Development Of Mobile Multimedia Module With An Ecological Awareness Based On Daily Project Learning

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Abstract.

Education and schools have great potential to support the success of efforts to instill the value of ecological awareness amidst the problems of environmental damage. The development of mobile multimedia modules designed with the concept of a daily project-based learning approach makes ecological education more meaningful and contextual. The purpose found out the method of implementing the value of ecological awareness through the development of mobile multimedia modules for elementary school students using a daily project-based learning approach. This type of research was research and development (research and development). The development model for this multimedia module is the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model from Lee & Owens. The results of the material validation showed that the overall average value of the validation is 3.6 in a very valid category. Media validation with an average value of 3.4 categories was valid. User response showed that an average number of 3.2 indicating a positive response. The test results on students showed the value of Sig. (2 tailed) was 0.000 < 0.05. Therefore, it can be concluded that there was a difference in the average Pre-Test and Post Test, which meant there was a change that showed the effectiveness of implementing ecological awareness values through the development of mobile multimedia modules for elementary school students with a daily project-based learning approach. The results of students' daily activities in the project also showed good and very good categories.

Keywords: *Daily Project-Based Learning, Ecological Awareness, and Multimedia Modules,*

I. INTRODUCTION

Environmental problems are still a scourge for the community to work hard to overcome through various programs. Even though, this day the phenomenon of environmental damage continues to occur, starting from forest fires, deforestation, accumulation of volumes of waste, pollution, extinction of flora and fauna habitat, critical status of diversity of flora and fauna and of course much more. As a formal institution that is equipped with a tested and measurable education and learning implementation system, schools have great potential to support the success of efforts to inculcate the value of this ecological awareness.Ecological awareness should be the most important part of educational goals. Education must be able to build educated human resources equipped with character and awareness about nature/environment, not vice versa, humans who are pragmatic-materialist oriented, who only see nature as an object, mechanistic, fragmented, separated from humans so that the stigma of normalization arises when ecosystems are dominated and exploited. However, ecological awareness is not built through an educational process that is purely educational transfer of knowledge only, but through a learning process that places students as active subjects in learning [1]. Transfer of knowledge can only make students limited to having knowledge about the environment, but lacking awareness and real action of caring for the environment through learning while doing [2].The implementation of environmental awareness in education has focused more on the cognitive domain. In fact, environmental education should be able to touch the affective and psychomotor domains which are close to a child's daily life.

This is very important as an effort to educate students about how the environment functions, human behavior as part of the environment, and how humans can manage and protect it, even though small habits in the surrounding environment [3]. The achievement of learning with ecological awareness also seems to be a challenge for implementing 21st century education. The main focus is on problem solving skills, critical thinking, and mastery of learning digitalization [4]. In an effort to achieve competence and environmental awareness values, it is necessary to develop learning media that can combine the use of digital technology with contextual values in learning.Multimedia module development mobile with approach daily project-

based learning be an appropriate learning design to instill the value of environmental awareness. This digital module has an interactive character that is systematically designed to help students achieve learning goals through gadget devices (Handphone) which combines several learning media such as audio, video, text, and graphics [5].Meanwhile, approach daily project-based learning is a learning approach that uses problems in collecting and integrating new knowledge based on experience in real activities. Daily project-based learning be an approach that seeks to link technology with everyday life problems that students are familiar with. This approach will become a value-oriented and contextual learning concept.This research is a continuation of the development of the focus of research conducted by researchers.

Previously, researchers had conducted several studies that focused on learning approaches collaborative problem-solving based learning (CPBL) and the use of multimedia media mobile. This research produced several important notes qualitatively. First; the design of the five syntactic models consists of problem orientation, organization, collaborative problem solving, presentation and discussion, and evaluation. In addition, a model matrix was also produced to guide teachers and student learning activities to achieve basic and global 21st century skills, namely problem solving, critical thinking, and cooperation. The resulting syntax and model matrix are feasible, valid, and practical[6] Research that has been carried out by researchers can be role model innovative start to support learning with various modifications, both elements of content and media. Departing from this role model by using the same media, namely the mobile multimedia module, researchers are trying to develop aspects of the approach that are considered to be more effective for implementing ecological awareness values, namely daily project-based learning, which can be applied to elementary school students.The implementation of the value of ecological awareness in elementary school students has a degree of importance that is quite vital in the midst of modernization which often has an impact on empathy towards the environment. The results of this study are expected to contribute to the world of education, especially in learning design that seeks to instill the character of caring for the environment by covering the cognitive, affective and psychomotor domains.

Multimedia module design mobile with approach daily project-based learning is a module design that combines digitalization and contextual values in learning to optimize learning objectives.In relation to the implementation of environmental education, several previous studies included the preparation of character-based e-modules that care for the environment during the Covid-19 pandemic. This study aims to describe the feasibility, practicality and student responses as well as develop character-based e-module teaching materials that care for the environment during the Covid-19 pandemic. The results of field trials obtained a percentage of 89.32%. Thus, the developed e-module is said to be suitable for use in learning during the Covid-19 pandemic [7]. Other studies have tried to include elements of local potential (the environment around students) in the implementation of science education, showing that the surrounding environment contributes to children from an early age in acquiring science knowledge, especially with the involvement of parents as companions [8].In South Korea, research has also been carried out involving elements of society in the implementation of environmental education to change lifestyles. Data was collected for six months in 2013. Some notes on lifestyle changes and perspectives from this study include; participants become aware of lifestyles that were previously centered on humans to rethink the universe as a part that is no less urgent. They experience a shift in perspective. A starting point for recognizing the interdependence between nature and humans. So, from this study it can be concluded that incorporating elements of the surrounding community is an important source of means for promoting ecological sensitivity [9].

The development of the world of education today can be seen from the learning process such as curriculum development, use of learning models, selection of learning methods, use of teaching materials and so on [10]. This development covers every level of education starting from education for early childhood to education at the tertiary level. So, the purpose of this research is to know the method of implementing ecological awareness values through the development of multimedia modules mobile in elementary school students with the approach daily project-based learning.

II. METHODS

This type of research is research and development (research and development). The development model for this multimedia module is the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation) from Lee & Owens. The ADDIE development model has the following stages; (1) Analysis (analysis); (2) Design (Design); (3) Development (development);(4) Implementation (application); and (5) Evaluation (evaluation). The choice of this model is because the ADDIE development model proposed by Lee and Owens is a development model for developing multimedia [11]. Data collection is done through direct observation, interviews stakeholders, and Focus Group Discussion (FGD), and validity testing.

The data collected includes; characteristics of students who are prospective program users (digital modules), students' initial knowledge/understanding of ecological awareness, learning tools (curriculum) include; basic competencies, indicators, instructional analysis, learning resources as materials in the design of multimedia module development mobile in elementary school students with the approach daily project-based learning for the implementation of the value of ecological awareness. Data collection was also carried out through class action in the implementation of limited tests using digital module applications.The instruments used for data collection were module validation sheets for media and material experts, teacher response questionnaires, pretest and posttest sheets. This instrument must be validated by experts. E Module feasibility data analysis technique to calculate the validation of material and media from each assessment item in the assessment indicator using a formula:

$$\overline{Xi} = \frac{\sum_{j=1}^{n} V_{ij}}{n}$$

Information::
$\overline{Xi}$ = average by the-i
V_{ij} = score of the evaluation result of the I-th evaluation item by the j-th validator
n = number of validators

Determining the validity of each assessment indicator item is based on the validity category as follows:

Table 1. Feasibility Value Conversion and Categorization

Interval	Category Description
$3,5 \leq X \leq 4$	Very Valid
$2,5 \leq X < 3,5$	Valid
$1,5 \leq X < 2,5$	Invalid
$X < 1,5$	Invalid

Teacher response data were obtained from a teacher's response questionnaire to learning activities, and then analyzed using descriptive statistics. The activity carried out to analyze the teacher's response data is to calculate the score of the assessment items according to the teacher's assessment indicators which are asked using the formula:

$$\text{average} = \text{Total score obtained} / \text{number of aspects}$$

Meanwhile, to determine the response category by matching the results with the established criteria, as follows:

Table 2. Conversion and Categorization of Satisfaction Survey Values

Interval	Category Description
$R < 0,5$	Not very positive
$0,5 \leq R < 1,5$	Not positive
$1,5 \leq R < 2,5$	Pretty positive
$2,5 \leq R < 3,5$	Positive
$3,5 \leq R$	Very positive

At the limited test implementation stage, percentages and the difference test of two means or t-test are used. The mean difference test technique and t-test were used to test the effectiveness of the mobile multimedia module for elementary school students with a daily project-based learning approach to implement ecological awareness values through pretest and posttest.

III. RESULT AND DISCUSSION

Module development multimedia mobile with approach daily project-based learning is a type of research and development that uses the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). This module was developed in the form of an android-based application with various features and components that aim to optimize learning by implementing ecological awareness in elementary school students.

The Need for Ecologically Conscious Learning

The needs analysis stage was carried out when conducting direct interviews with elementary school teachers about the implementation of environmental learning so far, especially in the digital era. The results of the interviews show that the environmental learning process so far still uses conventional methods and focuses more on cognitive and theoretical aspects.Countless only a few teachers who do field practice, for example by observing the growth of plants around the school, by distinguishing organic and inorganic waste. These activities still have drawbacks, among which are activities that are only ceremonial and incidental (once done).

Another weakness is added by the existence of pre-school facilities which are not all adequate, having a large yard for growing plants as a greening practice. In addition, there is no learning history storage media so that students cannot repeat the material that has been studied. The lecture method which has so far been applied is also not in accordance with the principle's student center learning and increased learning independence.As a solution to the problem based on the needs analysis, it has been answered with module development multimedia mobile with approach daily project-based learning. With the help of this technology, the learning process based on ecological awareness can be more contextual, because it approaches students' daily activities. Besides that, it is also meaningful, and of course innovative according to changes in 21st century society.

Mobile Multimedia Module Design

The design phase is carried out to design learning plan activities, design material to be displayed in digital form, and design prototypes of digital mobile modules. At this stage the features used in the development of this module were also designed, such as the application of material content features, pictorial and audio storytelling, quizzes, and daily projects.Taking quizzes that are packaged with obtaining scores becomes more interactive, this has the potential to increase user results compared to taking quizzes using textbooks (Pinoa, 2021). Figure 1 shows the prototype display of the mobile digital module.

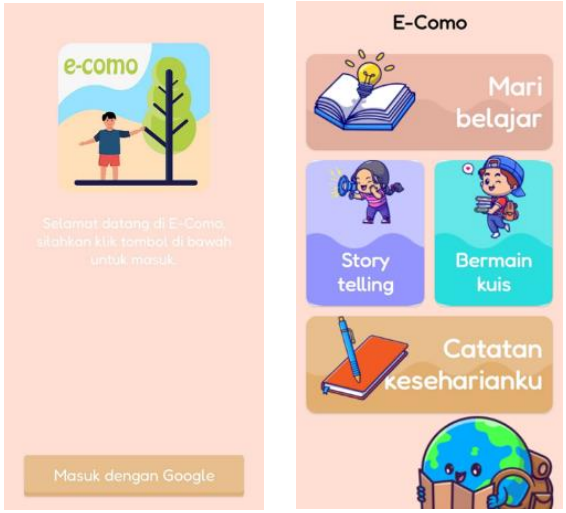

Fig 1. Design interface of E-Como, an environment-based mobile digital learning module

Mobile Multimedia Module Development

The development stage is carried out after designing a prototype digital mobile module. At this stage, the preparation of lesson plans, preparation of teaching materials, children's story content, quizzes, and daily projects have been carried out as hallmarks of the advantages of this digital module.

Material content components

One of the features in this digital module is the material content feature. The name of the feature in the application is let's learn. Inside is a digital book with 3 material titles that specifically discuss environmental knowledge by leading to ecologically conscious insights. The title of the material, among others; Natural Resources, Energy Around Me, and the Environment. The material content components are adjusted based on the semester learning plan so that the achievement of students is in accordance with the expected final ability.

Fig 2. Material content in the let's tell a story feature

Components of children's stories

The children's story component in this digital module is also a distinct advantage. This component contains a feature called storytelling, containing nine (9) titles of ecologically conscious children's stories accompanied by illustrations and audio.

Fig 3. Story telling menu in mobile digital module

Quiz component

The quiz component in this digital module is called the quiz feature. Contains four (4) quiz groups with multiple choice and true and false types. This quiz has a score if the user (student) answers correctly. If wrong, students/users are given the opportunity to repeat one more time. The quiz component is carried out based on the semester learning plan so that the achievement of students is in accordance with the expected final abilities.

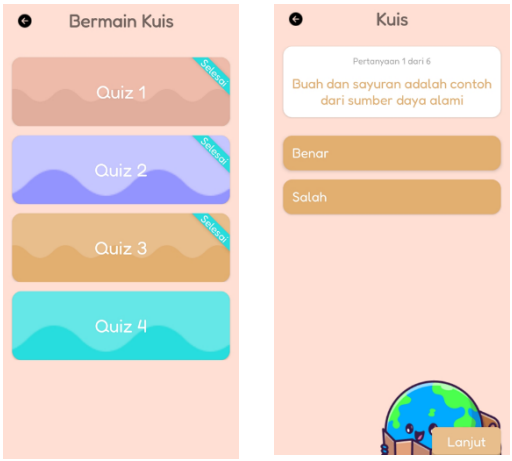

Fig 4. Quiz component in mobile digital module

Components of the daily learning project

The daily learning project component is one of the hallmarks and advantages of this module approach. The assumption is built that ecological awareness activities can have a more significant impact when carried out repeatedly starting with the activities and habituation of students in the environment where they live. This component is in a digital module called my daily notes. Contains projects per 10 days. Every day students get a project which if it has been successfully implemented students can check it in the application. If in one day the student can complete it, he will get points in the form of coins.

This development component is very relevant to the characteristics of the project-based learning model [12]. Project-Based Learning is a way of learning by using problems as a step in integrating new knowledge based on experience in real activities. Project-Based Learning is designed to facilitate students to carry out investigations using complex problems. Meanwhile, the addition of daily terminology is the development of project-based learning that has a contextual concept with student activities every day. Meena and Alison [13]. Also stated that Eco literacy is not only limited to knowledge of ecological concepts, but also about the ecosystem in which students live.

Fig 5. Daily record component on daily project based learning

Implementation of Digital Mobile Modules

Prior to implementation, validation is carried out first. Validation involves material expert validators and media experts. Based on the data in table 3, it can be concluded that the material validation assessment items obtained nineteen (19) very valid aspects and nineteen (19) valid aspects. Based on the calculation of the data, it shows that the overall validation average value is 3.6 which is included in the very valid category. Meanwhile for the results of media validation, the aspects emphasized were aspects of graphic feasibility and aspects of technological feasibility involving media experts and educational visual communication design. The average value shows the number 3.4 which is included in the valid category presented in table 4.

Table 3. Results of Material Validation Data Analysis

No	Material Feasibility Aspects	Mean Validator Value I	Mean Value Validator II
1	Aspects of content eligibility	3,8	3,6
2	Aspects of presentation feasibility	4	3,7
3	Aspects of language qualification	3,6	3,8
4	Aspects of contextual assessment	3,7	3,6
	Mean	3,6	

Table 4. Results of Media Validation Data Analysis

No	Material Feasibility Aspects	Mean Validator Value I	Mean Value Validator II
1	Graphic Aspects	3,5	3,4
2	Qualifying aspects of technology	3,4	3,4
	Mean	3,4	

Implementation of the module was also tested on elementary school teachers, totaling 17 teachers. After using the E-Como car digital module in the learning process, the teachers filled out the teacher satisfaction survey instrument. It was concluded that the results of the teacher's response to the implementation of learning media were in the form of mobile multimedia modules has an average of 3.2 which is included in the positive category. So that overall, the mobile multimedia module that has been developed by researchers has a positive value to continue to be developed and implemented in teaching and learning activities. The average user (teacher) response score is presented in table 5.

Table 5. Teacher Response Results

Assessment Indicator	Evaluation Details	Average Score
A. Interest	1. The application of this digital module is interesting and innovative	3
	2. The application of this digital environmental learning module makes students more enthusiastic about carrying out environmental-themed activities	3
	3. Using this digital module application can make learning about ecology (environment) not boring	3
	4. This digital module application supports students to master the skills of ecologically conscious activities in their daily life	3
	5. The existence of material connection with the surrounding environment makes this digital module application easy to understand	3
	6. With illustrations, it can provide motivation to study the material	4
B. Material	1. The delivery of material in this digital module application is related to everyday life	3
	2. The material presented in this digital module application is easy to understand	3
	3. Includes material in the current curriculum that fits the author's limitations	3
	4. The material presented in the digital learning module application is complemented by interesting component and complementary materials	3
	5. Evaluation of digital module applications according to indicators	3
	6. The application of this digital module encourages students to pay more attention to the surrounding environment	4
	7. The description of the material in the digital learning module application to achieve Basic Competency	3
C. Language	1. Sentences and paragraphs used in this digital module application are clear, communicative, and easy to understand	3

2. The language used in this digital module application is simple and easy to understand	4
3. The letters used are simple and easy to read	4
4. The choice of words and the use of sentences is in accordance with the language abilities of elementary school students	4
average = Total score obtained / number of aspects	3,2

The next implementation stage is a limited test through the pretest and posttest cycles. Implementation is carried out through the use of digital module applications in learning. Study material content, and story content then answer quizzes. In addition, students also apply the ten-day challenge which is a project in this lesson. Through the implementation of daily activities related to ecological conscious activities.Data analysis was carried out by conducting a normality test first. Based on the output results above, it is known that the Shapiro-Wilk significance value for the pretest variable is 0.072 > 0.05 and the posttest is 0.207 > 0.05. So, it can be concluded that the variable is normally distributed. Thus, the requirements or assumptions of normality in the Paired Sample T Test have been fulfilled.Then proceed with a descriptive analysis of the two samples studied, namely the Pretest and Posttest scores. For the Pretest score, the average learning result or Mean is 51.33. As for the Posttest score, the average learning outcome is 77.00. For Std. Deviation (standard deviation) in the Pretest of 6.557 and Posttest of 8.670. Lastly is the value of Std. The Mean Error for the Pretest was 1.197 and for the Posttest it was 1.583.

Because the average value of learning outcomes in the Pretest was 51.33 < Posttest 77.00, this means that descriptively there is a difference in average learning outcomes between the Pretest and Posttest results. Furthermore, to prove whether the difference is real (significant) or not, we need to interpret the results of the paired sample t test contained in the “Paired Samples Test” output table.Based on the results of the "Paired Samples Test" above, it is known that the value of Sig. (2tailed) is 0.000 <0.05, then H0 is rejected and Ha is accepted. So, it can be concluded that there is a difference in the average Pre-Test and Post Test, which means there is a change that shows the effectiveness of implementing the value of ecological awareness through the development of multimedia modules mobile in elementary school students with the approach daily project-based learning.The results of the descriptive analysis of the implementation of daily project-based learning on aspects of students' daily activities in an effort to save energy and natural resources show a good category, where 90% of students have carried out 2-3 types of relevant activities. In the aspect of students' daily activities in an effort to reduce plastic waste, it shows a very good category, where students have carried out >3 types of relevant activities. Furthermore, in the aspects of daily student activities in efforts to conserve plants, it shows a good category, namely students have carried out 2-3 types of relevant activities.

Table 6. Paired Samples Test Results

		Paired Differences					t	df	Sig(2-tailed)...
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	pretest - posttest ...	-25.667	9.444	1.724	-29.193	-22.140	-14.885	29	.000

IV. CONCLUSION

The implementation of ecological awareness has only focused on the cognitive domain. In fact, education that instills ecological (environmental) awareness is very important as an effort to educate students about how the environment functions, human behavior as part of the environment, and how humans can manage and protect it.This effort requires an innovation in the field of education that can combine contextual, digital-based educational content and meet the characteristics of 21st century education. The development of

mobile multimedia modules designed with the concept of daily project-based learning make ecological education more meaningful and contextual. The development of this module also has the potential to achieve 21st century educational skills namely; problem solving skills, critical thinking, literacy, creativity, communication, and social culture.

The aims of this study were 1) to find out the method of implementing ecological awareness values in elementary school students through the development of mobile multimedia modules with a daily project-based learning approach, 2) to find out the effectiveness of implementing ecological awareness values in elementary school students through the development of mobile multimedia modules with a daily project-based learning approach.The digital module development component consists of a material component, an audio-visual story component, a quiz component, and a ten-day project component that students can do at home within the framework of an ecological awareness movement.The results of media and material expert validation show very valid and valid categories. While the teacher's response showed a positive response. From the results of the pre-test and post-test, it can be concluded that there are changes that show the effectiveness of implementing the value of ecological awareness through the development of multimedia modules mobile in elementary school students with the approach daily project-based learning. The results of the descriptive analysis of the implementation of daily project-based learning on aspects of student activity show good and very good categories in different aspects.

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