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The Influence of Environmental Understanding on Environmental Concern in Biology Education Students

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ABSTRACT

Purpose of the study: This study aims to analyze the influence of environmental understanding on environmental concern among Biology Education students at Alauddin State Islamic University Makassar.

Methodology: A quantitative correlational design was employed involving 120 students selected through proportional random sampling. Data were collected using a validated Likert-scale questionnaire and analyzed using descriptive statistics, Pearson correlation, and simple linear regression.

Main Findings: The findings show a significant positive relationship between environmental understanding and environmental concern ($r = 0.69$, $p < 0.05$), with regression results indicating that environmental understanding significantly predicts environmental concern ($Y = 19.44 + 0.78X$).

Novelty/Originality of this study: This study highlights the integration of scientific environmental knowledge with Islamic ethical values in shaping environmental concern, specifically among biology education students in an Islamic higher education context.

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1. INTRODUCTION

Environmental issues have become one of the most critical global challenges in the 21st century [1]-[3]. Rapid population growth, urbanization, and industrial development have significantly contributed to environmental degradation, including pollution, deforestation, and loss of biodiversity [4]-[6]. These problems are not only ecological concerns but also threaten human health and sustainability [7]-[9]. Therefore, building environmental awareness and responsibility among young generations, especially university students, is essential to support sustainable development goals.

In Indonesia, environmental education has been increasingly emphasized within higher education institutions as part of efforts to cultivate environmentally responsible citizens. The Indonesian government, through Government Regulation No. 49 of 2014 concerning National Standards for Higher Education, highlights the importance of integrating character building, including environmental awareness, into academic learning outcomes [10], [11]. This regulation implies that universities are not only responsible for academic competence but also for shaping students' attitudes and behaviors toward environmental sustainability [12]-[14].

Despite this policy framework, the implementation of environmental values in higher education remains inconsistent [15]-[17]. Many students possess theoretical knowledge about environmental issues but do not necessarily translate this knowledge into responsible environmental behavior or concern [18]-[20]. This gap between cognitive understanding and affective response raises an important question about the actual effectiveness of environmental education in shaping students' environmental concern.

Environmental understanding is generally considered a cognitive foundation that can influence attitudes and behaviors [21], [22]. Students who have a strong understanding of environmental concepts are expected to demonstrate higher levels of concern for environmental preservation [23]-[25]. However, in practice, this relationship is not always linear [26], [27]. Some studies suggest that knowledge alone is insufficient to guarantee pro-environmental attitudes, as other factors such as personal values, social influence, and institutional culture may also play significant roles.

Previous research Giglio et al. [28] environmental education has extensively examined the relationship between environmental knowledge and pro-environmental behavior. However, most studies focus on general student populations or secondary education contexts, with limited attention given to biology education students at Islamic universities [29], [30]. In addition, there is still inconsistency in findings regarding the strength of the relationship between environmental understanding and environmental concern, indicating the need for further empirical investigation in different educational settings [31], [32].

Another important research gap lies by Taja et al. [33] the contextual setting of Islamic higher education institutions, where moral and religious values are expected to strengthen environmental responsibility. However, there is still limited evidence on how environmental understanding interacts with these educational and ethical frameworks in shaping students' environmental concern [34]-[36]. This gap suggests that existing models may not fully capture the complexity of environmental attitudes in such contexts.

Based on these gaps, this study introduces a novel perspective by focusing on biology education students at Alauddin State Islamic University Makassar, an institution that integrates scientific and Islamic values in its curriculum. The novelty of this research lies in examining how environmental understanding specifically influences environmental concern within a context that combines scientific learning with religious-ethical orientation, which has not been extensively explored in previous studies.

Therefore, the main objective of this study is to analyze the influence of environmental understanding on environmental concern among students of the Biology Education Study Program at Alauddin State Islamic University Makassar. The findings are expected to contribute both theoretically and practically by enriching the literature on environmental education and providing insights for improving instructional strategies that effectively foster environmental awareness and responsibility among university students.

2. RESEARCH METHOD

2.1 Research Design

This study employed a quantitative approach with a correlational design. The purpose of this design was to examine the influence of environmental understanding on students' environmental concern without manipulating any variables. The study focused on identifying the degree and direction of the relationship between the independent variable (environmental understanding) and the dependent variable (environmental concern). This design is considered appropriate because it allows the researcher to test hypotheses using statistical analysis based on numerical data collected from respondents [37], [38].

2.2 Population and Sample

The population of this study consisted of all students enrolled in the Biology Education Study Program at Alauddin State Islamic University Makassar. The sample was selected using a proportional random sampling technique to ensure that every student had an equal opportunity to be included in the study [39]-[41]. Before presenting the sampling distribution, it is important to describe the population structure used as the basis of sample selection. The following table presents the distribution of students based on academic level.

Table 1. Population Distribution of Biology Education Students

No	Academic Level	Number of Students
1	1st Year	78 students
2	2nd Year	82 students
3	3rd Year	74 students
4	4th Year	76 students
	Total	310 students

After determining the population structure, the sample size was determined using proportional allocation to ensure balanced representation from each academic level.

Table 2. Sample Distribution

No	Academic Level	Sample Size
1	1st Year	30 students
2	2nd Year	32 students
3	3rd Year	28 students
4	4th Year	30 students
	Total	120 students

This study involved two main variables. Environmental understanding served as the independent variable (X), while environmental concern was the dependent variable (Y). Environmental understanding refers to students' cognitive knowledge about environmental concepts, issues, and sustainability principles. Environmental concern refers to students' attitudes, awareness, and emotional responsibility toward environmental preservation. The operational indicators of each variable are presented in the following table.

Table 3. Operational Definition of Variables

Variable	Indicator	Description
Environmental Understanding (X)	Conceptual knowledge	Understanding of ecological principles
	Environmental issues	Awareness of pollution, climate change, etc.
	Sustainability concepts	Knowledge of conservation and sustainability
Environmental Concern (Y)	Awareness	Sensitivity toward environmental problems
	Attitude	Positive response to environmental protection
	Responsibility	Willingness to act in environmentally friendly ways

2.3 Research Instruments

Data collection was carried out using a structured questionnaire developed based on validated indicators of environmental understanding and environmental concern. The questionnaire used a Likert scale ranging from strongly disagree (1) to strongly agree (5). The instrument was tested for validity and reliability before being distributed to respondents. Before full distribution, the instrument structure is summarized as follows:

Table 4. Instrument Blueprint

Variable	Indicator	Number of Items	Scale
Environmental Understanding (X)	Knowledge-based items	15 items	Likert 1–5
Environmental Concern (Y)	Attitude-based items	15 items	Likert 1–5

Data collection was conducted in several stages. First, the questionnaire was distributed to selected respondents. Second, students completed the questionnaire based on their understanding and experiences. Third, all responses were collected and checked for completeness before being processed for analysis.
The research procedure can be summarized in the following flow:

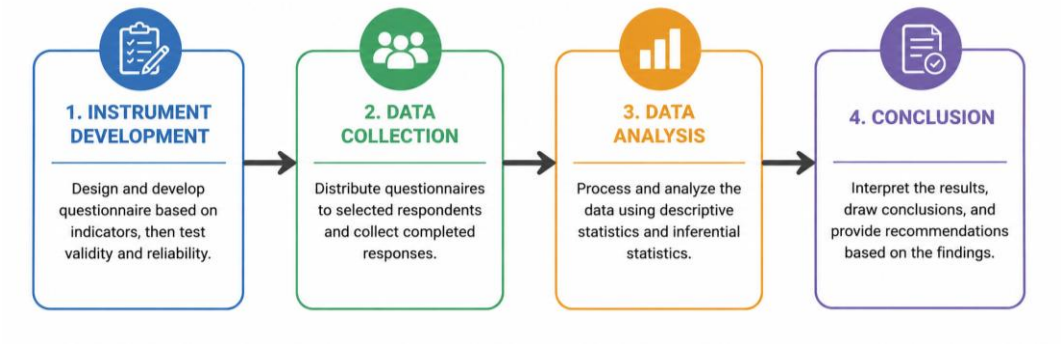

Figure 1. Research Procedure Flowchart

2.4 Data Analysis Technique

The data were analyzed using quantitative statistical methods. Descriptive statistics were used to describe the distribution of respondents' scores, while inferential statistics were applied to test the hypothesis. Specifically, simple linear regression analysis was used to determine the influence of environmental understanding on environmental concern. Before conducting regression analysis, the data were tested for normality and linearity assumptions to ensure the validity of the statistical model. The hypothesis was tested at a significance level of 0.05, where a p-value lower than 0.05 indicates a significant influence between variables.

3. RESULTS AND DISCUSSION

The respondents in this study were students of the Biology Education Study Program at Alauddin State Islamic University Makassar. A total of 120 students participated in this research. The demographic data were analyzed to provide an overview of the sample composition. Before presenting the statistical analysis, the distribution of respondents is shown in the table below.

Table 5. Distribution of Respondents by Academic Year

Academic Year	Frequency	Percentage
1st Year	30	25%
2nd Year	32	26.7%
3rd Year	28	23.3%
4th Year	30	25%
Total	120	100%

The table shows that respondents were relatively balanced across academic levels, ensuring proportional representation of student experiences. To describe the general condition of the variables, descriptive statistical analysis was conducted on environmental understanding and environmental concern scores.

Table 6. Descriptive Statistics

Variable	N	Mean	Std. Deviation	Minimum	Maximum
Environmental Understanding (X)	120	75.42	7.89	54.10	95.30
Environmental Concern (Y)	120	78.56	8.12	59.20	103.40

The results indicate that both environmental understanding and environmental concern are at a moderately high level among students. However, variability in scores suggests differences in individual awareness and attitudes toward environmental issues. Before hypothesis testing, the instrument was tested for validity and reliability. All questionnaire items were declared valid based on item-total correlation values exceeding the r-table value. Reliability testing using Cronbach's Alpha also indicated strong internal consistency.

Table 7. Reliability Test Results

Variable	Cronbach's Alpha	Interpretation
Environmental Understanding (X)	0.87	Reliable
Environmental Concern (Y)	0.89	Reliable

These results confirm that the instrument is consistent and suitable for further statistical analysis. The relationship between environmental understanding and environmental concern was analyzed using Pearson correlation. The analysis results show a strong positive relationship between the two variables.

- Correlation coefficient (r) = 0.69
- Significance level ($p < 0.05$)

This indicates that higher environmental understanding is associated with higher environmental concern among students. Simple linear regression was used to determine the influence of environmental understanding on environmental concern.

Table 8. Regression Analysis (SPSS-style Output)

Model	B	Std. Error	Beta	t	Sig.
Constant	19.44	4.21	-	4.62	0.001
Environmental Understanding (X)	0.78	0.06	0.69	12.31	0.001

The regression equation obtained is: $Y = 19.44 + 0.78X$

This means that every one-unit increase in environmental understanding increases environmental concern by 0.78 units. The significance value ($0.001 < 0.05$) indicates that environmental understanding has a statistically significant positive effect on environmental concern.

The findings of this study indicate that environmental understanding has a significant and positive influence on environmental concern among students of the Biology Education Study Program at Alauddin State Islamic University Makassar. The correlation analysis ($r = 0.69$) and regression result ($Y = 19.44 + 0.78$, $p < 0.05$) demonstrate that students with higher levels of environmental understanding tend to show stronger environmental concern. This relationship suggests that cognitive mastery of environmental concepts plays an important role in shaping students' attitudes and emotional responsibility toward environmental issues. In other

words, knowledge is not only a cognitive achievement but also a foundational factor that contributes to the development of environmental awareness.

These findings are consistent with several previous studies that highlight the importance of environmental knowledge as a predictor of pro-environmental attitudes. Earlier research has shown that students who possess better understanding of ecological systems, environmental degradation, and sustainability principles are more likely to demonstrate positive environmental behavior and concern [42], [43]. For example, studies in general university populations have reported similar positive relationships between environmental literacy and environmental attitudes, confirming that cognitive awareness often precedes affective and behavioral responses. This alignment strengthens the argument that environmental education remains a critical component in shaping environmentally responsible individuals.

However, despite this consistency, a clear research gap emerges when comparing this study with previous findings. Many earlier studies have primarily focused on general education settings or non-religious higher education institutions, often treating students as a homogeneous group without considering institutional context. In contrast, this study specifically investigates biology education students in an Islamic university environment, where scientific knowledge is integrated with religious and ethical values. This context introduces a different dimension that is often overlooked in previous research, particularly the potential interaction between environmental understanding and moral-religious consciousness in shaping environmental concern [44], [45].

The novelty of this study lies in its contextual and conceptual focus. First, it provides empirical evidence from an Islamic higher education institution, where environmental awareness is not only framed as a scientific issue but also as part of ethical and religious responsibility. Second, it emphasizes biology education students as future educators, which means their environmental understanding has a multiplier effect on future generations. This dual context scientific training and religious values offers a more comprehensive perspective on how environmental concern is formed. Therefore, this study contributes new insights into how environmental understanding operates within a value-based educational system, which has not been extensively explored in prior literature.

From a practical perspective, the results of this study have important implications for higher education institutions, particularly in curriculum development and instructional strategies. Strengthening environmental content within biology education courses can significantly enhance students' environmental concern. Lecturers are encouraged to integrate more contextual and problem-based learning approaches that connect theoretical environmental concepts with real-life environmental issues. Additionally, institutions should promote experiential learning activities such as field studies, environmental projects, and community-based programs to bridge the gap between knowledge and attitudes. These strategies can help transform environmental understanding into meaningful environmental responsibility.

Despite its contributions, this study also has several limitations that should be acknowledged. First, the research design is limited to a quantitative correlational approach, which cannot fully explain causal mechanisms behind the relationship between variables. Second, the data collection relies on self-reported questionnaires, which may be influenced by response bias or social desirability bias. Third, the study is limited to a single study program within one university, which restricts the generalizability of the findings to other contexts. Future research is recommended to use mixed-method approaches, include broader populations, and explore additional variables such as environmental values, religiosity, or social influence to obtain a more comprehensive understanding of environmental concern formation.

Overall, this study confirms that environmental understanding plays a significant role in shaping environmental concern among biology education students. By addressing both theoretical gaps and contextual uniqueness, the study contributes to a deeper understanding of environmental education in higher education settings and highlights the importance of integrating cognitive, ethical, and contextual dimensions in fostering sustainable environmental attitudes.

4. CONCLUSION

This study concludes that environmental understanding has a significant positive influence on environmental concern among Biology Education students at Alauddin State Islamic University Makassar. The findings indicate that students with higher levels of environmental knowledge tend to demonstrate stronger environmental awareness, attitudes, and responsibility toward environmental preservation. These results confirm that cognitive understanding of environmental concepts plays an important role in shaping students' environmental concern. In addition, the integration of scientific learning with Islamic ethical values contributes to strengthening students' environmental responsibility within the context of Islamic higher education. Therefore, universities are encouraged to enhance environmental education through contextual, problem-based, and experiential learning approaches that connect theoretical knowledge with real environmental issues and sustainable practices. Although this study provides important insights into environmental education, it is limited to a quantitative correlational design and a single institutional context. Future studies are recommended to

involve broader populations, apply mixed-method approaches, and explore additional variables such as religiosity, social influence, and environmental values to obtain a more comprehensive understanding of the factors influencing environmental concern among university students.

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AUTHOR CONTRIBUTIONS

The sole author was responsible for all aspects of this research, including conceptualization, methodology, validation, formal analysis, investigation, data curation, writing – original draft preparation, writing – review & editing, visualization, project administration, and funding acquisition.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

Not applicable.

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