

Effectiveness of e-LKPD Based on Science Process Skills Assisted Learning Management System Material Semester I Class XI SMA

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Abstract

Background: Test the effectiveness of the electronic student worksheet (e-LKPD). This Research hopes to test the efficacy of e-LKPD based on science process skills. **Methods:** The type of this Research is Research and development, which refers to the kind of ADDIE development (Analysis, Design, Development, Implementation, and Evaluation). The resulting product is an e-LKPD based on science process skills (KPS), carried out effectively by 28 students. The instrument used is a multiple-choice test. Instruments that have been developed for data collection. The resulting data is then analyzed quantitatively. **Results:** The result illustrates that the level of effectiveness of the KPS-based e-LKPD in learning outcomes is at 0.7, which is in the practical category with a moderate level. The PPP-based e-LKPD is effective at a reasonable level. **Conclusions:** Suggestions in this study are that it is hoped that the education office at the southern Sulawesi province level so that skills-based e-LKPD can be used for Biology teachers. Especially those who teach material about the first semester of class XI.

Keywords: Effectiveness; e-LKPD; Science process skills.



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Introduction

Teaching materials are information in the form of tools and texts that educators need as material for designing, planning, studying, and implementing a lesson. There are various principles in developing a teaching material that consists of; (1) Starting from easy things to understanding complicated things, (2) The occurrence of repetition can have an impact on strengthening understanding, (3) The existence of feedback activities can have a strengthening impact on student understanding, (4) Providing learning motivation to students can have an impact on student learning outcomes that will increase, (5) Achieving goals are like climbing stairs little by little, and at the end, it will reach at a high altitude (Depdiknas, 2008).

The role of teaching materials for teachers is to save the duration of teachers learning. Placing teachers as learning facilitators can change learning to be practical and interactive. In addition, teaching materials can play a role in students, such as reading and doing assignments without a teacher, and students can access learning anywhere and anytime. Students can learn depending on the speed at which students learn, the order of teaching students to follow their wishes, and students can test their learning abilities independently (Nana, 2020). According to Sadjati (2012), teaching materials can increase student learning motivation. The right way is to make teaching materials with exciting illustrations and color gradations for students to use in learning. Teaching materials can also explain how to find applications, correlations, and links between one theme and another.

Teaching materials can be used to increase student learning motivation by making teaching materials full of pictures and made in color so that it is interesting for students to know them and is different from the main book, which is standard. Teaching materials can be used to explain how to find applications, relationships, and relationships between one topic and another.

The student worksheet (LKPD) can be interpreted as printed teaching material and contains sheets containing instructions for use, materials, and assignments that students will do that are based on essential competencies (KD). LKPD has a function as a student learning guideline that can make it easier for teachers and students to carry out learning activities (Katriani, 2016). LKPD is a piece of paper that can build a problem-solving scheme and is helpful as a place to record the results of discussions and observations (Nana, 2020). According to Katriani (2016), there are stages in the preparation of LKPD and the structure of LKPD. The stages of LKPD preparation include;

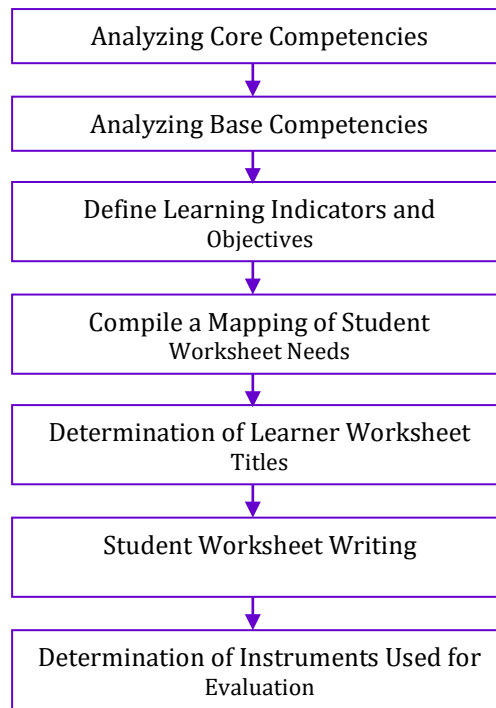


Figure 1. Order of preparation of Student Worksheet

The structure of the LKPD includes; (1) the Title of the activity unit, (2) the Topic, (3) the Sub-topic, (4) the Class, (5) the Semester, (6) Contains topic of the activity that is in line with the demands of KD, (7) Class identity. The structure of LKPD in general is; (1) Activity title, (2) Theme, (3) Sub Theme, (4) Class, (5) Semester, (6) contains the topic of activity following KD, (7) class identity.

The digital era that has transformed information and communication technology (ICT) is known as the era of the industrial revolution 4.0. Human daily activities are preoccupied with the use of technology. One of them is education, which demands innovation in teaching materials. The use of technology in the field of education can have an impact on learning and teaching activities that can run more effectively (Yelianti et al., 2018). Teaching materials' presentation has progressed following technological advances in the industrial revolution era 4.0. Initially, teaching materials were only in printed form. However, digital technology has now transformed teaching materials into electronic teaching materials. Currently, the implementation of relevant teaching materials is electronic because it can make it easier for teachers and students to learn and teach. Even electronic teaching materials are not limited by time and space. One example of electronic teaching materials is e-LKPD.

E-LKPD is a teaching material that has transformed due to computer assistance which was initially printed and transformed into electronics. Various features such as animations, images, and learning videos help students not get bored studying (Hafsah et al., 2016). e-LKPD has content arranged in sequence and then included in the learning activity unit, which is displayed with an electronic display. It contains images, animations, and learning videos that can impact users so that learning becomes interactive and makes learning more interesting (Puspita & Dewi, 2021). Bybee (2012) said that students must develop a scientific understanding and knowledge produced from the scientific investigation process. The way of thinking in science refers to process skills.

Process skills are an approach that focuses on the process of science learning based on the results of observations by scientists (Rusman, 2013). Lederman (2009) reveals that PPP is a skill closely related to scientific inquiry. Ongowo & Indoshi (2013) state that PPP is a fundamental skill that includes observation, inference, measurement, communicating, classifying, and predicting activities. Furthermore, advanced PPP includes controlling variables, operational definitions of variables, formulating hypotheses, making hypotheses, interpreting data, and conducting experiments. In line with this, Adnan et al. (2012) state that students must pay attention to the importance of increasing learning motivation as a tendency to improve the educational process, which is meaningful and has benefits and benefits and always tries to achieve the expected benefits of academism. Learning motivation can be a general trait or situation-specific state if students experience a lack of motivation. This can impact the attention aspect caused by students' difficulty understanding Biology material. According to Adnan & Bahri (2018), Guided Inquiry can make learners motivated and build their intelligent behavior, and motivated to provide ideas for teachers during learning. This refers to the theory of constructivism, namely learning personality, which allows students to explore the material according to the direction given. So that gives them ways and types of resources and can increase self-motivation. Students will feel flexible when doing assignments (Adnan et al., 2017). Then the results of Research conducted by Rukminingsih et al. (2020) regarding the science literacy ability of junior high school students in biology learning in South Sulawesi are still low. This shows that the learning process of biology in junior high school is not related to the real-life context, actual problems, and not the learning goals and needs of learners.

Atiyah et al. (2016) revealed that using PPP-based LKPD allows students to master knowledge. Students can be invited to carry out scientific investigation activities. So that students can carry out activities like a scientist who has a sense of inclination and confidence to be motivated to learn science. And can make students more active in learning and teaching activities. Therefore, the teacher only acts as a facilitator of students in learning and teaching activities. Based on Research by Ardhiantari et al. (2015), student responses to KPS-based LKPD are expected to be exciting, and students are not bored, so it can encourage students in terms of interest in learning. Rakhmi et al. (2017) show that PPP-based LKPD can be used as teaching material.

According to Moore (2005); Sumantri (2015), effectiveness is a condition that describes how far the target (duration, quality, and quantity) has been achieved, or the more significant the percentage level of a goal to be achieved, the higher the effectiveness. According to Hobri (2013), the results of the analysis of student learning outcomes based on individual completion level (KKM) and classical minimum of 80% show that the e-LKPD used is effective in the learning process.

The word practical originated from the English language, meaning adequate to succeed well. Popular scientific dictionaries define effectiveness, namely accuracy of use. Effectiveness is a component that is core to achieving the goals set in each unit of activity. The practical aspect in the field of Research and development is an urgent matter to know the level of application of a theory or model in a specific matter.

Van den Akker in Haviz (2016) states effectiveness refers to the degree of consistency of experience with purpose. Nieveen (1999); Haviz (2016) measured the effectiveness of

the award level in knowing a program and the hope of being able to use the program. In addition, a designed model can be expected to be used sustainably between its expectations and actualization. The hope referred to here is that the use of a product is expected to provide successful outcomes.

Field-tested learning tools if they are not effective; therefore, it is necessary to revise the learning tool. Furthermore, it is validated and tested for practicality and tested for effectiveness again. The effectiveness of this study is in the form of learning outcomes. [Agustanti \(2012\)](#) revealed that learning outcomes significantly change behavior. Learning outcomes, in this case, can be in the form of a daily test result, UTS, and UAS on a material. [Imamah \(2012\)](#) said that learning outcomes are about the results obtained by students on a topic in learning that is tested through a written test. The effectiveness of the PPP-based e-LKPD that has been developed; it is necessary to have practical test activities, thus obtaining an effective PPP-based e-LKPD.

Method

Scope of Research

The subjects of the study were 28 students at SMAN 14 Makassar. Research activities were carried out in August-November 2021. The research instrument used is the test. The data collection technique in this study is a problem; the types of questions made in this study are multiple choices.

Research design

Research and development (R&D) design used in this study. The development model used is ADDIE, with stages in the form of analysis, design, development, implementation, and evaluation.

Research Procedure

The existing research procedures in this study refer to the ADDIE development model. It has five stages: analysis, design, development, implementation, and evaluation. Here's a breakdown of the five stages:

Analyze

This stage includes data collection activities to obtain initial data. This is so that a learning problem in schools can be found. The activities carried out at this stage are needs analysis, goal analysis, and content analysis.

Design

This stage is a form of follow-up activity after the analysis stage. The needs analysis results are then adjusted to the product you want to develop. The design stage consists of e-LKPD design, PPP-based e-LKPD design, and research instrument design in the form of PPP-based e-LKPD validation instruments, teacher response questionnaires, student response questionnaires, and pretest and posttest questions to measure learning outcomes.

Development

This stage aims to realize various stages in the previous stage and obtain the results of PPP-based e-LKPD products. The PPP-based e-LKPD to be developed will meet the criteria, namely: (1) meeting the quality standards of the 2013 curriculum-based learning components, (2) containing discussions that refer to the essential competencies of the material according to the 2013 curriculum, (3) Based on the results of library review activities such as books and journal articles.

Implementation

This stage is carried out when the development activity ends. The implementation stage aims to apply PPP-based e-LKPD in the first-semester material. This stage includes the introduction of e-LKPD to students, practicality test, and effectiveness test.

Evaluation

This stage is the final stage of the ADDIE development model. The evaluation stage includes the overall revision process of the PPP-based e-LKPD product in the first-semester material after seeing the results of the developed products' validity, practicality, and effectiveness tests.

Data Collection and Data Analysis

This study used data analysis, namely N-gain. The average value is followed at the interval for determining the effectiveness category of e-LKPD presented in [Table 1](#).

Table 1. Product Effectiveness Criteria

N-Gain Score	Description
$g > 0,7$	High
$0.7 > g > 0,3$	Medium
$g < 0,3$	Low

Source: [Hake \(1999\)](#); [Savinainen & Scott \(2002\)](#)

Result

The study was conducted on 28 XI MIPA 2 SMAN 14 Makassar students. Students use science process skills-based e-LKPD in learning. Students are given 25 multiple-choice question items, and each question has five choices during the initial test (pretest) and the end of the meeting (posttest). Furthermore, the results are analyzed with the N-Gain test. Data on the results of learning outcomes of students can be seen in [table 2](#) below.

Table 2. Learning Outcomes Test Data

Variable	Value
Number of students	28
Average Value	82,42
Number of students graduating	28
Number of students who did not pass	0

The following is a comparison of the scores of students before and after participating in learning can be seen in [table 3](#) using the N-Gain analysis.

Table 3. N-Gain Score Analysis Results

Treatment	Average Value of Learners	Criteria
Pretest	42,4	
Posttest	82,4	
Gain Score	0,7	Medium

Discussion

Based on student learning results, 28 students achieved a KKM score of 70, so all reached KKM. The percentage of learners who graduate after being taught with PPP-based e-LKPD is 100%. The effectiveness category with a 100% student graduation score after using KPS-based e-LKPD can be categorized as effective because $\geq 80\%$ of students have been in the minimal completion category. Line with the opinion of [Hobri \(2013\)](#), who revealed that the e-LKPD that has been developed is categorized as effective if $> 80\%$ of all subjects meet the category of learning completion.

The Normalized Gain Test (N-Gain) is used to obtain information on changes in student learning outcomes from pretests and posttests. Normalized gain calculates the score by comparing the actual gain value with the maximum gain value (Rusman, 2013a). Based on the N-Gain score analysis results, Table 2 shows that the application of PPP-based e-LKPD can impact student learning outcomes. The number of students with a high N-gain score ($g > 0.7$) was ten people, and the medium category ($0.3 < g < 0.7$) was eight people. The assessment criteria on the normalized gain index are $g > 0.70$ (high), $0.70 \geq g > 0.30$ (medium), and $0.30 \geq g$ (low). Regarding these criteria, the average score of improving learning outcomes after using PPP-based e-LKPD is in the moderate category. However, some critical information is found when viewed from an individual aspect. Of the 28 respondents, ten students (35%) received an increase in the moderate category. Furthermore, 18 students (65%) experienced an increase in the high category.

Based on the description of the learning outcomes test, it can be said that the PPP-based e-LKPD in the first-semester material of class XI SMA / MA that has been developed is in the practical category to be used in the learning process. This is in line with Darmawati's (2019) research results, which revealed that effective teaching materials could impact student learning outcomes. Putra et al. (2016) showed that using LKPD can improve learning outcomes.

The specifications of PPP-based e-LKPD after passing the validation process by expert validators and field trial activities are as follows: (1) e-LKPD based on the PPP approach, (2) e-LKPD allows children to get learning experiences through stages, namely: OIP (Observation, inference, and classification), OIC (Observation, Classification, and Inference) and IDM3 (Variable identification, variable operational definition, Formulating, problems, making hypotheses, interpreting data). So that students do not only do one assignment, such as observation but can do the following assignment, such as classifying inference. (3) e-LKPD is developed concerning constructivist principles, (4) Formulation of indicators and learning objectives in HOTS-oriented e-LKPD, (5) e-LKPD is developed in digital (electronic) form, (6) e-LKPD is developed using the LMS application. (7) Terms of use of e-LKPD are laptops and smartphones with browser applications (Google chrome, safari, Mozilla firefox) connected to an internet connection. (8) e-LKPD can be done online (Online), (9) The design of e-LKPD includes an introduction, core, and closing part. (10) LKPD is also equipped with relevant, exciting images and videos. (11) e-LKPD may act as an evaluation tool. Evaluate the cognitive, attitudinal, and psychomotor abilities of students.

Conclusions

Developing a PPP-based e-LKPD-assisted learning management system with an ADDIE development model is adequate. This can be seen from student learning outcomes at an N-Gain score of 0.7 in the medium category. So that KPS-based e-LKPD in class XI SMA / MA material is adequate.

Declaration statement

The authors reported no potential conflict of interest.

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