Edutech 21(2), 2022

EDUTECH

Journal homepage : http://ejournal.upi.edu/index.php/edutech/index

DEVELOPMENT OF ELECTRONIC STUDENT WORKSHEETS THROUGH NATURAL SCIENCE PROJECT-BASED LEARNING IN ELEMENTARY SCHOOL

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Abstract. This research aims to produce project-based learning-based electronic learner worksheets as a support for natural science learning materials in the fifth grade of elementary school. Methods used by Research & Development using an approach developed using; Analyze, Design, Develop, Implementation, and Evaluation (ADDIE). This research was held at Munjul State Elementary School 01 East Jakarta. The steps in this study are 1) Conducting needs analysis through interviews and questionnaires, 2) Making product designs, 3) Conducting product development, 4) Conducting trials to learners and 5) Evaluating products. The object in the study was 30 elementary school fifth graders, data analysis techniques using interviews and questionnaires. The results of the development trial were evaluated by media experts 88.5% material experts 84.61% and linguists obtained from an average score of 92.3% with excellent categories, then the results of product trials through one to one got a score of 83.75% with excellent categories and product trial results through small groups got a score of 88.33 % with very good category. This research shows that project-based learning-based electronic learner worksheets are feasible to be used for learning media as an additional source of fifth-grade elementary school natural science learning.

Informasi Artikel :
Artikel diterima
Perbaikan 21 April 2022
Diterbitkan 29 Mei 2022
Terbit Online 29 Juni 2022

Kata kunci: Electronic Student Worksheet, Project Based Learning

A. INTRODUCTION

The advancement of science and technology globally, has affected all aspects of life, one of which is in the field of education. Technological progress is something that we cannot avoid in this life, because technological progress will go hand in hand with the advancement of science. The existence of technological advances in education has dynamic changes that require students to have creative thinking skills, non-routine thinking skills and have new ideas in dealing with every problem (Surmilasari et al., 2022). Every innovation is designed to bring positive benefits to human life. Various conveniences and new ways in the world of technology, especially the field of education, education is directed to create curiosity in the minds of students and the use of technology can help students understand and maintain concepts better (Raja & Nagasubramani, 2018).

Education is a conscious effort to prepare students through guidance,

 DOI:https://doi.org/10.17509/e.v21i2.46074

teaching, and training activities for their role in the future. The school as a formal education, systematically plans an educational environment that provides various opportunities for students to carry out various learning activities (Susandi & Widyawati, 2017). Therefore, the world of education requires innovation that is in line with the progress of science and technology without neglecting human values. The process and its application must also have maximum renewal, meaning that education must be able to prepare provisions for students to face the current conditions. If education fails to carry out its duties, this means also failure in the lives of students (Ketut Sri Puji Wahyuni et al., 2021).

One of the subjects in the 2013 curriculum is natural science. Natural science occupies an important role in the world of education because it becomes the basis and development of other sciences (Putra & Anggraini, 2016). According to (Fitri et al., 2020) learning natural sciences is still considered difficult by some learners. Given the importance of these lessons, it is highly expected that the role of a teacher in order to determine the approach or model of learning that can change the mindset and views of students towards natural sciences (Saparwadi, 2016). Students need to need science process skills in the learning of natural sciences. Science process skills can enable learners' learning in the learning process from experience, emphasizing the harmonious relationship between learning, work, and other learning activities to create or find the knowledge sought (Kastawaningtyas & Martini, 2017). Science process skills also have the potential to develop curiosity in life through scientific attitudes and knowledge gradually (Fransiska, Subagia, et al., 2018).

Natural science emphasizes scientific learning, which involves all aspects of students' ability to process problems and seek information, with the aim that students can think actively, creatively, critically, and solve problems around them scientifically (Widiyanti & Fitrotun Nisa, 2021). Therefore, the process of learning natural sciences carried out in schools must be able to facilitate students to develop their competencies in order to understand the environment scientifically. The material to be used in the study of natural sciences is the respiratory system in humans.

Natural science is essentially a scientific inquiry that provides a direct learning experience through the use of

 DOI:https://doi.org/10.17509/e.v21i2.46074

the development of process skills and scientific attitudes, one of the scientific inquiry learning models is project based learning (Apriany et al., 2020). Project based learning is a learning model that is suitable for all levels of education, because according to (Etherington, 2011) explaining learning with project based learning makes students can understand a problem and find solutions so that students learn to be means. Project based learning where the project is not as a goal, but a tool that emphasizes aspects of the learning process (Tasc1, 2015). So it can be concluded that, project based learning is a learning method that uses projects as a medium created by students so that students are able to construct their knowledge and skills well.

Project-based learning organizes learning around projects that engage students in real-world situations where they can explore and apply topics to solve complex problems related to the professional practice they are preparing for (Chiang & Lee, 2016). Learning with project-based learning has a positive influence on teachers and learners. Learners are more active in the learning process, because the project involves the learner as a whole and the context of the material taught according to the real world, as well as teachers will more easily interact and be close to students, encourage students to work well, work meaningfully, and find problems to find (Anazifa & Hadi, 2016). Project based learning is a learning model that is used not only to assess cognitive aspects, but also to assess student work. Project based learning is in accordance with the learning of natural sciences, because it encourages students to discover the facts of a phenomenon or event.

The key to success and progress for the nation is the existence of education that creates more effective methods or applications of learning in accordance with the times (Rahmadhani et al., 2021). Learning can be done well if the learning device or media used is in accordance with the purpose. Supporting media used in learning has utilized technology, it's just that students have not fully trained themselves by trying to practice questions independently to improve critical thinking. The learning resources used by students in the learning process only rely on package books that have been available by the school. The learning resources used are narrative, but books have benefits for their readers, because this narrative nature will cause learners to have difficulty constructing the information contained in them (Fitriyah & Ghofur, 2021), a good

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solution or method is needed to solve the problem.

The solution to the problem can use learner worksheets in the learning process. The teaching materials are designed by utilizing technology accompanied by materials, question exercises, and worksheets to support students in improving critical thinking skills. The method is then packaged in teaching materials in the form of electronic learner worksheets that contain materials and questions that are packaged with project-based learning that utilizes technology in the form of mobile learning. Learning using mobile learning is expected to have a positive impact on students because the learning process is not limited by space, anytime, anywhere (Warsita, 2018). The solution to the problem can use learner worksheets in the learning process. The teaching materials are designed by utilizing technology accompanied by materials, question exercises, and worksheets to support students in improving critical thinking skills. The method is then packaged in teaching materials in the form of electronic learner worksheets that contain materials and questions that are packaged with project-based learning that utilizes technology in the form of mobile learning. Learning using mobile learning is expected to have a positive impact on students because the learning process is not limited by space, anytime, anywhere (flexibel).

Several previous studies that developed project-based learning-based electronic learner worksheets showed positive results. (1) Research by (Ramadianti et al., 2021) on "Development of Lkpd Based on Project Based Learning Model to Improve Mathematical Creative Thinking Ability of Grade V Elementary School Students". The results of data processing show that the development of project-based learning-based learner worksheets is "very good and feasible", it can be concluded that project-based learning-based student worksheet products can be used as teaching materials in learning because they meet feasible, practical, and effective criteria.

(2) Research (Sholihah & Purwanti, 2021) mengenai "Pengembangan Lembar Kerja Peserta Didik Elektronik dengan Pendekatan Stem Berbasis Poject Based Learning Materi Energi dan Pemanfaatannya" obtains average score results by media experts, material experts, and linguists who fall into the category of "excellent" in other words worthy of teaching

materials. This research shows that the development of electronic learner worksheets is worth using.

Researchers sought to design learning media with participant worksheets with characteristic project-based learning in the fifth grade of elementary school using respiratory system materials in humans. This electronic learner worksheet is expected to be a useful and innovative product, especially for natural science learning activities in the fifth grade of elementary school.

Based on the results of research that has been presented on the development of project-based learning electronic learner worksheets, it shows that it is feasible to apply to students. Researchers strive to design electronic learner worksheets using project-based learning. As for the novelty of this study, researchers will conduct research in the development of project-based learning-based electronic learner worksheets on natural science subjects in respiratory system materials in humans, including the content of materials in the form of videos, quiz questions, project-making practice videos, and evaluation questions. Based on the description above, researchers are interested in conducting research on developing project-based learning electronic learner worksheets through natural science subjects in the fifth grade of elementary school.

B. METHODS

The purpose of this development research is to produce project-based electronic learner worksheets based on learning digestive system materials in humans in the fifth grade of elementary school natural science learning. The research was conducted on fifth grade students at SDN Munjul 01 Pago, East Jakarta in 2022. The research method used in this study is R&D (research and development). The development model used is ADDIE with 5 stages 1) analysis, 2) design, 3) development, 4) Implementation, 5) Evaluation.

1. Analyze

At this stage, the main activity is to analyze the need for the development of new learning media and analyze the feasibility of developing project-based learning-based electronic learner worksheets. This analysis is done by way of interviews and literature studies.

2. Design

Draw up a teaching material creation plan that begins with compiling and designing a student worksheet creation framework using canva. After that, researchers collect material

 DOI:https://doi.org/10.17509/e.v21i2.46074

materials about the digestive system in humans, collect image designs and questions as evaluation materials tailored to core competencies (KI) and basic competencies (KD), natural science lessons, theme 2 clean air for health, subtheme 1 how the body processes clean air?

3. Development

At this stage, researchers began to develop project-based learning electronic learner worksheets through liveworksheets, which previously the learner worksheets had been designed using canvas into ready-made products. The initial design has been completed and will then lead to a validation process by media experts, material experts and linguists to find out the level of feasibility of using assessment instruments.

4. Implementation

At this stage, the product is tested to students and teachers of the fifth grade of elementary school after improvements.

5. Evaluation

At this stage, products that have passed the trial will be implemented in real terms in the class intended as the subject of research. After the electronic learner worksheet is applied in learning, an initial evaluation is carried out to provide feedback on the learning media.

The data analysis technique used to perform data analysis is quantitative descriptive statistics. Assessment uses a rating scale, which is raw data obtained in the form of numbers and then interpreted in a qualitative sense. The assessment uses a rating scale on a scale of 5 consisting of a scale of 1 for Very Less, a scale of 2 for Less, a scale of 3 for Enough, a scale of 4 for Good, and a scale of 5 for Very Good.

Here is the rating scale that is used as a guideline in interpreting eligibility:

Table 1. Rating cale

No	Percentage	Eligibility Categories
1.	81% - 100%	Excellent
2	61% - 80%	Good
3.	41% - 60%	Enough
4.	21% - 40%	Less
5.	0% - 20%	Very less

 DOI:https://doi.org/10.17509/e.v21i2.46074

C. RESULT AND DISCUSSION

This development research uses an ADDIE model consisting of five stages. The stage consists of analyzing research needs, designing products and compiling instruments, actualizing products and validation of experts, student trials, and evaluations. The development of project-based learning electronic learner worksheets through liveworksheets begins with the creation of covers, instructions for using student worksheets, activity sheets, evaluation questions. The display of electronic student worksheet products based on the scientific approach of digestive system materials in humans can be seen in Figure 1, Figure 2, Figure 3, and Figure 4.

Figure 1. Electronic student worksheet cover display

Figure 2. Electronic student worksheet instructions for use display

Figure 3. View of material via video

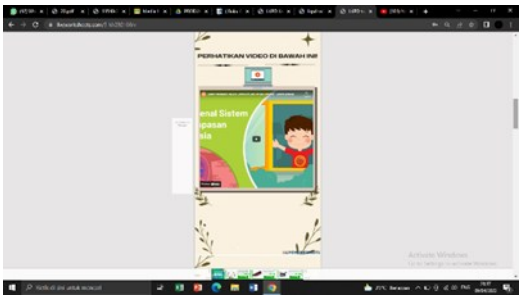

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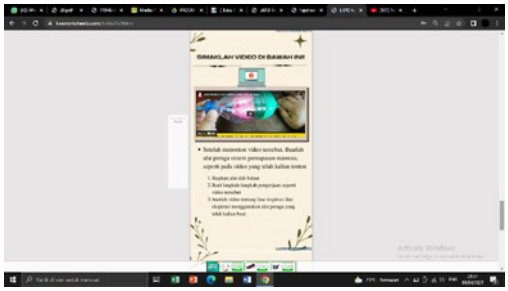
Figure 4. Quiz question view

Figure 5. Project creation video view



Validation of this learning media is carried out on one media expert, one material expert and one linguist, this validation is carried out to measure the validity level of electronic student worksheet that has been developed. Instruments for validation in the form of questionnaires, interactive learning media development assessment activities based on scientific approaches aim to collect data as a basis for determining the feasibility of products to be used in learning. Determination of the criteria for the level of validity and revision of products as presented in the following table:

Figure 5. Project creation video view

No	Aspects	Number of Items	Kriterium Score	Number of Experts	Total Value	%
1.	Student worksheet size	1	7	1	6	85%
2.	Student worksheet design	10	50		42	84%
3.	Meet user needs	2	15		14	93%
4.	Vidio view	3	15		15	100%
Sum		16	87	1	77	-
Average			88,5%			
Criterion			Excellent			

 DOI:https://doi.org/10.17509/e.v21i2.46074

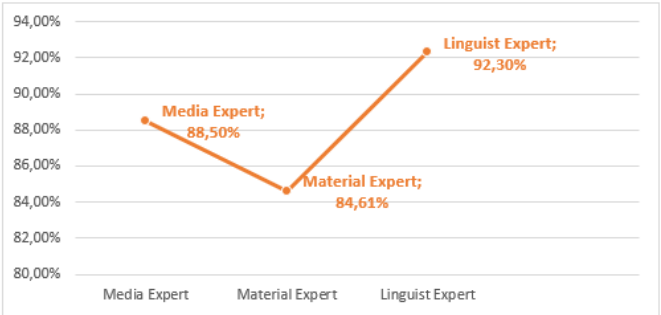
Table 3. Material Expert Test Results

No	Aspects	Number of Items	Kriterium Score	Number of Experts	Total Value	%
1.	Eligibility of content	5	30	1	25	83%
2.	Eligibility of presentation	3	20		17	85%
3.	Graphicness	3	15		13	86%
Sum		11	65	1	55	-
Average		84,61%				
Criterion		Excellent				

Table 4. Linguist Test Results

No	Aspects	Number of Items	Kriterium Score	Total Value	%
1.	Sentence structure	1	5	5	100%
2.	Sentence effectiveness	1	5	5	100%
3.	Terms used	1	5	4	80%
4.	Communicative language	1	5	5	100%
5.	Dialogical and interactive	3	15	13	86%
6.	Conformity to the level of student development	2	10	9	90%
7.	The blurriness and cohe-siveness of the thougt	2	10	9	90%
8.	Spelling accuracy	2	10	10	100%
Sum		13	65	60	-
Average		92,3%			
Criterion		Excellent			

Chart 1. Expert Validity Results Data



 DOI:https://doi.org/10.17509/e.v21i2.46074

Table 5. One to One Test Results

No	Aspects	Number of Items	Kriterium Score	Number of Respondents	Total Value	%
1.	Presentation of materials	3	50	3	42	84%
2.	Visual	4	65		52	80%
3.	Use of Student worksheet	1	15		13	86,6%
4.	Attractiveness of Student worksheet	1	15		12	86,6%
5.	Benefits of Student worksheet	1	15		15	100%
Sum		10	160	3	134	-
Average		83,75%				
Criterion		Excellent				

Table 6. Small Group Test Results

No	Aspects	Number of Items	Kriterium Score	Number of Respondents	Total Value	%
1.	Presentation of materias	3	90	6	80	88,8%
2.	Visual	4	120		110	91,6%
3.	Use of student workshet	1	30		25	83,3%
4.	Attractiveness of studet worksheet	1	30		24	80%
5.	Benefits of student worksheet	1	30		26	86,6%
	Sum	10	300	6	265	-
	Average			88,33%		
	Criterion			Excellent		

The development of project-based learning electronic learner worksheets is useful in learning for teachers and learners can make it easier for teachers to convey materials and as supporting materials about the digestive system in humans. Learners can also be motivated to learn because of the attractive design of electronic learner worksheet displays. Based on the results of research and development that has been carried out by researchers, project-based learning-based

 DOI:https://doi.org/10.17509/e.v21i2.46074

electronic learner worksheets that have been developed are preferred by learners and can deliver materials appropriately.

D. CONCLUSION

Based on the results of development research and discussion about the development of project-based electronic learner worksheets on natural science learning, the conclusions that can be drawn from this study are as follows:

This project-based learning electronic learner worksheet development procedure uses the ADDIE development procedure. The development step of electronic learner worksheets is carried out starting from the analysis stage to the development stage, namely expert validation. Based on the development stage, project-based electronic learner worksheets are produced on learning natural sciences digestive system materials in fifth grade elementary school humans.

The feasibility of project-based learning-based electronic learner worksheets based on expert assessment of materials reached an average percentage of 84.61% with interpretation criteria is very feasible, media experts provide assessments with an average percentage of 88.5% with very feasible criteria and linguists provide an average percentage of 92.3% with very decent criteria. Thus both the material, media and language e worksheets of project-based learning-based electronic learners have very feasible criteria.

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