

**DEVELOPMENT OF DIGITAL TEACHING MATERIALS TO SUPPORT  
LEARNING INDEPENDENCE FOR 5<sup>TH</sup> GRADE ELEMENTARY  
SCHOOL STUDENTS**

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**Article Info**

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**Article History:**

Accepted

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Revised

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Approved

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**Abstract**

The need for teaching materials is crucial in supporting the learning process, particularly in online-based learning where digital-based teaching materials are highly necessary. Therefore, this research developed digital teaching materials about the concept of ecosystems in elementary schools. The purpose of this research was to develop teaching materials that meet validity criteria and receive positive feedback from students as users. The research method used was research and development. The data collection techniques used were literature review, questionnaires, and documentation. The data analysis technique used was descriptive data analysis through quantitative analysis of the questionnaire, then it was interpreted qualitatively to obtain the feasibility of digital teaching materials and describe students' responses to the application of digital teaching materials. The results showed that the content validity was "very good", while the presentation and language validity were in the "good" category. The media validity was categorized as "feasible". In this case, the software element obtained a "very good" category, and the visual communication element obtained a "good" category. Furthermore, the average student response showed a positive reaction to digital-based teaching materials, with the appearance and presentation aspects rated as "strongly agree" and the benefit aspect rated as "agree".

**Keywords:** *Digital Teaching Materials; Ecosystem*

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## A. Introduction

Teaching materials are a set of learning materials designed to achieve learning objectives (Sungkono, 2003). In this context, teaching materials contain specific learning materials used to achieve learning objectives. It causes a fundamental difference between learning materials and the material descriptions in the textbooks. Material descriptions in textbooks can be referred to as teaching materials if they have been analyzed further to achieve learning objectives. Therefore, if material descriptions have been arranged to achieve learning objectives, they can be categorized as teaching materials. In addition, based on the opinions of Jamaludin and Rachmatullah (2017), teaching materials are a collection of learning materials that are systematically arranged and packaged in print and non-print forms used in learning activities. This definition shows that teaching materials are a systematically arranged collection of materials for learning activities and can be presented in print or non-print forms.

Therefore, in the context of developing teaching materials from this research, it refers to the concept of learning materials descriptions to achieve learning objectives arranged in non-print or digital teaching material forms.

Digital teaching materials are one of the teaching materials used in science learning. Digital teaching materials are a form of teaching material that combines text, audio-video, and image elements. According to Riding & Grimley (2008), multimedia-based digital teaching materials have three modes, sound-picture, text-picture, and picture-text-sound. The selection of these modes depends on the learning characteristics. In the context of the developed teaching materials, the mode of picture-text-sound was chosen. This selection is based on the learning characteristics conducted entirely in online learning. Therefore, the appropriate mode for digital teaching materials development is a mode that integrates picture-text-sound elements. Furthermore, according to Bundsgaad & Hansen

(2019), effective learning materials use didactic learning materials, which combine tools and text elements that facilitate learning. In this context, digital learning materials should combine text, audio, and video elements that can facilitate learning activities. Therefore, the choice of learning materials in the form of a combination of text, image, audio, and video elements is considered very appropriate for facilitating network-based learning activities.

Based on the above presentation, the development of digital learning materials is needed for elementary school students to support their self-directed learning, especially in the concept of the ecosystem. The ecosystem concept is one of the concepts that describe the interaction process between living creatures in an ecological system. This concept can be explained using visual and video elements. Therefore, the development of digital learning materials on the ecosystem concept, not only displayed textual elements but combined further with visual and video elements. So the processes in

an ecological system can be explained thoroughly. Thus, the selection of learning materials in the form of textual, visual, and audio-video elements is by the learning materials' characteristics of the ecosystem concept.

Based on the explanation above, the researcher developed digital learning materials using the text-image-audio-video mode because this mode combines verbal and nonverbal language elements. Through the combination of verbal and nonverbal language elements in digital learning materials, students can understand the content faster. (Munadi, 2010; Yuliana, F. H., et al., 2021). Moreover, Farhana, F., et al. (2021) stated that digital-based learning materials are generally more appealing to students than conventional learning materials. In addition, according to Utariyanti, Z. et al. (2015), the pictures in learning materials can help stimulate students' interest in the subject. Therefore, the development of digital-based learning materials, especially in the concept of ecosystems, is necessary.

## **B. Research Methodology**

The method used in this study is Research and Development (R&D), which aims to develop existing products or create new ones. At the end of this research, a product will be produced, either as the development result of an existing product or a newly developed product. The product resulting from this development study is a multimedia-based digital teaching material using picture-text-sound (PTS) mode on the ecosystem concept in the 5<sup>th</sup> grade of elementary school. This research uses the Borg & Gall development research design, which was modified into six steps, problem analysis, data collection, product design, product design validation, product improvement, and product testing (limited trial). The data collection techniques used was literature studies, questionnaires, and documentation. The literature review was conducted to develop instruments to measure the material feasibility, the feasibility of teaching materials as a learning media, and to describe student responses. The documentation was used to analyze available teaching material

documents as a basis for developing digital-based teaching materials.

The instruments used in this research are a questionnaire to validate the material feasibility, a questionnaire to assess the feasibility of teaching materials as a learning media, and a questionnaire to assess students' responses to digital teaching materials implementation. These instruments were developed based on theories of digital teaching material development. The questionnaire to validate the material feasibility was measured based on the aspects of content feasibility, presentation feasibility, and language assessment. Then, the questionnaire to assess the feasibility of teaching materials as a learning media was measured based on the aspects of teaching materials' feasibility as software and teaching materials' feasibility as a visual communication tool. Furthermore, the student response questionnaire was used to measure their description of teaching materials based on visual aspects, material presentation, and the benefits of digital teaching materials.

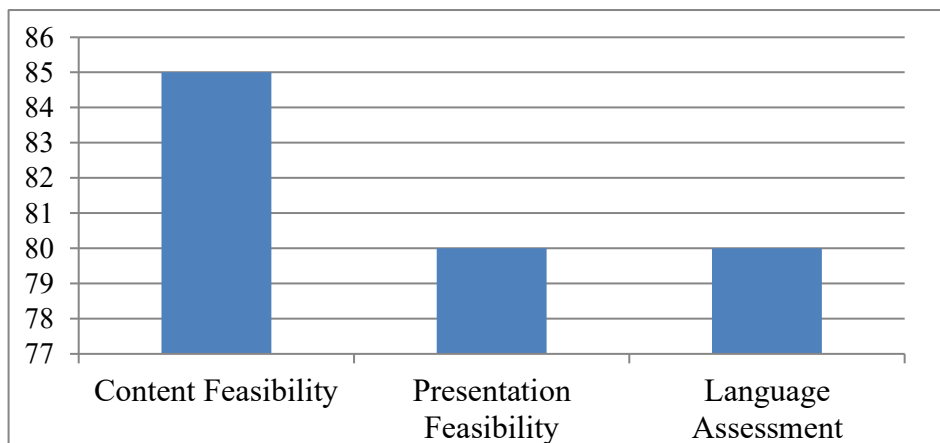
The data analysis technique used in this study is descriptive data analysis through processing the questionnaire results, which are then quantified in the form of scores, then

categorized to determine the feasibility and describe students' perceptions of digital teaching materials.

### C. Result and Discussion

The validation results of the digital teaching materials include the feasibility of the content, design, and student responses. Based on the validation test results of the digital teaching materials on the ecosystem

concept, the content feasibility obtained the "feasible" category. The following is a breakdown of the score obtained from the content's feasibility validation in graphical as shown below:



**Figure 1. Graph of Material Feasibility Validation Results**

Based on the diagram above, the validation results for each component of material feasibility, including content feasibility, obtained a score of 85, followed by presentation feasibility and language feasibility with a score of 80. The score of 85 in content feasibility indicates that the digital learning

material in the content aspects is in the very good category. Furthermore, the content of the learning material uses an integrated approach. An integrated approach is an approach to creating learning materials that combine the elements of learning material content in the learning material.

According to Brahler et al. (1999), digital teaching material should use an integrated approach. In this context, the integrated approach is not only for the learning material content, but also to integrate text, picture, and audio-video elements in the digital teaching material. In the developed teaching material, these aspects have been fulfilled. Therefore, this teaching material is considered feasible in terms of content validity. From the presentation feasibility aspect, the digital teaching material obtained a score of 80, which was categorized as good. The presentation aspect of the teaching material should include a concept map. In the developed teaching material, a concept map has been included in the description of each learning material. The concept map is crucial in teaching materials because it provides a holistic description of the learned material. It is in line with Hughes & Hay (2002), who stated that concept maps are the foundation of instructional development. Therefore, the first step in developing instructional materials is to create a concept map. Concept

maps can also help the author to develop instructional materials and can facilitate students to learn the intended instructional materials. Furthermore, in the presentation aspect, the developed instructional materials have been oriented toward problem-based learning.

The teaching material should be oriented towards problem-based learning, as this will prepare students' higher-order thinking skills. Moreover, according to Siagan et al. (2019), teaching materials oriented toward problem-based learning are highly effective in improving students' problem-solving and metacognitive skills. These skills are crucial to be developed as one of 21st-century thinking skills. Therefore, teaching material should be designed to support and enhance 21st-century thinking skills. Furthermore, Siska et al. (2019) mentioned that problem-based learning-oriented teaching material is also highly effective in improving self-efficacy.

Based on Bandura's opinion in Feist & Feist (2010), self-efficacy is a person's belief in their ability to

control their functions and events in the environment. In this case, self-efficacy is one of the determinants of a person's thinking activities, motivation, and behavior. Therefore, self-efficacy is very important in determining the success of a learning process. People with high self-efficacy tend to succeed in learning activities. Thus, one factor in improving learning success is cultivating self-efficacy. Self-efficacy can be fostered through problem-based learning-oriented teaching materials.

From the aspect of presenting the teaching material, it has been oriented towards the constructivist approach. Through this approach, meaningful learning can occur because students discover and construct their knowledge. In this way, the knowledge acquired is memorable. Furthermore, according to Mishra (2008), the orientation of the constructivist approach in teaching materials will be very effective in supporting student-centered and knowledge-centered learning. Student-centered learning tends to enhance student activity and

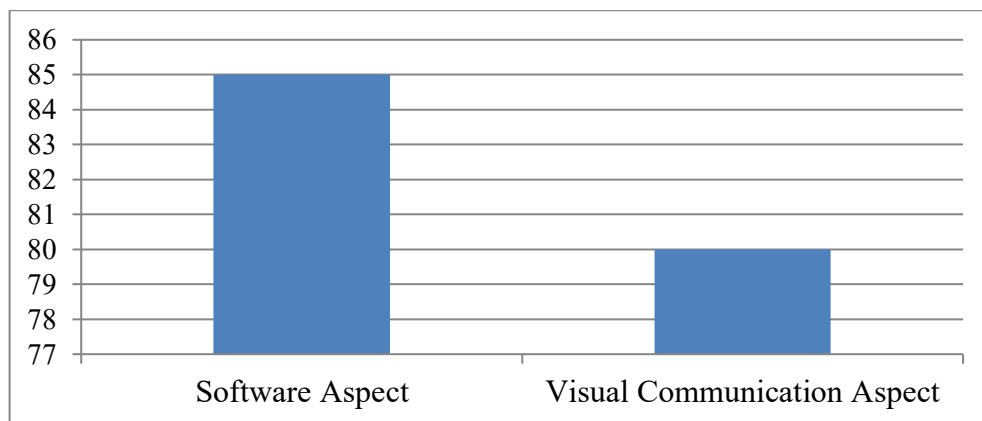
increase the probability of learning being more meaningful.

Next, in the aspect of language assessment obtained a score of 80 in the good category. Language assessment is to validate the use of language in the developed teaching materials. The use of language in teaching material must be communicative, as communicative language makes it easier for students to understand the purpose and goals written in the teaching material. In the case of digital teaching materials, communicative elements have been fulfilled, as there is not only text with communicative language but also audio elements provided to explain the purpose and goals conveyed in the text. In addition to communicative language, instructional materials should also fulfill the language appropriateness requirements for students' developmental levels. Language for elementary school students must be simple, easy to understand, and contextual. It is intended to make the message conveyed easy to understand by students. Because elementary school students tend to

use and understand simple language and they will be more familiar with language commonly used in their daily lives. Instructional materials developed based on the validation of language appropriateness have fulfilled the requirements of appropriate language rules for elementary school children's

developmental levels. Therefore, based on the validation results of the language aspect, these instructional materials are suitable for use by 5<sup>th</sup> grade elementary school students.

Then, the validation results of teaching materials feasibility as a learning media are shown below:



**Figure 2. Graph of Media Feasibility Validation Results**

Based on the graph above, the validation results of the teaching materials as a learning media obtained a score of 85 for the software aspect and 80 for the visual communication aspect. Those evaluation aspects of teaching materials as a learning media can be categorized as feasible with very good criteria for the software aspect and good criteria for the visual communication aspect. In terms of the software aspect, the prepared

teaching materials have fulfilled the aspects of usability and compatibility. It means that the teaching materials are easy to use, simple, do not require experts in their operation, and are easily accessible by students. In addition, the developed teaching materials also have a high level of legibility, which is in line with the opinion of Siegentahler et al. (2011), who state that digital-based teaching materials have a higher level of legibility



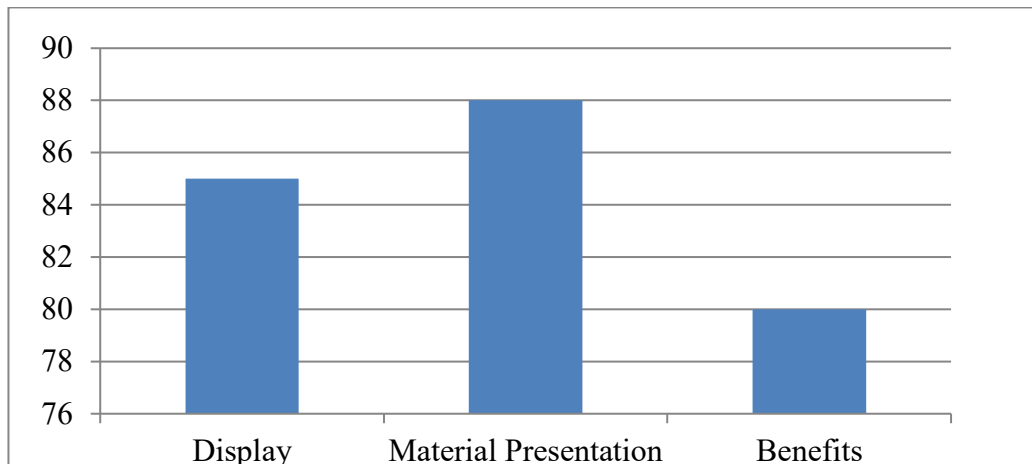
compared to printed teaching materials. Therefore in the usability aspect, the teaching materials have fulfilled the established criteria and are feasible to use in learning activities.

The teaching materials have also fulfilled compatibility elements, which means that the teaching materials as learning media do not require a specific player to run the media. In this case, all hardware and software support the teaching materials as learning media. Then in visual communication, the teaching materials have fulfilled the element of clear audio, where the narration matches the text or images, and the sound effects and background music do not disturb understanding. In the visual element aspect, the placement of titles and subtitles is balanced and proportional. The teaching materials also have appropriate, clear, and attractive animations and images for learning objectives. The visual of developed teaching materials has essentially fulfilled the clarity of audio and visual elements. The clearness of audiovisual elements is crucial because this digital teaching

material can also act as a learning medium, in which case it is an audiovisual medium. Digital teaching materials are developed based on audiovisual media because audiovisual elements can contribute to improving learning outcomes.

This corresponds with research findings that suggest that combining the audiovisual with appropriate learning models will effectively improve learning outcomes (Wijaya, S. et al., 2021; Sulfemi, W.B & Kamalia, Y, 2020). In line with this, a study conducted by Dewi, R. et al. (2020) showed that digital teaching materials in the form of instructional videos can improve students' understanding by up to 70.30% with good category. Therefore, based on previous research findings, the development of this teaching material is based on audiovisual.

The developed teaching material was tested in a virtual-based learning activity for 5<sup>th</sup> grade elementary school students after validation for feasibility. The graph below illustrates the student's responses to the implementation of this teaching material.



**Figure 3. Graph of Student Response Results**

Based on the graph, three aspects are the main components to describe students' responses to the digital teaching materials implementation. On appearance aspects, students' responses averaged 85, which falls into the category of strongly agree. It means that, based on students' perception of the appearance of the teaching materials, they responded positively to this aspect. In this case, on the appearance aspect of the teaching materials, the text and audio were clear, the images were not blurry, explanations are provided for each presented image, and the presented images were attractive to the students. On the presentation aspect of the material, students' responses averaged 88, which include the

category of very good. It means that, based on students' perception, the presentation aspect of the materials can encourage discussion activities with their friends, use examples that are close to the students' daily lives, help them understand figurative language and terms, and provide motivation for further learning.

Based on the above explanation, one of the students' perceptions regarding the presentation aspect of the teaching materials is that it can encourage discussion activities with other students. It is because the teaching materials are designed based on discussion activities, and the discussion process is a substantial part of these materials. With the discussion, the main objective of

developing the teaching materials can be achieved. One of the main goals of this teaching material development is to assist students in achieving conceptual change. Conceptual change is one of the ways used to reduce misconceptions among students, as stated by Ozkan & Selcuk (2015) who mentioned that conceptual change is an effective strategy for addressing misconceptions. A strategy is required to achieve conceptual change. Kyung-Hee et al. (2020) further stated that teaching materials based on discussion activities are effective in improving conceptual change, especially in science

concepts. Therefore, the strategy used to reduce misconceptions through teaching materials is the development of discussion-based teaching materials.

The next aspect of the perception assessment of the teaching materials is the benefit aspect. On average, students rated this aspect with a score of 80 in the “good” category. With this perception, digital teaching materials can encourage students to understand the presented material, make learning easier, generate students’ interest in using the teaching materials, and motivate students to study the material more diligently.

#### **D. Conclusion**

Based on the research results, it can be concluded as follows:

1. On the aspect of material feasibility, it has fulfilled the requirements to be used, with the category of “very good” for content feasibility and “good” for presentation and language feasibility.
2. Concerning the feasibility of teaching materials as a learning media, the research indicated that

the materials were suitable for use in the learning process. The software element obtained a “very good” category, while the visual communication element obtained a “good” category.

3. On average, students responded positively to the digital-based teaching materials. The appearance and presentation aspects were rated as “strongly

agree”, while the benefit aspect

received a “agree” response.

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