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The Development of Electronic Student Worksheets (E-LKPD) based on Scaffolding of Energy Material in Life System Class VII

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Keywords

Live worksheets, Scaffolding, Conceptual understanding, Electronic Student Worksheet

Abstract

The study aims (1) to develop, (2) to determine the feasibility, and (3) to determine the students' responses of electronic student worksheets (E-LKPD) based on the scaffolding of energy material in life system class VII. The research method of this study was developing the instructional design ADDIE model, which includes analyze, design, development, and evaluation stages. This research only reached the development stage. This research was conducted in class VIII. Observation, interviews, and questionnaires were the data collection techniques. 10 students filled out the response questionnaires. The data analysis technique used in this research is V Aiken and descriptive statistical data analysis techniques with a likert scale. The results showed that (1) has been produced electronic student worksheets (E-LKPD) based on scaffolding to increase of energy material concepts in life system class VII, (2) has a validity value of 0,86 with category of "high validity", (3) students said that the E-LKPD IPA is interesting with the proportion of student responses as a whole of 85,56. This study concludes that an E-LKPD based on scaffolding of energy material in life system class VII is feasible to use. Students gave an interesting response to the developed E-LKPD IPA.

Introduction

The demands in the educational world of the 21st century is increasing. As information technology has developed and many routine operations are being replaced by machines. The 21st century was also known as the time of knowledge (knowledge age) where the pursuit of the necessities of life was based on knowledge (Wijaya et al.2016). Nowadays, everyone must have to possess the critical thinking ability, knowledge, and digital literacy, information literacy, media literacy for master today's rapidly expanding information and communication technologies (Widyawati et al., 2022). Education is therefore urgently needed to transfer it. The covid-19 pandemic in 2020 brings the need for learning innovation which enabled the learners to achieve the desired learning/knowledge goal.

One of the learning innovations that a teacher can develop is the teaching material. It is one of the essential parts for teachers in carrying out the learning process. Teaching materials are used to help teachers deliver lesson materials to learners in order to accomplish the purpose of learning. The development of teaching materials makes learning more fun, effective, efficient, and less than intended learning (2020). It can be a bridge for learners to discover the concepts of materials being taught. Therefore, the selection of teaching materials that meet the needs of learners is needed to achieve the purpose of learning by keeping the material pleasant.

The most appropriate teaching material in the 21st century is that it comes in digital form for learners who are performing remote learning. With the teaching materials digitally available, learners can access them independently using their smartphone or PC. Today's learning technologies also stress more on digital and paperless platforms. This is supported by a study by Widyawati and Sujatmika (2020), which states that currently communities have turned to digital and eco-friendly media. Using digital platforms, they can be combined with visual media such as images, audio, and even videos that make it easier for learners to understand the material. This coincides with the study Widyawati et al. (2020), which suggests that visual media is one of the alternatives to information, stating that it can explain in detail phenomena that students cannot directly encounter. Some learning materials that discuss phenomena not always met by learners are science-learning materials.

Science is one of the many subjects that contain both abstract and microscopic matter. Science is much verbal, whereas the natural phenomena discussed are both visible and invisible when we want them. If the teacher is not good at picking words and also the right teaching material, it will bias her understanding of her own physical concept (Febriandika al 2016). One of the abstract and microscopic natural science materials is energy matter in the living system, where there are abstract energy accounting materials, a microscopic process of respiration and photosynthesis.

Based on the interviews and observations at one of the junior high schools in DIY, it was found that only 45% of learners scored above KKM on the daily assessment of energy materials in the life system. At the time of final assessment, there are still many learners who answer outmatch the material or participants who do not answer according to the concept. This proves that understanding of participants' concept of energy materials in living systems is still low. Energy materials in life's system are viewed as difficult for learners because they are microscopic and abstract. Therefore it takes appropriate teaching materials for learners in current remote learning. Selected teaching materials will affect the motivation, interest, and also the results of learning learners (Widyawati& Prodjosantoso, 2015)

One of the teaching materials that can be used in remote learning is e-l. The learner's worksheet helps learners understand the material because both the learner works the lesson and practices the experiment (Muzayyanah, 2020). This coincides with the study carried out by open and al (2022), which states that the sheet of learners can make learning easier and thus establish effective interaction between learners and educators. It can increase learners' activity in improved learning results. E-lunto can make it easier for teachers and learners to deal with long-distance learning because using smartphones or PC, learners can access the teaching materials the teacher shares via electronic messages. Especially in the condition of the covid-19 pandemic that causes learning to be online, it is best to be packed digitally so that it is accessed online using a mobile phone or computer called E-LKPD (Oda et al., 2022). There are various attractive platforms for creating e-lsheet. However, liveworksheet is a convenient platform to become an e-to-go container by having interesting tools that keep learners bored

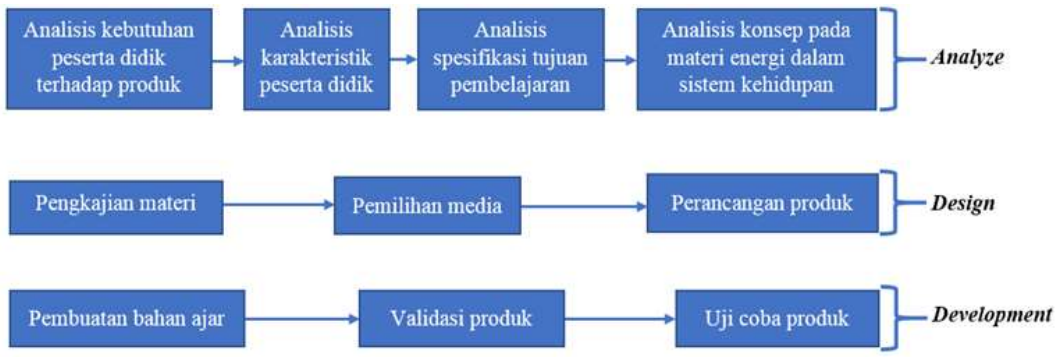
and able to understand the concepts being taught. It is also easy for the teacher to correct the assignment because there are tools that automatically correct the student's answers with an e-lyan packaging.

One of the learning models that can help learners understand the concept of scaffolding, where learners actively use their mental processes to find concepts that are being studied with help if learners need them. Once the learner has the ability to do this on his own, the assistance will be reduced. Scaffolding in the education world could be interpreted as a teacher who created the initial construction to maintain learners so successfully accomplish their assignments. After the trainees had finished the job, the scaffolding was gradually deleted (Kusmaryono et. 2020). Help can be instruction, encouragement, warnings, outlining the problem into breakthrough steps, setting examples, and other actions that enable learners to learn on their own (Nurdyanshah & Fahyuni, 2016).

Based on the description, it requires digital-based teaching to support the abstract and microscopic process of study for science. The study is intended to produce a teaching product that is e-lt-based scaffolding for energy materials in the life system for class vii that is worthy of use and attractive to learners.

Method

Research methods in the study are development studies with five-stage addie models: comprehensive (analysis), design (design), development (development), implementation (implementation), and implementation (evaluation). The study uses the Addie model because every step being taken clearly and meticulously. This is due to an evaluation in every stage of producing a maximum product. In this study, Addie's model is modified with only the development of development, because time and cost limitations and development research are devoted only to the research subject.



The development research stages described below:

1. Analysis (analysis), at this stage is the gathering of information from teachers and learners through observation and interviews. At this stage is the characteristic analysis of learners, the specifications for the purpose of learning, the concept analysis of energy materials in the life system. At this stage it also analyzes the learners' need for text-based materials on scaffolding.

2.The design, at this stage of materials study, the appropriate media selection for the development of the teaching material and the latter for the design of the material. At this stage it is still conceptual.
3. Development (development), at this stage is implementing the design of the teach material to be prepared for implementation, the validation of the products to the experts, two professors and two science teachers, and the test of the teach material e-lto-a technology-based scaffolding material in class VIII's system by 10 heterogenetically chosen learners.

The instruments used in this study are observation sheets, interview sheets, validation sheets, and protege response tests. The results of the given instrument are used to analyze, know the worthiness of the E-LKPD being developed, and as a consideration ingredient in the improvement of the e-lonto science. The instruments were developed using the likert scale. The data analysis used to know the worthiness of v Aiken, while to know learners' responses uses descriptive statistics.

Results and Discussion

In the study, this study produced teaching material E-LKPD IPA based *scaffolding* in the class VII SMP/MTs. The development of this teaching material uses the ADDIE development model which is modified only until the development. only due to time and cost limitations and this development is devoted to research subjects only.

To know the feasibility of the E-LKPD product developed, the product is validated by two professors and two science teachers. Based on the results of validation analysis using v Aiken, the total mean of 0.86. The mean according to the category suggested by Retnawati (2016) indicates a high category. There are six aspects to assess the feasibility of the e-lonto science that are developed include presentation, assessments, scaffolding approaches, language, graphing and symbolism, and operation.

No	Aspect	Average of each aspect	Total average
1	Presentation	0.90	0.86
2	Content feasibility	0.85	
3	approach *Scaffolding*	0.81	
4	Language	0.88	
5	Graphics and symbols	0.91	
6	Operational	0.89	

To find out students' responses to the developed Science E-LKPD, the product was tested in response to 10 class VIII students. The results of the analysis of student responses to the IPA E-LKPD, which was developed using descriptive analysis showed that the IPA E-LKPD based scaffolding in the seventh grade living system was stated to be attractive with an overall percentage of 85.56. There are 5 components to determine the response of students to the developed Science E-LKPD including presentation, operations, materials, language and scaffolding. The percentage of students' responses to the developed IPA E-LKPD.

No	Component	Average of each aspect	Percentage of each aspect	Overall percentage
1	Presentation	3,43	85,9	85, 56
2	Operational	3,34	83.5	
3	Material	3,43	85.8	
4	Language	3,5	87,5	
5	*Scaffolding*	3,4	85	

This study uses 3 stages, namely analyze, design, and development (development).

a.Analyze (analysis)

At the analysis stage, the researcher identifies the problem from the research results. The analysis step consists of several steps, namely analysis of the causes needed for product development, analysis of student characteristics, analysis of learning objectives, and analysis of the concept of energy in living systems.

At the analysis stage through observation and interviews, information was obtained that students had difficulty doing PJJ. As in the research conducted by Putria et al (2020) that online learning still has many obstacles. The participation of students in learning does not reach 100%. Students feel bored and bored. The enthusiasm of students is decreasing day by day because they are given assignments every day and cannot interact with their friends. In the analysis of observations and interviews in one of the junior high schools in Yogyakarta, students are quite diligent in doing assignments, but the results of their work are not all as expected. Students' answers are still far from the expected level of answers. Students need innovative teaching materials that are more interesting and clearer so that students understand the material provided. This is corroborated by research from Nurrita (2018) which shows that with the renewal of teaching materials, students can better understand learning easily, students' learning efficiency can increase according to learning objectives, provide a comprehensive experience in learning, and students are active. follow and be directly involved in the learning process so that their potential and creativity will develop.

At the stage of analyzing the characteristics of students, information was obtained that the characteristics of students seen from their cognitive abilities showed that only 45% of students scored above the KKM in the daily assessment of energy materials in living systems. Some of the sub materials in the energy matter in living systems are microscopic and abstract. Students are given material contextually and have not linked the material to everyday life. Therefore, the level of understanding of students' concepts is still lacking. It takes teaching materials that can facilitate students to explore the abstract and microscopic material so that students understand the concept of energy-matter in living systems during PJJ.

Analysis of learning objectives is carried out after knowing the problems and needs of students. This analysis will produce a product in the form of learning objectives. The learning objectives compiled refer to the 2013 curriculum and a copy of the Regulation of the Minister of Education and Culture of the Republic of Indonesia No. 37 of 2018 concerning Amendments to the Regulation of the Minister of Education and Culture No. 24 of 2016 concerning Core

Competencies and Basic Competencies of Lessons in the 2013 Curriculum in Basic Education and Secondary Education.

Analysis of the concept of energy-matter in living systems is carried out to select and systematically compile material concepts based on KI and KD curriculum 2013. The sub-materials discussed in the products developed are concepts and forms of energy, energy sources, food as an energy source, and transformation and metabolism.

b. Design (design)

The design phase begins with the design of products that are developed in accordance with the results of the analysis carried out previously. The design stage consists of several steps, namely material assessment, media selection, and product design.

1) Material

assessment is carried out by reviewing material through books, e-books, and other relevant learning resources for the product being developed.

2) Selection of media

The selection of media used to develop products must be in accordance with the needs of students. Liveworksheet was chosen to be used as a learning medium because students have used it before. In addition, the liveworksheet platform does not require a lot of quota to access it. Students can access it by clicking on the link shared by the teacher.

3) Design

The product developed in this research is E-LKPD IPA based scaffolding in the seventh grade living system. At this stage, a product design will be made including cover design, book identity, and others the evaluation.

c. Development (development).

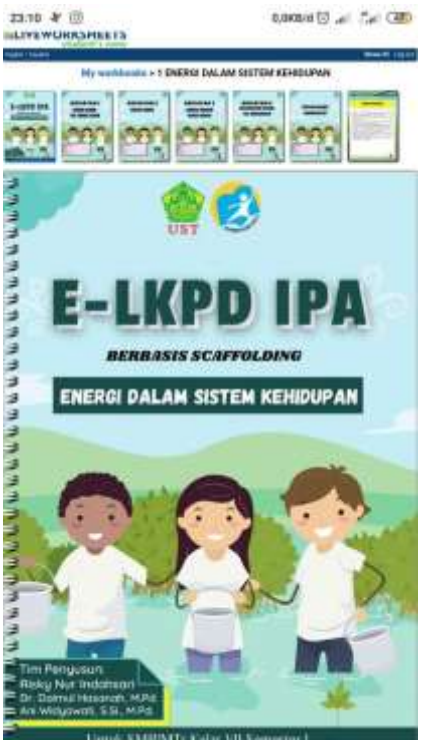
The development stage is the realization stage of the developed product. There are three steps, namely the manufacture of teaching materials, product validation, and test of students' readability responses to the scaffolding class VII. The validation process uses instruments that have been prepared in the previous stage.

1)Making teaching materials

The teaching materials developed are E-LKPD IPA based on the scaffolding of energy materials in living systems. These electronic teaching materials are created using the Canva platform and then transferred to the liveworksheet platform. In the developed IPA E-LKPD there is a

(a) Cover
(b) Foreword
(c) Table of contents
(d) Description of the scaffolding
(e) Content standards
(f) Concept map
(g) Learning instructions Learning
(h) activities consisting of 4 activities
(i) Evaluation
(j) bibliography
(k) About the compiler

To access the developed IPA E-LKPD, students were given a link by the teacher via whatsapp groups. Each student is also given a username and password by the teacher. The display of the developed IPA E-LKPD.



2) Product Validation

Product Validation of the developed IPA E-LKPD product was then assessed for its feasibility by science Education experts and as many as four validators using a validation sheet. There are six components tested in the validation sheet, namely the presentation component, content feasibility, scaffolding approach, language, graphics and symbols, and operations. Table 1. shows that the developed IPA E-LKPD has an overall average of 0.86 in the high category. The high category is in accordance with the validity clarification table by Retnawati (2016). In the aspect of presentation with five questions, an average of 0.90 was obtained. In the aspect of the feasibility of content with 11 questions, an average of 0.85 was obtained. In the aspect of the scaffolding with four questions, an average of 0.81 was obtained. In the linguistic aspect with five questions, an average of 0.88 was obtained. In the aspect of graphics and symbols with five questions, an average of 0.91 was obtained. In the operational aspect with four questions, an average of 0.89 was obtained. This shows that the developed IPA E-LKPD is declared very feasible to be a science learning teaching material.

3.) The Trial

The trial of the IPA E-LKPD product that has been validated by science education experts is then tested on class VIII students to determine the student's response to the developed IPA E-LKPD. Class VIII was chosen to respond to the readability of the product developed because students have already received the material so that students can determine which teaching

materials are suitable for them to get. Students are given a response questionnaire in which there are five aspects, namely aspects of presentation, operation, material, language, and scaffolding. Table 3. shows that the percentage of overall student responses is 85.56 with very good criteria. The excellent criteria are in accordance with the criteria for the percentage of student response test questionnaire results, according to Sudijono (2015). In the aspect of presentation with six questions, a percentage of 85.9 was obtained. In the operational aspect with five questions, a percentage of 83.5 was obtained. In the material aspect, with three questions, the percentage is 85.8. In the aspect of language with four questions, a percentage of 87.5 was obtained. In the scaffolding with two questions, a percentage of 85 was obtained. From these results, it was concluded that students were interested, could operate the E-LKPD well, and were interested in the IPA E-LKPD which was developed because it was rarely used.

E-LKPD IPA based scaffolding on energy materials in living systems is an innovation of teaching materials during the pandemic. Electronic student worksheets can make the subject matter livelier, deeper and increase the innovation and creativity of students so that students better understand the material provided and learning objectives can be achieved (Lathifah et al, 2021). The existence of assistance (scaffolding) such as outlining the problem into steps and providing examples in the developed IPA E-LKPD, students can be motivated, challenged to solve problems through an invention (Mendez, 2008). With this assistance, it is hoped that students will be able to better understand the concept of energy in living systems.

Students can access the IPA E-LKPD with the link shared by the teacher via the whatsapp group shared by the teacher. During the validation process with the science teacher, the teacher stated that currently, electronic-based teaching materials are still rare. The development of teaching materials such as the E-LKPD IPA is a good innovation to better understand students and motivate students to learn wherever and whenever they are. Students do not have to be present at school to learn the material. Students use the developed IPA E-LKPD and also follow the instructions provided. With this IPA E-LKPD, students are directed to analyze and conduct experiments in accordance with the KI in the 2013 curriculum.

Students are interested in using the developed IPA E-LKPD. There are many tools, such as matching answers, drag and down, check boxes, crossword puzzles, that make students like playing games. There are videos that can give students more understanding because they implement the material in everyday life. The operation of the IPA E-LKPD is also easy for students because students are used to using the live worksheet platform. Learners can access the E-LKPD IPA through a PC or smartphone. This research is supported by Nurul Wahyuni (2021) who states that the live worksheet is appropriate and effective to use because it raises the enthusiasm of students. Students are motivated to use the IPA E-LKPD which was developed using a live worksheet, because there are many tools that make them like playing. In addition, Dina and Putri (2022) state that interactive worksheets based on live worksheets can be used by educators in both offline and online learning. With live worksheets , teachers can develop their creativity to create interesting learning.

Conclusion

This research has produced a product in the form of E-LKPD IPA based scaffolding on energy material. In this study, development only reached the development stage. The developed IPA E-LKPD is feasible to be used as teaching material in science learning and has a validity with a high category of 0.86. Students' responses to the developed IPA E-LKPD showed that students were interested, could operate the E-LKPD well, and were motivated to learn to use the IPA IPA E-LKPD based scaffolding in the seventh grade living system because these teaching materials were rarely developed.

Recommendations

The researcher believes that the advancement of information technology in the 21st century requires paperless, real-time support, and that it is interesting to be a companion protege during the learning process.

Therefore, the following recommendations are made:

First recommendation: electronic instructional materials in the 21st century, electronic instruction had to be easily accessible at all times and from anywhere. Additionally, electronic instruction is paperless and increasingly paperless.

The second recommendation is the need for scaffolding learning models.
With the knowledge of scaffolding, 2013 curriculum-aligned independent learning is possible for students. The center of learning is no longer the teacher, but the student. This made students more engaged in conceptualization. When the students could not help, the instructor stepped in.

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