

Integration of Environmental Education in Geography Learning to Improve Ecological Attitudes and Knowledge of Senior High School Students

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Abstract

This study aims to describe the planning, implementation, and evaluation of geography learning in shaping environmental awareness attitudes and knowledge in class XI students at SMA Negeri 2 Pekalongan. Geography learning has a strategic role in instilling environmental awareness values through a contextual approach in accordance with the direction of the Merdeka Curriculum. This study used a descriptive quantitative approach with 134 students randomly selected from four classes. Data was collected through diagnostic assessments, attitude questionnaires, knowledge tests, and skill observations, which have been tested for validity and reliability. The results showed that geography lesson planning has integrated environmental values, although it is not always explicit in the learning objectives. Learning implementation through local case discussion and thematic reflection succeeded in increasing students' awareness of environmental issues. The evaluation shows that students have high environmental knowledge (mean score 22.33 out of 25), positive attitude towards the environment (mean 33.93 out of 40), and environmental care skills in moderate to high category (mean 30.00 out of 44). This finding confirms that geography learning is designed contextually and participatively can shape the character of students who care about the environment. This research recommends strengthening institutional support and developing sustainable learning strategies to strengthen ecological character education in schools.

Keywords: Geography learning, environmental awareness, character education, high school students, Merdeka Curriculum

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1. Introduction

Geography is a science that studies geospheric phenomena from a spatial and territorial perspective to comprehensively understand the relationship between humans and the environment (Lasaiba, 2022). In the context of education, geography is taught at the Senior High School (SMA) level to develop geographic knowledge, spatial analysis skills, and a caring attitude towards the environment (Kemendikbudristek, 2024; Mas'ad et al., 2024). The Merdeka Curriculum explicitly encourages learning that develops students' environmental literacy and social awareness through scientific and contextual approaches (Kemendikbudristek, 2024), making geography a strategic subject in character building and active engagement with environmental issues.

The content standards of geography education from (BSNP, 2006) also reinforce this by emphasizing the importance of spatial understanding, geospatial data analysis skills, and the ability to communicate geographic knowledge in an applicative manner. The value of caring for the environment is part of character education that needs to be instilled from an early age, reflected through behaviors such as throwing garbage in its place, caring for plants, maintaining cleanliness, and participating in environmental activities (Abhari, 2022; Ahbabuna et al., 2025).

Various studies have shown that contextual approaches to learning, especially those that relate environmental issues to students' daily lives, have proven effective in increasing their ecological awareness and social responsibility (Welerubun et al., 2022; Yusuf & Fajari, 2025). In practice, the use of digital media such as vlogs has also proven to be able to increase students' awareness of environmental issues in a creative and communicative manner (Dwi & Juhadi, 2020), while students who receive environmental education consistently show intention and motivation to act in an environmentally friendly manner, such as throwing garbage in its place and keeping the school clean (Anugrah et al., 2023). In addition, real environmental phenomena such as tidal flooding in the coastal area of Semarang can be used as contextual teaching materials that encourage students to understand the relationship between human activities and their impact on the surrounding environment (Setyaningsih et al., 2024).

However, based on the initial observation conducted by the researcher on grade XI students at SMA Negeri 2 Pekalongan, it was found that the attitude of environmental care has not fully grown consistently; about 40% of students still show less caring behavior, such as littering or lack of initiative in maintaining school cleanliness. This problem reflects that the planning and implementation of geography learning have not been fully optimized to shape the character of environmental care.

This research was conducted to explore the extent to which the geography learning process - from planning, implementation, to assessment - can shape students' environmental awareness attitudes and knowledge in a structured and measurable manner. The focus is on students in grade XI who are curriculum taught geography, considering that not all classes are allocated this learning. The purpose of this study is to describe and evaluate how geography learning can instill environmental awareness values through learning strategies that are relevant to the students' context. This research is expected to contribute to the development of geography learning practices that are not only cognitive, but also affective and applicative, as well as a foothold for schools in strengthening environment-based character education. In addition, the results can be a

reference in designing learning interventions at the secondary school level so that students' environmental literacy and skills can be developed since high school.

2. Method

This study uses a descriptive quantitative approach with the aim of describing the planning, implementation, and evaluation of geography learning in shaping students' environmental awareness attitudes and knowledge. The research was conducted in May 2025 at SMA Negeri 2 Pekalongan. The descriptive quantitative design was chosen because the main objective of this study is not to test causal relationships, but rather to portray the existing conditions systematically and measurably. While mixed-method or quasi-experimental designs might provide deeper insights into students' ecological attitudes, they were not selected in this research because of the limited timeframe and the focus on capturing the overall patterns of planning, implementation, and evaluation within a real classroom context without manipulating variables.

The research was conducted in May 2025 at SMA Negeri 2 Pekalongan. The research subjects consisted of 134 XI grade students selected from four classes (XI-2, XI-4, XI-5, and XI-7). The selection technique was initially referred to as simple random sampling; however, in practice, the selection was closer to a cluster/class-based sampling, since the intact classes were taken as research participants. The selection of these four classes was based on the consideration that only these classes were allocated the geography subject, which is the core focus of this study. Therefore, involving all students in these classes was deemed the most representative and relevant way to capture students' environmental attitudes and knowledge in relation to geography learning.

Several instruments were employed to collect data. At the implementation stage, a diagnostic assessment instrument was used to determine students' initial understanding of environmental issues. This instrument consisted of five open-ended questions converted into 1–4 scoring, covering parameters such as awareness of environmentally destructive behavior, understanding the urgency of environmental protection, involvement in environmental care activities, initiative to encourage peers, and understanding of human impacts (see Table 1).

Table 1. Diagnostic Assesment Parameters

No	Parameters
1	Awareness of behavior that damages the environment
2	Understanding the value and urgency of protecting the environment
3	Involvement in environmental care activities
4	Initiative to encourage friends to care for the environment
5	Understanding the environmental impact of human behavior

The diagnostic assessment instrument consisted of 5 items measuring students' awareness of environmental issues. As shown in Table 2, the instrument met the minimum validity threshold ($r\text{-count} = 0.389$) and achieved high reliability with a Cronbach's Alpha of 0.832, meaning it was consistent and suitable for use. The validity and reliability of the diagnostic assessment instrument were tested to ensure its feasibility in measuring students' initial understanding of environmental awareness (see Table 2).

Table 2. Results of Validity and Reliability Test of Diagnostic Assessment Instruments

Aspect	Value r-count	Cronbach's Alpha	Description
Items 1 – 5	0,389	0,832	Valid & Reliable

Students' environmental care attitudes were measured using a questionnaire consisting of 10 items developed from five indicators adopted from from (Rahman et al., 2021), namely waste management, energy saving, maintaining environmental quality, concern for ecosystems, and collective social care (see Table 3).

Table 3. Indicators of Environmental Care Attitudes (Rahman et al., 2021)

No	Indicators of Environmental Care Attitudes
1	Awareness in managing waste
2	Energy saving
3	Maintaining water, air, and land quality
4	Concern for environmental quality and protection of flora and fauna
5	Social care for others in protecting the environment collectively

The environmental care attitude questionnaire consisted of 10 items. The validity test showed all items met the required standard, and the reliability test produced Cronbach's Alpha of 0.881, indicating high reliability (see Table 4).

Table 4. Test Results of Validity and Reliability of Attitude Instruments

Aspect	Value r-count	Cronbach's Alpha	Description
Items 1 – 10	0,361 – 0,767	0,881	Valid & Reliable

For environmental knowledge, a test instrument in the form of 25 multiple-choice items was used. The indicators included knowledge of ecology and interactions between ecological components, awareness of environmental issues such as pollution and climate change, knowledge of resource conservation strategies, and the ability to make decisions based on local environmental issues (see Table 5).

Table 5. Indicators of Knowledge of Environmental Care

No	Knowledge Indicator
1	Knowledge of ecology and interactions between ecological components (Napitupulu et al., 2025)
2	Awareness of environmental issues (pollution, land degradation, climate change)
3	Knowledge of resource conservation and management strategies (Husamah et al., 2024)
5	Ability to make decisions based on local environmental issues (Chen et al., 2024)

The knowledge test instrument included 25 multiple-choice items. The validity results were acceptable, and the reliability test showed a Cronbach's Alpha of 0.923, categorized as very high (see Table 6).

Table 6. Results of Validity and Reliability Test of Knowledge Instruments

Aspect	Value r-count	Cronbach's Alpha	Description
Items 1 – 25	0,378 – 0,812	0,923	Valid & Highly Reliable

Students' environmental care skills were assessed using a teacher observation instrument consisting of 10 indicators, such as proper waste disposal, reusing materials,

saving water, maintaining classroom cleanliness, providing solutions for conservation, using eco-friendly tools, saving energy, participating in environmental projects, and keeping the surrounding area clean (see Table 7).

Table 7. Indicators of Environmental Care Skills

No	Skills Indicator
1	Disposing of garbage in its place
2	Reusing used paper
3	Saving water when washing practical tools
5	Maintaining class cleanliness
6	Conveying simple ideas or solutions for environmental conservation
7	Using environmentally friendly tools/materials
8	Energy saving (turning off the lights/projector)
9	Active in environmental discussions/projects
10	Cleaning the table or the surrounding area

The skill observation instrument contained 10 indicators of students' ecological behavior. Validity results were satisfactory, and Cronbach's Alpha reached 0.929, confirming very high reliability (see Table 8).

Table 8. Results of Validity and Reliability Test of Skills Instrument

Aspect	Value r-count	Cronbach's Alpha	Description
Items 1 – 10	0,62 – 0,826	0,929	Valid & Highly Reliable

All collected data were then analyzed using descriptive statistics with SPSS software. The results of each instrument were reviewed from the average value, minimum value, maximum value, and standard deviation to describe the effectiveness of geography learning in shaping attitudes, knowledge, and skills of environmental care. This study did not employ correlation or regression analysis because its primary aim was not to test predictive or causal relationships between variables, but rather to provide a descriptive overview of how geography learning integrates environmental values and affects students' ecological knowledge, attitudes, and skills in a classroom context.

3. Results and Discussion

A. Results

This section presents the findings of the study, starting from the planning of geography learning, the implementation process in the classroom, and the evaluation of students' knowledge, attitudes, and skills related to environmental care. Each stage is supported by field documentation and quantitative data analysis.

1. *Geography Learning Planning in Cultivating Environmental Care Attitudes and Knowledge*

Planning is an important initial stage in the implementation of learning because it is through this planning that teachers develop strategies, materials, objectives, and forms of evaluation that will be used. In this study, lesson planning was analyzed based on documents prepared by the XI grade geography teacher at SMA Negeri 2 Pekalongan. The researcher did not compile the module or learning media by himself but reviewed the teaching tools that had been used by the teacher in the teaching and learning process. The focus of the study lies in the extent to which the element of environmental awareness is

reflected in the planning made by the teacher.

The main document analyzed is the lesson plan (RPP), which includes components such as learning objectives, subject matter, steps of learning activities, assessment, as well as media and learning resources. In addition, the textbooks used by teachers were also examined as complementary materials. Based on the results of the analysis, the planning carried out by teachers has inserted environmental values, although it is not always explicitly mentioned in the formulation of learning objectives or indicators. These values more often appear in learning activities, such as local case-based discussions or reflections after watching environmental-themed shows. Documentation of the analyzed lesson plan (RPP) is presented in Figure 1, while the details of the planning components are summarized in Table 9.

Figure 1. Lesson plan (RPP) document analyzed in the study

Table 9. Systematization of learning planning based on lesson plans

RPP Components	Content/Description
Subject Identity	Students can identify types of pollution and show a caring attitude
Subject Matter	Discussion of river pollution cases, image analysis, and group reflection
Learning Objectives	Multiple choice test, attitude questionnaire, and observation by the teacher
Learning Activities	Geography Book Class XI, environmental video, learner worksheet (LKPD)
Assessment	Students can identify types of pollution and show a caring attitude

2. Implementation of Geography Learning in Cultivating Environmental Attitude and Care

The implementation of geography learning that is oriented towards environmental issues is assessed through a diagnostic assessment in the form of five triggering questions asked at the beginning of learning activities. The questions were designed to explore students' initial understanding and reflect on environmental issues. Students' answers were converted into 1-4 scoring and processed descriptively to obtain an initial picture of students' environmental attitudes and concerns. Classroom documentation during the

discussion activity is shown in Figure 2, and the descriptive statistics of the diagnostic assessment results are displayed in Table 10.



Figure 2. Students discussing local environmental cases during geography learning

Table 10. Descriptive Statistics of Student Diagnostic Assessment Results

N	Minimum	Maximum	Mean	Std. Deviation
134	1.00	4.00	2.55	0.47

The diagnostic assessment given to students at the initial stage of learning shows variations in the level of initial readiness. In general, students obtained an average score of 2.55 on a scale of 1-4. The highest score was on the indicator of understanding the environmental impact of human behavior (2.79), while the lowest score was on awareness of environmentally destructive behavior (2.25). Details of the five indicators and their descriptive statistical values can be seen in Table 1.

3. *Evaluation of Knowledge and Attitude of Environmental Care through Geography Learning*

The evaluation of students' environmental care was carried out on three aspects: knowledge, attitude, and skills. The knowledge aspect was measured through a multiple-choice test consisting of 25 questions. The results (see Table 11) show that the average score of students' knowledge was 22.33 out of a maximum of 25. Although the minimum and maximum values varied widely, the high average indicates that most students have understood the basic concepts of ecology, pollution, and environmental conservation.

Table 11. Descriptive Statistics of Environmental Awareness Knowledge Test Results

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Knowledge	134	10.00	25.00	22.33	3.13

The minimum and maximum values are quite far apart, indicating a variation in the level of understanding between students, but the high average indicates that most students have understood the basic concepts of ecology, pollution, and environmental conservation.



Figure 3. Students filling out the environmental care attitude questionnaire

Students' attitudes were assessed using a Likert-scale questionnaire with 10 statements. The analysis (see Table 12) revealed that the average attitude score was 33.93 out of 40. This shows that in general students had a positive attitude towards the environment, particularly in aspects such as waste management, energy saving, and concern for flora and fauna.

Table 12. Descriptive Statistics of Environmental Care Attitude Questionnaire Results

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Attitude	134	10.00	40.00	33.93	5.03

These results show that in general students have a positive attitude towards the environment, such as awareness in managing waste, saving energy, and caring for flora and fauna.

Meanwhile, the skills aspect was evaluated through teacher observation using 10 indicators of environmental care behavior rated on a 1–5 scale. The results (see Table 13) show that students obtained an average score of 30.00 out of 44. This places students' skills in the medium-to-high category, indicating participation in ecological practices such as maintaining classroom cleanliness, saving energy, and taking initiative in environmental care activities.

Table 13. Descriptive Statistics of Observation Results of Environmental Care Skills

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Skills	134	16.00	44.00	30.00	6.46

This value shows that students' skills are in the medium to high category, such as participation in maintaining classroom cleanliness, saving energy, and taking initiative in environmental care activities. An example of students' environmental care practice is documented in Figure 4.



Figure 4. Students participating in tree planting as part of environmental care practice

B. Discussion

Geography learning provides a strategic opportunity to instill environmental awareness attitudes and knowledge in students. Based on the research results, the learning process carried out at SMA Negeri 2 Pekalongan has shown a positive direction towards achieving this goal. At the planning stage, the analysis of lesson plans (see Table 9) revealed that environmental values were integrated into subject matter and learning activities, although not always explicitly stated in the learning objectives. At the evaluation stage, students demonstrated a high level of environmental knowledge with an average score of 22.33 out of 25 (see Table 11) and a generally positive environmental attitude with an average score of 33.93 out of 40 (see Table 12). These findings confirm that the materials chosen by the teacher, which were adapted to the local context, successfully encouraged students to identify pollution cases and reflect on environmental problems around them.

At the implementation stage, the diagnostic assessment through triggering questions provided an initial picture of the students' level of awareness of environmental issues. As shown in Table 10, the average score was 2.55 on a 1–4 scale, with the lowest indicator being awareness of environmentally destructive behavior (mean 2.25). Although most students understood the impact of human behavior on the environment (mean 2.79), their proactive awareness was still moderate. This result indicates that strengthening is still needed in shaping students' personal reflection and responsibility for their environmental conditions. The implementation of contextualized learning, such as local case discussions and reflection-based activities, is therefore an important step to gradually foster this awareness.

Evaluation on the knowledge aspect shows that most students have a high understanding of environmental concepts. The multiple-choice test results (see Table 11) revealed an average score of 22.33 out of 25, indicating that the implemented learning successfully transferred knowledge related to ecology, pollution, and conservation. This finding reinforces the view of (Husamah et al., 2024; Napitupulu et al., 2025) that understanding of issues such as pollution and conservation is the basis for the formation of pro-environmental behavior. The high knowledge score also reinforces the statement (Handayani et al., 2023) which emphasizes the importance of the connection between learning materials and real phenomena in students' daily lives.

In terms of attitude, students showed a positive tendency towards environmental

care. The questionnaire analysis (see Table 12) indicated an average score of 33.93 out of 40, reflecting strong awareness in managing waste, saving energy, and showing concern for ecosystems. This supports the findings of (Hariyadi et al., 2021; Warni et al., 2022), who argue that environmental care is part of ecological literacy that includes sensitivity, appreciation, and encouragement to act. Education linked to real practices in schools also plays an important role in shaping these attitudes, as shown by (Jančius et al., 2021; Rahman et al., 2021).

Meanwhile, in the skills aspect, students' involvement in direct practices such as maintaining classroom cleanliness and participating in environmental activities showed moderate to high results. Teacher observations (see Table 13) indicated that students achieved an average score of 30.00 out of 44, suggesting that while some ecological practices were well applied, further reinforcement is still needed. This finding is in line with (Pallawa, 2023; Pebriyanti & Kusnadi, 2024), who emphasized the importance of a conducive school environment in shaping ecological skills through habituation and active participation of students. Supporting this view, Juhadi et al. (2021) highlight that integrating disaster mitigation literacy through indirect teaching models—embedded within regular subjects and contextual materials—can significantly enhance students' awareness and practical skills related to environmental challenges, especially when reinforced with local cultural values.

Overall, the results of this study indicate that geography learning that is contextually designed and implemented with a participatory approach is able to shape students' environmental awareness attitudes, knowledge and skills. However, there are some limitations that need to be considered. The scope of the study, which involved only one school and one grade level, limits the generalizability. In addition, the skills instrument, which relies entirely on teacher observation and conversion of open-ended responses into numerical scores, has the potential to oversimplify the true meaning. Therefore, further research combining qualitative and quantitative approaches and a wider scope would be beneficial to gain a deeper understanding.

4. Conclusion

Geography learning at the high school level is proven to have a strategic role in shaping students' environmental awareness attitudes and knowledge. The results show that geography teachers' lesson planning has integrated environmental values into learning objectives and activities, although not yet fully explicit in the planning documents. The implementation of learning that emphasizes local issues and contextual approaches has succeeded in increasing students' awareness and participation in environmental problems around them.

Evaluation through various instruments shows that students have a high level of environmental knowledge, positive attitudes, and sufficient skills in implementing environmental care actions in the school environment. Geography learning that is designed in a structured, contextual, and reflective manner can encourage the formation of students' ecological character, especially through discussion activities, reflection, and direct observation of real problems.

However, optimization of learning needs to be done by expanding the scope of environmental material explicitly in planning, strengthening real practices at school, and involving all school members in creating a culture of environmental care. Further research

is recommended to use a mixed approach and reach a wider context in order to provide a more comprehensive picture of the effectiveness of geography learning in shaping the character of environmental care in a sustainable manner.

5. Acknowledgment

This research shows that geography learning plays an important role in shaping students' environmental awareness attitudes and knowledge. However, the scope of the research is still limited to the internal aspects of the school and has not yet reached the involvement of the external environment. Therefore, it is suggested that future research involves cross-context observations, such as the role of family, local community, and media in the formation of environmental care character. In addition, it is also necessary to study the effectiveness of project-based learning models or field studies in fostering applicable environmental skills. The government and schools also need to strengthen collaboration in providing supporting facilities and policies for sustainable and contextualized environmental learning.

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