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3D PAGE FLIP TECHNOLOGY: DEVELOPMENT OF TEACHING MATERIALS FOR MANGROVE ECOLOGY

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Abstract

Teaching material is one of supplement to supporting the implementation of learning. Teaching materials significantly influence the success of students in learning lessons at school. The aims of this study were (1) to determine the validity of teaching materials for mangrove ecology with local wisdom based on 3d page flip applications; (2) To find out the practical validity of mangrove ecology teaching materials with local wisdom based on 3d page flip applications; (3) To find out the effectiveness and validity of mangrove ecology teaching materials with local wisdom based on 3d page flip applications. This type of research is research and development with the ADDIE model approach, namely analysis, design, development, implementation, and evaluation. The findings indicated that the teaching material is appropriate for used in ecology course.

Keywords: Technology Based Media, 3D Page-Flip, Learning Materials, Mangrove Ecology

INTRODUCTION

The presence of teachers can be helped by the availability of teaching materials, such as books, modules, and other educational software that students can use for independent study. Teaching materials are all materials (both information, tools, and text) that are systematically arranged, which display a complete figure of the competencies that will be mastered by students and used in the learning process (Prastowo, 2015). Teaching materials that are aligned with the local context approach can increase student motivation to play an active role in learning activities (Septikasari & Frasandy, 2018). Good material is needed to achieve optimal learning goals. A good teaching material is to balance the elements of scientific literacy with scientific literacy as a knowledge 42%, as a way to investigate 19%, as a way to think 19%, and the interaction of science, technology and society 20% (Sukowati et al., 2017; Kazempour, 2014). Technology in education must be used appropriately to improve the quality of the learning experience of students (Udompong et al., 2014; Engels et al., 2017; Wilkinson & John, 1999).

Technological developments are marked by the emergence of various technology-based activities, such as e-commerce, e-government, e-medicine, e-laboratory, and e-education, all of which are electronic-based (Hamzah, 2011). Technology advancements in education are notably noticeable in the instructional materials Ghaliyah et al (2015), especially the media equipment utilized by secondary school students. Because it strives to spread knowledge from

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message senders to message recipients and motivate students to engage in learning activities, well said media plays a crucial role in education (Ambarwulan & Muliyati, 2016; Arsyad, 2013; Hasanah & Nulhakim, 2015; Lubis & Ikhsan, 2015; Syahrowardi & Permana, 2016). A science that analyses natural phenomena is biology (Hidayani et al., 2016; Latifah et al., 2016; Sari et al., 2015). Numerous natural events are explained by biology (Diani, 2016). As well as to create students who can glorify the greatness of Allah (Setiawan et al., 2013). The fulfilment of learning objectives can be aided by creativity in the use of educational media. Additionally, learning material can speed up and improve efficiency in the learning process (Khairani & Febrinal, 2016; Susanti et al., 2015; Safitri et al., 2015; Mulyadi et al., 2016). Flipbook media, which is the creation of ebooks as a substitute medium for learning physics, a branch of the natural sciences, is one of the uses of creative media (Hayati et al., 2015; Kurniawati et al., 2016). Learning can benefit from technological advancements, particularly in instructional materials (Anjarsari, 2016; Aditia & Muspiroh, 2013; Husain, 2014; Yuberti, 2015). Technology can be used to develop electronic books (e-books). These electronic books can be presented more attractively by using the 3D Page Flip application (Cholik, 2017; Ferdianto, 2018; Irwandani & Juariyah, 2016). 3D Page Flip is software that can be used to create e-books with 3D effects as teaching materials. This software is capable of converting Ms. Word, PowerPoint, and pdf files into 3D flash e-books in various formats, such as Exe, Zip, Html, 3DP, Screen Saver, and others (Alifya & Rahman, 2020). Flipbooks are therefore more effective and appealing when created with learning-supporting technologies (Kurniawan et al., 2018; Simanjuntak et al., 2019). Previously, 3D FlipBook software was used for a variety of innovations, including Multimedia FlipBook(Nazeri, 2013). Through the creation of a virtual module in the form of a multimedia flipbook, digital strategies can boost students' motivation, interest, and learning activities (Sugianto & Dony, 2013).

The use of technology-based teaching materials by teachers has a number of flaws that prevent pupils from engaging in creative thinking during learning activities. The capacity for developing concepts or solutions to issues as well as producing novel outcomes is referred to as creative thinking (Rohana & Ahyudin, 2017). Creative thinking has four indicators, namely fluency, flexible thinking, originality, and elaboration (Mubarokah & Wahyudi, 2019).

METHOD

This research was conducted from July to August 2023. This research used a qualitative method with the ADDIE development model (Lee & Owen, 2004). The stages of development with the ADDIE model are analyze, design, development, implementation, and evaluation. The details of the development plan are depicted in the following figure (Pribadi, 2009):

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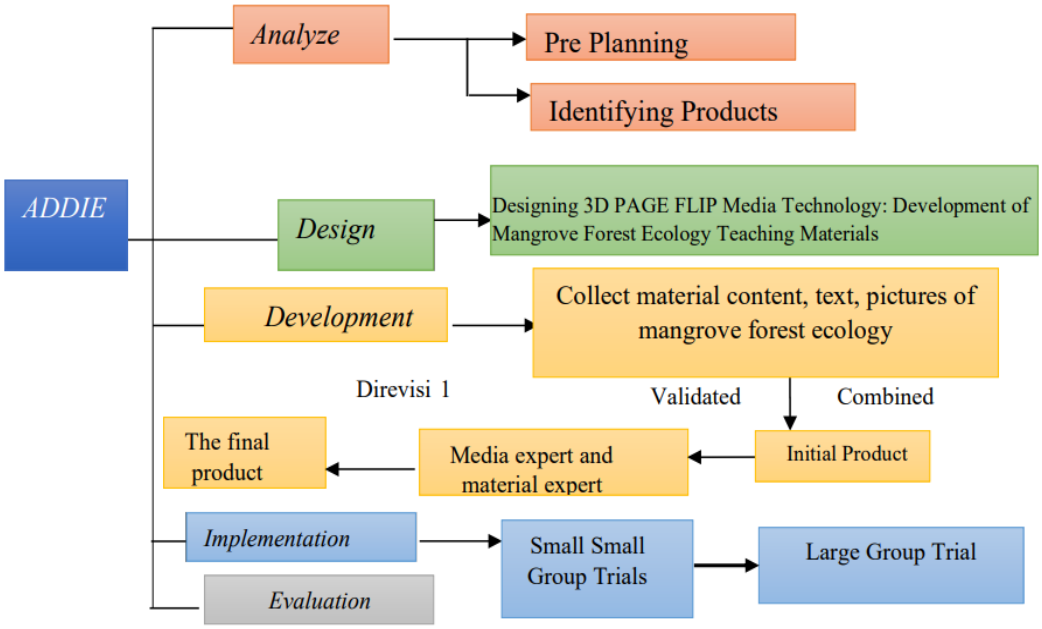

Figure 1: ADDIE Development Model

The data sources for this research are expert validation data and product trial data. The material test was carried out by four experts (2 lecturers and 2 biology teachers) and the media test was carried out by two experts (lecturers). Product trials are divided into small groups and large groups. Product trials for small groups (10 people) and large groups (20 people) were each carried out by 2nd semester students of the Biology Education Study Program, Faculty of Teacher Training and Education, Samudra University

Research instruments are questionnaires and documentation. Instrument expert questionnaire sheets were used to obtain data about the feasibility of questionnaires and language. Questionnaire sheets for material experts are used to obtain data regarding the feasibility of content, presentation, language, and graphics. Questionnaire sheets for media experts are used to obtain data on graphic feasibility. Student questionnaire sheets are used to obtain data on the feasibility of learning media to be implemented on students as product users, in the framework of evaluating the product as a result of development.

RESULT AND DISCUSSION

A. Result

1. Product Development

Teaching material was created with using professional 3D pageflip software, which allowed it combine the text with images of mangrove forests. This teaching material, not only using professional 3D pageflip software but also using Ms. Power point for initial design. The following is an overview of the products resulting from the development of teaching materials.

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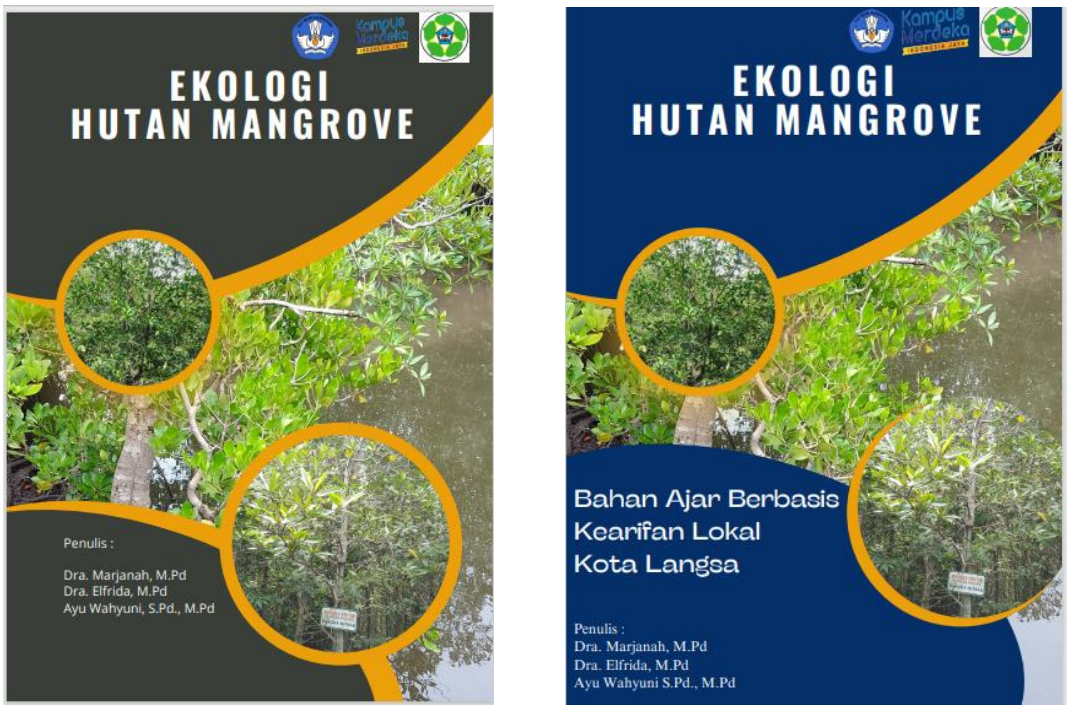
a) Cover of Teaching Materials

This cover contains the title of the teaching material, the ministry of education and culture logo, the independent campus logo, the university logo, a picture of a mangrove forest and the identity of the researcher. The cover design before revision and after revision can be seen in Figure 2.



(a) **(b)**

Figure 2: Cover Design (a) Draft of Mangrove Ecology Teaching Material, (b) Mangrove Ecology Teaching Material Cover after Revision

The cover of the teaching materials for mangrove forest ecology is shown in Figure 2 both before and after editing. Changes that take place in the two covers, such as those related to the use of colour, spelling, and writing are changed in accordance with the validator's suggestions. The cover of teaching materials becomes more attractive and in accordance with the target object. The cover of mangrove ecology teaching materials that have been designed is then validated by experts, namely two teaching material design experts and an ecological material expert.

b) Teaching Materials

The material presented in this teaching material includes: Preface, understanding of the bioecological description of mangrove forests, characteristics of mangrove forest habitat, structure and vegetation of mangrove forests, the life cycle of mangrove plants. An illustration of preface and materials used to introduce mangrove forest ecology can be seen as follows.

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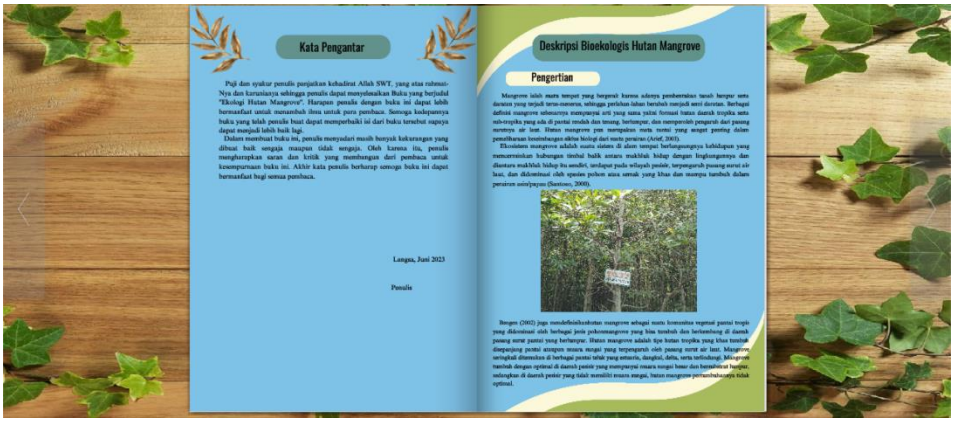
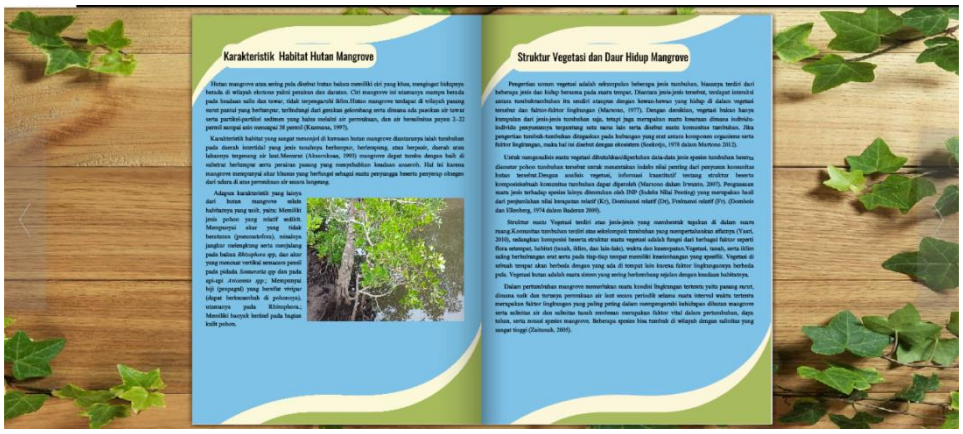


(a)



(b)

Figure 3: (a) Preface and Material of Definition of Mangrove Bio-ecology, (b) Material Characteristics of Mangrove Habitat, Structure and Vegetation Mangrove Life Cycle

2. Feasibility test

The feasibility of the product is assessed from the results of expert tests and trials in the two test groups. The following is a detailed explanation.

a) Media Expert Test

Validation by material experts aims to obtain data in the form of assessments, criticisms, and suggestions for improvement for the digital teaching materials being developed. As for the aspect of material expert assessment consists of aspects of content feasibility, presentation of material, and aspects of language. The results of the material expert's assessment can be seen in table 1.

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Table 1: Material Expert Score on the Quality of Digital Teaching Materials

No	Aspect	Indicators	Score				Average
			V1	V2	V3	V4	
1.	Content Feasibility	Conformity of material with Program Learning Outcomes and Course Learning Outcomes	4	4	4	3	3.75
		Material accuracy	4	3	3	3	3.25
		The significance of learning materials	3	3	4	3	3.25
		Novelty of learning materials	4	4	3	3	3.5
Validity score %							**85.93**
2.	Presentation	Material presentation	4	3	3	3	3.25
		Additional Supporting presentation	3	3	4	4	3.5
		Student engagement	3	3	3	4	3.25
		Feedback eligibility	4	4	4	3	3.75
		Feasibility of formative questions	3	3	3	3	3.00
Validity score %							**83.75**
3.	**Language**	Task	4	3	3	3	3.25
		Communicative	3	3	3	3	3.00
		Dialogic and Interactive	4	4	4	3	3.75
		Suitability to the level of development of students	3	3	3	3	3.00
		Consistency and cohesiveness of thought	4	3	3	3	3.25
Validity score %							**81.25**
Overall Validity Score							**83.64**
Category							**Very Valid**

The results of the material expert's assessment of professional 3D pageflip-based digital teaching materials show a percentage of 83.64%. This percentage indicates that the digital teaching material product developed is in the good category and is suitable for use without revision. The assessment from material experts reached this percentage because it was seen from the three aspects assessed, namely the aspects of content feasibility, presentation, and language, the average rating was good. However, the percentage does not reach 100% because there are a number of things that are still lacking according to the experts' assessment, such as giving rewards for correct answers and wrong answers in each practice question which is still lacking, there is material that is still lacking, and adding practice questions in each sub-chapter and instructions. Do the questions, and there are several videos and pictures that must be added with explanations and sources. Researchers make suggestions and comments given by material experts.

b) Media Expert

Validation by media experts aims to determine the feasibility of using or operating digital teaching material products. Media expert assessment indicators consist of: appearance, illustration, color composition, selection and font size, navigation icons, interactivity, appropriateness of images and animations, as well as ease of use of media and readability of text. The results of the media expert's assessment can be seen in Table 2.

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Table 2

No	Aspect	Indicators	Score				Average
			V1	V2	V3	V4	
1.	Graphics	Appearance	4	4	4	3	3.75
		Illustration	4	3	3	3	3.25
		Color composition	4	4	3	4	3.75
		Selection of font type and size	4	4	4	4	4
		Layout (navigation icon)	4	4	4	3	3.75
		Interactivity	3	4	4	4	3.75
		Mangrove image feasibility	4	4	4	3	3.75
		Ease of use of media	3	3	4	3	3.25
		Text Readability	4	4	4	3	3.25
Validity Score %							**81.2**
Overall Validity Score							**90.27**
Category							**Very Valid**

The results of the media expert's assessment of professional 3D pageflip-based digital teaching materials show a percentage of 90.27%. This percentage indicates that the digital teaching material product developed is in a very valid category and is suitable for use without revision.

3. Practicality Test

Practicality tests were carried out on students consisting of product trials carried out in small groups and large groups, as follows:

a) Small Group Trial

This small group test aims to identify problems early when the media is used. Through this small group trial, it is hoped that there will be no fundamental problems when using this learning mangrove forest image. This small group trial was carried out by biology education students in small groups as can be seen in Figure 4.

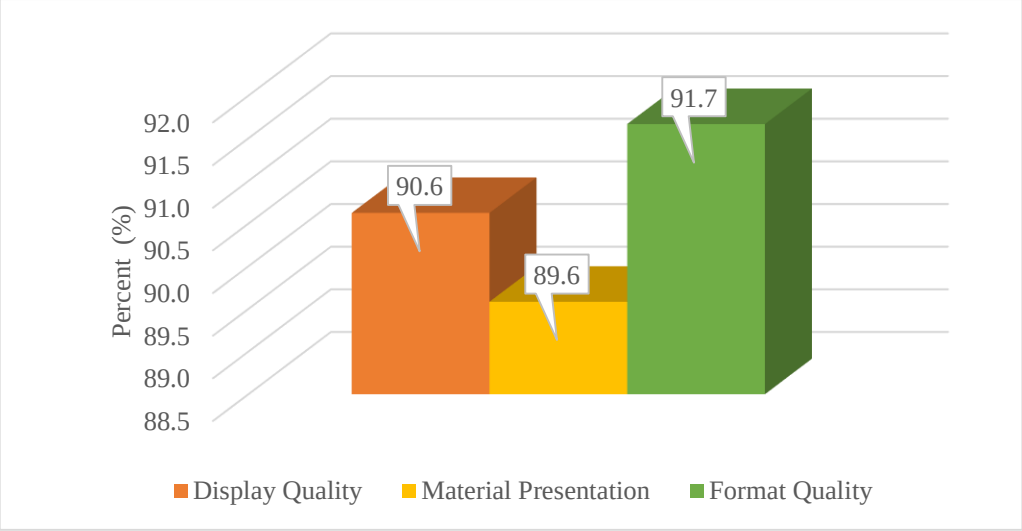

Figure 4: Results of Small Group Test of the Quality of Digital Teaching Materials

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Based on Figure 4 the results of the assessment of a small group of students on professional 3D pageflip-based digital teaching materials show a percentage of display quality of 90.6%, the percentage of presentation of material is 89.6% while the percentage of format quality is 91.7%. The results of the three aspects of the small group test assessment of the quality of digital teaching materials with an average score of 90.63% can indicate that the digital teaching material products developed are in a very good category and are suitable for use in learning ecology courses.

b) Large Group Trial

After conducting a small group trial, the next stage is the researcher conducting a feasibility test on a large group where this stage is the final stage. The feasibility test by the reviewer is a limited field test that aims to broadly identify the population that will assess and respond to professional 3D pageflip-based digital teaching materials. The results obtained in this trial will be used as a revision of the final product. The results of student assessments from large group trials can be seen in Figure 5.

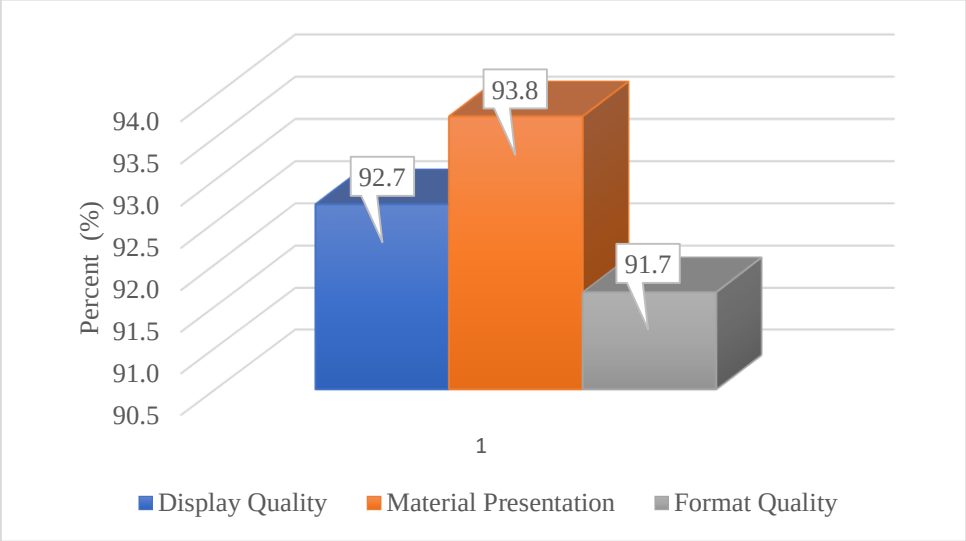

Figure 5: Results of Large Group Test on the Quality of Digital Teaching Materials

Based on Figure 5, the results of the assessment of the large group of students on digital teaching materials based on 3D page flip professional, the percentage of display quality is 92.7%, and the percentage of presentation of material is 93.8%, while the percentage of format quality is 91.7%. The results of the three aspects of the small group test assessment of the quality of digital teaching materials with an average score of 92.73% can indicate that the digital teaching material products developed are in a very good category and are suitable for use in learning ecology courses.

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B. Discussion

The results of this study are related to the results of research which states that theoretical feasibility based on expert lecturer studies shows an average percentage of 97.9% with a very valid category (Muhlas, 2019). Game-based E-Book learning media was developed to increase students' interest in learning during a pandemic (Karyada et al., 2022). Modules can assist schools in realizing quality learning (Lapawi & Husnin, 2020). Reviewing the development of teaching materials for science process skills using the discovery learning model helps students in small group try outs master the components of science process skills with good qualifications (Esomar et al., 2020).

CONCLUSION

The following conclusions are based on the results of research on the development of teaching materials that have been carried out:

1. The results of the development of digital teaching materials using professional 3D pageflip software on mangrove forest ecology lecture materials consisting of teaching materials, the Ministry of Education and Culture logo, the independent campus, the University logo, the mangrove forest image, the identity of the researcher, the introduction, the module instructions, the main display (introduction, material, material summary). This teaching material product also contains pictures and learning supports that help students understand the material of mangrove forest ecology as a local potential of Langsa, Aceh.
2. The results of the assessment of media experts and material experts for the feasibility of teaching materials, namely this teaching material has a very good category based on the overall percentage of material experts' assessments, namely 83.64% and media experts as a whole, namely 90.27%. While the test results in terms of the respondent test have a very good category with an average percentage of each in the small group trial of 90.63% and in the large group trial of 92.73%. Based on the validation carried out, it can be concluded that this teaching material is feasible to use in learning ecology courses.

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