

DEVELOPMENT OF INTERACTIVE E-LKPD USING ADDIE MODEL TO IMPROVE SCIENCE PROCESS SKILLS AND LEARNING MOTIVATION OF STUDENTS OF JUNIOR HIGH SCHOOL

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Received 23 September 2024 | Revised 08 October 2024 | Accepted 17 November 2024

doi: 10.63895/ij30321271.2025.v2.i1.pp34-43

Abstract

This research is development research which aims to investigate various aspects of Interactive E-LKPD using the ADDIE model at SMPN 1 Bungku Selatan. The main focus of research includes validity, practicality, effectiveness on science process skills and student learning motivation. Data was collected through questionnaires and tests, with product validity measured using the average score from the validation sheet, practicality evaluated through observation sheets on the implementation of teacher activities using the guided inquiry learning model and student questionnaires, effectiveness measured by effect size from the pretest and posttest, and student learning motivation assessed with closed questionnaires converted into percentages. The research results show that the Interactive E-LKPD developed using the ADDIE model is proven to be suitable for use in learning. From validity, the product obtained an average feasibility level of 3.74, with the "valid" category. Assessment of the implementation of teacher activities using the guided inquiry learning model for this product shows an average score of 3.60, which indicates that this product is practical to use in the learning process. In terms of effectiveness, Interactive E-LKPD succeeded in significantly improving students' science process skills with an effect size value reaching 0.86 with the criterion of having a "big effect". The use of Interactive E-LKPD also succeeded in increasing students' learning motivation as seen from the average percentage of initial learning motivation of 60.66% and after learning using Interactive E-LKPD, learning motivation was obtained at the first meeting with an average percentage of 77.29%, the second 88.11%, and the third meeting 94.09%, these results indicate an increase in student learning motivation at each meeting. So that the development of Interactive E-LKPD using the ADDIE model is effective in producing learning products that are not only academically valid, but also practical and effective in improving learning outcomes and student motivation at SMPN 1 Bungku Selatan.

Keywords: E-LKPD, liveworksheet, ADDIE model, science process skills and learning motivation

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How to cite: Muspirad, Y., Darsikin, & Mustapa, K. (2025). Development of interactive e-LKPD using ADDIE model to improve science process skills and learning motivation of students of junior high school. *International Journal of Education, Humaniora, and Social Studies*, 2(1), 34-43.

Introduction

Changes and development of the 2013 curriculum were based on the results of international research regarding the abilities of Indonesian students. Facts in schools and PISA results show that education still does not meet 21st century standards, which require 4C competencies and understanding of concepts, including science process skills (KPS) such as formulating problems, formulating hypotheses, identifying variables, interpreting data, and concluding (Canlas & Guevarra, 2020).

One of the reasons why students' worksheets (LKPD) do not practice these skills is the low level of science process skills. Integrating KPS into LKPD can be an effective tool for developing science process skills and scientific attitudes because it provides the structure and guidance needed to guide students in learning scientific concepts and exploration (Nurchahyo et al., 2018).

The use of LKPD in learning can help students in the learning process (Melindawati, 2021). Observations at SMPN 1 Bungku Selatan show several problems in science learning: (1) the use of conventional learning

models by teachers which makes the classroom atmosphere monotonous, boring, and reduces students' learning motivation; (2) lack of use of electronic learning media, which limits learning interactivity; (3) the use of ready-made LKPD from publishers or educational service providers, which are not made by the teacher themselves and do not suit the characteristics of the students, are less effective in terms of appearance, content and practicality. This hinders students from experimenting and observing which supports the development of the necessary KPS.

Mazida et al. (2023) explains that teachers need to prepare learning tools and develop effective learning models in the classroom. LKPD that is well designed by the teacher and appropriate to the students' character helps guide them through the scientific process in a systematic and directed manner. The transformation of printed LKPD into interactive E-LKPD allows students to access learning materials anytime and anywhere, making lessons more lively, in-depth, practical, and increasing student creativity (Herlina et al., 2023). An

interesting learning process can motivate students to understand and prove scientific concepts, so that these concepts are not easily forgotten. Using interactive E-LKPD can also make students more active in learning (Indrawan et al., 2022).

According to Sardiman (2014), learning motivation is the driving force within students which creates and maintains learning activities and provides direction so that learning goals are achieved. Motivation is very important in the learning process because it can foster enthusiasm, curiosity and activeness in learning, so that students are encouraged to study science more seriously (Krismony et al., 2020).

Understanding concepts in science learning does not only include the concept itself, but also application and discovery, which requires students to be actively involved in the learning process and discover problems scientifically. The solution to maximize science learning is to develop learning tools that make it easier for students to learn (Sujana, 2013). Interactive E-LKPD development uses the ADDIE model, which consists of Analyze, Design, Develop, Implement, and Evaluate, ensuring reflection and feedback at each stage for continuous improvement (Prihartanti et al., 2023). This model is adapted to guided inquiry learning, where the teacher acts as a facilitator who helps students find information deductively and constructively (Ngeritini, 2014).

Guided inquiry learning involves students in investigating problems logically, systematically and critically so that they can formulate their findings well (Damayanti, 2015). In this model, the teacher gives problems and students solve them independently, honing their critical thinking in solving problems. The development of interactive E-LKPD based on guided inquiry means that students are not given initial information and must find answers based on the instructions in the LKPD (Nismidawati et al., 2022).

Based on the description above, it is known that it is necessary to develop an Interactive E-LKPD using the ADDIE model to improve the science process skills and learning motivation of students at SMPN 1 Bungku Selatan.

Methods

This research is development research which aims to develop, validate and test the practicality and effectiveness of electronic Student Worksheets (LKPD) which focus on substance pressure material and its application in everyday life. This research uses the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model

Implementation of research at SMP Negeri 1 Bungku Selatan during the even semester of the

2023/2024 academic year, from January until completion. The research population consisted of all class VIII students at SMP Negeri 1 Bungku Selatan (85 students), with the sample selected from class VIII A (25 students) with 14 boys and 11 girls with an average age of 14.5 years. During the research, 3 meetings were held with material on solid pressure at the 1st meeting, liquid pressure at the 2nd meeting, and gas pressure at the last meeting.

Data collection techniques include product validation questionnaires, observations, and 10-number multiple choice tests for students, as well as data analysis that includes product validity, practicality, and effectiveness using scores and percentages as evaluation methods.

Validity Analysis of Interactive E-LKPD Products. The validation sheet for the level of validity of the learning tools developed is calculated based on visible descriptors. To calculate the average score, the following formula is used:

$$\text{Validation Value} = \frac{\sum \text{shoes validator}}{\sum \text{item}} \quad (1)$$

To find out the teacher's assessment and student responses, it is obtained by calculating the questionnaire answers and then converting them into percentages. The formula used to measure questionnaire responses is:

$$\%X = \frac{\sum \text{answer score}}{\text{Maximum score}} \times 100\% \quad (2)$$

Practicality analysis will be carried out using questionnaire data given to teachers and students to measure the practicality of Interactive E-LKPD. The questionnaire sheet data is calculated based on *descriptor* what is visible. To calculate the average score, the following formula is used:

$$\text{Practical Value} = \frac{\sum \text{answer score}}{\sum \text{item}} \quad (3)$$

Analysis of the effectiveness of implementing learning tools that have been developed using tests *Effect size*. The effectiveness of the learning device is obtained from data from multiple choice test results on science process skills regarding the analysis of experimental data on pressure of substances made into graphs and then predicted results through mathematical analysis.

Effect size calculated using the formula Cohen (2007) as follows:

$$S_{of} = \sqrt{\frac{Spre^2 + Spost^2}{2}}$$

Effect Size d can be calculated as:

$$d = \frac{d}{S_{of}} \quad (3)$$

Information:

- S_{of} = Standard deviation of test scores
 \bar{d} = Average test score ($M_{Posttest} - M_{Pretest}$)
 S_{pre} = Pretest standard deviation
 S_{post} = Posttest standard deviation

Spears et al. (2013) states that standard deviation is best for paired designs and also as an option *standardizer* the best is S_{of} . Meanwhile, the effectiveness of learning tools related to student learning motivation was analyzed from data from the results of a 35 number student learning motivation questionnaire and then a 10 number student response questionnaire to the interactive E-LKPD. The researcher grouped each questionnaire question item according to the aspect observed. The questionnaire used in this research is a closed questionnaire with alternative answer choices provided, namely: SS = Strongly Agree, S = Agree, RR = Undecided, TS = Disagree and STS = Strongly Disagree. With the following scores: SS = 5 for positive statements and 1 for negative statements, S = 4 for positive statements and 2 for negative statements, RR = 3 for positive and negative statements, TS = 2 for positive statements and 4 for negative statements, and STS = 1 for positive statements and 5 for negative statements (Sugiyono, 2019).

The questionnaire assessment that has been obtained can be processed using the formula written by Purwanto (2010), which is as follows:

$$E.G = \frac{R}{SM} \times 100\% \quad (4)$$

Information:

- E.G = The percent value sought
R = Raw score obtained by students
SM = Ideal maximum score of that test concerned
100 = Fixed number

Results and Discussion

The results of instrument validation in this research show that the RPP, Interactive E-LKPD, science process skills (KPS) and student learning motivation instruments have been declared valid after passing a validation process by expert lecturers. This validation aims to measure the feasibility and validity of the instruments used in the process of learning substance pressure material and its application in daily life using the ADDIE development model.

1). Validation of the learning implementation plan (RPP)

Table 1. The results of the RPP analysis can be seen at

Assessment Aspects	Average Score	
	Validator 1	Validator 2
Lesson Plan Format	4	4
Fill out the lesson plan	3,5	3.5
Language	3.67	3.67
Benefits of RPP Sheets	3.5	4
Average	3.73	
Category	Valid	

Based on Table 1, the validation results obtained from the two validators obtained an average score of 3.73 in the valid category, but improvements still need to be made thanks to the suggestions given by the validators. The suggestions and results for improving the RPP can be seen in Table 2.

Table 2. Suggestions and results for improvements to the RPP

No	Improvement Suggestions	Improvement Results
1	Preferably for learning purposes using IT	Has been adapted to include IT in learning objectives
2	The learning objectives at each meeting are adjusted to the competency achievement indicators	The learning objectives at each meeting have been adjusted to the competency achievement indicators

Input and suggestions from validators are used as references for researchers to obtain products with better results.

Science process skills

The results of the validation analysis of the science process skills test sheet can be seen in Table 3 below:

Table 3. Results of validation analysis of science process skills tests

Assessment Aspects	Average Score	
	Validator 1	Validator 2
Legibility	4	4
Variable Clarity	4	4
Distractor Function	4	4
Option Writing	3.7	3.8
Concept Truth	4	4
Average	3.95	
Category	Valid	

Based on Table 3, it can be seen that the validation results from the two validators obtained an average score of 3.95 in the valid category, but improvements still need to be made based on suggestions for improvement provided by the validator. The suggestions and results for improving the science process skills test sheet can be seen in Table 4.

Table 4. Suggestions and Results for Improvements to the Science Process Skills Test

No	Improvement Suggestions	Improvement Results
1	Adjust the Table header to repeat on each page to avoid truncation	Has been adjusted and added table headers on each page
2	Correct the editorial of each indicator	Editorial corrections have been made for each indicator

Motivation to learn

The results of the validation analysis of student learning motivation sheets can be seen in Table 5.

Table 5. Results of Analysis of Student Learning Motivation

Assessment Aspects	Average Score	
	Validator 1	Validator 2
Diligent in doing tasks	3,8	3,8
Tenacious in facing difficulties	3,6	3,6
Enjoys independent learning	3,8	3,8
Receive lessons well	3,8	3,8
Can defend his opinion	3,4	3,6
It is not easy to let go of what you believe	3,4	3,6
Enjoys finding and solving problems	3,8	4
Rate-rate	3,71	
Category	Valid	

Based on Table 5, it can be seen that the validation results from the two validators obtained an average score of 3.72 in the valid category, but improvements still need to be made based on suggestions for improvement provided by the validator. The suggestions and results of improvements can be seen in Table 6.

Table 6. Suggestions and Results for Improving Student Learning Motivation

No	Improvement Suggestions	Improvement Results
1	Adjust the Table header to repeat on each page for easy observation by students	Has been adjusted and added table headers on each page
2	It is better to set limits for each indicator in a statement that fits the grid	Has been adjusted and added limits to each indicator according to the grid

2) Development

This research is development research using the ADDIE model which includes 1) *Analysis*, 2) *Design*, 3) *Development*, 4) *Implementation*, and 5) *Evaluation*. The results of research and development from each stage are:

1) Analysis (*Analysis*)

At this stage, curriculum analysis, student analysis, material analysis and learning objective analysis are carried out. This analysis aims to determine the basic

problems needed as a reference and consideration for the Interactive E-LKPD product to be developed.

a) Curriculum analysis

Curriculum analysis was carried out by reviewing the curriculum documents of SMPN 1 Bungku Selatan. The curriculum used in class VIII is the 2013 curriculum

b) Student analysis

The results of the character analysis of class VIII students at SMPN 1 Bungku Selatan are listed in the Table 7.

Table 7. Results of analysis of student characteristics

No	Indicator	Analysis Results
1	Student Characteristics	Student learning outcomes are low
		Students' learning motivation is low
		Interest in learning is still low
		The formation of scientific attitudes is still low
2	Material	Less active in the learning process
		Students are less interested in taking science lessons related to physics material
3	Student Learning Style	Students tend to find science lessons difficult, one of which is material about pressure in substances and its application in everyday life
		Students prefer explanations through learning media and doing practicums

c) Material analysis

Material analysis is carried out by observing the curriculum and syllabus used, so that the material that will be used in the Interactive E-LKPD is developed in accordance with the subject outcomes that must be achieved by students. The results of the material analysis can be found below Class VIII, there are several materials that make it possible to develop Interactive E-LKPD using a guided inquiry learning model to improve science process skills, namely the material on pressure of substances and its application in everyday life. The initial part of the Interactive E-LKPD consists of the cover page (*cover*), core competencies, basic competencies, competency achievement indicators, learning objectives and instructions for use.

c. Selection of supporting applications to produce electronic LKPD, namely devices that have been previously designed using the Canva application and then integrated into an online learning platform using a website *liveworksheets* to be accessed and used by students

2) Development (*Development*)

This stage is a continuation stage of the stage *design* to produce Interactive E-LKPD on substance pressure material and its application in everyday life.

a) *Interactive E-LKPD Validation*

The Interactive E-LKPD created is then validated by media expert validators and material expert validators. The purpose of this validation is to measure and evaluate the level of validity of the product being developed. The validation instrument uses a scale *likert*. The results of the validation analysis of the Interactive E-LKPD by media experts can be seen in Table 9

Table 8. Media Expert Interactive E-LKPD Validation Analysis Results

App Evaluation	Average Score	
	Validator 1	Validator 2
Feasibility of presenting Interactive E-LKPD	3.80	3.80
Interactive E-LKPD cover design	3.50	3.75
Cover page typography	3.75	3.75
Cover illustration	3.5	4
Interactive E-LKPD content design (content layout)	3.50	3.50
Content typography	3.75	3.75
Display quality	3.75	3.75
Use and operation of Interactive E-LKPD	4	4
Average	3.74	
Category	Valid	

The results of the interactive E-LKPD validation analysis by material experts can be seen in Table 9.

Table 9. Results of interactive E-LKPD validation analysis by material experts

App Evaluation	Average Score	
	Validator 1	Validator 2
Content qualification	3.80	3.80
Feasibility of presentation	3.86	3.71
Average	3.79	
Category	Valid	

Based on Table 8 and Table 9, it can be seen that the results of media expert validation by the two validators obtained an average score of 3.74 in the valid category, and the results of material expert validation by the two validators obtained an average score of 3.79 in the valid category but improvements still need to be made. based on suggestions for improvements provided by the validator. The suggestions and results for improvements to the Interactive E-LKPD can be seen in Table 10 below:

Table 10. Suggestions and results for improvements to interactive E-LKPD

No.	Improvement Suggestions	Improvement Results
1.	Set the distance between the left, right, top and bottom boxes to fill them completely	Adjusted the distance left, right, top, bottom on the box

2.	It's best for learning purposes using IT	It has been adjusted and added to learning objectives using IT
3.	Improve the image quality so it doesn't break	Image quality has been improved

b) *Assessment*

The next procedure, namely Interactive E-LKPD, is assessed by three teachers. The purpose of this teacher assessment is to determine the suitability of Interactive E-LKPD in learning. The results of the teacher assessment analysis can be seen in Table 11.

Table 11. Teacher assessment analysis results

Description	Appraiser 1	Appraiser 2	Appraiser 3
Knowledge construction	3.75	4	3.75
Design	3	3	3.50
Language	3	3.50	3.50
Aspects of learning activities use the guided inquiry model	4	3.75	3.75
Average	3.44	3.56	3.63
Percentage	85.94	89.06	90.63
Criteria	Very high	Very high	Very high

Based on Table 11, it can be seen that the results of assessor 1 obtained an average score of 3.44, a percentage of 85.94% with very high criteria, assessor 2 obtained an average score of 3.56 with a percentage of 89.06% with very high criteria. , and rater 3 obtained an average score of 3.63 with a percentage of 90.63% with very high criteria

Small Group Test

Individual tests were carried out by 8 students with details of 2 people with high ability, 3 people with medium ability and 3 people with low ability. The results of the individual test analysis can be seen in Table 13 below

Table 12. Table of Small Group Test Analysis Results

Description	Results
Total score	264
Rate-rate	3.67
Percentage (%)	91.67
Category	Proper to use

Based on Table 12, it can be seen that the small group test results obtained an average score of 3.67 with a percentage of 91.67% in the category suitable for use in learning.

3) Implementation (Implementation)

The Interactive E-LKPD development product on substance pressure material and its application in daily life to improve science process skills and student learning motivation is validated by experts, then enters the next stage, namely the application of the Interactive E-LKPD product which is tested in large groups or trials try the field. This field trial was carried out in class VIII A.

Students carried out learning activities on the product being developed, then underwent a series of tests, where this test was carried out to test the effectiveness of the product. There are teachers who are assessed on the implementation of teacher activities using the guided inquiry learning model. The practicality of using development products using observation sheets for implementing teacher activities using the guided inquiry learning model.

a) *Practicality of interactive E-LKPD*

Practicality of Interactive E-LKPD through assessment results from observation sheets on the implementation of teacher activities using the guided inquiry learning model during the learning process carried out in the school laboratory room. The practical results of the Interactive E-LKPD are presented in Table 13.

Table 13. Practical Results of Interactive E-LKPD

Rated aspect	Meeting 1	Meeting 2	Meeting 3
Introduction	3.29	3.71	3.86
Core activities/guided inquiry syntax	3.18	3.71	3.88
Closing	3.25	3.75	3.75
Average	3.60		
Category	Practical		

Based on Table 13, it shows that the average value obtained from the first, second and third meetings, namely 3.60, is in the practical category. It can be said that Interactive E-LKPD is practical used in learning.

b) *Effectiveness of interactive E-LKPD*

The effectiveness of Interactive E-LKPD is measured through results *pretest* and *posttest* science process skills test and student learning motivation questionnaire results.

Table 14. Percentage of science pross skills test results

PPP indicators	Percentage	
	<i>Pretest</i>	<i>Posttest</i>
Observation (observing)	12	96
Classification (classifying)	32	80
Concept application (applying the concept)	32	68
Predict (foresee)	40	84
Interpretation (interpreting)	68	84
Using tools	36	100
Experiment (planning and conducting an experiment)	32	92
Communicate	40	68
Asking question	36	68
Average Percentage	36.44	82.22

Science process skills

Students' science processes are measured by results *pretest* and *posttest* science process skills test. The test questions used consist of ten multiple choice questions. This learning consists of nine aspects, namely: observation skills (observing), classification (categorizing), concept application (applying concepts), prediction (predicting), interpretation (interpreting), using tools, experimentation (planning and conducting experiments), communicating and asking question. The percentage of science process skills test results obtained from the test results *pretest* and *posttest* indicators can be seen in Table 14.

Based on Table 14, it can be seen that students' science process skills have increased in each indicator. Improvement occurred in every indicator of science process skills. Average percentage *pretest* 36.44% and average percentage *posttest* 82.22 experienced an increase of 45.78%.

The results of the science process skills effectiveness test can be seen that *effect size* a score of 0.86 with the criteria of having a large effect. This shows that the use of Interactive E-LKPD using a guided inquiry model to improve science process skills in substance pressure material and its application in everyday life is effective to use.

c) *The Effect of Interactive E-LKPD on Student Learning Motivation*

Student learning motivation was measured using a questionnaire sheet with 35 assessment aspects. The questionnaire used has been validated by expert validators. The results of student learning motivation data can be seen in Table 15.

Table 15. Description of learning motivation score

Sub Variable	Percentage			
	Motivation early	Motivation Pert.1	Motivation Pert.2	MotivasiPe t.3
Diligent in doing tasks	58.00	77.80	89.80	95.40
Tenacious in facing difficulties	63.20	76.20	87.40	93.40
Enjoys independent learning	59.00	78.20	88.00	95.00
Receive lessons well	60.20	80.40	87.00	92.80
Can defend his opinion	61.60	76.80	86.00	95.60
It's not easy to let go of what	61.40	76.40	87.80	90.40

Sub Variable	Percentage			
	Motivation early	Motivation Pert.1	Motivation Pert.2	Motivasi t.3
Learning Motivation you believe				
Enjoys finding and solving problems	61.20	75.20	90.80	96.00
Average Percentage	60.66	77.29	88.11	94.09

Based on Table 17, it can be seen that the results of the student learning motivation questionnaire before implementing Interactive E-LKPD obtained an average percentage of 60.66% and the average percentage at the first meeting was 77.29%, the second meeting was 88.11% and the third meeting was 94.09 %. These results indicate that there is an increase in student learning motivation at each meeting. This shows that Interactive E-LKPD is effective in student learning motivation.

4) Evaluation

The final stage of developing this Interactive E-LKPD is to carry out an evaluation to see the feasibility of the Interactive E-LKPD using a guided inquiry learning model on substance pressure material and its application in students' daily lives. The benchmark for the success of developing Interactive E-LKPD is seen from feedback (*feedback*) given by students according to the questionnaire they have filled out. The results of the analysis of student response questionnaires obtained can be seen in Table 16.

Table 18 Results of student response questionnaire analysis.

Description	Results
Total score	858
Average score	3,43
Percentage (%)	85,80

Based on Table 18, it can be seen that the average score of student responses obtained was 3.43 with a percentage of 85.80% in the practical category. This shows that Interactive E-LKPD is practically used in learning.

Validity of interactive E-LKPD

This research aims to develop an interactive E-LKPD using the ADDIE model for substance pressure material and its application in daily life, with the aim of improving students' science process skills and learning motivation. Ritonga et al., (2022) said that development is a process of designing learning logically and systematically to determine all the things that will be done in learning activities, taking into account the potential and competencies of students. Interactive E-LKPD is structured based on core competencies, basic

competencies and competency achievement indicators, and follows a guided inquiry learning model.

The analysis stage includes understanding student characteristics, analyzing material to ensure relevance to the curriculum, and determining learning objectives. The material on pressure of substances and its application in everyday life was chosen based on this analysis, because it allows students to carry out simple experiments to improve science process skills and learning motivation. This is in line with the opinion of Rizani et al. (2022), who say that for students who will carry out the learning process, teachers need to know easy ways to determine learning objectives, methods and media as well as learning materials that can be used to facilitate the student learning process.

The design stage involves collecting references, preparing an Interactive E-LKPD format with components such as a cover page, core competencies, basic competencies, competency achievement indicators, learning objectives, and instructions for use. Integration with Canva applications for graphic design and online learning platforms such as *Liveworksheets* This is also done to ensure that Interactive E-LKPD can be accessed and used effectively by students.

The supporting application for producing electronic LKPD is a device that has been previously designed using the Canva application. According to (Isnaini et al., 2021) to convey information accurately and interestingly, creativity is needed in making appropriate infographics, one of which is using Canva. Purwati & Perdanawanti (2019) explain that Canva can generally be used for graphic design needs, such as making flyers, posters, greeting cards, certificates, presentations and infographics, using attractive images and templates.

It is then integrated into an online learning platform using a website *liveworksheets* to be accessed and used by students. *Liveworksheets* is a website that can make interactive worksheets that can be accessed online. *Liveworksheets* easy for students to use, students can work straight away and don't need to download or register first to access the E-LKPD that has been uploaded on *liveworksheets*. This is also in line with previous research conducted by Suharsono and Handayani (2022) that after using Interactive LKPD based on *liveworksheets* Student learning motivation has increased.

At the development stage, the Interactive E-LKPD is validated by expert validators and evaluated by teachers and small group tests. The validation results show that the Interactive E-LKPD is in the very valid category, with a high average validity value from two expert validators. Assessment by teachers and small group tests also show

that Interactive E-LKPD is suitable for use in learning, with scores that meet the specified eligibility criteria.

Practicality of Interactive E-LKPD

This Interactive E-LKPD is considered practical based on the results of observations of the implementation of teacher activities using the guided inquiry learning model. Results of observations of the implementation of teacher activities in the learning process. The analysis results show an average score of 3.60 in the "practical" category.

This Interactive E-LKPD is considered effective and easy to use in the learning process. It helps facilitate learning by providing clear and structured guidance for students, so they can more easily understand the material being taught. Apart from that, the advantage of Interactive E-LKPD also lies in its ability to help teachers evaluate student understanding directly and provide timely feedback.

Effectiveness of Interactive E-LKPD on Science Process Skills

The effectiveness of Interactive E-LKPD in improving students' science process skills is tested through *pretest* and *posttest* in class VIII.A of SMPN 1 Bungku Selatan. Test results *N-gain* show value *effect size* a score of 0.86 with the criteria of having a large effect. The use of interactive E-LKPD with a guided inquiry model has been proven to have a big effect in increasing students' understanding of substance stress material and its application in everyday life.

Features such as images, videos and simulations in Interactive E-LKPD help increase students' interest in learning actively and conducting their own experiments. The guided inquiry model also encourages students to play an active role in the learning process, starting from observing, formulating problems, determining variables, designing experiments, to formulating conclusions and presenting them.

This finding is consistent with previous research showing that guided inquiry-based Interactive E-LKPD is effective in improving students' science process skills (Masruha et al., 2021). Apart from that, the use of E-LKPD also makes it easier for educators to manage learning, helps students discover concepts through activities alone or in groups, and supports the development of students' science process skills and scientific attitudes (Fitriani et al., 2023).

The Effectiveness of Interactive E-LKPD on Student Learning Motivation

Interactive E-LKPD has been proven to be effective in increasing student learning motivation, as measured through a learning motivation questionnaire with 35

assessment aspects. The results of the student learning motivation questionnaire before implementing Interactive E-LKPD obtained an average percentage of 60.66% and the average percentage at the first meeting was 77.29%, the second meeting was 88.11% and the third meeting was 94.09%. This shows that there is an increase in student learning motivation at each meeting. The results obtained show a very good interpretation of its positive influence on students' learning motivation. The use of the guided inquiry learning model in the context of substance stress material and its application in daily life has proven to be more effective than conventional approaches.

The interactive E-LKPD feature that presents material with pictures and videos has been proven to be able to attract students' attention, help them understand the material better, and encourage them to learn actively with direct learning experiences (Nirmayani, 2022). Previous research by Suharsono et al. (2021) also shows that the use of Interactive E-LKPD is effective in increasing student learning motivation.

Evaluation at each development stage using the ADDIE model shows that the Interactive E-LKPD has succeeded in meeting the practical criteria with a percentage of 85.80%, indicating positive acceptance in its use at SMPN 1 Bungku Selatan.

Conclusions

Based on the results of the research that has been carried out, it can be concluded that the Interactive E-LKPD which was developed using the ADDIE development model is valid to use by looking at the average score of media expert validation results of 3.74 and material expert validation results of 3.79. This product has also been proven to be practical for use in learning based on observations of the implementation of teacher activities using the guided inquiry learning model with an average score of 3.60. Furthermore, this Interactive E-LKPD is effective in improving students' science process skills, as evidenced by the analysis of scores that reflect high criteria and an effect size score of 0.86 with the criteria having a large effect. This product also succeeded in increasing students' learning motivation by an average percentage. The average before implementing Interactive E-LKPD was 88.11%, and the average percentage at the first meeting was 77.29%, the average percentage at the second meeting was 88.11% and the average percentage at the third meeting was 94.09%. This shows the very good category.

Acknowledgment

The author would like to thank all parties who have supported and contributed to this research.

Conflict of interest

The authors declares that there is no conflict of interest in this research. All parties involved have given their consent and contributed without any bias or influence that could affect the research results.

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International Journal of Education, Humaniora, and Social Studies, March 2025 Volume 2 Number 1, pp 34-43

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