Development of Environmental Education Teaching Module Using Discovery Learning Model for Elementary Students

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ABSTRACT

This study aims to produce a product in the form of an environmental education teaching module using the discovery learning model for elementary students. This research is a development research conducted using the 4D development model, which consists of define, design, develop, and disseminate. The research subjects involved teachers and students from the second-grade class of SDN 067/VIII Muaro Sekalo. Data collection techniques were the use of validation questionnaires for teacher and student responses. The collected data were analyzed using qualitative and quantitative analysis. The research results indicate the validity and practicality of the environmental education teaching module using the discovery learning model for elementary students consists of an average validity level of 4.47 with very valid category and an average practicality level of 4.81 with very practical category. It can be concluded that the development of the environmental education teaching module using the discovery learning model for elementary school students is suitable for use in the learning process.

Keywords: *teaching modules, environmental education, discovery learning*

INTRODUCTION

The current environmental crisis that is happening has become a widely discussed topic in both print and electronic media. This is because the issue poses a threat to human life in this world through natural disasters such as floods, earthquakes, landslides, and droughts. These phenomena arise not only from natural factors but also from factors caused by human beings, such as the destruction of nature, which hinders its proper functioning. Fajriansyah et al. (2021) revealed that the main problem in the environment is the disharmony and imbalance caused by human actions. While humans strive to fulfill their needs, they often overlook the harmony and balance in nature. As a result, they excessively exploit the environment to meet their needs, leading to damage caused by human activities.

The environmental damage in Indonesia is worsening day by day and directly threatens human life. The level of environmental destruction increases the risk of natural disasters. The causes of environmental damage can be attributed to two factors: natural events and human activities (Andriani & Bakhtiar, 2017) Environmental issues should be taken seriously and addressed accordingly. The damage to the environment can be reduced through an education process aligned with policies (Widodo & Wardani, 2020) The education process is the most appropriate means to enhance individuals' knowledge, skills, and attitudes, particularly regarding environmental awareness (Bahij et al., 2022).

Schools are expected to participate in environmental management, especially primary schools. Through primary schools, it is hoped that awareness of the environment can be instilled in the younger generation from an early age. Afandi (2013) explains that through the education process, it is expected to help every student as a member of society develop awareness and sensitivity to environmental issues. Education plays a role in environmental conservation, including the implementation of environmental education.

Environmental education can be integrated into the school curriculum. It can be implemented through interdisciplinary, multidisciplinary, and transdisciplinary approaches in primary schools. Adawiah et al. (2022) state that education in the school environment can be a platform for quality education in shaping and developing students' character. All events that occur in the school environment can be integrated as character education programs in classroom teaching, across various subjects.

Adawiah et al. (2022) also explain that the development of environmental education programs in primary and secondary education levels has been implemented since 2016 through the Adiwiyata program. This program encourages schools to be environmentally conscious and promotes environmental preservation. This is supported by the opinion of Widiawati et al. (2022) who express that Environmental Education is an educational program aimed at nurturing children or students to have understanding, awareness, rational attitudes, and responsible behavior regarding the reciprocal relationship between the population and the environment in various aspects of human life.

In reality, the process of integrating environmental education in primary schools is not yet optimal. The results of observations at SDN 067/VIII Muaro Sekalo show that many students are still not concerned about the environment. This can be seen from their behavior of littering, damaging plants in the school, and allowing trash to scatter around the classroom. Interviews with class teachers indicate that in the learning process of sixth grade in primary school, there is no teaching module available to assist teachers in implementing environmental education for students. So far, activities only refer to teaching modules in some subjects, but they have not been specifically designed to cultivate an environmentally conscious character. Furthermore, looking at the learning outcomes in the independent curriculum, it is evident that in Phase B, students are expected to acquire certain abilities related to environmental preservation, such as the ability to identify problems related to the conservation of natural resources in their surroundings and their connection to the conservation of living organisms.

One determinant factor in the teaching and learning process is through effective teaching models. Therefore, students are expected to understand innovations through innovative and creative teaching models, such as the Discovery Learning model. Based on this, it is perceived that there is a need for innovation in the form of developing Teaching Modules for Environmental Education using the Discovery Learning Model for Primary School Students. This study aims to produce a product in the form of an environmental education teaching module using the discovery learning model for elementary school students.

METHOD
This study is a development research using the 4D (Four D) development model. Arkadiantika et al. (2020) stated that the 4D development model consists of four main stages, namely Define, Design, Develop, and Disseminate. Each stage is described as follows.

a. Define Stage:
The stage of definition consists of student analysis, concept analysis, and task analysis.

1. Student Analysis

This stage involves analyzing the characteristics of students, specifically fourth-grade students who are the subjects of the study. The analysis includes assessing their academic abilities or cognitive development, skills they possess, and their social abilities. The student analysis is conducted to obtain a comprehensive understanding of the students' intellectual level and skills, which will inform the development of an environmental education teaching module using the discovery learning model tailored to the students' needs.

2. Concept Analysis

Concept analysis is crucial for developing the concept of the discovery learning model in designing the environmental education teaching module. This stage is important to ensure that the content of the module aligns with the required competencies of the students. To support concept analysis, the following analyses need to be conducted: a) analysis of learning objectives and learning elements to determine the content of

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the environmental education teaching module, and b) analysis of learning resources to gather and identify sources that support the development of the environmental education teaching module.

3. Task Analysis

This stage aims to identify the various skills that students need to possess. The researcher will assess and compile these skills as part of the developed product. Additionally, additional skills may be added as supplementary skills.

b. Design Stage:

In the design stage, the development takes the form of selecting the product to be developed, choosing the format, selecting the media, and creating an initial design of the prototype for the environmental education teaching module using the discovery learning model. The design stage involves designing a storyboard related to the format of the teaching module.

c. Develop Stage:

The development stage involves producing the development product through two steps: (1) expert appraisal followed by revision, and (2) developmental testing.

The goal of the development stage is to produce the final form of the environmental education teaching module using the discovery learning model after revising it based on the input from expert practitioners and the data from the testing. The steps in this stage are as follows:

1. Expert appraisal

Experts/practitioners assess the environmental education teaching module using the discovery learning model, including the validation of the content, media, and language.

2. Developmental testing

Field testing is conducted to obtain direct feedback such as responses, reactions, comments from students and observers regarding the environmental education teaching module using the discovery learning model that has been developed. Continuous testing is carried out until a valid module is obtained.

d. Disseminate Stage:

The dissemination stage is the final stage of the development process, aiming to promote the product to be accepted by other subjects. Dissemination can be done to individuals or groups, even through electronic media such as email. Dissemination can also be done through practitioners, such as teachers, to be used in classrooms. After usage, teachers can provide feedback, corrections, suggestions, and evaluations regarding the environmental education teaching module used.

Subject of Testing

The subjects of testing in this development research are students and teachers of Grade II at SDN 067/VIII Muaro Sekalo. The purpose of testing this device is to obtain feedback in the form of recording all responses, reactions, and comments from students and teachers in order to revise or improve the draft that will be produced. This testing is also conducted to assess the level of practicality.

Data and Data Sources

The types of data in this research are quantitative data and qualitative data. According to Sugiyono (2018) quantitative data is data in the form of numbers or quantified qualitative data, while qualitative data is data in the form of words, sentences, charts, pictures, and photos. The quantitative data in this research are the data from the questionnaires of subject matter experts, media experts, language experts, as well as the data from the questionnaires of students and teachers. Meanwhile, the qualitative data in this research are the suggestions, criticisms, and responses from validators, teachers, and students, which are used as considerations for improvement. The data sources in this research are validators, teachers, and students.

Data Collection Instruments

The data collection instrument in this research is a questionnaire. In this research, the researcher uses a closed-ended questionnaire. A closed-ended questionnaire is a questionnaire where the number of items, answer alternatives, and responses are predetermined, and respondents simply choose according to the actual situation. This instrument is used to assess the feasibility of the environmental education teaching module using the developed discovery learning model (validity and practicality).

Data Analysis Technique

The data to be obtained in this research are qualitative and quantitative data. Qualitative data consist of responses and suggestions/inputs from the expert team, which are collected and recommended for product improvement. Meanwhile, quantitative data consist of evaluations of product development obtained from the expert team and all respondents, which are analyzed and processed.

Validity Level Analysis

To determine the score intervals and categories, the following value conversion provisions are used:

Tabel 1. Value Conversion

Interval	Category
$X > \overline{X}_i + 1,80$ Sbi	Very Valid
$\overline{X}_i + 0,60$ SBi $< X \leq \overline{X}_i + 1,80$ SBi	Valid
$\overline{X}_i - 0,60$ SBi $< X \leq \overline{X}_i + 0,60$ SBi	Quite Valid
$\overline{X}_i + 1,80$ SBi $< X \leq \overline{X}_i + 0,60$ SBi	Less Valid
$X \leq \overline{X}_i - 1,80$ SBi	Very Invalid

Metermine the interval class, the following calculations are carried out:

Ideal Maximum Score   : 5
Ideal Minimum Score   : 1
Ideal Averange ($\overline{X}_i$)   : $\frac{1}{2}(5 + 1) = 3$
Ideal Standard Deviation (SBi)   : $\frac{1}{6}(5 - 1) = 0,67$

To get a score range of very valid, valid, quite valid, less valid and very invalid, the following calculations are made:

Very Valid Category
$$= X > \overline{X}_i + 1,80 \text{ SBi}$$
$$= X > 3 + (1,80 \cdot 0,67)$$
$$= X > 3 + (1,21)$$
$$= X > 4,21$$
$$= 4,22 - 5,00$$

Valid Category
$$= \overline{X}_i + 0,60 \text{ SBi} < X \leq \overline{X}_i + 1,80 \text{ SBi}$$
$$= 3 + (0,60 \cdot 0,67) < X \leq 3 + (1,80 \cdot 0,67)$$
$$= 3 + (0,40) < X \leq 3 + (1,21)$$
$$= 3,40 < X \leq 4,21$$
$$= 3,41 - 4,21$$

Cuite Valid Category
$$= \overline{X}_i - 0,60 \text{ SBi} < X \leq \overline{X}_i + 0,60 \text{ SBi}$$
$$= 3 - (0,60 \cdot 0,67) < X \leq 3 + (0,60 \cdot 0,67)$$
$$= 3 - (0,40) < X \leq 3 + (0,40)$$
$$= 2,60 < X \leq 3,40$$
$$= 2,61 - 3,40$$

Less Valid Categori
$$= \overline{X}_i - 1,80 \text{ SBi} < X \leq \overline{X}_i - 0,60 \text{ SBi}$$
$$= 3 - (1,80 \cdot 0,67) < X \leq 3 - (0,60 \cdot 0,67)$$
$$= 3 - (1,21) < X \leq 3 - (0,40)$$
$$= 1,79 < X \leq 2,60$$
$$= 1,80 - 2,60$$

Very Invalid Category
$$= X \leq \overline{X}_i - 1,80 \text{ SBi}$$
$$= X \leq 3 - (1,80 \cdot 0,67)$$
$$= X \leq 3 - (1,21)$$

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$$= X \leq 1,79$$

The data obtained from the questionnaires of the experts are calculated to determine the validity level of the media, content, and language. The calculation is done using the following formula.

$$R = \frac{\sum_{j=1}^{n} Vij}{nm}$$

Information:

R   : Average of expert/practitioner assessment results
Vij   : Score from experts/practitioners' assessment of the j criteria
n   : The number of experts/practitioners who assess
m   : Number of criteria

To see the score intervals and validity categories of the teaching modules being developed, see the following table.

Tabel 2. Score Intervals and Categories

Interval Sektor	Category
4,22 – 5,00	Very Valid
3,41 – 4,21	Valid
2,61 – 3,40	Quite Valid
1,80 – 2,60	Less Valid
0 – 1,79	Very Invalid

Practicality Level Analysis

Data on the practicality of the developed product was obtained from the assessment questionnaire given by teachers and students. The questionnaire in this study was structured in the form of a Likert scale. The teacher's response questionnaire was composed of five statement alternatives, namely Strongly Agree with a score of 5, Agree with a score of 4, Disagree with a score of 3, Strongly Disagree with a score of 2, and Very Strongly Disagree with a score of 1. The practicality analysis also uses the same method as the validity analysis. To calculate the average of the teacher's and student's questionnaire responses, the above-mentioned average formula is first applied. After that, the overall average is calculated using the following formula:

$$Rtotal = \frac{total\ amount}{numbers\ of\ respondents}$$

To see the score interval and practicality category, you can see the table below;

Tabel 3. Score Intervals and Categories

Interval Sektor	Category
4,22 – 5,00	Very Practical
3,41 – 4,21	Practical
2,61 – 3,40	Quite Practical
1,80 – 2,60	Less Practical
0 – 1,79	Very Impractical

RESULTS AND DISCUSSION

This research and development resulted in a product in the form of an environmental education teaching module using the discovery learning model for elementary school students. The product was developed following the 4D development steps (define, design, develop, disseminate). In the Define stage, the determination is done through analysis of student characteristics, concept analysis, and task analysis.

In this study, the validity of the developed product was obtained through the assessment of content validators, media validators, and language validators. This activity was carried out to produce a teaching module product that is suitable for students. The level of validity of the environmental education learning module with the discovery learning model is presented in Table 4.

Tabel 4. Product Validity Level

Validator	Value	Category
Material	4,41	Very Valid
Media	4,20	Valid
Language	4,81	Very Valid
Rata-rata	4,47	Very Valid

Table 3 shows that the average validity score of the product is 4.47, which falls into the very valid category. This score indicates that the developed environmental education teaching module, using the discovery learning model for elementary school students, is suitable for use. Table 1 also indicates that the validity levels of the content, media, and language meet the required standards. During the validation process, there is a focus on the steps of discovery learning within the developed module. The steps of the discovery learning model included in the content of the environmental education teaching module are as follows.

Figure 1. Steps of the discovery learning model

Furthermore, during the validation of the media, an average score of 4,20 was obtained, falling into the highly valid category. Based on the validation process, there were some revisions related to the appearance of the product in the environmental education teaching module. The revisions are as follows.
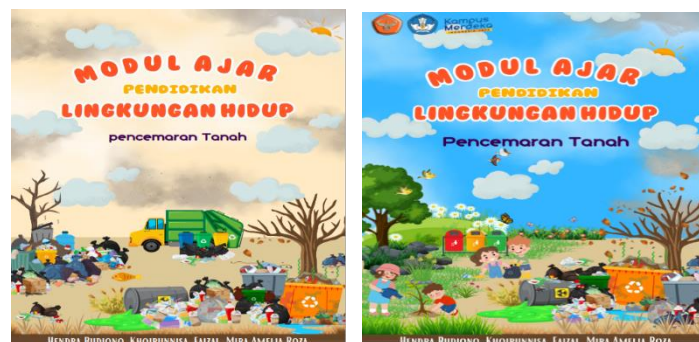

Figure 2. a). before revision dan b) after revision

The practicality results of the environmental education teaching module using the discovery learning model can be seen in the following table.

Tabel 5. Product Prakticality Level

Subject	Value	Category
Teacher	4,92	Very Practical
Students	4,71	Very Practical
Averange	4,81	Very Practical

In Table 5, the practicality level of the teaching module can be seen with an average score of 4.6, falling into the highly practical category. This data is obtained from the responses of teachers as educators, with an average score of 4.5 in the highly practical category. Meanwhile, the data from student responses show an average practicality score of 4.6, also falling into the highly practical category. The next stage, which is the final stage of the research and development procedure, is product dissemination. This stage is carried out after the product has been deemed valid and practical for use. The product is distributed to several schools in the Jambi province. The distribution is conducted in two schools, namely SDN 76/IX Mendalo Darat and SDN 131/IV Kota Jambi.

Based on the presented results, it can be concluded that the development process of the environmental education teaching module using the discovery learning model for elementary school students has followed all stages of the 4D development process and meets the criteria for usability in the learning process. At the beginning of the research, characteristics analysis, concept analysis, and task analysis are required. These three analyses are necessary in the product development process before designing the product. Muqdamien et al. (2021) stated that learner analysis is an examination of student characteristics, including their abilities, backgrounds, knowledge, and cognitive development levels. It also involves designing tasks that align with the competencies that students need to achieve and identifying the main concepts to be developed.

In the Design stage, the initial product design is created based on the curriculum requirements and predetermined needs analysis. The current applicable curriculum is the independent curriculum. (Al Bahij et al., 2022) Santika et al. (2022) explained that curriculum changes require educators to adhere to the applicable regulations or policies, including the use of teaching modules. This aligns with the statement by Maryono et al. (2023) that since independence, education in Indonesia has continuously evolved, including the curriculum In the Development stage, the product's feasibility is assessed in terms of validity and practicality. Ramadhany & Prihatnani (2020) explained that development is a stage aimed at producing a product. Furthermore, Chan et al. (2019). stated that validation aims to assess the feasibility of the product to determine whether it is suitable for pilot testing or not.

The validity of the content in the environmental education teaching module, using the discovery learning model for elementary school students, shows a validity level of 4,41. This is important to ensure that the content aligns with the intended learning objectives. Dewantara et al. (2020) mentioned that selecting appropriate and valid media that align with the characteristics and learning styles of students can accommodate their learning styles in understanding the learning materials. In Figure 1, it is evident that there are steps of the discovery learning model present in the developed environmental education teaching module. Based on this, Giawa et al. (2022) suggest the need to develop teaching materials in the form of modules that are oriented towards discovery learning. Learning with discovery learning can build students' self-concept, develop their talents, avoid learning solely at the verbal level, and allow time for students to assimilate and accommodate information. Gita et al. (2018) mentioned that the content organized in teaching materials should be in line with theories, facts, and provide a description of the knowledge that needs to be learned.

During the language validation process, an average score of 4.81 was obtained, falling into the highly very valid category. Based on this validation level, it is evident that the language used in the teaching module meets the standards of Indonesian spelling. No language improvements were observed in the developed environmental education teaching module. Rahmawati (2019:389) mentioned that the language used in

teaching materials should be suitable and appropriate according to language rules and the students' development to facilitate learning.

In terms of the practicality of the environmental education teaching module using the discovery learning model, a questionnaire was distributed. Silalahi & Budiono (2023) stated that one way to assess the practicality of a product is through questionnaire distribution. In this study, practicality data were obtained from the questionnaire responses of teachers and students after using the environmental education teaching module using the discovery learning model. Cristiana et al. (2021) mentioned that the practicality of a product can be seen from the responses of students after using the product. A similar perspective was also expressed by (Ambarwati & Istianah, 2018), who explained that the practicality of a product can be determined by the responses of expert practitioners (educators) who confirm its effective application.

At the level of product practicality, it appears that the resulting product is suitable for use by students, especially elementary school students. Chan & Budiono (2019) mentioned that the purpose of assessing the practicality of the developed product is to determine the extent to which the product is usable and to evaluate its practicality using questionnaires given to teachers and students to assess their feedback after using the tested product. Dissemination was carried out in two elementary schools, namely SD 76/IX Mendalo Darat and SDN 131/IV Jambi City.This activity is also carried out to assess whether the product needs to be reevaluated. Maryono & Budiono (2021) stated that evaluation aims to measure the developed product and determine whether evaluation is needed at each stage.

CONCLUSIONS AND RECOMMENDATION

Based on the research findings and discussions, several conclusions can be drawn as follows: (1) The educational module product for environmental education using the discovery learning model for elementary school students has been proven to be valid for use by fourth-grade students. This is evidenced by the average validation scores for content, media, and language, which obtained an average score of 4,47 in the very valid category. (2) The educational module product for environmental education using the discovery learning model for elementary school students is highly practical for use in the learning process. This is supported by the results of questionnaires given to teachers and students, which obtained an average score of 4,81 in very practical category. This research contributes to teachers by providing them with an understanding of developing educational modules for environmental education using the discovery learning model for elementary school students. Additionally, this research and development provide knowledge to teachers regarding the stages of developing educational modules in accordance with the current curriculum requirements. This research also provides knowledge to teachers regarding the steps involved in developing educational modules for environmental education using the discovery learning model. For future research, it is recommended to develop similar products with broader learning outcomes and topics.

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