Validity Test of Electronic Student Worksheets (e-LKPD) Based on Scientific Processing Skills

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ARTICLE INFORMATION

ABSTRACT

Various types of teaching materials used by educators. One of them is the electronic student worksheet or e-LKPD. The teaching materials must go through a validity test. The purpose of this study was to test the level of validity of the e-LKPD based on science process skills. This research is research and development or research and development. This study refers to the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The product in this study, namely e-LKPD based on science process skills, was validated by 3 expert validators. The instrument in this study was a product validation questionnaire. The data obtained using the developed instrument, then analyzed quantitatively. The results showed that the level of validity of the e-LKPD based on science process skills, which was 4.5, was in the valid category. So that the e-LKPD based on science process skills is valid. The benefit of this research is to see the level of accuracy or validity of teaching materials in the form of e-LKPD based on science process skills so that they can be useful for teachers and students in the learning process.

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INTRODUCTION

Teaching materials are materials that are very important factors for the effectiveness of the teaching and learning process. Lack of teaching materials can have an impact on the quality of learning and teaching (Depdiknas, 2008). Teaching materials developed should complement teaching materials that have deficiencies to achieve goals in the learning process that can be adapted to the characteristics of students, types of subject matter, environmental conditions and can motivate and increase students' enthusiasm for learning in biology lessons (Prastowo, 2014). Appropriate and adequate teaching materials will make it easier for students to understand and accept learning (Zunaidah & Amin, 2016).

One type of teaching material is LKPD (student worksheet). LKPD is a collection of

student activity sheets that allow students to carry out real activities with the objects and problems studied (Prastowo, 2014). LKPD serves as a learning guide for students to facilitate students and teachers in carrying out teaching and learning activities. LKPD can also be defined as printed teaching materials in the form of sheets of paper containing material, summaries and instructions for carrying out tasks that must be done by students, which refers to the basic competencies achieved (Katriani, 2016).

The pandemic in early 2020 was caused by the Corona virus disease 2019 (Covid-19). As a result of the pandemic, the Ministry of Education and Culture issued a policy of learning from home through online or online learning in accordance with (SE Mendikbud No. 24, 2020). Hamdan (2018) digital which is known as the industrial revolution 4.0 has an impact on life. This allows humans to interact in the fields of trade transactions, transportation and education online. One of the right steps so that online learning can run well is to develop electronic teaching materials such as electronic LKPD (e-LKPD).

e-LKPD is a student work guide to make it easier for students to understand learning material in electronic form whose application uses computers, notebooks, smartphones and mobile phones (Putriyana, *et al.* 2020). e-LKPD contains the presentation of teaching materials that are arranged in a coherent manner into certain learning units that are presented in an electronic format in which there are animations, video images that make users more interactive with the program and can make the learning process more interesting (Puspita & Dewi, 2021). The developed e-LKPD presents learning by prioritizing the student center, students' learning skills and helping students to construct their own knowledge.

Constructivistic learning is based on the active participation of students in problem solving, critical and creative thinking (Adnan, *et. al.*, 2014). Constructivist theory is the basis for the development of e-LKPD based on science process skills (Budiningsih, 2008). Because this theory can indicate that students play an active role in learning activities. So that they can actively carry out various units of activity, be active in HOTS-oriented learning, formulate concepts, and give meaning to the things being studied, and can construct their own knowledge ideas through the application of e-LKPD based on science process skills.

Aqsan, *et al.* (2015) stated that the LKPD with the Science Process Skills approach can answer problems in the 2013 Curriculum. This can indicate the ability of science process skills to be possessed by students in learning and requires teachers to develop teaching materials that stimulate student activity in the classroom. LKPD based on science process skills (KPS) can be used as teaching materials, and can improve students' abilities in carrying out learning activities (Rakhmi, *et al.*, 2017).

The application of a less than optimal scientific approach can have an impact on students, one of which is through scientific literacy. In accordance with the results of research by Adnan, *et al.,* (2021) it was found that the scientific literacy ability of junior high school students in biology learning in South Sulawesi was still low. Likewise, Adnan & Bahri (2018) showed that the application of guided inquiry had a positive effect on students' metacognitive skills. The implementation of guided inquiry is proven to be able to empower students' metacognitive skills to be higher than traditional learning.

Learning can be integrated with Information and Communication Technology or ICT with the main target of using technology in learning to introduce, facilitate, assist in improving thinking skills, and help

mastery of subject matter. This can be applied by teachers to build effective and efficient learning. Technology, Pedagogy, and Content Knowledge (TPACK) based learning which is an integration between technology, materials and pedagogy that interact with each other to produce ICT-based learning (Sutrisno, 2011). TPACK is a framework that can integrate aspects of technological knowledge, pedagogy, and content as a whole so that it creates a new way of thinking about combining these three aspects in learning. By integrating the three aspects of TPACK in learning, it can certainly provide variations in learning (Nurdiana, 2016). Therefore, TPACK can be integrated into teaching materials such as e-LKPD.

e-LKPD developed by researchers based on science process skills and based on TPACK. This can be seen from the integration of technology in the form of the Moodle platform, which is part of the system and the learning process is utilized from the Learning Management System (LMS) side. The LMS will be integrated with e-LKPD based on science process skills with material content for the first semester of class XI. So that the TPACK framework is formed and provides direction in ICT-oriented meaningful learning and can improve learning outcomes.

Kusaeri & Supranato (2012) stated that validity refers to the accuracy, meaningfulness and usefulness of a conclusion obtained from the interpretation of the score. Azwar (2014) states that content validity is a validity that is estimated through testing the content of a test with rational analysis or through professional judgment. Content validity is divided into two types, namely face validity and logical validity. Content validity shows that a product developed is based on a relevant curriculum or based on a strong theoretical rationale, while construct validity shows internal consistency between product components (Haviz, 2016).

Akbar (2013) states that expert validation is done by means of a person or several learning experts assessing the product using a validation instrument. Salim (2019) states that a product is valid if it meets valid requirements through an evaluation by an instrument. A valid instrument will get the right or valid data so that it can produce the right research results and conclusions and vice versa (Sugiyono, 2019). Therefore, before using the e-LKPD, validation needs to be done so that the e-LKPD is valid and the learning objectives to be achieved can be achieved. An indication of a valid instrument is if there is a match between the items of the questionnaire and the product as a whole. The purpose of this research is to produce e-LKPD based on valid science process skills. Therefore, it is necessary to conduct a validity test to obtain valid e-LKPD based on science process skills.

METHOD

Types of research

This research is a research and development (research and development). This development research refers to the ADDIE (Analysis, Design, Development, Implementation and Evaluation) model conducted in July-October 2021.

Research subject

The research subjects are 3 expert validator lecturers. The research instrument is a product validation questionnaire.

Data collection technique

The data collection technique used in this research is a questionnaire. The questionnaire used is a validation questionnaire. The data analysis used is validity data analysis. The validity value (Va) or the total mean value is referred to the interval determining the validity level of Hobri (2013) in Table 1 as follows.

Table 1. Product Validity Criteria

Validity Score V_a	Validity Criteria	Information
$V_a = 5$	Very Valid	No revision needed
$4 \leq V_a < 5$	Valid	No revision needed
$3 \leq V_a < 4$	Quite Valid	Partial revision
$2 \leq V_a < 3$	Less Valid	Partial revision
$1 \leq V_a < 2$	Invalid	Total revision

Description: V_a is the value of determining the level of product validity

RESULTS AND DISCUSSION

Validation is carried out on didactic requirements, special didactic requirements, construction requirements, technical requirements, content feasibility aspects, constructivist paradigms, and modifications to the Learning Management System (LMS) software. The results of the e-LKPD validation analysis based on science process skills are described as follows:

Table 2. Results of e-LKPD Validation Viewed from Didactic Requirements

Statement	Value			Average of Each Statement
	V1	**V2**	**V3**	
Suitability of basic competencies and indicators of competency achievement.	5	4	5	4.7
Conformity of indicators of competency achievement with the material.	5	4	4	4.3
Conformity of competency achievement indicators with learning objectives.	4	5	5	4.7
Conformity of learning objectives with assignments.	5	5	5	5.0
Suitability of learning objectives with method.	4	4	5	4.3
The assignments in the e-LKPD are in accordance with the level of the child's development.	5	4	4	4.3
Average				4.6
Category				Valid

The validity of this initial stage of e-LKPD on the aspect of didactic requirements is declared invalid. This is because indicators of competency achievement with basic competencies are not appropriate, indicators of competency achievement with material, and indicators of competency achievement with learning objectives are not appropriate. Input from the expert validator, the e-LKPD is revised and developed according to the advice of the expert validator. After passing the revision stage, the e-LKPD was re-validated and declared valid. Based on the results of the validity of the above, it is caused by the e-LKPD based on science process skills which was developed based on the analysis of basic competencies, there is conformity with indicators, learning objectives, methods and assignments. This is also in line with Fitriana, *et al*., (2019) which states that there is a need for conformity between learning materials and basic competencies and indicators of competency achievement.

Table 3. Results of e-LKPD Validation Viewed from Special Didactic Requirements

Statement	Value			Average of Each Statement	Average of Each Aspect	Category
	V1	V2	V3			
Suitability of characteristics of science process skills with the activities presented by the OKI (Observation, Classification, Inference).	5	5	4	4.7		
Suitability of characteristics of science process skills with the activities presented by OIP (Observation, Information, Prediction).	4	5	4	4.3		
Suitability of characteristics of science process skills with the activities presented by IDM3 (variable identification, operational definition of variables, formulating problems, making hypotheses, interpreting data).	5	5	4	4.7	4.6	Valid
Suitability of the characteristics of science process skills with the activities presented by the OKI (Observation, Classification, Inference).	5	5	4	4.7		

Based on the aspect of special didactic requirements, there is an average value of each statement, which is 4.6 with a valid category. This is due to the suitability of the characteristics of science process skills with the activities presented by the OIC (Observation, Classification, Inference), there is a suitability between the characteristics of the science process skills and the activities presented by the OIP (Observation, Inference, Prediction), the conformity of the characteristics of science process skills with the activities presented by IDM3 (variable identification, operational definition of variables, formulating problems, making hypotheses, interpreting data), the suitability of the characteristics of science process skills with the activities presented by OKI (Observation, Classification, Inference). The presence of patterns of science process skills such as OKI, OIP and IDM3 is something new in educational research. The use of these patterns in assignments can indicate that students will not stop at one stage, eg. observation. Instead, they can continue the assignment to the next stage such as classification activities, even inference.

Therefore a pattern (OKI) is formed and so

are other process skill patterns. Thus, students can improve the understanding and process skills of students' science process skills. This is in accordance with the opinion of Rakhmi, *et al*. (2017) which states that LKPD based on science process skills can be used as teaching materials. And LKPD based on science process skills can improve students' scientific process abilities in carrying out learning activities. Similarly, Atiyah, *et al*. (2016) revealed that the use of LKPD based on science process skills can have a good impact on students, especially in understanding scientific knowledge. Students are invited to conduct scientific investigations so that they can act scientifically and have a sense of interest and confidence to study Natural Sciences. Students are given the opportunity to be actively involved in learning. Thus, teachers can become facilitators of students in the teaching and learning process.

Table 4. Results of e-LKPD Validation Viewed from Construction Requirements

Statement	Value			Average of Each Statement	Average of Each Aspect	Category
	V1	V2	V3			
The clarity of the sentences used is clear and does not have multiple meanings.	4	4	5	4.3		
The presentation of the language according to the EYD spelling.	4	4	5	4.3		
The presentation of the language used is simple, easy to understand, and communicative.	5	4	5	4.7		
The appropriateness of clear sentence structure.	5	4	5	4.7		
The presentation of the language used is in accordance with the cognitive development of students.	4	4	4	4.0	4.5	Valid
Identity compatibility to make administration easier (name, student ID number, class, subject and so on)	5	4	4	4.3		
Suitability of e-LKPD title with the material.	4	5	5	4.7		
Conformity of clear usage instructions for e-LKPD	5	4	5	4.7		

The aspect of construction requirements has an average of 4.5 for each statement, which is considered valid. This is due to the clarity of the sentences used clearly and the absence of double meanings, the presentation of language that is in accordance with the EYD spelling, language that is simple and easy to understand, and communicative. In addition, the suitability of the sentence structure is clear, the identity is appropriate so as to facilitate administration (name, student identification number, class, subject and so on), the suitability of the title of the e-LKPD with the material, the suitability of clear instructions for using e-LKPD, the presentation of the language on the e-LKPD. LKPD based on science process skills is very concerned about the level of cognitive development of students who are in the realm of formal operations. Similarly, Lestari, *et al.* (2018) states that based on the validity value of the linguistic aspect, the LKPD is declared valid if it meets the criteria for the validity of a teaching material.

Table 5. Results of E-LKPD Validation Viewed from Technical Requirements

Statement	Value			Average of Each Statement	Average of Each Aspect	Category
	V1	V2	V3			
Suitability of E-LKPD cover.	4	4	5	4.3		
Suitability between variations in type and proportional font size.	5	4	5	4.7		
Appropriate text and image color selection.	4	4	5	4.3		
Image quality and clarity.	4	4	5	4.3	4.3	Valid
Text eligibility.	4	4	5	4.3		
Background and text color integration.	5	3	5	4.3		
Wuality of illustrations (images, videos, and animations).	4	4	4	4.0		
Appropriate use of terms and symbols.	4	4	5	4.3		

The results of the e-LKPD validation based on science process skills on the technical requirements are declared valid because the illustrations (images, videos, and animations) are not clear, the font type and size are not proportional, while the use of terms and symbols is appropriate. In line with this, Jumairi (2015) stated that the LKPD used as teaching materials should actually contain clear writing and clear images according to the material. This makes it easier for students to learn. Then, the technical requirements of e-LKPD based on science process skills are valid because of the suitability of the quality of the illustrations (images, videos, and animations), the type and size of the fonts are proportional, and the use of terms and symbols is appropriate.

Table 6. Results of e-LKPD Validation in terms of Content Feasibility

Statement	Value			Average of Each Statement	Average of Each Aspect	Category
	V1	V2	V3			
Clarity of topics in E-LKPD based on scientific processing skills.	5	4	5	4.7		
Assignments in E-LKPD based on scientific processing skills are developed with the development of science.	5	4	5	4.7		
Assignments are written in a simple and easy to understand way	4	4	5	4.3		
The illustrations in the science process skills-based e-LKPD are presented clearly and support the assignment description.	5	4	5	4.7	4.7	Valid
Assignment of e-LKPD based on science process skills is developed in a coherent manner.	5	4	5	4.7		
Assignments are given in accordance with the material.	5	5	5	5		

The feasibility aspect of the science process skills-based e-LKPD content has a value of 4.7 with a valid category. This is because the assignments are written simply and are easy to understand, the illustrations in the scientific processing skill-based e-LKPD

presented are clear and support the assignment description, the science process skills-based e-LKPD assignments have been developed in a coherent manner, and the assignments given are appropriate. with material. In line with this, according to the National Education Standards Agency (BSNP), there are four assessment indicators in the preparation of

teaching materials, one of which is the feasibility of the content (Kinanti & Sudirman, 2018). Trianto (2012) argues that valid criteria for teaching materials means that the results of the assessment have provided accurate information about the teaching materials developed.

Table 7. Results of E-LKPD Validation Viewed from the Constructivistic Paradigm

Statement	Value			Average of Each Statement	Average of Each Aspect	Category
	V1	V2	V3			
Stimulating students to be able to construct knowledge.	4	5	5	4.7		
Stimulating students to work together in groups.	5	5	5	5.0		
Stimulating meaningful learning.	4	4	5	4.3	4.6	Valid
Stimulating students to be directly involved in the process of discovering scientific facts, concepts, and principles.	4	5	4	4.3		

The constructivist paradigm aspect has an average value of 4.5 for each aspect with a valid category. This includes stimulating students to be able to construct knowledge, stimulating students to work together in groups, stimulating meaningful learning, stimulating students to be directly involved in the process of discovering scientific facts, concepts, and principles. Subaedah (2016) stated that there was an increase in students' interest in learning, understanding and application of concepts as well as increasing the ability of science process skills in classes that applies a constructivist approach.

Piagnet's theory is the basis for the development of scientific processing skills-based e-LKPD. Because this theory directs researchers in developing products in terms of choosing how to deliver material according to the stages of cognitive development of students at the SMA/MA level. This is in accordance with Ibda (2015) that Piagnet's theory is clearly very relevant in the process of children's

cognitive development. As a result of the presence of this theory, humans can find out that there are certain developmental stages in children's thinking abilities at their level.

Bruner's theory is the basis for the development of e-LKPD based on scientific processing skills, because it can indicate that students can be directly involved in the process of discovering scientific facts, concepts and principles. Thus, students actively build their knowledge base through the OKI, OIP, and IDM3 scientific processing skills patterns. Bruner's theory (discovery learning) contains a pedagogical approach based on constructivist learning theory. This theory, proposes that students actively build their own knowledge base through exploration, experimentation, and reflection (Wang, 2008).

The Ausuble theory is the basis for the development of e-LKPD based on science process skills. The theory directs students to associate new experiences, phenomena, and facts into their knowledge structure, so that

students get a meaningful learning experience through OKI, OIP, IDM3 activities. This is in line with the Ausubel theory, namely that meaningful learning occurs when someone learns by associating new phenomena into their own knowledge structure. In the learning process, a person constructs what he has learned and can associate these new experiences, phenomena, and facts to the structure of students' initial knowledge (Burhanuddin, 2010).

Vygotsky's theory is the basis for the development of e-LKPD based on science process skills. Because the theory directs students to carry out learning activities in groups. Therefore, the implementation of e-LKPD based on science process skills will form small group-based learning. The purpose of forming the group is to make students discuss with each other and exchange ideas in completing assignments on e-LKPD. Thus, a pattern of interaction with each other is formed in students that encourages cognitive development. This is in line with the contents of Vygotsky's theory in the form of part of small group-based learning. Through these groups students can discuss with each other to exchange ideas and findings that can be concluded (Amiruddin & Asikin, 2004).

Table 8. Results of e-LKPD Validation Viewed from Modified Learning Management System (LMS)

Statement	Value			Average of Each Statement	Average of Each Aspect	Category
	V1	V2	V3			
Creativity and innovation	4	2	5	3.7		
Ease of touch and click	4	5	5	4.7		
Clear use instructions	4	5	5	4.7	4.5	Valid
Ease of operation	5	5	5	5		
LMS development opportunities for the development of science and technology.	5	5	4	4.7		

The LMS modification aspect has an average value of 4.5 for each statement with a valid category, which includes creativity and innovation in, creativity and innovation in, clarity of instructions for use, ease of operation, and opportunities for developing LMS for the development of science and technology. Salim (2019) states that the validity of a product if it meets valid requirements through evaluation by an instrument. The tool can be used if it can measure the desired aspect of the researcher and can reveal the data on the variables studied.

CONCLUSION

The teaching materials used in this research are e-LKPD based on science process skills in the first semester of class XI SMA/MA. The value of the results of the validity test is 4.5 with a valid category. So that e-LKPD based on science process skills can be useful for teachers and students in the learning process.

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