

Development of Digital-based LKPD on Ecosystem Material

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ABSTRACT

This study aims to produce valid and practical digital-based LKPD on ecosystem material for junior high school students. This type of research is research and development. The media development design used is the 4-D (Four-D) model, namely define, design and development, and disseminate. However, this study was modified and limited to reaching the 3-D stage because the media developed was only to test the feasibility of the LKPD media. The subjects in this study were nine students of CLASS VII SMP. The instruments used include validation sheets and questionnaires. The study results show that the developed digital-based LKPD is valid as a student learning tool with an average percentage of 79.25%. The results of the student response questionnaire got 87.5% in the positive category. Using the developed LKPD can significantly increase students' interest in learning and improve learning outcomes.

Keywords: Digital-based LKPD, Ecosystem, Instructional Media.

INTRODUCTION

Natural science learning is one model of curriculum implementation that is recommended to be applied at the elementary school (SD) and junior high school (SMP) levels (Eccles & Wang, 2016; Fukuda, 2020; Inganah et al., 2023). According to Listianingsih et al. (2021), learning science fun is exciting, but this will sometimes become unpleasant and boring if science learning is only teacher-centered. In the learning process, students often find it challenging to understand the material, incredibly complex materials, and cannot be observed or visualized directly (Chen et al., 2021; Sugianto et al., 2022). The low ability of students' scientific literacy is closely related to the weakness of the Biology Science learning process in class. Teachers have not been able to make and implement learning tools that are integrated with approaches that can guide students to learn more actively. Teachers are more likely to use the lecture method in teaching concepts so that the learning process is only centered on the teacher, while students are only directed to memorize concepts, facts, and theories (Gajić et al., 2021; Mukagihana et al., 2021; Sah et al., 2023). Teachers must prepare various strategies to develop students' abilities to master as much learning material as possible (Brainerd et al., 2017; Lauridsen et al., 2019). One of the preparations that the teacher must prepare is teaching materials. For this purpose, teachers must use variations in teaching materials (Anjarwati et al., 2023; Fakhurrizi et al., 2019). With teaching materials, the learning process can run more effectively because the teacher not only functions as a teacher but also as a facilitator who can guide students in understanding learning topics (Zhang et al., 2022).

Learning is currently considered less effective because teachers only rely on teaching materials provided to students as integrated thematic textbooks (Putra et al., 2016). As for the results of the interviews that the researchers conducted with science

subject teachers in junior high school biology in the learning process, there were still many students who had not been able to solve problems optimally, and the teacher only used teaching materials in the form of textbooks and the learning process the teacher only used the lecture method (Humaidi et al., 2022; Tsai et al., 2019). Such as the experience experienced by the teacher when teaching food chains in ecosystems, students only know examples of food chains in a given ecosystem, and students are less able to identify the process by which food chains occur in these ecosystems. Students do not understand the types of animals in the environment, so it is difficult to explain the food chain. As a result, student learning outcomes and learning motivation are decreasing. Thus, teaching materials need to be developed to help students learn, which can be used as additional learning materials other than textbooks (Choirunnisa et al., 2022; Yendrita & Syafitri, 2019).

The availability of quality learning tools is one of the factors that can support the learning process to run well and improve the quality of education (Choirudin et al., 2021). The development of electronic media in the industrial era 4.0 led teachers to be able to design digital learning (Hasanah et al., 2022; Sekaryanti et al., 2023). One of the teaching materials that can be used in the learning process is digital-based Student Worksheets. As outlined in digital-based LKPD, learning innovations be in the form of learning content that can attract students' learning interest, such as experiments or games (Anwar et al., 2019; Diella & Ardiansyah, 2019). With digital-based LKPD, it can make it easier for teachers to direct students in discovering concepts through experiments or investigations (Widyo et al., 2020). Digital-based LKPD contains a set of fundamental activities that students must carry out to maximize understanding of the formation of basic abilities according to indicators of achievement of learning outcomes that must be taken (Zulmi & Akhlis, 2020). The digital-based LKPD contains a series of activities in the form of short materials and practice questions (Irdam Idrus & Sri Irawati, 2019; Setiati et al., 2021).

Based on this, to overcome the existing problems, it is necessary to develop the learning media used. The solution can be done by developing digital-based worksheets that support enjoyable class learning. LKPD was developed on a digital basis to stimulate students to be able to participate actively in solving the problems given in learning. The existence of digital-based LKPD can increase teachers' creativity, so the media created will look interactive and fun and attract students' learning interest. The digital-based LKPD includes sheets in the form of exercises that can be done according to standards, are practical, and can be reached.

Previous research findings state that digital-based LKPD is declared valid and practical (Mala et al., 2019). LKPD is reliable and feasible (Zulmi & Akhlis, 2020). Muharayani (2019) titled Development of Guided Inquiry Worksheets Based on Local Potential in Class X Ecosystem Material at SMAN 1 Bonti. Based on the research results of Guided Inquiry Worksheets based on local potential, ecosystem material meets the validity aspect in terms of language by 84.66% (very valid), material by 80.44% (very valid), and media by 73.11% (valid). Meanwhile, from the practicality aspect, the student response and teacher response to this development showed that large-scale trials were 80.9%, small-scale trials were 40.79.71%, and teacher responses were 88%. All the existing aspects have positive criteria.

The difference between this research and the previous one is to develop valid digital-based worksheets for use in learning. The LKPD can also (Muliadi et al., 2021) be distributed by the teacher through the WhatsApp group so that learning is more flexible. In addition, the digital-based LKPD used also aims to help students understand the concept of ecosystems. The material used is ecosystem material for class VII SMP.

Ecosystem material has a comprehensive scope, so in the developed LKPD, activities have learning indicators regarding ecosystem components. Therefore, based on the background mentioned above, this research aims to develop digital-based LKPD on ecosystem material to increase student learning interest, which is valid for use in biology learning for class VII SMP.

RESEARCH METHOD

This type of research is Research and Development. The media development design used is the 4-D model (Four-D model). This research involved nine students of Class VII junior high school biology subject. This study aimed to develop digital-based Student Worksheets for ecosystem material based on the 4-D model (Four-D model). This 4-D development model consists of four stages: Define, Design, Develop, and Disseminate. This model can be used for various product development, including LKPD teaching materials (Darmayanti et al., 2022). However, this research was modified and only limited to reaching the 3-D stage, including:

- (1) In this stage, an analysis of student characteristics is carried out, an analysis of student learning facilities, an analysis of learning materials, and an analysis of KI and KD adjusted to the syllabus. The following presents essential competencies (KD) and indicators in Table 1.

Table 1. Basic Competences and Indicators

Basic Competency	Competency Achievement Indicator
3.5 Analyze the relationship between ecosystem components and food webs in the surrounding environment	3.5.1 Analyze ecosystem components based on their type 3.5.2 Analyze the types of symbiosis in the ecosystem 3.5.3 Proving food chains in Ecosystems

- (2) In this stage, the researcher determines the software, creates a framework, designs the components contained in the digital-based LKPD Ecosystem, such as the cover design for the LKPD display, and prepares material to be used in the LKPD.
- (3) Development, in this stage, makes LKPD using CorelDRAW software. This stage has been revised based on expert opinion and student trials. This phase has two steps:
 - a. Expert Verification (Expert Opinion): Expert verification of the problem in the form of a feasibility study of ecosystem material on LKPD media prior to testing, and the results of this verification are used to correct the media used.
 - b. Student Response Questionnaire: The questionnaire is intended to identify student responses to digital-based LKPD, which is used to determine eligibility.

The research instrument used was a validation sheet and a student response questionnaire using a Likert scale. Data validation results were analyzed according to the aspects observed, including material, illustrations, quality, and appearance of the media and their benefits by the validator, and the results were categorized as shown in Table 2.

Table 2. Validity Criteria adapted (S. N. Hasanah et al., 2020)

Validity Value	Validity Level
$0 \leq \bar{V} < 25$	Invalid
$25 \leq \bar{V} < 50$	Less valid
$50 \leq \bar{V} < 75$	Valid
$75 \leq \bar{V} \leq 100$	Very valid

Suggestions from the validator are presented to revise a better LKPD. Media and instruments are considered valid if they enter a valid minimal interpretation. The student response questionnaire contains five indicators: creative, effective, efficient, and attractive. Student responses were considered positive. At least 70% of students filled out the questionnaire by agreeing (Asyrofi et al., 2018; Khoiriyah et al., 2022; Wulandari et al., 2022). The data obtained in this study are in the form of qualitative and quantitative data. Qualitative data were analyzed descriptively to find trends during the study, while quantitative data were analyzed through statistical tests. The indicators of the success of this study are: 1) The success criteria developed by the LKPD. Are the materials being developed used in the correct/good category without modification, or are they rarely modified? 2) Get a positive response from students. 3) Students can use the LKPD they have developed to help students understand ecosystem material.

RESULTS AND DISCUSSION

Quality media that can support the student learning process becomes attractive and begins to be used by teachers. Using this media can add to students' progress in learning and help the interaction process between students and teachers (Hindrasti et al., 2020). The product produced in this study is a digital-based worksheet. The developed media contains ecosystem material, namely types of ecosystem components, patterns of interaction in ecosystems, food chains, and human efforts in maintaining ecosystems. Several sections in the media include instructions for use, KI and KD, learning objectives, material descriptions, sample questions, and practice questions. The display of digital-based LKPD on ecosystem material is presented in Figure 1.



Figure 1. Digital-based LKPD Display

This study developed media in the form of digital-based Student Worksheets using the four-D model modified from the model developed by Thiagarajan. However, this study was limited to the third stage, namely, development. The results of the development stages are described as follows:

(1) Define stage

There are four steps in the define stage. These steps will become a reference for developing digital-based LKPD media. The first is an analysis of the characteristics of the students based on the results of unstructured interviews with biology teachers and seventh-grade students of junior high school. The teacher still uses the traditional learning model, explains the steps with a few questions and answers, and provides examples of questions. As a result, students are not used to exploring their knowledge and approaches. Moreover, studying biology usually only works with textbook questions. Students are used to teacher-centered learning and are not active when learning occurs. So that makes students bored and do not have a high interest in learning biology.

Second, analysis of student learning facilities. Learning facilities used today must keep up with the development of the digital era. Electronic media such as cellphones, laptops, and LCDs must be optimized. So students don't just stick to textbooks. By using digital devices to access the developed LKPD, students' interest in learning is hoped to increase.

Third, analysis of learning materials. Analysis of learning material is carried out to make it easier for students to understand the content or content of the material that is adjusted to the results of the KD analysis. Ecosystem material is presented per the learning objectives in the syllabus. It is hoped that students will understand the essential concepts of ecosystem components, what types of symbiosis occur, and how food chain processes occur by proving it to the surrounding environment.

Fourth, analysis of KI and KD. The results were obtained after analyzing the Core Competencies (KI) and Basic Competencies (KD) in class VII SMP by developing digital-based worksheets on ecosystem material. Student activities refer to KI three, namely knowledge, and KI four, namely skills, with reference focused on basic competencies 3.5 and 4.5. Student activity, in this case, is to analyze ecosystem components by identifying how the relationships between ecosystems and food webs in the surrounding environment.

(2) Design Stage

The Design (planning) stage is for Digital-based LKPD Planning and what will be used to make the LKPD. There are several ways to plan this LKPD—specifically, LKPD content organization, format selection, and LKPD design. LKPD preparation includes exercises adapted to the material, syllabus, and curriculum and compiled from the contents of the LKPD material using several textbook sources taken from textbooks and other relevant reference books. Furthermore, the initial preparation of the first LKPD includes instructions for use, KI and KD, learning objectives, material descriptions, sample questions, and practice questions. LKPD media is a form of digital-based media designed using the CorelDRAW application. The E-LKPD design is designed to stimulate their interest in learning by involving students directly accessing it through digital devices to provide an experience for students following technological developments. In this design, the layout is consistent with good use of symbols and typography so that it can be used as LKPD teaching material for independent study, which can be used flexibly because of its nature which can be used online and offline.

(3) Develop stage

At this development stage, the aim is to make good Student Worksheets (LKPD) media as student support in the learning process. The developed LKPD was tested for validity and practicality. The validation process is carried out to determine the level of validity of the developed LKPD. Meanwhile, practicality was based on completing a student response questionnaire on ecosystem material for grade VII SMP as many as nine students. The results of the validation of material and media experts as well as the results of the student response questionnaire in the development of the E-LKPD can be seen in Table 3.

Table 3. Percentage of Validation and Response of LKPD Development

No.	Aspect	Validator	Indicator	Percentage	Mean Percentage	Category
1	Media Validation	Validators 1	Content,	75%	79.25%	Very valid
		Validators 2	Language, Material	78%		
	Material Validation	Validators 1	Concept, Practical, Knowledge	81%		
			Construction	83%		
2	Student Response	Validators 2	Interesting, efficient, creative, and effective	-	87.5%	Positive

Based on the validation and questionnaire data analysis results, digital-based student worksheets (LKPD) on ecosystem material are very valid and suitable for learning, with an average percentage of 79.25%. LKPD on ecosystem material is designed so students must think critically to analyze information based on experience, existing abilities, and instructions to make it easier for students and teachers to use LKPD. The developed LKPD is equipped with pictures related to students' daily lives so that they can improve students' critical thinking skills. LKPD is declared valid and appropriate if it meets the validity and eligibility criteria of the specified standard (Hayong & Putra, 2020; Ndia et al., 2021).

Furthermore, the researchers distributed the developed digital-based LKPD to students via WhatsApp. Students are asked to observe and study the digital-based LKPD for 45 minutes. After observing and understanding the LKPD, students are given a questionnaire to fill out an answer questionnaire form by providing a checklist in the appropriate column for the sections. This is in line with the research by Cholily et al. (2021), which used a student response questionnaire to analyze the practicality of the media being developed. The results of student responses in Table 3. with a percentage of 87.5%, are in a positive category indicating that the appearance of the LKPD on the cover has an attractive quality, the selection of the background is by the material, the writing in the LKPD can be read, does not use too many fonts, and the selection of exciting colors. LKPD technically be used in the form of hardware or software, clear instructions for using LKPD are available, and LKPD can be used easily. The information conveyed in LKPD is by the material. LKPD is structured to make students the subject and center of attention in learning so that students can explore, process, and construct their knowledge

independently based on information obtained from the learning process (Dewi & Agustika, 2022). Students feel enthusiastic when using digital-based LKPD because it contains displays that are interactive, interesting, and fun (Wulandari & Novita, 2018).

This could not be carried out at the last stage in the development of digital-based LKPD because this research only reached the development stage where it only aimed to determine the feasibility of the developed digital-based LKPD media. Learning that uses digital-based LKPD compared to other ordinary teaching materials has advantages and can significantly influence students' ability to solve given science problems. The advantages of this LKPD are that it is by the characteristics of students, can adjust to the speed of students' thinking, and facilitates different student learning styles. This research is limited to LKPD based on digital ecosystem materials for class VII junior high school students. It is hoped that further research can develop various teaching material products for other materials so that the availability of teaching materials is more varied. In addition, further research and teachers can continue the development of this digital-based LKPD at the implementation and evaluation stages. The implications of this research are expected to be able to develop teacher creativity in learning so that students are interested and interested in learning and understanding the material well, especially ecosystem material.

CONCLUSIONS

Based on the research and discussion results, it was concluded that the digital-based LKPD validation developed results were declared valid by expert validators and suitable for use through student responses. Using LKPD in learning increases teacher creativity in using various teaching materials. Digital-based LKPD can increase students' interest in learning because the learning process is not monotonous like the conventional models that teachers usually use during learning. The use of the developed LKPD can significantly improve student learning outcomes. Thus digital-based LKPD products for ecosystem material for class VII SMP can be used as good learning media in schools.

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