a direct understanding of the observed phenomenon or behaviour. The result of the regression test with a constant value of $\propto$ environmental literacy is 18.358, and the directional coefficient/βX is +0.775; the higher the motivation to learn, the higher the level of environmental literacy. The significance value obtained from the ANOVA test was 0.000, below the 0.05 threshold. This result indicates that the hypothesis tested demonstrates a statistically significant effect. Therefore, learning motivation has been shown to improve eco-literacy significantly. The research concludes that learning motivation is essential in the learning process, serving as a driving force that enhances students' engagement, understanding, and overall academic success so that it can improve students' eco-literacy. 2024 Scientiae Educatia: Jurnal Pendidikan Sains

1. Introduction

Science education in the 21st century aims to create a generation that understands scientific theory and can think critically, adapt to change, and play an active role in solving various global challenges that continue to grow. The current curriculum in Indonesia focuses on student-centred learning as the key concept and educators as facilitators. Motivation is vital in the educational process (Handgraaf, 2022). The teacher facilitates the learning process in the classroom and encourages learners to be more active (Fitri et al., 2021). Without motivation from within learners, the learning atmosphere will be passive (Susanti et al., 2021). Learners' Intrinsic motivation will encourage them to be more curious about information provided by others, so learning in the classroom will become more active. Now, it is no longer the teacher who provides information or material; students must also be able to give their opinions on knowledge gained through their experiences.

According to Roxana Moreno's book Educational Psychology, motivation and achievement have a strong positive correlation: learners with higher learning motivation are likelier to learn and achieve than learners with lower motivation (Moreno, 2010). Learning motivation exerted a positive and significant influence on the reading ability of 12th graders, and motivation to learn plays a significant and positive role in shaping the influence of school culture on the reading

ability of 12th graders (Edwar R.C, 2024). So, there is a need to increase student learning motivation because, according to research by Filgona et al. (2020), student attendance in class is only a sign that students live in a society that requires their children to attend school. Highly motivated students tend to learn easily and make the classroom fun to learn. In contrast, unmotivated students may learn very little, making the teaching and learning process painful and frustrating (Filgona et al., 2020).

The Merdeka curriculum in Indonesia emphasises a holistic approach and is relevant to real life, including raising environmental issues. Environmental issues are an important theme to encourage students' awareness of sustainability and responsibility for the earth. According to data from the Ministry of Environment and Forestry in 2020, national environmental problems in Indonesia are dominated by waste problems, water resources, water quality and quantity, and land environmental problems. This data is reinforced by data from the Central Statistics Agency in 2021 regarding the limitations of fossil energy and the insignificant development of renewable energy resources. (Rilianti & Huda, 2023). Learning motivation supports the Merdeka Curriculum's goal of improving students' eco-literacy and addressing Indonesia's environmental challenges. The environment, which is now a source of problems, requires increased eco-literacy through individual awareness and lifelong learning (Kadarisman & Pursitasari, 2023; Nurbaeti et al., 2020). Ecoliteracy is relevant in science learning, where the curriculum aims to develop students' skills to understand, preserve the environment, and appreciate the diversity of God's creation (Abas et al., 2023; Wahyuni et al., 2022).

Eco-literacy, derived from the Greek words "oikos" (habitat) and "logos" (knowledge), represents the complex human ability to adapt to the environment and respond to ecological challenges (Sentosa et al., 2024). Environmental education promotes sustainability by fostering societies capable of managing resources responsibly and minimizing environmental impacts (Fitriani, 2023). Achieving this requires motivational drives to internalize sustainability values, empowering learners with the knowledge, skills, and determination to protect nature (Rahma et al., 2022). Learning motivation is crucial in developing eco-literacy by enabling students to analyze environmental problems and act scientifically.

Other research results show that the effect of learning motivation on Science Literacy Ability has a significant effect, and family parenting on Science Literacy Ability has a significant effect (Syah et al., 2020). Learning motivation also influences the development of the disciplinary character of 6th-grade students of SD Kembangan Bambanglipuro Bantul. It is possible that if the learning motivation possessed by students is high, then the level of student discipline character will also be high, and vice versa. The discipline character is also low if the student's learning motivation is low (Mugiantarsih, 2021).

Learning motivation is an important foundation in the development of ecoliteracy. Motivated students are driven to understand, apply, and spread ecological values. Thus, increasing learning motivation, both intrinsic and extrinsic, will contribute to the achievement of a more environmentally aware and responsible generation. Studying environmental literacy encourages learners to become socially aware, integrate knowledge from various disciplines, and act responsibly. It helps them understand how science can be applied to address environmental issues (Kadarisman et al., 2023). A 'robust' theoretical approach to sustainability literacy builds upon earlier definitions of literacy, expanding the understanding of how individuals can participate in and contribute to sustainable practices.

2. Method

The methods should include relevant details on the materials, experimental design, and techniques so that the experiments can be repeated. Names of products and manufacturers should be included only if alternate sources are deemed unsatisfactory. Novel experiments should be described in detail. If the previous researcher's method is used, please describe that method briefly and explain in detail if you modify the procedure.

This study uses a quantitative paradigm with an exploratory approach to identify the relationship between the variables studied. The research design is a survey that combines descriptive correlational analysis to explore the impact of environmental pollution on students' learning motivation. The research process involved the preparation stage, data collection through questionnaires, and data analysis using simple linear regression and ANOVA to test the hypotheses. Sampling was conducted using simple random sampling to ensure fair representation of the student population at SMK Assalam Sumberbaru, Jember Regency. Each step of this research is based on the quantitative paradigm that emphasises objectivity, generalisation, and quantification of data to produce measurable and statistically testable results. Classroom learning applied outdoor learning with a problem-based learning model.

At the end of the lesson, a questionnaire was distributed to students to measure their learning motivation and eco-literacy. The instrument used for data collection is a questionnaire. To measure students' motivation to learn, five indicators are developed into 20 statements. The learning motivation framework of indicators in Table 1 (Rinaldi et al., 2021).

Table 1. Learning motivation questionnaire grid indicators

No	Indicator
1	Determination In Education
2	Ability to deal with adversity
3	Attention Acuity
4	Educational Attainment
5	Self-Directed Learning

Measuring the level of eco-literacy uses two components: knowledge, awareness, and practical competence. (Abas et al., 2023). The grid of the eco-literacy instrument can be observed in Table 2. The questions were used for a knowledge and awareness component and practical competence, with a questionnaire of 20 statement items. The indicator was developed in 20 statements. The following is a grid of indicators (Suryanda et al., 2023).

Table 2. Eco-literacy questionnaire indicator grid

No	Item	Indicator
1	Science	Knowledge of the principles of ecology
		Understanding of the impact of human actions on ecosystems
2	Diligence and competence in the field	Caring for living things and the environment in which they live.
		Get involved by doing things that can reduce negative impacts on nature, both small and large.

Eco-literacy analysis uses SPSS-based statistical tests. These include simple linear regression tests and one-way ANOVA tests. Combining a simple linear regression test and one-way ANOVA is an appropriate statistical approach for eco-literacy analysis because each can answer different research questions: cause-effect relationship and comparison between groups. The

questionnaire utilized a Likert scale ranging from 1 to 7, which enabled more detailed and nuanced results in measuring respondents' eco-literacy. Before conducting research, the validity and reliability of the research instruments to be used. The following are the results of the statistics assisted by SPSS version 26.

The questionnaire's validity was thoroughly examined with students to guarantee its accuracy and relevance. In addition, feedback was solicited from the SMK Assalam teachers to validate the instrument further. This process helped confirm that the questionnaire effectively measured the intended constructs. Presented below are the detailed results of the validity test, which outline the effectiveness and reliability of the questionnaire in assessing the targeted variables.

Table 3. Validity test

No	r-table	Pearson Correlation	Description
1		0,810	Valid
2		0,622	Valid
3		0,489	Valid
4		0,486	Valid
5		0,545	Valid
6		0,431	Valid
7		0,370	Valid
8	0,361	0,441	Valid
9		0,485	Valid
10		0,401	Valid
11		0,375	Valid
12		0,350	Valid
13		0,430	Valid
14		0,387	Valid
15		0,378	Valid

The validity test results indicate that the instrument is valid, with all 15 questionnaire items successfully validated. Thus, the questionnaire is deemed suitable for use in the study. Furthermore, the researchers performed a reliability test, which resulted in a Cronbach's Alpha value of 0.692, exceeding the minimum threshold of 0.60. As the criteria for both validity (with all items being valid) and reliability (Cronbach's Alpha > 0.60) were met, the questionnaire instrument, having passed both validity and reliability tests, is deemed suitable for use in the research.

3. Result and Discussion

The study collected data by distributing questionnaires to respondents to measure their eco-literacy. The questionnaire assessed various dimensions of eco-literacy, including environmental knowledge, attitudes toward environmental issues, and environmentally friendly behaviours. To present a complete overview of the respondents' level of environmental awareness and understanding, the data analysis outcomes of the questionnaire are presented and analyzed in this section. Subsequently, the hypothesis testing results offered insights into the relationships and effects under investigation. According to the results of the normality test, normality and homogeneity tests were performed to meet the requirements of hypothesis testing.

Table 4. One-sample Kolomogorov-Smirnov test

Description		Unstandardised Residual
N		30
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	7.82910249
Most Extreme Differences	Absolute	.075
	Positive	.070
	Negative	-.075
Test Statistic		.075
Asymp. Sig. (2-tailed)		.200[c,d]

The one-sample Kolomogorov-Smirnov test yielded a significance value of 0.200, as shown in the table above, indicating that the value is above the 0.05 alpha threshold. We can conclude that the data follows a normal distribution. Thus, it is evident from the analysis that the data satisfy the assumption of normality, rendering it appropriate for statistical analyses that assume normally distributed data. The findings of the homogeneity test are detailed in Table 5.

Table 5. Test of homogeneity of variances

	Description	Levene Statistic	df1	df2	Sig.
Score	Based on Mean	1.227	2	57	.301
	Based on Median	.997	2	57	.375
	Based on the Median and with adjusted df	.997	2	50.883	.376
	Based on trimmed mean	1.223	2	57	.302

Since the significance value of 0.301 is higher than the alpha level of 0.05, the test data meets the criteria for homogeneity. To ensure the consistency of the data, the results of the homogeneity of variances test show that the variance between groups is homogeneous. This indicates that the data meet the assumption of homogeneity, making them suitable for use in several statistical tests, such as ANOVA.

Table 6. Regression analysis

	Model	Unstandardised Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	18.358	10.389		1.767	.088
	Motivation to learn	.775	.158	.680	4.907	.000

The results in the table above suggest that the constant value ($\propto$) for eco-literacy is 18.358, while the directional coefficient (βX) is +0.775. The positive value of the coefficient suggests a direct relationship between learning motivation and eco-literacy. Specifically, as learning motivation increases, eco-literacy also increases proportionally. This implies that higher levels of

motivation to learn contribute to an improvement in eco-literacy. The equation that can be derived from these findings is:

$$Y = 18.358 + 0.775\,X1$$

The data suggest that learning motivation significantly contributes to improving environmental literacy. The significance value of 0.00, less than 0.05, indicates statistical significance, as the computed t-value of 4.907 exceeds the critical t-table value of 1.7011. These findings lead to the rejection of the H_0 and support the Ha. The results demonstrate a positive relationship, showing that as learning motivation increases, environmental literacy also improves. This emphasizes the important role of learning motivation in enhancing environmental literacy.

Table 7. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.680[a]	.462	.443	7.968

Based on the R-squared value of 0.462, as illustrated in the table above, it can be concluded that learning motivation influences 46.2% of eco-literacy. This means that nearly half of the variation in eco-literacy can be explained by the level of learning motivation. 53.8% of eco-literacy is influenced by other factors not included in this model.

Table 8. ANOVA test

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1528.616	1	1528.616	24.079	.000[b]
	Residual	1777.551	28	63.484		
	Total	3306.167	29			

Based on the table above, the significance value of 0.000 indicates an influence, as it is smaller than the alpha level of 0.05. Consequently, this study concludes a significant relationship between learning motivation and eco-literacy. This finding aligns with Edwar's research, highlighting that students' learning motivation enhances their literacy levels.

The Effect of Learning Motivation on Students' Ecoliteracy on Environmental Pollution Material

This study aims to assess the significant influence of learning motivation on students' environmental literacy, especially concerning environmental pollution. Applying environmental integration learning in the subject of living things and their environment, environmental pollution material in class X SMK Assalam Sumberbaru, Jember. Learning is done outdoors, inviting students to survey several locations for environmental pollution. Learning like this is one way to motivate students to carry out activities. There are findings related to environmental pollution, including the garbage burning by the community, the amount of garbage disposal in the river, and the use of motorised vehicles every time they travel. There are class X students who live close to the school but still use motorised vehicles to get to school. This is one of the causes of environmental pollution.

Based on the regression test results in Table 7, learning motivation affects eco-literacy by 46.2%; this shows the importance of learning motivation in students. This demonstrates that although learning motivation significantly impacts eco-literacy, additional factors contribute to shaping an individual's level of eco-literacy. Consistent with Hamdiyanti's research, motivation

to learn mathematics was important for students' mathematical literacy (Hamdiyanti et al., 2024). An important contribution to efforts to understand how to improve environmental literacy through the application of appropriate learning approaches (Miterianifa & Mawarni, 2024).

Learning motivation can increase because of teaching materials that are interesting to students and not boring. One of the teaching materials that influences the environment-based textbooks. The results of this study are explained in Table 6: the constant value $\propto$ of eco-literacy is 18.358, and the direction coefficient / βX is +0.775; if the coefficient is positive, then eco-literacy increases if learning motivation increases. Following the research of Arga et al., using environment-based learning resources can improve the eco-literacy of students, which is considered better than applying conventional learning (Arga & Rahayu, 2019).

Based on Table 8, the significance value is 0.000 <0.05, so it can be concluded that learning motivation influences increasing eco-literacy. Edwar's study demonstrated that learning motivation positively and significantly affects literacy and shows that classroom motivation fosters a positive school culture, further influencing literacy (Edwar, 2024). Similarly, another study by Zulfikri confirmed that learning motivation moderates the relationship between digital literacy and learning outcomes (Zulfikri, 2023). In another study, it was found that students' learning motivation significantly positively influenced their learning outcomes. This finding may be significant for lecturers and parents to make important efforts to support students' motivation to succeed (Nur'aini et al., 2020). Although the research did not directly address eco-literacy, understanding how learning motivation affects learning outcomes may provide valuable insights in developing eco-literacy among students.

4. Conclusion

The findings indicate that learning motivation significantly enhances the eco-literacy of vocational education students, especially concerning environmental pollution materials. Learning motivation is essential to enhancing students' eco-literacy, which encompasses their understanding of environmental issues, awareness of the impacts of environmental pollution, and their ability to take responsible actions toward the environment. This finding highlights the significance of fostering learning motivation as a key factor in developing students' environmental consciousness and behaviour. Data analysis reveals that as students become more motivated to learn, their eco-literacy improves. This suggests that learning motivation drives and prompts students to engage more effectively in learning, improving their ability to grasp and apply environmental concepts in everyday life. Consequently, it is highly recommended that learning motivation be increased through engaging and relevant learning approaches to foster eco-literate attitudes and behaviours in students. This research confirms that learning motivation is a crucial factor for educators to consider in supporting the achievement of environmental education goals.

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