

DEVELOPMENT OF DIGITAL STUDENT WORKSHEETS (LKPD-D) LIVEWORKSHEET ON THE CRITICAL THINKING SKILLS AND PROBLEM SOLVING ABILITY OF STUDENTS OF JUNIOR HIGH SCHOOL

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Abstract

This research aims to develop an assisted digital student worksheet (LKPD-D). *liveworksheet* on students' critical thinking skills and problem solving abilities which are assessed in terms of validity, practicality and effectiveness. The research method used is development research (*R&D*) with the ADDIE model (*Analysis, Design, Development, Implementation, Evaluation*). The subjects of this research were class IX students at SMP Negeri 2 Bungku Selatan. The overall score validation from the validator shows a validity level of 90%, both of which are included in the valid category. The response of teachers and students to the LKPD was 95% for teachers, while the student response questionnaire was 87.21%, both of which were in the very practical category. The effectiveness of Digital LKPD products in improving critical thinking skills and problem solving abilities is measured by percentage scores *Effect Size*. The effect size value is 1.23 with a very large effect interpretation, which means that the LKPD has a significant impact on improving students' critical thinking skills. The effect size value is 1.37 with a large effect interpretation, which means that the LKPD has a significant impact on increasing problem solving abilities. learners. These results indicate that the Digital LKPD is assisted *liveworksheet* valid, practical and effective.

Keywords: Digital LKPD, liveworksheet, ADDIE model, critical thinking skills, problem solving ability

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Introduction

UNESCO has developed four pillars of learning for the 21st century: learning to know, learning to do, learning to be, and learning to live together, which are relevant to critical thinking and problem solving skills (Kalelioğlu & Gülbahar, 2014). Critical thinking skills are important in science learning because the process is in line with the character of science learning and is important for solving everyday problems (Hariyati & Rachmadyanti, 2022).

However, junior high school students' critical thinking skills are still low, so teachers need to make innovations to improve them (Umam, 2018). Polya proposes four stages of problem solving: understanding the problem, implementing a solution plan, checking again, which can be used to measure students' difficulties with problem solving problems (Arsyabinta, 2023).

The low problem solving abilities of students according to PISA are because students are not used to learning based on mathematical problem solving (Nabilah & Siregar, 2023). Therefore, creative solutions are needed,

such as improving teaching materials or the quality of the learning process.

Student Worksheets (LKPD) are an important part of learning tools that can be arranged according to students' needs to learn independently (Haspen et al., 2021). The use of LKPD is expected to encourage students to be more active, creative and think critically (Fatimatul Khikmiyah, 2021). Digital technology can be integrated into LKPD to make learning more fun and interesting (Nuryani & Handayani, 2020). One tool that can be used is liveworksheet, which converts printed worksheets into interactive online worksheets (Triana et al., 2021).

Liveworksheets allow teachers to change traditional LKPD into online LKPD that are interactive and automatically correct, and student answers can be saved and downloaded at any time (Firtsanianta & Khofifah, 2022). The ADDIE model is a model that can be used to develop LKPD through the stages of Analysis, Design, Develop, Implement and Evaluate (Asmayanti et al., 2020).

The 2023 South Bungku State Middle School 2 education report card report on the National Assessment:

Minimum Competency Assessment (Ministry of Education, Culture, Research and Technology) shows that literacy skills are lacking, namely the achievements obtained are less (29.55% of students have achieved minimum competency) where The definition of achievement is that less than 40% of students have achieved minimum competency for literacy. Efforts are needed to encourage students to achieve minimum competency. This position is in the middle rank (41-60%) in the ranking in the district.). Low literacy skills indicate a lack of critical thinking skills, which can be seen in students' ability to give reasons, make conclusions, and formulate problems (Pertiwi & Kadarisma, 2023). Based on the description above, it is necessary to carry out a deeper study regarding the development of assisted digital LKPD *liveworksheet* It is hoped that it can improve students' critical thinking and problem solving skills.

Methods

This research is a type of research *Research and Development* (R&D) which aims to produce learning products in the form of digital LKPD. The digital LKPD development process uses the ADDIE model, which consists of five stages: *Analysis, Design, Development, Implementation, and Evaluation.*

This research was conducted at SMP Negeri 2 Bungku Selatan, Bungku Selatan District, Morowali Regency, Central Sulawesi Province, from January 2024 to June 2024. The research population was all class IX students with a total of 39 students (20 boys and 19 girls), and the sample was class IX B with 17 students (6 boys and 11 girls) aged 15-17 years. Qualitative data includes the results of the LKPD design and suggestions from validators, as well as data from expert validation sheets, teacher validation sheets, and student response sheets. Quantitative data includes critical thinking and problem solving skills essay test scores, as well as validator assessment questionnaires, teacher assessments, and student responses. Data collection instruments include observation, tests and questionnaires. Data was analyzed qualitatively based on suggestions and input from validators as well as test results and student responses, while quantitative data was analyzed using statistics to calculate the percentage of questionnaire scores and measure the validity, practicality and effectiveness of the LKPD. To calculate the average score, the following formula is used;

$$IN_{ah} = \frac{T_{with}}{T_{sh}} \times 100 \%$$

Information:

IN_{ah} : Expert Validation; T_{with} : Total Empirical Score Achieved; T_{sh} : Total Expected Score

Questionnaire sheet data is calculated based on visible descriptors. To calculate the average score, the following formula is used:

$$PK = \frac{\text{total score resulting from data collection}}{\text{criteria score}} \times 100\%$$

PK = Percentage of practicality (%)

Criterion Score = Maximum practicality score

Measuring the effectiveness of LKPD in improving students' critical thinking skills and problem solving abilities through pretests and posttests *Effect size* which measures how much influence the use of LKPD has on improving students' critical thinking skills and problem solving abilities. *Effect Size* calculated using the formula *Cohen's* as follows:

$$S_{of} = \sqrt{\frac{to^2 + spost^2}{2}}$$

Effect Size d can be calculated as

$$d = \frac{d}{S_{of}}$$

S_{of} = Standard deviation of test scores; \bar{d} = Score test rate

($M_{Posttest} - M_{Pretest}$); S_{pre} = Pretest standard deviation

S_{post} = Posttest standard deviation

Results and Discussion

Development of assisted digital LKPD *Liveworksheet*

The development in this research resulted in assisted LKPD *liveworksheet* with the stages of development of the ADDIE model. Stages *Analysis, Design and Development, Implementation and Evaluation.*

Results of assisted LKPD development *liveworksheet* refers to the ADDIE steps which consist of five stages, namely *Analysis (Analysis), Planning (Design), Development (Development), Implementation (Implementation), and Evaluation (Evaluation)* with the following descriptions:

1) *Analysis*

Initial stage in the development of assisted LKPD *liveworksheet* This is conducting an analysis of the curriculum and analysis of students.

a. Curriculum Analysis

The curriculum analysis stage is carried out to study and find out the curriculum used in the school. This step was taken to adapt to the curriculum in force at SMP Negeri 2 Bungku Selatan. This activity is continued by reviewing learning outcomes to formulate learning objectives that will be used as considerations in preparing the LKPD. Based on the results of the Curriculum analysis, researchers chose Environmentally Friendly Technology material. Table 4.1 learning outcomes and learning objectives (CP) and Learning Objectives (TP) from Environmentally Friendly Technology material.

Table 1. Basic Competencies and Indicators of Competency Achievement

CP Elements	Learning objectives
UNDERSTANDING SCIENCE: Students understand measurement systems in scientific work; alternative energy and its use to overcome energy availability problems.	✓ Students are able to analyze the principles used in environmentally friendly technology
	✓ Students are able to compare the positive and negative impacts of implementing environmentally friendly technology
	✓ Students are able to analyze the application of environmentally friendly technology that might be developed so that it does not produce hazardous waste.
	✓ Students are able to formulate ideas or suggestions to overcome the negative impacts of water purification
	✓ Students are able to analyze problems that arise due to the application of non-environmentally friendly technology
	✓ Students are able to formulate ideas or suggestions to overcome problems that arise due to the application of environmentally unfriendly technology

b. Material analysis

Material analysis aims to determine the material needed and used in developing LKPD. Apart from that, material analysis also aims to develop learning objectives to be achieved during learning. The material chosen is environmentally friendly technology because the use of environmentally friendly technology material in research develops important 21st century skills, such as critical thinking, creativity, collaboration and technological literacy. Students are invited to identify environmental problems, formulate hypotheses, develop innovative solutions, and provide reasons for choosing these solutions. This process trains them in systematic problem solving and critical thinking.

c. Needs analysis

Remarks After conducting a needs analysis, a learning readiness analysis is then carried out. Learning readiness in question is students' readiness to receive learning material, because learning readiness does not only mean physical and mental readiness, but also readiness to master the subject matter (Asmah, 2021). The results of the analysis of students' learning readiness can be seen in Table 2.

Table 2. Students' learning readiness

Learning Readiness	Amount
Initial understanding GOOD	4 Students
Initial understanding ENOUGH	6 Students
Initial understanding NOT ENOUGH	7 Students

From the results of the analysis of students' learning readiness, it can be concluded that in general class IXA students have a poor understanding of environmentally friendly technology material. This was obtained from the results of limited interviews with class IX science teachers who stated that they had never made LKPD with the help of *liveworksheet* in learning. Apart from that, teachers also do not fully use LKPD on environmentally friendly technology material and more often use tests obtained in school textbooks. The current LKPD is not adequate, innovative and effective enough to support the learning process in schools.

2) *Design*

This stage begins with designing an assisted digital LKPD product *liveworksheet* with environmentally friendly technology materials based on the results of the analysis stages. LKPD is designed in one way *platform* design and visual communication *online* namely the Canva application. According to Purwati & Perdanawanti (2019) explained that Canva can generally be used for graphic design needs, such as creating *flyer*, posters, greeting cards, certificates, presentations and infographics, using attractive images and templates.

3) *Development*

This stage continues the design process stage after obtaining the LKPD prototype. This stage includes the development of learning device products, namely LKPD, validation of LKPD, as well as testing to measure the validity of its suitability, which will be validated by validators using assessment instruments.

The digital LKPD assisted by the live worksheet is then included *web liveworksheet* on www.liveworksheet.com. How to access the page *liveworksheets* visit the site *Liveworksheets* Of www.liveworksheets.com. Look for the "buttonLogin" or "Sign In" located in the top right corner of the page. On the page *login*, You will be asked to enter your registered email address and password. If you don't have an account, click the "Sign up" or "Register" to create a new account. After filling in the email and password, click the "buttonLogin" or "Sign In". After that you will be asked to verify your identity via email or other security method. Once successful *login*, will be redirected to *dashboard* account in *Liveworksheets*, where you can create, edit, and use interactive worksheets.

The developed LKPD can be accessed at [link https://tinyurl.com/s4bfzh5y](https://tinyurl.com/s4bfzh5y); <https://tinyurl.com/4k5wdk4w> and <https://tinyurl.com/mtn2uuef>. After the LKPD has been imported into the live worksheet, it is then validated by 2 validators. At this stage, scores from product validation and product revisions are also obtained.

a. Product validation

Product validation is obtained through assessment by validator 1 and validator 2. The validation results can be seen in Table 2.

Table 2. Results of LKPD validation by validators

Validator	Qualifying Score
Validator 1	70,00 %
Validator 2	93,02 %
Rata-Rata Skor Validator	81,51 %
Category	Valid

Based on the validation results, it is known that the digital LKPD learning tool is assisted *liveworksheet*. The critical thinking skills and problem solving abilities of students at SMPN 2 Bungku Selatan can be developed with the percentage of the "valid" category determined based on the validation results of 2 validators.

b. Product revision

After validation is carried out by media experts and the material is then revised based on the suggestions given by the validator.

c. Limited Trial

The revised LKPD was imported again on *web liveworksheet* and then tested on a limited basis involving 6 students selected by the class IXB science teacher based on different cognitive levels. Respondent R1 got an average score of 82.50, respondent R2 got an average score of 87.50, respondent R3 got an average score of 80.00, respondent R4 got a score of 77.50, and respondent R5 got an average score of 85.00 while respondent R6 obtained an average score of 82.50. Overall, the aspects tested obtained an average score of 82.50 in the high category. The results of the trial stated that the LKPD was practical and could be used in field trials.

Table 3. Limited Trial

No	Trials	Student Response						Amount
		R1	R2	R3	R4	R5	R6	
1	LKPD	82.50	87.50	80	77.50	85	82.50	495
Rate-rate							82.50	
Category							Height	

4) Implementation

This stage aims to see the practicality of the LKPD through the responses of teachers and students to the assisted LKPD *liveworksheet* developed and also to see the effectiveness of the LKPD through pretest and posttest.

a. Field Trials

Field trials were carried out to evaluate the practicality and effectiveness of assisted digital LKPD *liveworksheet*

which has been developed. This is done by looking at the results of tests before being treated (pretest) and tests after being given treatment (posttest), as well as by measuring student and teacher responses to the products developed by researchers.

b. Teacher Response Questionnaire

The teacher's response is used as a test of the practicality of the LKPD being developed. The teacher's response showed an overall score of 3.80 with a percentage of 95% in the very practical category and the LKPD was declared suitable for use in learning as seen in Table 4.

Table 4. Results of analysis of teacher responses to LKPD

Teacher Responsiveness	Practicality Score
Teacher 1	92.50 %
Teacher 2	97.50 %
Average Teacher Score	95.00 %
Category	Very Practical

c. Student Response Questionnaire

Student responses are used to determine the practicality of the LKPD being developed. The students' responses after filling in the response questionnaire showed a total score of 3.49 with a total percentage of 87.21% in the very practical category and the LKPD was declared suitable for use in learning as seen in Table 5.

Table 5. Data from analysis of student responses

Respondents from 17 students	Practicality Score
Total score	593
Rate-rate	3.49
Percentage	87.21%
Category	Very Practical

Apart from the table, the assessment results of teacher and student responses to the LKPD product are also depicted in the Figure 1.

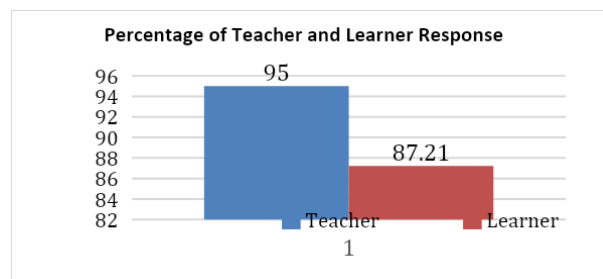


Figure 1. Percentage diagram of teacher and student responses to LKPD.

d. Critical Thinking Skills

Students' critical thinking skills were analyzed through the results of pretests and posttests carried out before and after being treated using LKPD in learning. This can be seen in Table 6.

Table 6. Pretest and posttest data

Description	Critical Thinking Skills	
	Pretest	Posttest
Rate-rate	45	76
Shoes Ideal	100	100
<i>Effect Size</i>	1.23	
Interpretation	Very Big Effect	

Improving students' critical thinking skills can be identified through Figure 2.

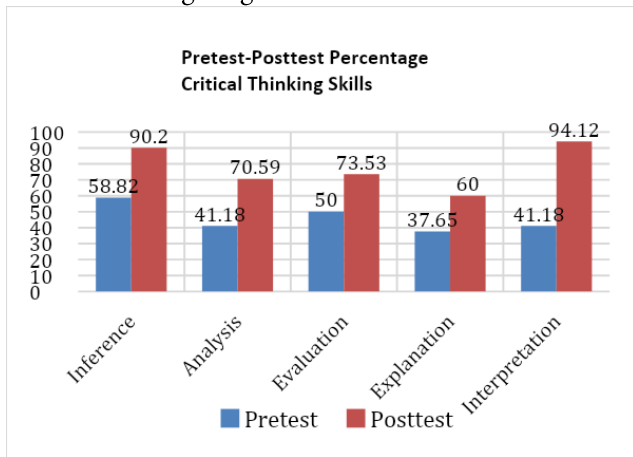


Figure 2. Diagram of students' pretest and posttest results

The tables and diagrams presented show a significant increase in critical thinking skills on the five indicators observed. Inference indicators increased by 31.38%, followed by analysis which increased by 29.41%, evaluation with an increase of 23.53%, and explanation which increased by 22.35%. Interestingly, the interpretation indicator showed the highest increase with a percentage of 52.94%. This shows that students' interpretation indicators develop more rapidly than other indicators, providing a positive impact on overall critical thinking abilities.

Interpretation indicators relate to students' ability to understand and describe the objects observed. Interpretation helps students re-explain and understand the meaning of an event, data, procedure or rule. Students also provide feedback and convey the results of their observations of an object.

Using a variety of learning methods, such as group discussions, problem-based learning, and using LKPD, can help students understand the material better. Interesting and relevant LKPD can motivate students to engage more actively and improve their interpretation skills. This means that LKPD is assisted *liveworksheet* has an effect on increasing students' interpretation indicators.

The explanation indicator was quite minimal, namely only increasing by 22.35%, this was caused by the lack of students' skills in explaining or providing information regarding the causes and effects of a problem. This ability includes students' ability to explain statements or opinions

expressed so that they become strong opinions. Explanation involves students' ability to express results from data, evidence, opinions, or questions.

e. Problem Solving Ability (KPM)

Students' problem solving abilities are measured by the results *pretest* and *posttest*. Mark *effect size* obtained from the pretest and posttest results of problem solving ability with an interpretation of 1.37. Pretest and posttest data on problem solving abilities can be seen in Table 7.

Table 7. Pretest and posttest data on problem solving abilities

Description	Problem solving skill	
	Pretest	Posttest
Rate-rate	59	82
Shoes Ideal	100	100
<i>Effect Size</i>	1.37	
Criteria	Big Effect	

The improvement in problem solving abilities can be seen significantly through graphic analysis of evaluation results. The graph shows a clear progression in problem solving skills from pretest to posttest.

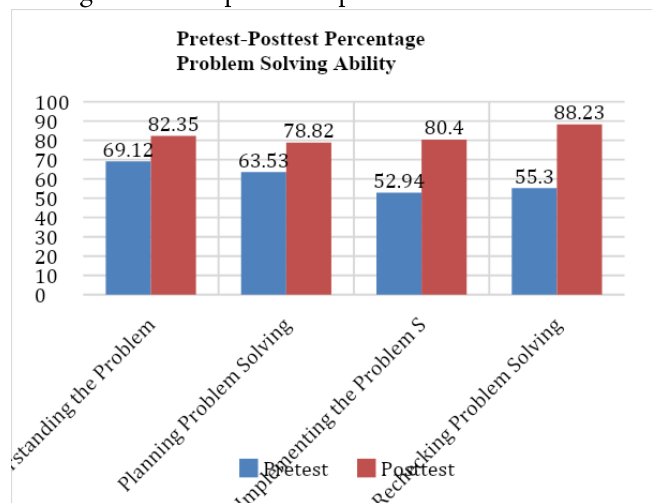


Figure 3. Problem solving ability percentage diagram

There was an increase in problem solving abilities, even though the category was moderate. Data interpretation shows that problem understanding increased by 13.23%, problem solving planning increased by 15.26%, implementation of problem solving plans increased by 27.46%, and re-examination of problem solving showed the highest increase, namely 32.93%.

The biggest increase occurred in the problem solving re-examination indicator because it was due to the factor that students were able to re-write relevant reasons which were supported by strong reasons and valid evidence.

Based on the results of the average problem solving abilities of students, it shows that digital LKPD assisted by live worksheets is quite effective in improving students' problem solving abilities.

4 Evaluation

Evaluation is the final step in the LKPD development stage which aims to find out and obtain the final results of the LKPD product development that has been carried out. This stage is carried out by evaluating students' pretest and posttest results, teacher and student response questionnaires. The success of developing this LKPD is measured from the feedback provided by teachers and students through distributed questionnaires.

Mongi & Hendry (2021) stated that the evaluation results are used to provide *feedback* then if there are revisions made according to the results of needs that have not been met within the development objectives, an evaluation can be carried out. Evaluation also provides a basis for continuous improvement so that LKPD can continue to be refined according to student needs and educational developments. Based on the results of this evaluation, we got an idea that the development of LKPD was assisted *liveworksheet* on critical thinking and problem solving skills have been successful. The overall validation results can be seen in Table 8.

Table 8. Recapitulation of development results

Rated aspect	Average validation score	Validation criteria	information
assisted LKPD <i>liveworksheet</i>	81,51	Valid	With Revision
Limited group practicality test	82,50	Height	
Teacher response to LKPD	95,00	Very Practical	
Student responses to LKPD	87,21	Very Practical	
Pretest-posttest KBK	56,28	Effective enough	
Pretest-posttest KPM	56,42	Effective enough	

The discussion in this research focuses on the three problem formulations mentioned at the beginning of the chapter, namely how to develop LKPD, whether LKPD assisted by live worksheets can improve critical thinking skills and whether it can improve students' problem solving abilities. The following is an explanation of each of these problem formulations.

Developing LKPD with the help of Liveworksheet

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. One of them is by utilizing various relevant learning strategies, methods and tools so that learning objectives can be achieved effectively and efficiently.

Developing Student Worksheets (LKPD) for teachers is an important step in improving the quality of learning in the classroom. Good LKPD must be designed by considering students' needs, learning objectives, and relevant material. Teachers need to ensure that the LKPD created can facilitate in-depth understanding of concepts, encourage active involvement of students, and develop critical thinking and problem solving skills. In this way, LKPD is not only a teaching aid, but also an effective medium for achieving broader educational goals. LKPD development follows the stages of developing the ADDIE model, where the stages start from Analysis, Design, Development, Implementation, and Evaluation.

1) Analysis

In the first stage, researchers carried out curriculum analysis, material analysis and needs analysis where each stage of analysis was carried out continuously. The researcher carried out curriculum analysis to see the curriculum implemented in schools. SMP Negeri 2 Bungku Selatan implements the independent curriculum, so researchers formulate learning objectives and the flow of learning objectives according to the independent curriculum.

The next analysis is material. The material chosen by researchers is environmentally friendly technology material. The reason for choosing this material is because there is discussion related to the environment, so that students can improve their ability to identify environmental problems, formulate hypotheses, develop innovative solutions, and test the effectiveness of these solutions. This process trains them in systematic problem solving and critical thinking.

Putra and Agustiana (2021) stated that needs analysis was carried out with the aim of understanding the needs of students and teachers during the learning process. The researcher also carried out a needs analysis at this stage with the aim of getting input on what kind of LKPD the researcher should develop that is appropriate to the school situation and the needs of students and teachers. Needs analysis was obtained through interviews with class IX science teachers and 17 students. The results of interviews and observations show that assisted digital LKPD has never been developed *liveworksheets* in classroom learning. This is because teachers only focus on the test questions in the textbook prepared by the school. Based on the results of this analysis, it can be concluded that digital LKPD is assisted *liveworksheets* needed in learning and is expected to be a pioneer of good LKPD in the future for schools.

2) Design

Design is the second step in the LKPD development stage. The researcher designs the LKPD which will be

developed using the help of the Canva application in designing it. The designed LKPD contains cover components, learning outcomes, research objectives, and the flow of learning objectives and questions as learning reflection material. At this stage a LKPD product is produced which will be developed.

2) Development

The third stage is development, where in this stage the digital LKPD product that has been designed is imported into the application *liveworksheet*. There are 3 LKPD developed, namely LKPD 1 containing material on the principles of environmentally friendly technology, LKPD 2 containing material on environmentally friendly technology applications and LKPD 3 containing material on non-environmentally friendly technology. After that, the LKPD was validated by 2 validators to see the level of validity.

Validation is carried out and suggestions for improvements are received from the validator so that it becomes a reference for researchers to revise the product. The results of the validation carried out by the validator overall obtained a score percentage of 81.51% in the valid category and could be tested on a limited number of 6 students.

The limited trial involved 6 students selected by the class IX teacher with different cognitive levels, namely high, medium and weak. Overall, the percentage score results for the LKPD are in the high category with a score of 82.50% in the high category according to the Likert scale achievement level table. Thus it can be concluded that the LKPD developed can be implemented in learning.

The same research was also carried out by (Marlina, 2022) regarding the development of online LKPD assisted by live worksheets on combined permutation material where the research obtained a percentage score of 76% with valid criteria for validity. This has similar results to the live worksheet-assisted LKPD that the researcher carried out which differs only in the variables studied as well as the characteristics of the students and the material.

3) Implementation

Development includes assessing aspects of product validity before proceeding to the implementation stage (Baharuddin, 2018). The implementation stage is passed by implementing the LKPD product in field trials. The field trial stage was carried out three times face to face involving 17 students in its implementation. The first time it was implemented was on June 14, then on June 19 and finally on June 21.

After completing the field trial, the teacher and students filled out a response questionnaire to the LKPD. The overall percentage of results obtained in the teacher response questionnaire was 95.00% in the very practical

category, while the student response questionnaire received an overall percentage score of 87.21 in the very practical category.

The pretest and posttest results also showed significant results on both critical thinking skills and problem solving abilities with very large effect sizes. N.F. et al., (2022) in their research, also obtained a validity value in the very valid category, a practicality value through student response questionnaires of 93% and an effectiveness value of 0.71, which means there is a very high increase in student learning outcomes. .

4) Evaluation

Kurnia et al., (2019) in their research said that the evaluation stage is the final stage where improvements (revisions) are made after receiving suggestions, comments and input from students, teachers and validators. The same thing was also stated by (Rustandi, 2021) that at this stage management of the assessment results and drawing conclusions are carried out.

The evaluation stage in developing LKPD is a very important stage to ensure the quality and effectiveness of the product that has been developed. At the evaluation stage, this process is divided into two main types, namely formative evaluation and summative evaluation.

Formative evaluation is conducted during each stage of development to provide feedback that can be used for continuous improvement. For example, during the development stage, product validation is carried out by a validator on the product being developed for evaluation, the LKPD prototype is then tested on a limited group of students and field trials to get feedback from them in order to make revisions.

A summative evaluation is carried out after the implementation of the LKPD to assess its overall effectiveness. This evaluation involves measuring the achievement of learning objectives, as well as improving critical thinking skills and problem solving abilities. Through these two types of evaluation, researchers can ensure that the resulting LKPD not only meets appropriateness standards, but is also truly effective in students' critical thinking skills and problem solving abilities. From the evaluation results, it was found that the LKPD product was assisted by a live worksheet which could be used as a learning tool in class IX of SMP Negeri 2 Bungku Selatan.

The Effect of Liveworksheet-assisted LKPD on Critical Thinking Skills

Pretest and posttest are used at the beginning and end of learning to see whether there is an increase in critical thinking skills after using the LKPD assisted by live worksheets. The results of improving students' critical thinking skills are known based on the results of the initial

assessment (pretest) before using the LKPD and the final assessment (posttest) after using the LKPD.

Next, in calculating the effectiveness of assisted LKPD media liveworksheet, the researcher used effect size calculations and obtained an effect size value of 1.23 which is greater than 1 with the interpretation of "very strong effect", this shows that there is an influence of the use of assisted Digital LKPD liveworksheet on students' critical thinking skills, apart from that it also has a significant impact in optimizing critical thinking skills. These results are in line with research conducted by (Annida et al., 2022) in their research, namely that the use of e-LKPD based on live worksheets can be an alternative or learning innovation that can be applied in online or direct learning processes. The use of e-LKPD based on live worksheets can be used as a choice of teaching materials in learning.

Effect of Liveworksheet assisted LKPD on problem solving ability

The increase in students' problem-solving abilities can be seen in the effectiveness of digital LKPD on problem-solving abilities. It can also be seen using an effect size with a value obtained of 1.37 which has the interpretation of "very strong effect", meaning that digital LKPD learning is assisted. liveworksheet provide a strong effect in optimizing the problem solving abilities of class IXB students at SMP Negeri 2 Bungku Selatan.

The same research was also conducted by (Fauziah et al., 2023) that there was a significant increase in mathematical problem solving abilities. However, there are things that differentiate previous research from what researchers conducted, namely research samples, classes, materials and also regional characteristics.

Conclusions

Based on the research that has been carried out, it can be concluded that the live worksheet assisted LKPD developed at SMP Negeri 2 Bungku Selatan is declared valid, practical and effective. The overall validity of the average score reached 81.51% in the valid category, while practicality was assessed through teacher and student response questionnaires with an average score for teachers of 95% and for students of 87.21%, both in the very practical category. . The effectiveness of the LKPD was measured through the results of the pretest and posttest, showing an increase in students' critical thinking skills with an effect size value of 1.23 with a very large effect interpretation, which means the LKPD had a significant impact on improving students' critical thinking skills. Apart from that, LKPD is also effective in improving students' problem solving abilities with an effect size value of 1.37 with a large effect interpretation, indicating a

significant impact on improving students' critical thinking skills.

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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