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Romi Isnanda, Syahrul Ramadhan et Yenni Hayati

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Résumé de l'article

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Romi Isnanda
Padang State University

Syahrul Ramadhan
Padang State University

Yenni Hayati
Padang State University

Abstract

Expanding information related to environmental degradation is one potential approach to enhance students' environmental literacy and awareness (eco-literate). This research investigates the relationship between students' skills in writing popular text-based articles and their ecological literacy. A quasi-experimental research design was employed with a one-group test. The sample consisted of 23 Indonesian Language and Literature Education Program students, selected through purposive sampling. Data collected included scores on writing assignments of popular articles and questionnaire results regarding students' knowledge of ecological literacy. Data analysis techniques involved testing for correlation, regression, normality, multicollinearity, heteroskedasticity, F-test, and t-test. Pearson correlation results showed a significant relationship between students' eco-literate knowledge and their ability to write popular articles, with a coefficient of determination of 55.4%, indicating that 55.4% of the variation in the ability to write articles can be explained by eco-literate knowledge. The regression analysis revealed a strong correlation coefficient of 0.942, indicating a very strong relationship between various aspects of eco-literate knowledge and students' ability to write popular articles. The t-test further demonstrated that environmental concern is the factor that has the most significant influence on students' writing ability, with a regression coefficient (b2) of 1.793.

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Introduction

The organization of education processes cannot be separated from the evolution of human thinking, which constantly competes with the progress of time. This has implications for various innovations in human social life. Education will never remain static; it will always evolve and change, leading to the birth of innovations (Hidayat, 2021; Kristiawan et al., 2016). Innovation is a change, or renewal, involving ideas and concepts to bring about such a transformation (Firmansyah, 2019). These innovations are inseparable from the development of technology and communication. This results in significant changes in various areas of society. These changes occur rapidly, whether consciously or not. The rapid pace of development brings about both negative and positive impacts (Zhonggen, 2019).

One of the negative effects of technological and communication advancements is environmental damage. This is due to the flourishing of an insensitive or apathetic attitude among the population towards their natural surroundings (Twenge et al., 2018). This condition is a result of a lifestyle dominated by technological mediation. Communication and interaction among individuals are minimal (Ahlborg et al., 2019; Dienlin & Johannes, 2020; Murray et al., 2021). People can fulfill their needs without social contact with others. The reduced social contact and interaction, in the context of community life, undoubtedly led to a decreased concern for the environment and its contents (Marnoto & Trijayanti, 2023). If this issue occurs on a larger scale within the context of life, it will eventually become a contemporary concern, both at the national and global levels, which is environmental damage. Therefore, efforts are needed to make environmental damage an issue of concern for various parties (Varela et al., 2018). These efforts involve disseminating information related to the condition of environmental damage. This includes the causes of environmental damage, the processes involved, and the extent of its impact on social interactions within the community (Eriksson et al., 2023; Evangelista et al., 2018).

As the issue extends to a broader level, everyone should contribute to its prevention. Ardoin et al. (2020) explain that environmental conservation efforts are holistic and require support from all parties. This is concretely achieved through the integration of environmental content into the curriculum, at various educational levels, to cultivate environmental awareness (Sukma et al., 2020; Žalėnienė & Pereira, 2021). In line with this, Suwandi (2019) elucidates that, based on the foundational framework of the Curriculum 2013 of the Republic of Indonesia, environmental preservation should be the concern of all educational elements. Environmental preservation is not solely the responsibility of science or environmental science teachers, but extends to all subject teachers (Chorpita & Barlow, 2018; Higgins-Desbiolles, 2020).

Based on the rationale of education's responsibility of instilling environmental awareness, the Language and Literature Education Program plays a vital role in supporting national initiatives. This is accomplished through one of the elements of language-skill development, namely writing skills. Writing is the productive effort of individuals to create something (Xalikova, 2018). It involves the technical process of expressing one's thoughts and emotions in written language. The process of converting thoughts into written form is reliant on the writer's information and knowledge. This knowledge is acquired through the interpretation and integration of language skills. In other words, writers need not only understand the theoretical nature and technical aspects of writing, but also engage in critical or higher-order thinking (Sun & Zhang, 2022). More specifically, this is applied through the teaching of writing popular articles. These are written pieces that provide a summary of scientific literature presented in easily understandable language (Jiang & McComas, 2014). The goal of transforming purely scientific language into popular language for readers is to increase readership. This change in writing style is beneficial for expanding the readers' knowledge and reaching a non-professional audience, not just academics. Moreover, writing

popular science articles serves as a valuable tool for reflection and adds significant value to a writer's ability to change perspectives, understand the subject matter, and develop scientific literacy (Chorpita & Barlow, 2018; Paul et al., 2020).

Therefore, the process of teaching the skill of writing popular articles should be text-based. In this context, "text" refers to presenting contextual themes, especially those that are related to eco-literacy. This means that the learning process involves the integration of ecological values. This integration of ecological values in education has been explored in research, such as the study conducted by Kobia (2023), which explains that traditional proverbs can enhance eco-literacy. Additionally, Johns and Pontes (2019) highlight that nature reserves can promote environmental literacy. Furthermore, Kazazoglu. (2025) and Kadwa and Alshenqeeti (2020) elaborate on the existence of four types of English-language texts that are based on eco-literature: marine lexicon, environmental lexicon, marine and island environmental lexicon, and agricultural-land lexicon.

Furthermore, expanding information that is related to environmental damage is one alternative to enhance students' ecological literacy and environmental awareness. In other words, environmentally-themed written work can guide students to contribute to the dissemination of information. This can take the form of studies or research from various perspectives on the environment. Some previous studies have presented research findings on environmental damage, explaining that sediment loads from surface soil erosion, caused by mining, lead to the deterioration of speleological systems (the science that studies cave structures) Valderrama et al. (2017 (Nugroho & Kristanto, 2020). Concurrently,) concluded that the concept of environmental damage has implications for human life. If human disturbances exceed the natural environment's carrying capacity, the environment cannot naturally rehabilitate itself, requiring human intervention to restore it.

Previous research has investigated students' eco-literacy. Setiadi et al. (2023) found a positive and significant influence of eco-literate competence on environmental sustainability among elementary-school students in Indonesia. Additionally, Wahyuni et al. (2022) demonstrated that a good level of eco-literacy can foster a better understanding of students' environmental-care behaviour. Rahma et al. (2022) conducted a pilot study to explore students' eco-literate abilities concerning disaster-risk reduction efforts. Additionally, Rantung et al. (2023) discovered that students' eco-literacy can be increased by incorporating song lyrics into language teaching, thereby enhancing their language competency. However, there is a gap in the literature regarding the relationship between eco-literacy and student-writing education. Therefore, this study aims to investigate the relationship between students' ecological literacy knowledge and their skills in writing popular articles.

Methodology

Research design

This research employs a quantitative approach with a quasi-experimental design using a single group (Siedlecki, 2020). Students are tested on their ability to write popular articles related to environmental issues and are asked to fill out a questionnaire regarding their eco-literate knowledge. The instructors assess both traits, and then conclude whether these two facets are related to each other. They also determine which attribute of eco-literacy has the most significant impact on the student's ability to write popular articles.

Participants

The research subjects are students from the Indonesian Language and Literature

Education Program at the State University of Padang in the academic year 2022-2023. The selection of the participants was carried out using a purposive sampling method, with the criteria being students from the Indonesian Language and Literature Education Program at the State University of Padang who have not received instruction on writing popular articles. These criteria resulted in 23 students being selected as participants.

Data collection

Data for this study was collected through a combination of methods. Firstly, a text-based Indonesian language learning process was implemented as part of this research. Then, students were tasked with writing popular articles, and their assignments were assessed by lecturers using a rubric, or writing skill assessment tool. Additionally, questionnaires were distributed to gather information regarding students' eco-literate knowledge. The rubric for evaluating the quality of the students' articles consisted of criteria, such as the appropriateness of topic selection, the choice of titles, presentation of issues within their written work, adherence to writing structure, and language style (see Table 1). Each of these criteria had a maximum score of 20, resulting in a total score of 100. The eco-literate knowledge questionnaire contained 20 items, adapted from Tyas et al. (2022), and covered four key areas: fundamental knowledge of ecological principles (items 1-5), environmental concern (items 6-10), responsibility for environmental conservation (items 11-15), and the wise use of natural resources (items 16-20). Respondents were asked to rate their agreement with each statement on a scale of 1 (Strongly Disagree) to 4 (Strongly Agree).

Table 1: Assessment criteria for popular article writing skills.

Assessment Criteria	Description	Maximum Score
Theme selection	Relevance of the theme regarding environmental issues	20
Title	Engaging, clear, and representative of the entire text	20
Presentation of issues in the writing	Clear and logical presentation of the issues	20
Writing structure	Adherence to academic standards, consistency, and writing style	20
Writing style	Use of a popular (accessible to the general public) writing style	20
	Total Score	100

Data analysis

The analysis in this study employed both descriptive and quantitative methods. Descriptive analysis was used to present the students' responses to the eco-literate knowledge questionnaire and their score on abilities in writing articles. On the other hand, quantitative analysis was conducted to address two key research questions: firstly, whether there is a significant correlation between students' eco-literate knowledge and their proficiency in writing popular articles; and secondly, which specific aspect of eco-literate knowledge holds the most significant influence over their capacity to write popular articles effectively.

The analysis in this study comprises several statistical tests and regression models to address the research questions. First, a Pearson correlation test is employed to answer the initial research question, assessing whether there is a strong and significant relationship between the variables. The significance level is determined by the p-value, and a relationship is considered

significant if the two-tailed p-value (Sig.) is less than 0.05. The second test involves multiple regression analysis to develop a model that demonstrates the relationship between the independent variable (eco-literate knowledge) and the dependent variable (article-writing skills). The coefficient of determination (R square) quantifies the extent of this influence. Additionally, the F-test and t-test are conducted to determine the direction (positive or negative) and the significance of the influence, with significance accepted, if the p-value (Sig.) is less than 0.05.

In response to the second research question, other regression tests were performed, preceded by tests for normality, multicollinearity, and heteroskedasticity to meet the prerequisites. The study included two research questions, leading to two regression models known as Regression Model 1 and 2. In Regression Model 1, the equation is expressed as $Y = a + bX + e$, where Y represents the variable of popular article writing skills, X represents eco-literate knowledge, a stands for the constant, b is the regression coefficient, and e is the error term. Meanwhile, Regression Model 2 is described by the equation $Y = a + b1X1.1 + b2X1.2 + b2X1.3 + b3X1.4 + e$. Here, Y still represents popular article writing skills, while X1.1 to X1.4 represent different aspects of eco-literate knowledge, a is the constant, b1 to b4 are the regression coefficients, and e remains the error term. These regression models are instrumental in analyzing the influence of eco-literate knowledge on the ability to write popular articles while considering specific areas of eco-literacy.

Results

Descriptive analysis results

The assessment results for popular-article writing skills and eco-literate knowledge are presented in Table 2. The average score for popular-article writing skills is 90.00, with a maximum score of 100.00 and a minimum score of 75.00. Meanwhile, the average score for eco-literate knowledge is 72.09, with a maximum and minimum score of 80.00 and 60.00, respectively.

Table 2: Descriptive analysis results.

Parameter	Variable	
	Article Writing Skills	Eco-Literate Knowledge
Mean	90.00	72.09
Maximum	100.00	80.00
Minimum	75.00	60.00
Standard Deviation	7.23	5.40
N	23	23

The scores for article-writing skills in each part are presented in Figure 1. The highest score achieved by students is in the area of title selection, which is 94.57, while the lowest score is obtained in the area of relevance to the theme (86.96). This indicates that while students are proficient at crafting engaging titles for their articles, they may need to focus more on ensuring that the content of their writing aligns closely with that chosen theme. A high score in title selection demonstrates students' creative and attention-grabbing abilities, which are essential for drawing readers in. However, the slightly lower score in relevance to the theme suggests that there might be room for improvement, in terms of content development and maintaining a coherent narrative throughout the articles.

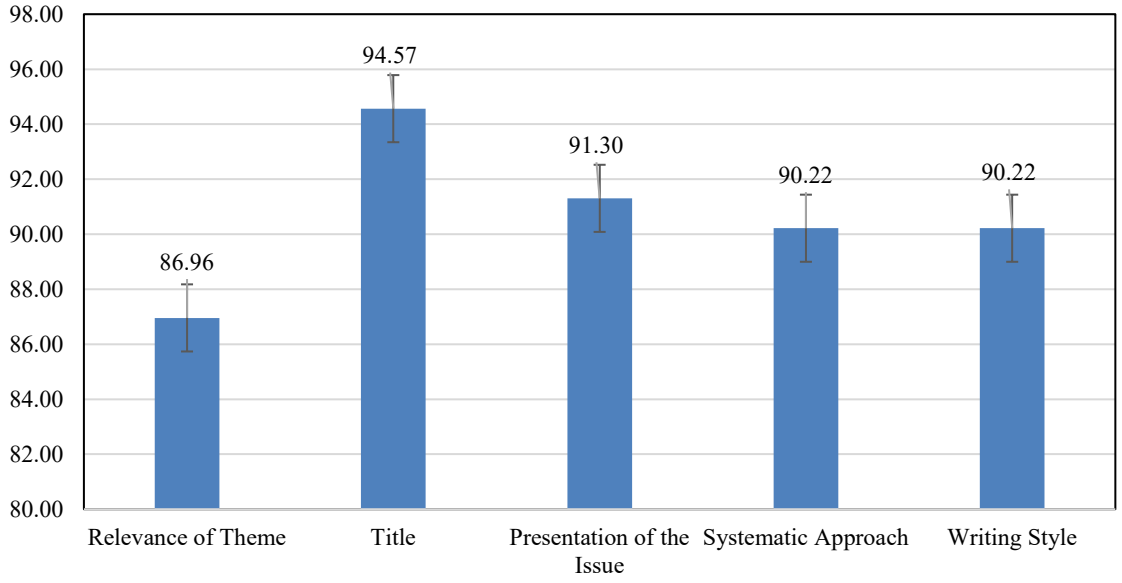

Figure 1: Students' writing skills scores acquisition.

Next, after assessing students' popular article-writing works through text-based eco-literacy learning, an analysis was conducted to evaluate their comprehension of eco-literacy knowledge, which is a strategic issue both at the national and international levels. Figure 2 illustrates the key topics that were used to classify students' comprehension, which include basic, ecological-principles knowledge, environmental concern, environmental responsibility, and wise natural-resource conservation. The area with the highest score is "responsibility for environmental conservation," with a score of 92.17, while the lowest is "fundamental knowledge of ecological principles," with a score of 86.74.

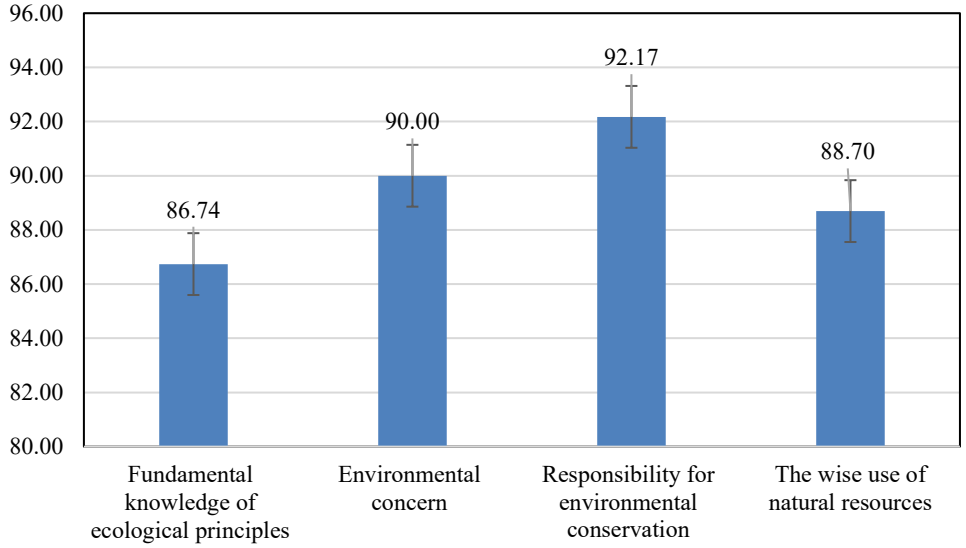

Figure 2: Students' ecological literacy knowledge level.

Several factors could contribute to the gap in students' eco-literacy, especially in their grasp of fundamental ecological principles. Students' personal interests and motivation can influence their level of engagement with eco-literate content. Those who have a strong interest in environmental issues are more likely to actively seek out and absorb knowledge, while others

may not prioritize it. Additionally, the learning environment, encompassing class size, teaching staff, and peer interactions, can significantly impact students' engagement with and understanding of eco-literate topics.

Test results for Model 1

In the initial stage, a Pearson correlation test was conducted to address research question 1, which states, "Is there a significant correlation between students' eco-literate knowledge and academic grades?" The results of the Pearson correlation test for Regression Model 1 are presented in Table 3. The correlation (Pearson correlation) value obtained is 0.744, with a significance level (Sig. 2-tailed) of 0.000, which is less than 0.05. Therefore, it can be concluded that there is a strong and significant relationship between students' eco-literate knowledge and their ability to write articles.

Table 3: Results of Pearson correlation test - Model 1.

	Correlations		
	Eco-Literate Knowledge		Writing Skills
Eco-literate knowledge	Pearson correlation	1	.744**
	Sig. (2-tailed)		.000
	N	23	23
Writing skill	Pearson correlation	.744**	1
	Sig. (2-tailed)	.000	
	N	23	23
**Correlation is significant at the 0.01 level (2-tailed).			

The test results for Model 1 include the coefficient of determination, the F-test (model fit test), and the t-test (parameter significance test). The coefficient of determination (R Square) test aims to determine how much the independent variable (students' eco-literate knowledge) can explain the dependent variable (the ability to write popular articles). In Table 4, it is observed that the value of the coefficient of determination (R Square) is 0.554, indicating that the ability to write popular articles can be explained or influenced by students' eco-literate knowledge to the extent of 55.4%. The remaining 44.6% is influenced by other variables outside the scope of the model.

Table 4: Coefficient of Determination value - Model 1.

			Model Summary[b]	
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.744[a]	.554	.533	5.07875

Note: [a]Predictors: (constant), eco-Literate knowledge; [b]Dependent variable: writing skills.

The F-test (model fit test) is used to determine whether the model formed in the research is suitable and can be used for analysis. Based on Table 5, the calculated F value is 26.113, with a significance value (Sig.) of 0.000. Because the Sig. value is 0.000, which is less than 0.05, it can be concluded that Model 1, formed in this research, is deemed appropriate and can be used for analysis.

Table 5: F-Test (Model Fit Test) - Model 1.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	673.551	1	673.551	26.113	.000[b]
	Residual	541.667	21	25.794		
	Total	1215.217	22			

Note: [a]Dependent variable: writing skills; [b]Predictors: (constant), eco-literate knowledge.

Based on Table 6, it is observed that the constant value is 85.000, and the regression coefficient (b) is 10.833. Therefore, Model 1 in Equation 1 is derived as follows: Y = 85.000 +10.833X + e.

The equation for Model 1 can be interpreted in these ways:

1) The constant value of 85.000 signifies that if the eco-literate knowledge of the students is zero, the writing skills will have a value of 85.000.
2) The b value of 10.833 indicates that for each increase of 1 unit in the eco-literate knowledge of the students, the writing skills will increase by 10.833.
3) For students with low eco-literate knowledge (code 0), the calculation is as follows: Y = 85.000 + 10.833(0) = 85.000. This means that low eco-literate knowledge among students will result in writing skills of 85.000.
4) For students with high eco-literate knowledge (code 1), the calculation is as follows: Y = 85.000 + 10.833(1) = 95.833. This means that high eco-literate knowledge among students will result in writing skills of 95.833.

Table 6: T-Test (Parameter Significance Test) - Model 1.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		b	Std. Error	Beta		
1	(Constant)	85.000	1.531		55.508	.000
	Eco-literate knowledge	10.833	2.120	.744	5.110	.000

Note: [a]Dependent variable: writing skills.

Based on Table 6, which presents the t-test results (parameter significance test), a calculated t-value of 5.110 is obtained with a significance level (Sig.) of 0.000. Since the Sig. value is 0.000, which is less than 0.05, it can be concluded that students' eco-literate knowledge significantly and positively impacts writing skills. This indicates that the higher the eco-literate knowledge of the students, the higher the quality of their writing skills.

Test results for Model 2

Regression Model 2 represents an equation model to determine the influence of each section of students' eco-literate knowledge (including areas of fundamental ecological-principles knowledge, environmental concern, environmental responsibility, and wise natural-resource conservation) on writing skills. It is also used to address research question 2, which asks, "Which aspect of students' eco-literate knowledge has the greatest impact on students' ability to write under environmental themes (writing skills)?"

The testing for Model 2 includes classic assumption tests (normality test, multicollinearity test, and heteroskedasticity test), correlation coefficient values, the coefficient of determination, the F-test (simultaneous test), and the t-test (parameter significance test). The normality test is used to determine whether a regression model, the dependent variables, and the independent variables follow a normal distribution. The Kolmogorov-Smirnov (K-S) test in Table 7 indicates that the regression equation has a significance value of 0.200. This means

that the regression equation satisfies the assumption of normality, because it has a significance value greater than 0.05.

Table 7: Results of the Normality Test.

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		23
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	2.48494251
Most Extreme Differences	Absolute	.097
	Positive	.077
	Negative	-.097
Test Statistic		.097
Asymp. Sig. (2-tailed)		.200[c,d]

Note: [a]Test distribution is normal; [b]Calculated from data; [c]Lilliefors Significance Correction; [d]This is a lower bound of the true significance.

The multicollinearity test aims to determine whether there is any correlation among independent variables in the regression model. A good regression model should not exhibit correlation among independent variables. Based on Table 8, it is observed that the calculated collinearity statistics values for all independent variables show tolerance values of ≥ 0.10 and VIF values of ≤ 10. Therefore, it can be concluded that there is no multicollinearity among the variables in the regression equation.

Table 8: Results of the Multicollinearity Test.

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Fundamental ecological principles knowledge	.493	2.028
	Environmental concern	.198	5.051
	Environmental responsibility	.289	3.458
	Wise natural resource conservation	.653	1.532

Note: [a]Dependent variable: writing skills.

The heteroskedasticity test aims to determine whether there is a difference in residual variance from one observation to another in the regression model. Based on Figure 3, it can be observed that the points are scattered randomly, without forming any distinct pattern, and are evenly distributed above and below zero (0) on the Y-axis. This indicates that there is no heteroskedasticity in the regression equation, and therefore, the regression model is suitable for use.

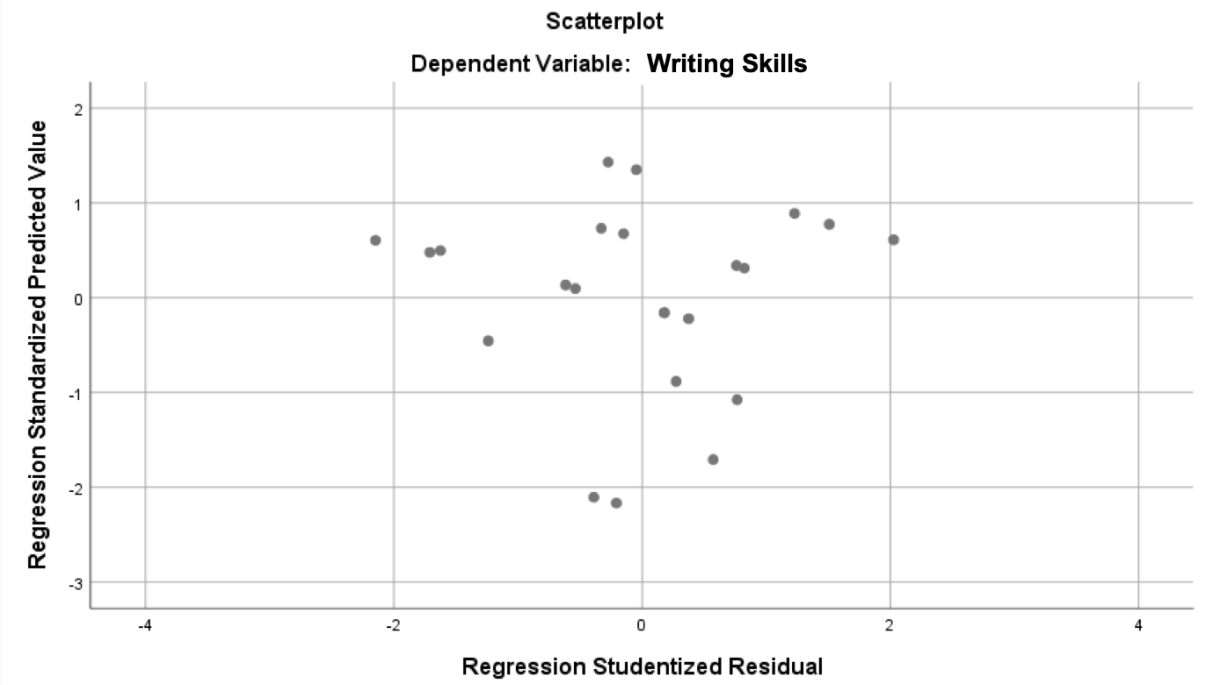

Figure 3: Results of Heteroskedasticity Test.

The correlation coefficient (R) and coefficient of determination (R Square) test aims to determine how well the independent variable (students' eco-literate knowledge) can explain the dependent variable (academic scores). Based on Table 9, it is found that the correlation coefficient (R) is 0.942, which means that there is a very strong relationship between the areas of students' eco-literate knowledge and academic scores. Additionally, the coefficient of determination (R Square) is 0.888, indicating that academic scores can be explained, or influenced, by the topics of basic ecological-principles knowledge, environmental concern, environmental responsibility, and wise natural-resource conservation to the extent of 88.8%, while the remaining 11.2% is influenced by other components that are outside the scope of the model (research).

Table 9: Correlation coefficient and coefficient of determination values - Model 2.

			Model Summary[b]	
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	.942[a]	.888	.863	2.74721

Note: [a]Predictors: (constant), fundamental ecological-principles knowledge, environmental concern, environmental responsibility, and wise natural-resource conservation; [b]Dependent variable: writing skills.

The F-test (model fit test) is used to determine whether the model formed in the research is suitable and can be used for analysis. Based on Table 10, the calculated F- value is 35.754 with a significance level (Sig.) of 0.000. Since the Sig. value is 0.000, which is less than 0.05, it can be concluded that Model 2 formed in this research is deemed appropriate and can be used for analysis. In other words, the elements of basic ecological-principles knowledge, environmental concern, environmental responsibility, and wise natural-resource conservation, when considered together, have a significant, simultaneous influence on students' writing skills.

Table 10: F-Test (Model Fit Test) - Model 2.

			ANOVA[a]			
Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	1079.369	4	269.842	35.754	.000[b]
	Residual	135.849	18	7.547		
	Total	1215.217	22			

Note: [a]Dependent variable: writing skills; [b]Predictors: (constant), fundamental ecological principles knowledge, environmental concern, environmental responsibility, and wise natural resource conservation.

Based on Table 11, Model 2 can be represented as follows: Y = 8.787 + 1.251X1.1 + 1.793X1.2 + 0.559X1.3 + 0.991X1.4 + e.

The interpretation of Model 2 yielded these results:

1) The constant value of 8.787 indicates that if the areas of basic ecological-principles knowledge, environmental concern, environmental responsibility, and wise natural-resource conservation have a value of zero, then the writing skill scores will be 8.787.
2) The value of b1, 1.251, signifies that for every 1-unit increase in basic ecological principles knowledge and students' eco-literate knowledge, there will be a 1.251 increase in eco-literacy.
3) The value of b2, as 1.793, indicates that for every 1-unit increase in the area of environmental concern, students' eco-literate knowledge will increase by 1.793.
4) The value of b3, 0.559, represents that for every 1-unit increase in environmental responsibility, students' eco-literate knowledge will increase by 0.559.
5) The value of b4, as 0.991, implies that for every 1-unit increase in the area of wise natural resource conservation, students' eco-literate knowledge will increase by 0.991.

Table 11: T-Test (Parameter Significance Test) - Model 2.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		b	Std. Error	Beta		
2	(Constant)	8.787	8.690		1.011	.325
	Fundamental ecological principles knowledge	1.251	.517	.271	2.419	.026
	Environmental concern	1.793	.666	.477	2.694	.015
	Environmental responsibility	.559	.697	.117	.801	.434
	Wise natural-resource conservation	.991	.424	.228	2.340	.031

Note: [a]Dependent variable: writing skills.

The results of the t-tests reveal important insights into the impact of the various components of students' ability to write according to environmental themes, as indicated by their writing skill scores. Among these areas, it is evident that fundamental ecological principles knowledge (X1.1) and environmental concern (X1.2) play a significant and positive role in influencing academic scores. This suggests that a more comprehensive understanding of ecological principles and a heightened environmental concern contribute to improved writing skill scores. In contrast, environmental responsibility (X1.3) shows no significant effect on writing-skill scores, as its p-value exceeds the threshold of significance. Additionally, wise natural resource conservation (X1.4) demonstrates a substantial positive influence on writing-skill scores, indicating that a more responsible approach to conserving natural resources is associated with improved academic performance. Overall, the findings highlight that environmental concern stands out as the most influential factor, with the highest regression

coefficient (b2) of 1.793, emphasizing its pivotal role in shaping students' writing skills, as related to environmental themes.

Discussion

The research was conducted as part of the learning process in the courses of creative literary writing and educational articles within the Indonesian Language and Literature Education Program, with 23 students enrolled in the academic year of 2022-2023. The learning objectives were to enable students to understand the process of scientific reasoning, especially in selecting appropriate diction, writing effective sentences, constructing paragraphs, and planning compositions to produce academic works (papers, final assignments, and theses) correctly and effectively. The learning process followed an integrated learning scenario that was outlined in the semester's lesson plan, encompassing methods, strategies, and teaching materials. This was done to maintain consistency in the learning flow, ensuring that it did not disrupt the established curriculum of the program. Consequently, the implemented learning process was able to meet the learning objectives and accommodate research data in two separate sessions.

In the first session, efforts to achieve the learning objectives were text-based. This means that the learning process was not solely focused on structural and grammatical characteristics but also incorporated an understanding of the functional aspects of language or grammar in accordance with the context of human life. In the second session, as a demonstration of assessing students' understanding of the concept of the writing process and its stages, the session continued with a writing-practice exercise. During this stage, students worked on each step of the writing process.

The language functions that are referred to pertain to how those are used within the context of human life, such as linguistics in cultural and social contexts (Schleppegrell, 2013). These two areas are related to the implications of language in human interactions in the real world. One of these forms can be manifested through written works. In this context, this implies a diverse or wide readership target in the form of popular articles. Therefore, the learning process is conducted by guiding students to explore various text genres. In addition, students are also directed to explore the world of literature. This indicates that the learning process is text-oriented. The implemented learning process exposes students to two regions of understanding: structural grammar and functional grammar.

The text-oriented learning process, in a concrete manner, was implemented by presenting texts that were related to the environment. These readings were presented in various environmental conditions that impact the social and cultural contexts of community life. Various media and strategies were used to present them in the learning process, including social media and other mediums. The strategy involved students analyzing the texts individually and in small groups. In the next step, the participants were asked to interpret and understand the social reality caused by the lack of community awareness regarding the environment. Subsequently, when the students were exposed to the importance of language in human life, especially in the context of writing, it naturally raised their awareness of how to produce written works that prioritize readability. The processes undertaken by the students followed a concrete and sequential approach, ensuring that the written work produced was informative and effectively communicated. This, of course, requires continuous practice, because writing is not a one-time process, but one that requires ongoing effort, starting from developing ideas to creating a complete, written discourse.

In the second session, to assess students' understanding of the concept of the writing process and its stages, a writing-practice exercise was continued. Additionally, the learning strategy in the second session aimed to collect data in the form of students' scores on their popular-article writing skills and their comprehension of the text-based learning process.

Specifically, they were asked to write popular articles in pairs, as determined beforehand. The theme chosen as the foundation for expressing their ideas was eco-literate knowledge of environmental awareness. The selection of this theme was based on the consideration that eco-literacy is one of the most current issues, both locally and nationally, even on an international scale. Data regarding the scores for the popular article writing skills were obtained at the end of the learning process, which involved performance assessment.

The purpose of selecting a theme related to eco-literate issues was to serve as an interpretation of how to guide students in producing written works that could act as a platform for expanding information, thereby increasing the readers' knowledge. When students discuss issues of strategic importance, such as eco-literate topics, they automatically become participants in advocating for the significance of environmental preservation. Indeed, this objective, whether on a local or global scale, is not solely the responsibility of certain entities but is a collective duty for all layers of society to uphold. This should be done in accordance with the respective positions, functions, and roles of each segment of society, within the context of social life.

This research successfully answered the two research questions posed. The analysis results in Model 1 indicate a significant and positive relationship between eco-literate knowledge and students' writing skills. In other words, the more students are informed and aware of ecological and environmental issues, the better they tend to be at expressing their thoughts and ideas in writing. This finding suggests that eco-literacy, or knowledge related to environmental awareness, plays a valuable role in enhancing students' writing skills. It implies that when students are educated about ecological matters, they are better equipped to articulate their thoughts, opinions, and arguments in a coherent and compelling manner, when it comes to writing tasks. This connection between eco-literacy and writing proficiency underscores the importance of including environmental education as a component of a well-rounded curriculum to improve students' overall writing abilities.

Furthermore, the analysis results in Model 2 show that the eco-literate component with the most substantial impact on writing skills is the one regarding environmental concern. This finding underscores that the extent to which students are genuinely concerned about environmental issues has a profound effect on their writing abilities. Students who exhibit a high-degree of environmental concern tend to produce written work that is more informed, passionate, and persuasive about topics that are related to ecology and environmental conservation.

Students' knowledge in other fields can significantly enhance their skills in writing articles (Weissbach & Pflueger, 2018). This interdisciplinary insight allows them to draw connections between various subjects, leading to more innovative and diverse perspectives. Furthermore, it equips them with valuable research, critical thinking, and problem-solving skills that are essential for crafting well-informed and credible articles. Understanding the specialized terminology of different fields empowers them to communicate effectively in technical or specialized niches (Hero & Lindfors, 2019). This cross-disciplinary knowledge also provides a broader perspective and context, enabling students to contextualize current events and trends, making their articles more informative and engaging. Moreover, it fosters creativity and innovation, as students can integrate ideas from different fields to offer fresh and unique perspectives. With empathy, and audience understanding, they can tailor their articles to resonate with specific readers, connecting and engaging them more effectively. In addition, their experience with various media forms and adaptability to new fields make them versatile writers who can incorporate multimedia elements, and adapt to the evolving demands of the writing world.

Conclusion

This study demonstrates that eco-literate knowledge significantly influences students' writing skills in popular articles. Among the various aspects of writing, students excel the most in determining the title (94.57), whereas their weakest point is establishing the theme's relevance (86.96). This indicates that there is a need for improvement in students' ability to connect the existing cases with what they are trying to convey. Regarding eco-literate knowledge, the highest score fell within "responsibility for environmental conservation" (92.17), while the lowest was under "fundamental knowledge of ecological principles" (86.74). This suggests that students need further guidance on essential environmental principles. The statistical analysis in this study, using two models, successfully answers the research questions. Model 1 indicates a strong and significant relationship between students' eco-literate knowledge and their ability to write popular articles ($0.000 < 0.05$), with an influence of 55.4%. Furthermore, Model 2 shows that the component of eco-literate knowledge with the most significant impact on the ability to write popular articles is "environmental concern" ($b=1.793$).

The implications of the results of this study hold significance for both education and environmental awareness. First and foremost, the findings emphasize the importance of incorporating eco-literacy into educational curricula. This perspective appears to have a positive and substantial influence on students' writing skills, particularly in the context of popular articles. Therefore, educators and curriculum designers should consider integrating environmental education as a fundamental component of the academic syllabus, aiming not only to enhance students' ecological awareness, but also to bolster their writing abilities when addressing environmental topics. Furthermore, the specific areas of eco-literacy that have been identified as significant, such as "environmental concern," should be given special attention. Emphasizing the importance of students' emotional engagement and concern for environmental issues can be a potent tool in fostering both ecological consciousness and writing proficiency. This implies that pedagogical approaches should be designed to stimulate and nurture students' environmental concern and empathy, as this appears to be strongly correlated with their writing performance. Moreover, the study reveals that students excel in certain areas of writing, like determining the title, but struggle with others, such as establishing the relevance of the theme. This highlights the need for a more balanced and comprehensive approach to writing instruction, addressing not just the technical aspects, but also the critical thinking and contextualization skills that are crucial for producing impactful and informative articles.

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Author's Contribution

All the authors contributed significantly in this study's conception and design, data collection, analysis and interpretation of results, as well as the draft-manuscript preparation. They all reviewed the results and approved the final version of this manuscript.

Author Bio

Romi Isnanda is a lecturer in the Department of Language Teaching Science at the Faculty of Languages and Arts, Padang State University, Indonesia. His research interests focus on

language-teaching methodologies, curriculum development, and technology integration in language education. Dr. Isnanda has contributed to several academic journals and has been involved in various educational projects aimed at enhancing language instruction in Indonesian schools. He is passionate about improving language education through innovative teaching practices.

Syahrul Ramadhan is a faculty member in the Department of Language Teaching Science at the Faculty of Languages and Arts, Padang State University, Indonesia. His research interests include applied linguistics, language acquisition, and educational technology. He has published multiple papers on developing language skills in second-language learners and has participated in numerous educational seminars and conferences, both locally and internationally.

Yenny Hayati is a lecturer in the Department of Language Teaching Science at the Faculty of Languages and Arts, Padang State University, Indonesia. Her research focuses on language assessment, teacher training, and curriculum design. Dr. Hayati is committed to advancing language education through evidence-based research and has presented her work at various academic events in Indonesia and abroad.

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