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# NEEDS ANALYSIS FOR DEVELOPING SCIENCE TEACHING MODULES TO IMPROVE ENVIRONMENTAL AWARENESS OF GRADE VIII STUDENTS IN SCHOOLS

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***Abstract***

*This study aims to comprehensively analyze the needs (Define stage) in developing a Natural Science (IPA) teaching module aimed at increasing environmental awareness of Grade VIII junior high school students. This study adopted the Research and Development (R&D) method, focusing on the Needs Analysis stage of the 4-D model (Define). Data collection was conducted through teacher interviews and distribution of needs analysis questionnaires to students and teachers. The research subjects consisted of Grade VIII students and three science teachers in a public junior high school. The results confirmed a significant gap between ideal learning conditions and current practices. The main findings indicated a very high need (90.20%) for a module that integrates in-depth learning, as current teaching methods are largely conventional, evidenced by the lowest score in the method aspect (38.24%). Furthermore, despite high initial awareness (84.31% and 63.97%), the learning materials lacked a specific module on Climate Change and failed to fully transform knowledge into active ecological behavior. This study strongly concludes that contextual, interactive, and technology-integrated science teaching modules are urgently needed to facilitate reflective thinking, encourage active ecological behavior, and bridge the gap between conceptual mastery and practical environmental responsibility in Grade VIII students.*

***Keywords*****:** *Needs Analysis, Environmental Awareness, Science Module, In-depth Learning Science Module*

## INTRODUCTION

Fundamental aspect in character education and sustainable education because it is directly related to the formation of pro-environmental behavior that is essential for preserving natural resources, such as waste management, water conservation, and

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pollution reduction [1]. Raising environmental awareness from an early age is a crucial foundation for developing a generation with ecological responsibility for their surroundings. Environmental awareness, in this context, can be defined as an individual's attitude and understanding of the consequences of human behavior on the environment, which encourages positive and sustainable actions[2].

Every level of education, from early childhood to secondary school, plays a vital role in supporting the sustainable development agenda. This is achieved through the instilling of values, strengthening ecological awareness, and cultivating pro-environmental behaviors in students as part of the process of national character of national character in any format [3]. Effective learning needs to be designed contextually and based on real experiences because this approach has been proven to increase students' knowledge, attitudes and positive actions towards the environment [4].

Experiential learning and solving real-world problems have been proven effective in fostering environmental awareness. Recent research even shows that collaboration skills have a stronger influence on increasing environmental awareness than critical thinking skills [5]. Thus, the implementation of environmental education in the science curriculum at the junior high school level is a concrete effort to foster ecological awareness and scientific thinking skills that can be applied in everyday life. This approach not only strengthens students' understanding of various environmental issues but also encourages their active participation in environmental conservation activities [6].

However, real-world conditions reveal significant gaps. Current instructional media are often too textbook-like and inadequately support the visualization of science concepts, strongly arguing for the need to develop new modules, as they play a crucial role in facilitating independent learning and increasing learning effectiveness [7].

Specifically, there is still a research gap related to the development of science modules specifically aimed at increasing environmental awareness of eighth-grade students, especially in specific local contexts. This gap includes the limitations of contextual learning media, the lack of specific modules, and the less than optimal transformation of environmental knowledge into active ecological behavior in students. To address these gaps in media, methods, and local context issues, this study focuses on a detailed needs analysis (the Define stage of the 4-D model) as a basis for developing a systematic and contextual Science Teaching Module.

The novelty of this research lies in the identification of specific needs in SMPN Kota Tasikmalaya for Science Teaching Modules that integrate deep learning to facilitate reflective thinking and encourage pro-environmental behavior, while simultaneously filling the gap in research on the development of contextual teaching materials in the region. Several cross-regional studies report varying levels of environmental literacy and awareness as well as limitations in contextual and easily accessible learning media for teachers and students [8], In other research, the

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Learning Module can encourage changes in students' attitudes and actions towards environmental problems [9]. Systematic development of learning materials is often conducted through a research approach. The research framework used is Research and Development (R&D), specifically referring to the 4-D model proposed by Thiagarajan et al. The development stages include Define, Design, Develop, and Disseminate [10].

The use of this R&D model emphasizes that the initial stage (Define) including needs analysis and curriculum analysis is a crucial phase [11]. This analysis is essential to ensure the product being developed aligns with student characteristics, local challenges, and the school context. The analysis in the Define stage aims to identify gaps between ideal conditions and actual conditions on the ground.

Based on these considerations, this study conducted a comprehensive needs analysis as part of the Define stage in the 4-D development model to design a science teaching module aimed at increasing the environmental awareness of Grade VIII respondents at a junior high school in Tasikmalaya City. The needs analysis activities covered several aspects, including:

1. analysis of curriculum and competency standards;
2. identification of students' initial abilities and learning needs related to environmental concepts;
3. teacher preferences regarding module format and features; and
4. facilities and infrastructure available at the school.

The findings from this analysis form the basis for designing and developing contextual and easy-to-implement modules. This research is expected to provide practical contributions in the form of recommendations for relevant science teaching module content and design, while also addressing the research gap in developing contextual teaching materials in the Tasikmalaya region.

## METHOD

This study is part of a Research and Development (R&D) project that adopts the 4-D development model proposed by Thiagarajan, consisting of Define, Design, Develop, and Disseminate stages. However, this article specifically reports only the Define stage, particularly the needs analysis process conducted as the initial phase in developing a deep learning-based science teaching module to strengthen students' environmental awareness.

This study employed a descriptive mixed-methods approach to obtain comprehensive information regarding the needs for science module development. The research was conducted at Tasikmalaya City Junior High School during the odd semester of the 2024/2025 academic year, from September to October 2025.

The quantitative and qualitative data were integrated through descriptive triangulation analysis. Questionnaire findings were used to identify general patterns of students' and teachers' needs, while interview results were used to strengthen, explain, and deepen the interpretation of quantitative findings related to learning conditions, environmental awareness, and the need for science teaching modules.

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This study involved a population consisting of eighth-grade science students and teachers at Tasikmalaya City Junior High School The method used for sample determination was purposive sampling. The research sample involved 34 eighth-grade students and 3 science teachers.

Data collection was conducted through needs analysis questionnaires and semi-structured interviews involving students and science teachers (Nadia et al., 2025). The questionnaire instruments were designed to measure several dimensions related to science learning and environmental awareness, including:

1. students perceptions of science learning,
2. science learning experiences,
3. needs for science learning modules,
4. needs for deep learning-based modules and environmental awareness,
5. understanding of environmental awareness concepts,
6. educational technology utilization, and
7. learning methods applied in science instruction.

Meanwhile, the teacher questionnaire explored aspects related to teaching experiences, the use of teaching materials, technology integration, environmental learning, and the need for innovative science modules.

Semi-structured interviews with teachers were conducted to explore current learning conditions, learning resources used in science instruction, challenges in teaching environmental topics, the integration of environmental awareness in classroom learning, and teachers' expectations toward the development of contextual and technology-integrated science modules. In addition, interviews with students explored learning experiences, difficulties in understanding environmental change materials, the use of technology in learning, and students' expectations regarding interactive science learning modules.

The research instruments, consisting of questionnaires and interview guidelines, were validated through content validity by two experts before data collection. The first validator was an expert in science education and environmental learning, while the second validator was an expert in instructional development and educational technology. Both validators are lecturers in postgraduate education programs with experience in

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teaching material development and educational research.

The validation process evaluated several aspects of the instruments, including:

1. clarity of instructions and statements,
2. relevance of indicators to the objectives of the study,
3. appropriateness of questionnaire items,
4. content validity,
5. language accuracy and readability, and
6. potential bias in the statements.

Based on the validators' suggestions, several revisions were made to improve the instruments before they were administered to participants. The revisions included simplifying several statement items, refining indicator alignment with the objectives of the needs analysis, improving sentence clarity, and adjusting the language to suit Grade VIII students' comprehension levels. Information regarding the Guttman

Table 1. Scale

| Scale | Measurement | |
|---|---|---|
| | (+) | (-) |
| 0 | Not Suitable | appropriate |
| 1 | appropriate | Not Suitable |

Referring to the data presented in Table 1, the calculation of the average percentage for each component is done by applying the formula below. The questionnaire data were analyzed descriptively using percentage calculations based on the Guttman scale. Each response was scored dichotomously, with "Yes" responses scored as 1 and "No" responses scored as 0. The obtained percentages were then interpreted using percentage interpretation criteria to determine the level of needs analysis results.

$$P_{(s)}\ (\%) = \frac{S}{N} \times 100\%$$

Keterangan:

Ps = Eligibility percentage (%)
S = Total score accumulation
N = Maximum total value

The following process includes interpreting the results of the needs questionnaire completed by teachers and students, which is used to guide the development of ethnoscience-based modules and facilitate decision-making. The questionnaire data were analyzed descriptively using percentage calculations based on the Guttman scale. The obtained percentages were then interpreted using percentage interpretation criteria, as presented in Table 2.

Table 2 Summary of Teacher and Student Needs Criteria.

| Percentage Range | Interpretation |
|---|---|
| 0% – 25% | Very Poor |
| 26% – 50% | Poor |
| 51% – 75% | Good |
| 76% – 100% | Very Good |

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Furthermore, the interpretation and decision-making results from the needs questionnaire distributed to teachers and students provide the basis for calculating the needs analysis percentages. These percentages are then classified based on the needs criteria listed in Table 2. Based on the analysis, it can be concluded that the development of a science learning module is necessary to meet the needs of teachers and students.

The percentage value that has been obtained The analyzed data is interpreted and decisions are made by converting Likert scale scores into achievement levels on a 4-point scale. Based on the needs criteria in Table 2, the analysis results show that the development of science learning modules needs to be adjusted to the needs of teachers and students.

## RESULT AND DISCUSSION

The analyzed data is interpreted and decisions are made by converting Likert scale scores into achievement levels on a 4-point scale. Based on the needs criteria in Table 2, the analysis results show that the development of science learning modules needs to be adjusted to the needs of teachers and students.

According to information provided by teachers, current learning utilizes textbooks, modules, school worksheets, and various online resources. However, textbooks still have limited content, particularly in sections addressing environmental awareness, making it difficult to obtain appropriate learning media and assignment formats. Furthermore, there are no modules specifically addressing climate change.

The dominant learning method remains conventional, with most of the material delivered through lectures and the remainder through laboratory experiments. Therefore, teachers urgently need innovative science modules that incorporate deep learning to increase student interest and motivation. A quantitative analysis of nine aspects of student needs indicates a high urgency for the development of new teaching modules, as demonstrated by two key findings:

1. Urgency of Module Development and Approach

The needs analysis showed that developing a deep learning-based module is an urgent priority. The module's needs component received the highest score, at 90.20% (very good), confirming that students require a learning process that facilitates critical, analytical, and reflective thinking skills. Therefore, the developed module must be both informative and interactive, enabling active student engagement and enhancing critical thinking skills. [13], [14].

On the other hand, the learning methods aspect showed the lowest score at 38.24%, thus illustrating that the learning strategies used in schools are still predominantly conventional and do not yet lead to an inquiry or project approach. Therefore, the development of innovative, in-depth learning-based teaching modules is urgently needed to bridge this gap and improve students' overall learning experience. (Legowo et al., 2024)

Furthermore, students' overall need for science modules also ranged from good to very good, with a percentage range of 64.71% to

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79.41%. This finding reinforces the importance of providing modules that are more relevant, contextual, and aligned with the demands of 21st-century learning. Developing learning modules that are responsive to student needs and local contexts is crucial for improving learning effectiveness and environmental awareness in seventh grade. [15].

2. Behavior and Media Gap

Although students' initial awareness is high, there are still shortcomings in media and methods for converting knowledge into concrete actions. This study found that the demand for learning modules based on a deep learning approach is very high. This finding aligns with the curriculum's demands, which encourage higher-order thinking skills and learning orientation in students. A score of 90.20% indicates a strong drive among students to engage in more challenging and meaningful learning. Therefore, developing learning modules that are creative, contextually relevant, and capable of stimulating environmental action is crucial to address this gap. [16]

Although students' initial awareness is high, there are still deficiencies in media and methods for converting knowledge into concrete actions. This study found that the demand for learning modules based on a deep learning approach is very high. This finding aligns with the curriculum's demands, which encourages higher-order thinking skills and learning orientation in students. A score of 90.20% indicates a strong drive among students to engage in more challenging and meaningful learning. Therefore, developing learning modules that are creative, contextually relevant, and capable of stimulating environmental action is crucial to address this gap.

In addition, the need for science modules in general which are in the good to very good category further emphasizes the importance of developing teaching modules which are designed not only to present information, but also to be able to facilitate active student involvement [17]. Thus, the development of in-depth learning-based modules is a relevant solution to improve the quality of science learning at the junior high school level.

The needs analysis data, collected through interviews with teachers and questionnaires, indicated that students indicated a clear gap between ideal learning and the implementation of learning that occurred at Tasikmalaya City Junior High School

Based on interviews, teachers explained that the learning resources currently used include textbooks, modules, school worksheets, and several internet sources. However, teachers stated that textbooks do not yet fully cover the content, particularly in sub-topics related to environmental awareness. The availability of relevant media and assignment formats is also still limited, making it difficult for teachers to deliver the material comprehensively. Furthermore, a specific module addressing climate change is not yet available.

Current learning processes primarily utilize lecture methods, with limited practical work. This situation indicates that learning does not provide adequate space for in-depth or experiential exploration of concepts.

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These findings confirm that learning conditions in the field do not yet reflect an ideal learning approach, particularly in the context of strengthening environmental awareness. The lack of supporting media, incomplete materials, and the absence of specific climate change modules indicate that teachers are limited in developing more contextual and applicable learning.

The dominance of the lecture method shows that learning activities are not optimal in training high-level thinking skills or encouraging active student involvement. [18]. Teachers expressed a strong need for innovative, immersive learning-based modules to enhance students' interest, motivation, and conceptual understanding.

Teachers expressed a strong need for innovative, immersive learning-based modules to enhance students' interest, motivation, and conceptual understanding. A quantitative analysis of nine aspects of student needs demonstrates a strong urgency to develop new teaching modules that better align with current learning needs. The main findings fall into two broad categories.

First, the demand for in-depth learning-based modules showed the highest score, at 90.20%, which is considered very good. This percentage confirms that students need a learning model that encourages critical, analytical, and reflective thinking skills.

In contrast, the learning methods aspect received the lowest score of 38.24%, indicating that the learning strategies used in schools are still dominated by conventional methods and are not yet inquiry- or project-oriented. Furthermore, the demand for science modules is generally in the good to very good category, with a range of 64.71% to 79.41%. This indicates the need to develop more innovative modules to improve learning effectiveness and meet students' needs for independent and active learning [19].

This finding indicates that learning requires updating both in terms of approach and media [5]. The high demand for in-depth learning modules reflects the importance of providing teaching materials that stimulate higher-order thinking. The low percentage of students in the learning methods aspect demonstrates a significant gap between classroom learning practices and recommended pedagogical approaches, such as inquiry-based learning, projects, and problem-solving (Nghiem et al., 2025)

The gap in the behavioral and media aspects shows that students actually have good awareness and understanding of environmental issues [20], but have not yet gained sufficient learning experience to translate knowledge into concrete actions. This situation reinforces the need for modules that not only present material but also provide technology-based practical activities, reflection, and exploration that support more meaningful learning.

Thus, developing immersive learning-based teaching modules is a strategic solution to address the weaknesses of current learning methods and bridge the gap between understanding and action. These modules are expected to support more relevant, contextual science learning and consistently build environmental awareness [21].

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Table 3. Results of Student Needs Analysis on Science Learning and Environmental Awareness

| Aspects | Average (%) | Category | Gap Implications |
|---|---|---|---|
| Students' Perceptions of Science | 54.90% | Good | Learning is not yet fully contextual and engaging |
| Understanding Environmental Awareness | 84.31% | Very Good | Students understand environmental issues but require reinforcement toward real actions |
| Environmental Awareness Behavior | 63.97% | Good | Awareness exists but has not fully transformed into consistent behavior |
| Educational Technology | 50.98% | Good | Technology integration in learning remains limited |
| Media Development | 65.44% | Good | Students require more interactive and contextual media |

Analysis of five aspects of student needs shows a clear gap between conceptual understanding, learning experiences, and actual behavior in science learning and environmental awareness.

1. Student Perception of Science

Student perception of science learning obtained an average of 54.90%, which is in the category of Poor - Fair. This value indicates that science learning is not fully perceived as enjoyable, relevant, or contextual by students. The implication of this gap is the need to develop more interactive and contextual teaching modules to optimize interest and sharpen students' understanding of science. The development of more interactive and contextual teaching modules is an urgent need to foster interest and improve the construction of students' understanding related to science learning. (Nurrisma et al., 2024).

2. Environmental Understanding and Behavior Gap

The results show a gap between students' conceptual understanding and actual behavior. Students' understanding of Environmental Awareness showed a very high result, namely 84.31% with the Strongly Agree category. However, the level of Environmental Awareness reflected in actual behavior only reached 63.97% with the Good category. This gap indicates that conceptual understanding has not yet fully transformed into consistent pro-environmental habits or actions. The implication is that students need reinforcement that links concepts to concrete actions, and they need more innovative learning strategies that encourage interaction to address the gap between understanding and behavior. (Vodovozov et al., 2024). This condition shows the need for updated (innovative) learning strategies and encourage activeness (interactivity) to overcome the gap between students' understanding and

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behavior regarding environmental awareness. [22].

3. Educational Technology

The Educational Technology aspect achieved a score of 50.98% and is in the Sufficient category. This finding indicates that the use of the internet and digital technology in learning is still suboptimal. The implication of this gap is the need for hybrid modules that integrate technology and are based on local contexts to increase engagement and effectiveness in science learning [23]

4. Development of Teaching Media

The Media Development aspect obtained a score of 65.44% with a classification of Good to Very Good. This finding indicates that students view interactive media as having high significance. The implication is that the development of teaching modules that are responsive to student needs and local contexts is very important to increase the effectiveness of learning and environmental awareness in the classroom. [16]

5. The developed teaching modules

The developed teaching modules must be equipped with innovative and contextual visual media and experiment-based activities to improve the quality of science learning and environmental awareness. Developing teaching modules that are responsive to student needs and local contexts is crucial to improving the effectiveness of learning and environmental awareness in grade VIII.

## CONCLUSION

Based on the needs analysis, it can be concluded that there is a significant gap between students' conceptual understanding, learning experiences, and pro-environmental behavior in science learning. Although students demonstrated high environmental awareness, current learning practices remain dominated by conventional methods and lack contextual and technology-integrated teaching materials. Therefore, the development of interactive, contextual, and deep learning-based science modules is urgently needed to strengthen students' environmental awareness and active engagement in learning.

This study contributes to science education research by providing empirical information regarding the needs of students and teachers in developing science teaching modules that integrate deep learning and environmental awareness at the junior high school level.

However, this study was limited to the Define stage of the 4-D model and involved participants from only one junior high school. Therefore, the findings cannot yet be generalized to broader educational contexts. Future research is recommended to proceed to the Design, Develop, and Disseminate stages by developing and testing the effectiveness of the proposed science teaching module in improving environmental awareness and students' learning outcomes.

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