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Development of Electronic Student Worksheets (E-LKPD): A Scientific Approach Based on Discovery Learning in Natural Science Learning

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ABSTRACT

The aim of this research and development is to produce E-LKPD learning media with a scientific approach based on discovery learning in science that is feasible, practical, and effective. The type of research is the ADDIE development model, which includes analysis, design, development, implementation, and evaluation. The research results show: (1) The Media Expert validation test obtained an average result of 87% in the very good category; (2) The Material Expert validation test obtained an average result of 96% in the very good category; and (3) The Design Expert validation test Instructional results obtained an average of 93% in the very good category; (4) individual trials obtained an average result of 91% in the very good category; (5) small group trials obtained an average result of 90% in the very good category; (6) field group trials obtained an average result of 89% in the very good category; and (7) practicality tests for teachers obtained an average result of 90% in the very good category, while practicality tests for students obtained an average result of 93% in the in the very good category. For the results of using E-LKPD with a scientific approach based on discovery learning, the experimental class obtained an average learning outcome value of 78, while the control class obtained an average learning outcome value of 72. Hypothesis testing used an independent sample T-test with a 2-tailed sig result of 0.000 < 0.05. This shows that students who use E-LKPD Discovery Learning have higher learning outcomes with a confidence level of 95%

KEYWORDS

Worksheet; scientific; discovery learning; natural science

INTRODUCTION

Learning is a relatively permanent change in behavior and the result of repeated practice. The subjects of learning are students, who are the center of learning activities (Thobroni, 2015). In the current era of convergence of Information and Communication Technology (ICT), students are encouraged to have core skills and special skills, namely the use of Information and Communication Technology (ICT), so that educators are expected to be able to use media and teaching materials that are able to engage students actively and have fun. , interesting, and interactive (Trilling and Fadel, 2009).

Kusumawardani & Hisnan Hajron (2022) The essence of science learning outcomes is to enable students to master existing concepts. Natural Sciences (IPA) is part of science, which originally comes from the English "science," which means I know. Science is a systematic collection of theories, the general application of which is limited to natural phenomena, born and developed through scientific methods such as observation and

experimentation, which foster scientific attitudes such as curiosity, openness, and honesty. Science learning outcomes are carried out according to the characteristics of science, which include that science is a collection of concepts, principles, laws, and theories, as well as attitudes of determination, curiosity, and perseverance, so that students learn meaningfully (Sarini et al., 2018).

Science learning outcomes are changes in students' abilities obtained through the educational process involving cognitive, affective, and psychomotor aspects after going through the training process in science learning activities (Sahiu & Wijaya, 2017). Learning outcomes are often used as a measure to find out how far someone has mastered the material that has been taught. Learning outcomes are the achievement of a form of behavioral change that tends to persist in the cognitive, affective, and psychomotor domains of the learning process carried out within a certain time frame (Hutauruk & Simbolon, 2018).

LKPD is a reference for students that is used for the teaching and learning process and contains tasks that students must complete and guides students to construct the knowledge they have learned to solve a problem (Utami et al., 2020). According to Jumairi (2015), LKPD can be used by teachers according to students' needs so that meaningful learning occurs. The aim of using LKPD is to make teaching and learning more effective and achieve previously formulated learning objectives. The use of LKPD in the learning process is expected to make it easier for teachers and support and encourage students to be able to think, analyze, and compile the results of their activities using the abilities they have (Umaroh et al., 2022).

According to Lubis et al. (2021), LKPD plays an important role in learning because it can increase student learning activities. According to Kardena and Mawardi (2021), they also argue that LKPD can be used to activate students during learning. As for Nurlisna et al. (2020), they argue that if LKPD is used in learning, it can increase student activity and guide them to discover knowledge through their activities. Basuki & Wijaya (2018) also argue that a good LKPD is one that can make it easy for teachers to teach and can help students learn and solve problems independently. One of the advantages of developing LKPD is that it can be designed according to school characteristics and students' circumstances (Julianti & Sumarmin, 2018).

Gusti & Ratnawulan (2021) stated that in classroom learning activities to make it easier for students, teaching materials are needed in the form of LKPD. The use of LKPD will form an effective interaction relationship between teachers and students, thereby fostering students' interest in the science concepts they are studying. The use of LKPD is expected to help students in the learning process and increase students' interest in learning. However, in reality, most of the LKPD circulating in schools does not contain experimental activities, demonstrations, or discussions. Similar to research conducted by Prabandari et al. (2022), who stated that many students still feel bored and are not enthusiastic about learning because of the limited LKPD that supports learning, which has an impact on reducing learning outcomes, In line with Istiqomah's (2021) research, which stated the reality on the ground that many teachers still use conventional LKPD, which are instant, just use them, just buy them from the publisher without trying to prepare, plan, and create them.

SMP Negeri 1 Hamparan Perak, based on the results of a pre-survey using the interview method with class VII and class VII science subject teachers, shows that in learning activities, teachers never use interactive media. The teaching materials used are only science textbooks. Teachers only use the questions contained in the textbook without any LKPD support. Teachers only use technology, namely Microsoft Power Point, in

presenting learning, supported by the use of YouTube as a reference in delivering learning. Then, based on the science learning results of SMP Negeri 1 Hamparan Perak students, it is not optimal because there are still many who have not reached the minimum completion criteria (KKM). The data obtained shows that only 16 out of 33 students, or 45% of students' exam results in science subjects, succeeded in reaching the KKM. Meanwhile, 18 out of 33 students, or 54%, were still not optimal, and the majority of students' scores did not reach the KKM. Where the minimum completeness criteria (KKM) that has been set is 70.

Use of E-LKPD, according to Beladina et al. (2013) Student worksheets (LKPD) are a learning medium that can be used to support the learning process, whether individually or in groups. Students can build their own knowledge using various learning sources. The teacher plays more of a facilitator role, and one of the teacher's duties is to provide learning tools (including LKPD) that suit their needs. According to Andriyani et al. (2020), LKPD is not only in conservative form but also in electronic form.

Suryaningsi et al. (2021) explained that creating innovative E-LKPD is important to meet the demands of 21st century learning, which requires students to be active and creative. According to research by Sari et al. (2022), teachers and students need E-LKPD based on STEM-integrated problem-based learning to stimulate critical thinking skills for problem solving in biology learning.

Purnama & Suparman (2020) explained that E-LKPD is a student work guide to make it easier for students to understand learning material in electronic form, which is applied using desktop computers, notebooks, smartphones, or cellphones. a set of basic activities that must be carried out by students to maximize understanding in an effort to achieve learning goals. The use of E-LKPD in learning has an impact on making student learning activities more enjoyable, making learning interactive, giving students the opportunity to practice, and motivating students to learn.

According to Cahyani et al. (2022), E-LKPD is prepared using language and sentences that are appropriate for students' ages so that they are easy to understand. E-LKPD also contains activities that can help students develop their social, emotional, moral, and aesthetic communication skills, such as observing videos that contain various kinds of differences that are commonly encountered in everyday life and being asked to give examples of attitudes. tolerance that they have ever had. Apart from that, students were also asked to take photos of the results of their activities in their notebooks to see whether the results of their activities were neat or not.

Safitri et al. (2021) concluded that PBL-based E-LKPD is a solution to be developed during online learning to achieve scientific process skills. According to researchers, Purnama and Suparman (2020) also agree that low critical thinking skills require a solution for developing E-LKPD that suits students' character. And finally, according to Mispa et al. (2022), teachers find it easier to use E-LKPD in delivering material.

The scientific approach is intended to provide students with an understanding of recognizing and understanding various materials using a scientific approach. Information can come from anywhere, at any time, without depending on unidirectional information from the teacher. The learning atmosphere is expected to encourage students to find out from various sources through observation. The application of a scientific approach to learning involves process skills such as observing, asking, gathering information, associating, and communicating (Permendikbud No. 81, 2013). In carrying out these processes, teacher assistance is needed as a facilitator.

Discovery learning places greater emphasis on discovering concepts or principles that were previously unknown. In the Discovery Learning model, the teacher acts as a guide by

providing opportunities for students to learn actively and guiding and directing student learning activities according to objectives. Conditions like this are a form of student orientation in learning activities (Budiningsih, 2005; Hanafiah, 2009). Teaching materials are not presented in their final form, but students are required to carry out various activities to collect information, compare, categorize, analyze, integrate, reorganize, and draw conclusions. The essence of this learning model is to teach students to gain knowledge by involving them in investigating real problems (genuine problems) by involving them in research, helping students identify concepts or methods, and encouraging students to find ways to solve the problems they face. Bruner suggests that students should learn through active participation with concepts and principles so that they gain experience and carry out experiments that allow them to discover the principles themselves (Slavin, 2011; Purwanto, 2012).

Based on the problems and results of the pre-survey that researchers conducted at SMP Negeri 1 Hamparan Perak, the use of LPKD and the use of media in science learning are still very minimal in the learning carried out by teachers. So, the solution to overcome this problem requires the development of innovative teaching materials that can encourage enthusiasm and improve student learning outcomes to the maximum.

The formulation of the research problem is as follows: (1) Is E-LKPD with a scientific approach based on Discovery Learning suitable for use in science learning based on the assessment of material, media, and design experts? (2) Is E-LKPD with a scientific approach based on Discovery Learning practical for use in science learning based on user assessments, namely students? (3) Is E-LKPD with a scientific approach based on Discovery Learning effective in science learning?

RESEARCH METHODS

The research method used in this research is the research and development (R&D) method. The development carried out in this research utilized the ADDIE development model. ADDIE consists of five stages, which include analysis, design, development, implementation, and evaluation. Followed by a quasi-experimental design. The main characteristic of quasi-experimental design is the development of true experimental design, which has a control group but cannot function fully to control external variables that influence the implementation of the experiment (Sugiyono, 2019) to see the effectiveness of student learning outcomes using E-products LKPD with a scientific approach based on discovery learning in science learning.

This research will be carried out at SMP Negeri 1 Hamparan Perak, Jl. Besar Hamparan Perak, Klumpang Kebun, Hamparan Perak District, Deli Serdang Regency, North Sumatra 20374.

The subjects in this research were three validators, namely material, media, and design experts. As well as user respondents, namely students of SMP Negeri 1 Hamparan Perak. Meanwhile, the object of this research is E-LKPD with a scientific approach based on discovery learning in science learning at SMP Negeri 1 Hamparan Perak.

Research Instrument

This research uses a research instrument in the form of a questionnaire. The instrument used in this research was adapted from Sriadhi (2018). The questionnaire used is a check-list questionnaire. Then the results from the respondents are calculated as the average score obtained using the formula for determining the level of eligibility as follows:

:

$$P = \frac{\sum x}{\sum x^1} x\ 100\ \%$$

Information:

P = Large percentage

$\sum x$ = Total score of validator answers

$\sum x^1$ = The highest number of answer scores

Table 1. Validator Questionnaire Value Weight Conversion Indicators

Answer Choices	Validity Level	Criteria
80% – 100%	Very valid	No revision
60% – 79%	Valid	No revision
40% - 59%	Fairly valid	Partial revision
20% - 39%	Invalid	Revision
0% - 19%	Very invalid	Revision

(Source: Arikunto, 2012)

Table 2. Material Expert Validator Questionnaire Grid

No.	Assessment Aspects	Answer				
		1	2	3	4	5
Guide and Information						
1.	Description of the E-LKPD product					
2.	Guide to using E-LKPD					
3.	Formulation of goals					
4.	Formulation of competencies / learning outcomes (CP)					
Content/Materials						
1.	Conformity of objectives with the curriculum					
2.	Suitability of material to purpose (CP)					
3.	Up to date material					
4.	Description of the concept or theory					
5.	Order (syntax) of presentation of material					
6.	Conformity of material coverage with objectives (CP)					
7.	Suitability of material depth to objectives (CP)					
8.	Ease of understanding terms and formulations					
9.	Suitability of examples or illustrations to the material					
10.	The content of the material is appropriate to the level and grade level					
11.	The material presented is appropriate to everyday life					
Evaluation						
1.	Suitability of question coverage with objectives (CP)					
2.	Conformity of the question domain with the objectives (CP)					
3.	Suitability of the difficulty level of the questions with the objectives (CP)					
4.	Distribution of question items based on question domain					
5.	Distribution of questions based on level of difficulty					
Suitability of Servings with Student-Centered Learning Demands						
1.	Encourage students' curiosity					
2.	Encourage students to build their own knowledge					

(Source: Sriadhi, 2018)

Table 3. Media Expert Validator Questionnaire Grid

No.	Assessment Aspects	Answer				
		1	2	3	4	5
Instructions and Information						
1.	Description of the E-LKPD product					
2.	Clarity of instructions for using E-LKPD					
Media Operation Performance						
1.	Ease of installation and configuration					
2.	Accurate use of media navigation symbols					
3.	Ease of use of navigation buttons (usability)					
4.	Search accuracy and material links (hyperlinks).					
5.	Interface quality					
6.	Stimulus-responsive interactivity of the user with the system					
Systematics						
1.	Layout of the media display (screen)					
2.	Displays the correct center of view (point center)					
3.	Acceleration of letters, numbers and symbols					
Ethics						
1.	Visual quality (resolution) of the image					
2.	Color composition and resolution					
3.	Kesesuaian warna teks dengan background					
4.	Acceleration of text and images					
Video or Animation Quality						
1.	Use of video/animation resolution (pixels)					
2.	Suitability of the object/video/animation with the material					
3.	Visualization of objects based on concepts/abstract material					
4.	Clarity of the narrator's voice in the video					

(Source: Sriadhi, 2018)

Table 4. Design Validator Questionnaire Grid

No.	Assessment Aspects	Answer				
		1	2	3	4	5
Guide and Information						
1.	The description of the E-LKPD product is very clear					
2.	The E-LKPD usage guide is easy to understand					
3.	The formulation of KI, KD and Indicators is very clear					
4.	The formulation of objectives is very clear					
Multimedia Materials						
1.	The material is appropriate to the topic of discussion					
2.	The material supports the achievement of learning objectives					
3.	The material is appropriate to the thinking abilities of students (users)					
4.	The material explains concepts or theories according to learning objectives					
5.	Presentation of material is arranged sequentially (hierarchically)					
6.	The breadth of material coverage is in accordance with the learning objectives					
7.	The material summary includes all the material presented					
8.	Spelling and grammar are easy to understand					
9.	Writing material is arranged in an orderly manner (systematic)					
Media Design and Facilities						
1.	Learning media is easy to use					
2.	Command buttons have accurate links (hyperlinks).					
3.	Learning media can be run without damage					
4.	Letters, numbers and symbols on the media are written clearly					

No.	Assessment Aspects	Answer				
		1	2	3	4	5
5.	Visual images (graphics) in the media are very good					
6.	Audio quality is very good					
7.	Video quality is very good					
8.	The coloring of the media content is very good					

(Source: Sriadhi, 2018)

Table 5. Student Questionnaire Grid

No.	Assessment Aspects	Answer				
		1	2	3	4	5
Information Guide						
1.	The E-LKPD usage guide is easy to understand					
2.	E-LKPD learning media is easy to use					
3.	Command buttons have accurate links (hyperlinks).					
4.	E-LKPD learning media can be run without damage					
5.	E-LKPD has interactive facilities for users					
6.	E-LKPD helps students in independent learning					
7.	E-LKPD helps students be more active in the learning process					
Aesthetics and Quality of Video or Animation						
1.	The E-LKPD design has attractive colors and images					
2.	Letters, numbers and symbols on the E-LKPD are written clearly					
3.	The visual image on the E-LKPD is very good					
4.	The quality of the learning audio is very good					
5.	The quality of the learning videos is very good					
6.	The coloring of the contents of the E-LKPD is very good					
7.	Learning using E-LKPD is more fun					
8.	Students are interested in using this media to learn					
9.	This media makes students more enthusiastic/active in learning					
10.	This media helps to understand learning material					
11.	This media helps improve students' abilities					

Product Practicality Data Analysis Techniques

Data obtained from user respondents' assessments, namely students, were analyzed by determining the percentage of students who gave answers with positive responses for each category stated in the questionnaire. The formula used to analyze user responses, namely students, is as follows:

$$\%\ Practicality = \frac{\sum obtained\ value}{\sum maximum\ value}\ x\ 100\ \%$$

Then the results of the response values from users are represented in table 6 practicality as follows:

Table 6. Product Practicality Categories

Interval	Category
81 - 100	Very practical
61 - 80	Practical
41 - 60	Quite practical
21 - 40	Less practical
0 – 20	Not practical

(*Source: Sriadhi, 2018)*

Table 7. Teacher Practicality Questionnaire Grid

Aspect	Indicator	Descriptor
Accessibility	Ease of use of E-LKPD	Discovery Learning-based e-LKPD is easy to use

	based on Discovery Learning	Discovery Learning-based e-LKPD provides flexibility in use
		E-LKPD based on Discovery Learning makes navigation easy
Usefulness	Efficiency	Discovery Learning-based e-LKPD helps save time in learning preparation
		Complete learning materials are available
	Ease of helping to increase the achievement of learning objectives	Learning materials in video form attract students' interest in learning
		Discovery Learning-based e-LKPD provides an interesting learning experience..
Presentation	The Informatics E-LKPD display makes it easier for students to understand new knowledge	Picture illustrations make it easier to understand the material
		The language used in Discovery Learning-based E-LKPD is easy to understand
		Selection of font type and size is easy to read

Table 8. Student Practicality Questionnaire Grid

Aspect	Indicator	Descriptor
Accessibility	Ease of use of E-LKPD based on Discovery Learning	Discovery Learning-based e-LKPD provides flexibility in use
		E-LKPD based on Discovery Learning makes navigation easy
		E-LKPD berbasis *Discovery Learning* memberikan kemudahan dalam navigasi
Usefulness	Discovery Learning-based e-LKPD makes it easier for students to understand new knowledge.	Learning materials in video form attract my interest in learning
		Complete learning materials are available
		Discovery Learning-based e-LKPD provides an interesting learning experience.
Presentation	The Informatics E-LKPD display makes it easier for students to understand new knowledge	Picture illustrations make it easier to understand the material
		The language used in Discovery Learning-based E-LKPD is easy to understand
		Selection of font type and size is easy to read

Product Effectiveness Data Analysis Techniques

The effectiveness test aims to obtain information about whether or not a product is being developed to be tested in the learning process. This effectiveness test will measure student learning outcomes. Testing the normality of distribution using the Lilliefors Sudjana test (2017) with the requirements of Compare Lo with Ltable with the following criteria:

1. If Lo is greater than Ltable, it means the population is not normally distributed.
2. If Lo is smaller than Ltable, it means the population is normally distributed.

Followed by a homogeneity test with the following requirements:

1. If Fcount < Ftable, then the samples have the same variance.
2. If Fcount > Ftable, then the samples do not have the same variance.

Hypothesis testing

Learning is said to be effective if there is a significant difference in learning outcomes between classes that are given treatment and those that are not given treatment. Hypothesis testing uses the average difference test, or t test (independent sample t-test). The t test is a mean difference test to find out whether there is a significant difference at the 0.05

significance level.
The hypothesis is formulated as follows:

1. H0: μ1=μ2 (there is no difference in the average between classes that were given treatment and those that were not given treatment).
2. Ha: μ1≠μ2 (there is an average difference between classes given treatment and those not given treatment).

RESULTS AND DISCUSSION

Results

Development of E-LKPD media using the Canva platform. Based on a storyboard that has been designed from the E-LKPD media product. development of learning media in the form of an E-LKPD, which contains science material and is equipped with practice questions to strengthen students' understanding.

Figure 1. Display of Home Page, Cover, Core Competencies, E-LKPD

Figure 2. Display of Data Collection and Data Processing, Evidence and Drawing Conclusions

The results of the validation data obtained from media experts can be seen in table 9 below:

Table 9. Results of Media Expert Assessment Data

Aspect	Indicator	Score	(%)	Criteria
Guide and Information	Description of the E-LKPD	5	100%	Very Eligible
	Clarity of instructions for using E-LKPD	5	100%	Very Eligible
Media Operation Performance	Ease of installation and configuration	4	80%	Eligible
	Accuracy of using media navigation symbols	4	80%	Eligible
	Ease of use of navigation buttons (usability)	5	100%	Very Eligible
	Search accuracy and links (hyperlinks) for material	4	80%	Layak
	Interface quality	4	80%	Eligible
	User stimulus-responsive interactivity with system	4	80%	Eligible

Systematics	Media display (screen) layout	5	100%	Very Eligible
	Displays the correct center of view (point center)	4	80%	Eligible
	Acceleration of letters, numbers and symbols	4	80%	Eligible
Ethics	Visual quality (resolution) of image	4	80%	Eligible
	Color composition and resolution	4	80%	Eligible
	Text color match with background	4	80%	Eligible
	Text and image acceleration	5	100%	Very Eligible
Video or animation quality	Use of video/animation resolution (pixels)	5	100%	Very Eligible
	Suitability of object/video/animation with material	4	80%	Eligible
	Visualization of objects on concepts/abstract materia	4	80%	Eligible
	Clarity of the narrator's voice in video	5	100%	Very Eligible
Average			**87%**	**Very Eligible**

Table 10. Material Expert Assessment Results

Aspect	Indicator	Score	(%)	Criteria
Guide and Information	Description of the E-LKPD product	5	100%	Very Eligible
	Guide to using E-LKPD	5	100%	Very Eligible
	Goal formulation	4	80%	Eligible
	Formulation of competency/learning outcomes (CP)	5	100%	Very Eligible
Content/ Materials	Conformity of objectives with curriculum	5	100%	Very Eligible
	Suitability of material for purpose (CP)	5	100%	Very Eligible
	Material update	5	100%	Very Eligible
	Description of concept or theory	5	100%	Very Eligible
	Order (syntax) of presentation of material	5	100%	Very Eligible
	Conformity of material coverage with objectives (CP	5	100%	Very Eligible
	Conformity of material depth with objectives (CP)	4	80%	Eligible
	Ease of understanding terms and formulations	5	100%	Very Eligible
	Suitability of examples or illustrations to the material	5	100%	Very Eligible
	The content of the material is appropriate to the level and grade level	5	100%	Very Eligible
	The material presented is appropriate to everyday life	5	100%	Very Eligible
Evaluation	Conformity of question coverage to objectives (CP)	5	100%	Very Eligible
	Conformity of question domain to objective (CP)	5	100%	Very Eligible
	Conformity of the difficulty level of the questions to the objective (CP)	5	100%	Very Eligible
	Distribution of question items based on question domain	4	80%	Eligible
	Distribution of questions based on difficulty level	4	80%	Eligible
The suitability of the presentation for student-centred learning	Encourage students' curiosity	5	100%	Very Eligible
	Encourage students to build their own knowledge	5	100%	Very Eligible
Average			**96%**	**Very Eligible**

Table 11. Table of Instructional Design Expert Assessment Results

Aspect	Indicator	Score	(%)	Criteria
Guide and Information	The description of the E-LKPD product is very clear	5	100%	Very Eligible
	Guide to using E-LKPD is easy to understand	4	80%	Eligible
	The formulation of KI, KD and Indicators is very clear	5	100%	Very Eligible
	The goal formulation is very clear	5	100%	Very Eligible
Multimedia	The material is appropriate to the topic of discussion	5	100%	Very Eligible

Aspect	Indicator	Score	(%)	Criteria
Materials	Material supports achievement of learning objective	5	100%	Very Eligible
	The material is appropriate to the thinking abilities of students (users)	4	80%	Eligible
	The material explains concepts or theories according to learning objectives	4	80%	Eligible
	Presentation of material is arranged sequentially (hierarchically)	5	100%	Very Eligible
	The breadth of material coverage is in accordance with learning objectives	5	100%	Very Eligible
	The material summary includes all the material presente	5	100%	Very Eligible
	Spelling and grammar are easy to understand	5	100%	Very Eligible
	Writing material in an orderly manner (systematic)	5	100%	Very Eligible
Media Design and Facilities	Easy to use learning media	5	100%	Very Eligible
	Command buttons have accurate links (hyperlinks)	4	80%	Eligible
	Learning media can be run without damage	4	80%	Eligible
	Letters, numbers and symbols on the media are written clearly	5	100%	Very Eligible
	Visual images (graphs) on very good media	5	100%	Very Eligible
	Audio quality is very good	4	80%	Eligible
	Video quality is very good	4	80%	Eligible
	The coloring of the media contents is very good	5	100%	Very Eligible
Average			**93%**	**Very Eligible**

The results of individual trials can be seen in the table below:

Table 12. Individual Trials

No	Assessment Indicator	Average Percentage	Criteria
1.	Information Guide Aspect	91%	Very Eligible
2.	Aesthetic Aspects and Quality of Animation Videos	90%	Very Eligible
Average		**91%**	**Very Eligible**

The results of the small group trial can be seen in the table below:

Table 13. Results of Small Group Trials

No	Assessment Indicator	Average Percentage	Criteria
1.	Information Guide Aspect	88%	Very Eligible
2.	Aesthetic Aspects and Quality of Animation Videos	92%	Very Eligible
Average		**90%**	**Very Eligible**

The results of field trials can be seen in the table below:

Table 14. Field Trial Results

No	Assessment Indicator	Average Percentage	Criteria
1.	Information Guide Aspect	89%	Very Eligible
2.	Aesthetic Aspects and Quality of Animation Video	89%	Very Eligible
Average		**89%**	**Very Eligible**

Table 15. Summary of the average percentage of feasibility research results for E-LKPD

No	Respondents	Average Percentage	Criteria
1	Media Expert	87%	Very good
2	Material Experts	96%	Very good
3	Instructional Design Experts	93%	Very good

4	Individual Trials	91%	Very good
5	Small Group Trials	90%	Very good
6	Large Group Trials	89%	Very good
Average		**91%**	**Very good**

The following is descriptive data from the Practicality Test of E-LKPD learning media by teachers.

Table 16. Average Percentage of E-LKPD Media Practicality Test Results for Teachers

No	Assessment Indicators	Average Percentage	Criteria
1	Accessibility Aspect	90%	Very good
2	Aspects of Usefulness	88%	Very good
3	Aspects of Presentation	93%	Very good
Average		**90%**	**Very good**

The following is descriptive data from the Practicality Test of E-LKPD learning media by students.

Table 17. Average percentage of E-LKPD media practicality test results for students

No	Assessment Indicators	Average Percentage	Criteria
1	Accessibility Aspect	93%	Very good
2	Aspects of Usefulness	93%	Very good
3	Aspects of Presentation	94%	Very good
Average		**93%**	**Very good**

Frequency distribution of post-test learning outcomes for students who do not use E-LKPD Discovery Learning.

Table 18. Post-Test Frequency Distribution of Student Learning Results in the Control Class

No.	Class Intervals	Edge of Class	Frequency	Relative Frequency
1	47-51	46,5-51,5	2	7%
2	52-56	51,5-56,5	4	15%
3	57-61	56,5-61,5	9	33%
4	62-66	61,5-66,5	8	30%
5	67-71	66,5-71,5	2	7%
6	72-76	71,5-76,5	2	7%
Total			**27**	**100%**

Based on the data in Table 18, it can be seen that the average post-test score for student learning outcomes in the control class is 57, where there are 9 students who have post-test scores that are the same as this average, 6 students get scores below the average. learning outcomes, and 12 students who got scores above the average learning outcomes in the control class.

The frequency distribution of students' post-test learning outcomes using E-LKPD Discovery Learning is presented in Table 19 below:

Table 19. Post-Test Frequency Distribution of Student Learning Results in the Experimental Class

No.	Class Intervals	Edge of Class	Frequency	Relative Frequency
1	54-58	53,5-58,5	3	11%
2	59-63	58,5-63,5	3	11%
3	64-68	63,5-68,5	5	19%
4	69-73	68,5-73,5	12	44%

5	74-78	73,5-78,5	4	15%
6	79-83	78,5-83,5	0	0%
Total			27	100%

Based on the data in Table 19, it can be seen that the average post-test score for student learning outcomes in the experimental class was 68, there were 5 students who had the same post-test scores and 6 students got scores below the average learning outcomes, and 16 students who got scores above the average learning outcomes in the experimental class.

Table 20. Summary of Normality Test Results

Class	Learning Outcomes	Lcount	Ltable	Sig. (α= 0,05)	Summary
Experiment	Pre-test	0,143	0,1665	0,165	Normal
	Post-test	0,155	0,1665	0,094	Normal
Control	Pre-test	0,158	0,1665	0,082	Normal
	Post-test	0,078	0,1665	0,200	Normal

(Source: Test results using SPSS software by researchers)

The results of the normality test can be concluded that the experimental class variable has a pre-test L value of 0.143 and a post-test of 0.155 < L table value of 0.1665 and an experimental pre-test significance value of 0.165 and post-test of 0.094 > α = 0.05 so it can be concluded that the experimental class pre-test and post-test variables were normally distributed. Furthermore, the results of the control class variable are pre-test 0.158 and post-test 0.078 < Ltable value, namely 0.1665 with a significance value, namely pre-test 0.082 and post-test 0.200 > 0.05, which concludes that the learning results of the pre-test control class and the post-test is normally distributed.

Table 21. Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Student Learning Outcomes	Based on Mean	.208	3	104	.890
	Based on Median	.192	3	104	.901
	Based on Median and with adjusted df	.192	3	92.214	.901
	Based on trimmed mean	.207	3	104	.891

(Source: Test results using SPSS software by researchers)

Based on the test results using SPSS, the significance value based on mean is 0.890 > 0.05. This shows that the experimental class post-test variance and control class post-test data are homogeneous, and the requirements for conducting an Independent T-test sample test are met.

Analysis of the achievement of student learning outcomes using E-LKPD Discovery Learning in the experimental class and control class is carried out by paying attention to the maximum score or value with the minimum value as follows:

Table 22. Maximum Value and Minimum Value

Class	Xmax	Xmin
Experiment (Post-test)	78	54
Control (Post-test)	72	47

This research uses the independent sample T-test, which is a statistic used to compare the averages of two groups of data that are significantly different. This test is applied to situations where two groups of data come from different populations or are not related to

each other. The focus of this test is to determine whether there is a significant difference between the averages of the two groups of data. The hypothesis is formulated as follows.

Ho: There is no difference in average between classes that were given treatment and those that were not given treatment

Ha: There is an average difference between classes that were given treatment and those that were not given treatment

Hypothesis testing in this study using the Independent Sample T-Test is presented in Table 23.

Tabel 23. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Student Learning Outcome	Equal variances assumed	.004	.953	-5.585	52	.000	-9.630	1.724	-13.089	-6.170
	Equal variances not assumed			-5.585	51.685	.000	-9.630	1.724	-13.090	-6.169

(Source: Test results using SPSS software by researchers)

The 2-tailed significance result is 0.000 < 0.05, which shows that students who use E-LKPD Discovery Learning have a real difference with a confidence level of 95%. Apart from that, it can also be seen that the increase in the average score of the experimental class for pre-test and post-test was 58.33 and 67.96, respectively. This shows that the use of E-LKPD Discovery Learning tends to have better learning outcomes.

Discussion

In this research, an analysis was carried out on the feasibility of this product. The results of the media expert feasibility test showed that this learning medium was declared very good, with an average score of 87%. Material experts also consider this learning medium to be very good, with an average score percentage of 96%. Likewise, instructional design experts gave excellent ratings with an average percentage of 93%.

Next, a trial was carried out to assess the information guide aspect, the aesthetic aspect, and the quality of the learning media animation video. The results show that this medium was rated as very good by test participants, with an average percentage of 91% in individual trials, 90% in small group trials, and 89% in large group trials.

Contextual learning, of course, requires contextual-based learning resources. One learning medium that is very suitable for using a contextual approach is E-LKPD. In science learning using Canva, E-LKPD is prepared based on learning design principles that are adapted to the main teaching material so that it will bring students into the learning process in real life. Besides that, the E-LKPD that was developed was based on input into needs analysis activities for teachers and students to obtain information that the E-LKPD for science learning that was developed was indeed needed and could provide convenience for students and teachers as users of learning media. So from the question above, it can be concluded that the use of E-LKPD in science learning that is being developed is suitable for implementing the learning process.

In this research, it was found that the E-LKPD media was considered very good by both teachers and students. Teachers provide assessments with very good criteria with an average percentage score of 90%, while students also provide assessments that fall within the criteria of very good with an average percentage score of 93%. This medium was developed by paying attention to aspects of accessibility, usefulness, and presentation, making it very practical to use to improve students' learning outcomes.

Mursid, R. et al. (2022) stated that improving learning outcomes is very helpful in achieving quality science and knowledge in their field, problem solving, developing interests and talents, and applying technology in the 21st century to the ability to think creatively through the application of holistic and effective event learning strategies.

From the results of research data analysis, it can be concluded that there are significant differences through testing in learning outcomes between students who take part in learning via E-LKPD Discovery Learning and students who take part in learning using the Expositor. Based on the research that has been carried out, the effectiveness of E-LKPD can be seen from tests on student learning outcomes.

The results of this research are also in line with previous research, in accordance with the statement of Hamidah et al. (2018), which states that the effectiveness of E-LKPD can be assessed by the increase in learning achievement after students take part in learning, including increases in academic achievement, the ability to independently complete assignments and positive changes in attitudes. Including visual learners, active learners, and reflective learners (Alias and Siraj, 2012: 12–17). The role of the teacher as an encouragement and provider of facilities plays a central role in learning using E-LKPD Discovery Learning, where students need to be encouraged to take full responsibility for their learning tasks. As a facilitator, the teacher must consistently provide responses in a timely manner.

CONCLUSION

Based on the problem formulation and research results, it can be concluded as follows:

1. The E-LKPD learning media developed for science learning is suitable for use in improving student learning outcomes in science lessons.
2. E-LKPD learning media developed for practical science learning are used to improve student learning outcomes in science lessons.
3. The E-LKPD learning media developed for science learning is effectively used to improve student learning outcomes in science lessons.

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