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Development of Problem-Based Learning (PBL) Video Development to Improve Student's Critical Thinking Ability in Science Learning in Elementary School

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Abstract:- This research focuses on developing PBL-based science learning videos with the subject matter of changing the shape of objects and increasing critical thinking skills as a solution to the problems students face in science subjects at SDN Cikini 02. The findings of these problems have been analyzed related to the difficulty of understanding concepts in the subject matter of changes in the form of objects. The material about changing the shape of objects is an essential and concrete concept because it is encountered in everyday life. The video development that will be carried out in this research is a PBL-based video closely related to the steps in PBL learning. The research method used is research and development with the ADDIE model, namely Analysis, Design, Development, Implementation, and Evaluation. The problems characterize the PBL learning process (can be raised by students or teachers). Students deepen their knowledge of what is known and how to solve problems in groups to help each other collaborate in solving problems. Through PBL, students can exchange ideas and work together to solve problems, improving critical thinking skills. This development research uses to test and non-test instruments in data collection techniques. The trials carried out were individual, small group, and field trials. A pretest was carried out before the trial in the experimental class, and a posttest after all trial stages were completed. The results of the calculation of the average final score, the control group has an average value of 67.58. The average for the experimental group is 86.33. It has a significant difference test value of 0.000 <0.05. There is a difference in the average final results for the control and experimental groups, where the average experimental value is higher than the control group average.

Keywords:- *Learning Video, Problem Based Learning, Science, Critical Thinking.*

I. INTRODUCTION

Science results from knowledge and experience through a series of scientific processes tested using critical thinking. This study aims to produce learning video products based on Problem Based Learning (PBL) to improve fifth-grade elementary school students (Nurjanah et al., 2021; Wahyudiana et al., 2021). Audio-visual media can be heard and seen; thus, learning is more effective. Researchers want to raise this matter for further research and development. In choosing media, an educator needs to analyze the criteria for learning media and select this developed video media (Harsanti, 2018). PBL-based science learning videos with material-changing objects can optimize science learning activities at SDN Cikini 02 and create meaningful learning activities. Learning video is a product that is designed systematically based on the applicable curriculum (Ningrum et al., 2022; Sudrajat et al., 2018). In its development, it applies to learning principles. Students can quickly and interestingly examine the subject matter from the video (Azmy et al., 2022; Wantika, 2017). This study uses video in learning to improve critical thinking skills. The purpose of learning using video media includes cognitive, affective, and psychomotor goals. (Anderson, 1987). The cognitive goal in question is that students can develop their cognitive abilities regarding recognizing again and providing stimulation in the form of motion and sensation. Cognitively, students can show a series of still images without sound and photo media and frame films, even though it is less economical (Sari et al., 2022). The designed videos can show real examples to practice them with special activities such as practicum. The affective goal is that video can be an excellent medium in influencing attitudes and emotions by using appropriate techniques and effects (Iasha, 2018). The psychomotor goal is that video is a suitable medium to show the movements used. For example, in carrying out practices that involve body movements, these movements can be slowed or accelerated. Students can get visual feedback on their abilities to try these skills through videos, as exemplified through the video (Acesta et al., 2021; Aningsih et al., 2022).

First, the material with a high difficulty level must be delivered using many innovative ways to receive it well. The objects around us have unique properties and characteristics. By understanding the properties of objects, we can study the natural phenomena that occur around us well (Yustitia et al., 2021). By understanding the nature of things, you know what you will do when you are in a river, sea, or lake. By knowing the properties of objects, you know what you will do to change the shape of those objects. Even though there are only three forms of matter, all three can experience changes in form in different ways. A changing environment causes changes in the shape of objects. For example, the temperature of the environment becomes hot or cold. Changes in the form of an object include freezing, melting, evaporating, condensing, subliming, and crystallizing (Setiawan et al., 2021).

The third is the lack of innovative media. Most of the teachers who hold class V are senior teachers who have limitations in finding and using innovative media. The media most often used is video media (Utomo et al., 2021). While learning media in the form of video has its drawbacks, one of which is opposition or inappropriate retrieval, which can cause the audience to doubt interpreting the images they see (Daryanto, 2010). In addition, the biggest obstacle is the ignorance of the latest reference materials to find and create learning media that can be a liaison for conveying material on the circulatory system. According to Oemar Hamalik (2003:54), learning is a combination of human elements, facilities, equipment, and procedures that influence each other to achieve learning.1 The term learning can be defined from various points of view. From a behavioristic point of view, learning changes student behavior by optimizing the environment as a source of learning stimulus.

II. RESEARCH METHOD

This research was conducted by applying the development research method, the R & D (Research and Development) method. The development model used is the ADDIE development model because each step has clear goals and objectives for novice designers. They are testing the effectiveness of this study using the Quasi Experiment method with a mixed-method approach. This research combines two forms of research that have existed before, namely qualitative and quantitative research.

➢ *Research Time and Place*

Research and development activities of PBL-Based Learning Videos (Problem Based Learning) were carried out in class V of SDN Cikini 02. The research was carried out from October 2021 to December 2021.

➢ *Research Subject*

The research subjects consisted of 3 students in individual trials, ten students in small group trials, and 30 students in field trials.

➢ *Development Procedure*

This research is included in development research that aims to produce media, namely PBL-based learning videos with subject matter changes in object form, to improve the critical thinking skills of 5th-grade elementary school students. This type of research is research and development. Development activities are testing the validity or feasibility and testing the effectiveness of the products that have been made by conducting limited trials and usage trials so that they become tested products and can be used by the wider community, especially students and teachers. In theory, Borg & Gall, in their book Sugiyono (2015:297), states that research and development methods are research methods used to produce a product, then test the feasibility and effectiveness of the product so that it becomes a product that can be utilized under the predetermined goals.

According to Borg & Gall in Adelina Hasyim (2016: 88) suggesting that R&D steps can be simplified according to the needs of researchers, that research using large-scale R&D requires much effort, cost, and time as well as originality. The limitations on the aspects of time and research implementation and up to step 7 are sufficient to test the validity and feasibility of the developed video learning media.

➢ *Data, Instruments, and Data Collection*

To validate the product developed, it refers to the type of data in quantitative and qualitative data. Quantitative data in the form of information was obtained by using a questionnaire after using PBL-based learning videos. Qualitative data in the form of information from interviews with classroom teachers, comments, responses, and suggestions for improvement based on the results of assessments from material experts, media experts, and linguists. In addition, it also goes through a feasibility test based on the results of an assessment by a teacher who teaches in grade 5.

- *Questionnaire*

This study used a questionnaire to determine how the response of students' interest in learning before and after using PBL-based learning videos.

- *Interview*

The interview aims to obtain information about the characteristics of students in grade 5, competency standards in science subjects, and the difficulties encountered by grade 5 teachers in the learning process in the classroom. In addition, this interview also aims to identify the needs of students in learning activities.

- *Instrument*

The research instrument went through the testing phase, namely homogeneity, normality, reliability, and difference.

➢ *Data analysis technique*

The resulting learning media is declared feasible, and a thorough evaluation must be carried out. The estimation of validity and reliability is through the product trial phase, whose measurement uses a Likert Scale. The evaluation of this learning media is the average score obtained from the answers to the questionnaire, which has a score of 1-5 choices, while in the student response questionnaire, the choice of scores used is 1-4. The research instrument in the form of a questionnaire is analyzed using a Likert Scale with the following criteria:

Table 1. Assessment Scale of Validation Instruments and Trial Instruments

Answer Options	Score
Very Good	5
Good	4
Enough	3
Not Enough	2
Very Less	1

Answer Options	Score
Very Good	4
Good	3
Enough	2
Not Enough	1

After that, the interpretation of the scores obtained is as follows:

Table 2. Score Interpretation

Presents	Criteria
81% - 100%	Very Worth It
61% - 80%	Worthy
41% - 60 %	Decent Enough
21% - 40%	Not Worth It
0% - 20%	Not Feasible

The results of data analysis on the given instrument will be presented in the form of tables and graphs. The data analysis technique used the t-test with the following formula (1)

$$t = \frac{md}{\sqrt{\frac{\sum xd^2}{n\,(n-1)}}} \quad (1)$$

where t is the t-test score, Md is the average gain, Xd is the deviation of the gain score to the mean, d is the difference between the scores after and the scores before each subject, Xd2 is the square of the deviation of the gain scores to the mean, and n is the number of samples (subjects of the study).). The following calculation is used to determine the percentage of success: (Lestari & Yudhanegara, 2017).

$$p = \frac{s}{n} x\ 100\% \quad (2)$$

where P is the percentage of success (%), S is the number of scores, and N is the maximum number of points. The PBL-based learning video developed is feasible if the minimum level of quality achieved is in a good enough category.

III. RESULT AND DISCUSSION

This research aims to produce PBL-based learning videos. The developed teaching media is expected to be one of the adequate learning resources so that the interest in learning science for fifth-grade students can increase. This research is a simplification and adjustment of the ADDIE model. According to Rozalena and Dewi (2016), the ADDIE model is a combination of analyzing, designing, developing, implementing, and evaluating activities. The stages of the modified R&D research from Sugiyono (2009) are as follows.

A. Analysis stage

The following activities: (1) conduct an analysis of the competencies required of students; (2) analyze the characteristics of students regarding the learning capacity, knowledge, skills, attitudes that students and other related aspects have possessed; (3) conduct material analysis under the demands of competence. The author conducted a preliminary study using observations and interviews at SDN Cikini 02. According to Arikunto (2013:265), "observation is a conscious effort to collect data that is carried out systematically, with standardized procedures." This observation was carried out to directly determine the science learning process in elementary school and the extent to which supporting learning media was used. Moleong (2004: 186) suggests that the interview is a "conversation with a specific purpose. The conversation was carried out by two parties, namely the interviewer who asked the question and the target of the interview, namely the party who answered the question. Interviews were conducted with fifth-grade teachers. From the observations and interviews conducted, potential problems were found. From these potentials and problems, the author conducted a needs analysis. Then the author intended to design a PBL-based learning video used for science learning on the material of changing objects.

B. Design Stage

The design stage is carried out with a frame of reference for whom learning is designed and what abilities are desired to be learned, how the subject matter or skills can be studied well, how to determine the level of mastery of the lessons that have been achieved references for authors related to the designed PBL-based learning videos. Then prepare the appropriate Learning Implementation Plan design and design the type of assessment instrument, including the questions used for the pretest and posttest. This video design stage is intended for students. Their competence is in the natural sciences with a problem-based learning model that will be used to improve critical thinking. The assessment and evaluation are adjusted to the principles of the problem-based learning model.

C. Development Stage

The Development Stage includes collecting interactive multimedia-based learning media/materials, making illustrative images, typing, and others. Then proceed with the preparation of interactive multimedia-based learning media with the help of the required software. At this stage, the activities carried out are determining core competencies, essential competencies, learning objectives, and determining the subject matter and learning media to be used, including evaluation instruments, all of which are outlined in the lesson plan, then a flowchart is made as a reference. Researchers then collect supporting materials such as photos, videos, animations, and pictures. All the collected materials are then entered into the video processing application according to the design made on the flow chart. Video processing is carried out by researchers whom an expert assists in their field. The results of the PBL video products are then packaged in a learning compact disc (CD) as a product design and uploaded to Google Drive and YouTube so that they can be accessed anytime and anywhere as a learning medium.

D. Implementation

The development results are applied in learning to determine the effect on the quality of learning which includes effectiveness, attractiveness, and learning efficiency. Several experienced experts and practitioners conducted design validation to assess the newly designed product. Each expert plays a role in assessing the design developed so that its weaknesses and strengths can be identified and whether or not it is feasible or not as a development product. (Sugiyono, 2013: 536). Design validation is an activation process to assess whether the product design is suitable for use or not.

E. Evaluation

Evaluation is the last stage which includes formative evaluation and summative evaluation. Formative evaluation is carried out to collect data at each stage used to refine, and summative evaluation is carried out at the end of the program to determine its effect on student learning outcomes and the quality of learning in general. In this study, only formative evaluation was carried out because this type of evaluation was related to the stages of development research to improve the resulting product development. After analyzing and finding the advantages and disadvantages to produce a viable product, the writer then revises the PBL-based learning video product according to the advice of experts.

➢ *Testing*

PBL-based learning videos that have been validated are then carried out with limited trials. In the limited trial activity, several students and class teachers were asked to fill out a feasibility instrument to assess the product developed as revision material for product perfection before being tested on a broader scale, namely the use trial. The results of product revisions that have been carried out in limited trials are then tested for use in the field to see the effectiveness of the products made. Suppose the PBL-based learning video is feasible and effective. In that case, a trial of its use is carried out, namely as a student learning medium in learning activities within science lessons with the subject matter of changing the shape of objects.

Table 3. Expert Validation Results

No.	Aspect	Percentage (%)	Score	Criteria
1	Matter expert	86	43	so worth it
2	Media expert	98	49	so worth it
3	Language expert	88	44	so worth it

The results of the validation of content/material, media, and language experts in PBL-based learning videos are presented in figure 1.

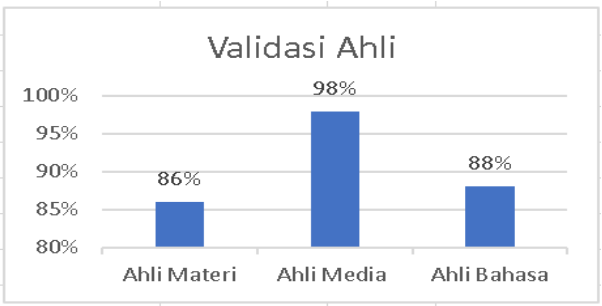

Fig 1. Expert Validation Results

Based on the expert validation test results, the score for the material aspect was 86%, the media aspect was 98%, and the language aspect was 88%. The average of all aspects is 90.67%, with a very decent category. From these data, it can be concluded that the learning video media developed is very feasible to be used as a source of student learning.

Table 4. Class V Teacher Validation Results

No.	Aspect	Percentage (%)	Score	Criteria
1	Matter	80	16	so worth it
2	Media	95	19	so worth it
3	Language	90	18	so worth it
4	Appearance	90	18	so worth it
	Average	89		so worth it

The results of the test instrument validation in the form of essay questions are presented in figure 2

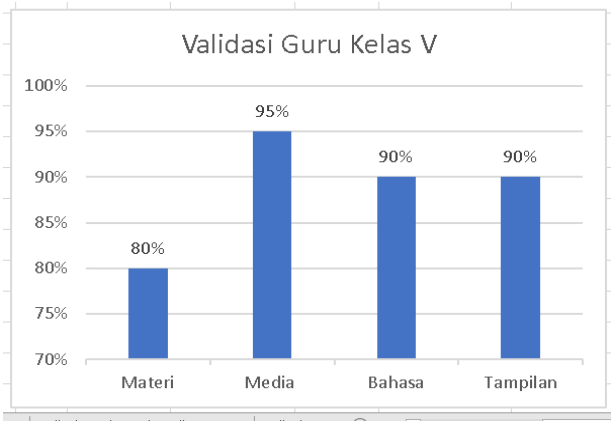

Fig 2:- Instrument Validation Results by the 5th grade science teacher

Based on the teacher's instrument validation results shown in table 4, the average score for all aspects was 89%. This score indicates that the test instrument in the form of essay questions that will be used as a pretest and posttest of learning that is developed is included in the very appropriate category to be used as a measuring tool. The pretest was given to the students before the product trial was conducted, and the pretest was given after the product trial. The product referred to in this research is a PBL-based learning video.

After expert validators carried out the product feasibility test, material experts, media experts, language experts, and instrument feasibility tests by fifth-grade science teachers, the learning video media was refined based on suggestions from experts and teachers then tested on students. The learning video media trial was conducted three times, namely individual trials, small group trials, and field trials. The following is the data from the test results from students.

➢ *Individual Trial*

Individual trials were conducted on three students based on abilities below, equal, and above average.

Table 5. Individual Trial Results

No.	Aspect	Percentage (%)	Score	Criteria
1	Matter	91.7	18.3	so worth it
2	Media	95.0	19	so worth it
3	Language	98.3	19.7	so worth it
4	Appearance	96.7	19.3	so worth it
	Average	95.4		so worth it

The results of individual trials of PBL-based learning videos are presented in figure 3

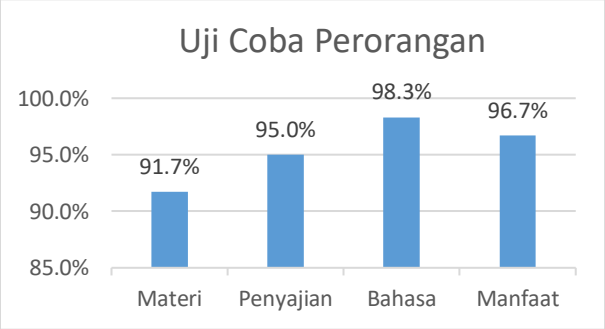

Fig 3. Individual Trial Results

Based on the results of individual trials shown in table 5, the average score for all aspects is 95.4%. This score indicates that the learning video media for changing the shape of objects developed is included in the category suitable for learning media.

➢ *Small-Group Trial*

Small group trials were conducted on ten students, with different characteristics from individual trials.

Table 6. Small-Group Trial

No.	Aspect	Percentage (%)	Score	Criteria
1	Matter	93.0	18.6	so worth it
2	Media	95.0	19	so worth it
3	Language	99.0	19.8	so worth it
4	Advantage	96.5	19.3	so worth it
	Average	95.9		so worth it

Based on the results of the small group trial shown in table 4, the small group trial of PBL-based learning videos is presented in the form of a bar chart in figure 4.

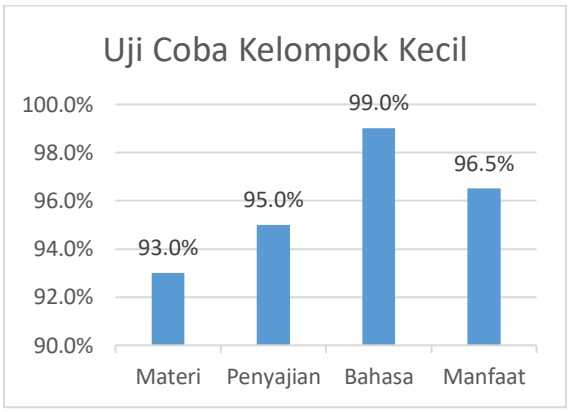

Fig 4. Small-Group Trial Results

Obtained the average score of all aspects is 90.85%. The description of each aspect assessed, namely the material aspect, obtained a score of 93.0%; the presentation aspect got 95.0%, the language aspect got a score of 99.0%, and the benefit aspect got a score of 96.5%. This score indicates that the learning video media developed is included in the worthy category for learning media.

➢ *Field Trial*

Table 7. Field Trial

No.	Aspect	Percentage (%)	Score	Criteria
1	Matter	92.8	18.6	so worth it
2	Media	95.0	19.0	so worth it
3	Language	99.0	19.8	so worth it
4	Advantage	96.5	19.3	so worth it
	Average	95.83		so worth it

The results of the PBL-based learning video field trial are presented in figure 5

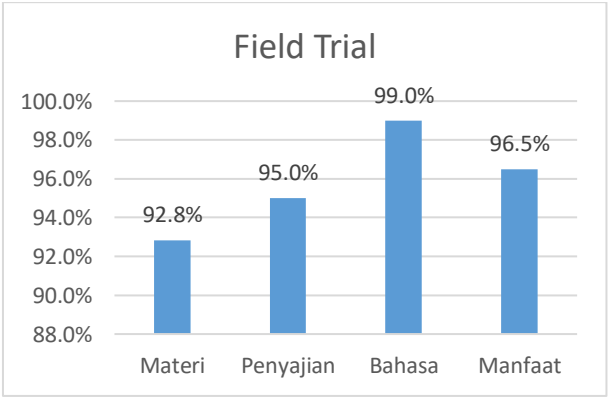

Fig 5. The result of the field trial

Based on the results of the field trials shown in table 5, the average score for all aspects was 95.83%. The description of each aspect assessed, namely the material aspect, obtained 92.8%; the presentation aspect got 95.0%, the language aspect got a score of 99.0%, and the benefit aspect got a score of 96.5%. This score indicates that this PBL-based learning video is included in the category suitable for use as a learning medium for a material change in the form of objects in class V Elementary School.

After going through the three trial stages, the final product, in the form of a final learning video, is ready to be implemented in the field as a PBL-based learning video to improve critical thinking skills.

F. Data analysis

➢ *Instrument Validity Test Results*

- *Instrument Validity Test*

The validity test in this study was conducted to determine whether the test instrument used was suitable as a measuring tool to increase student interest. This test involved 30 students who were included in the research subjects. Based on the calculation results, the results of the declared valid items are presented in table 8.

Table 8. Instrument Validity Test Results

Result	**Pearson Corrleation**	.711’	.711’	.795”	.740’	.840”	1
	Sig. (2-tailed)	0.021	0.021	0.006	0.014	0.002	
	N	10	10	10	10	10	10

Based on Table 6, it is known that the number of questions whose validity was measured was five essay questions which had a correlation coefficient value more significant than the r table. Thus, the instrument is declared valid and suitable to be used as an instrument to measure critical thinking skills in fifth-grade elementary school students.

- *Instrument Reliability Test*

Reliability refers to the notion that an instrument has a level of confidence. It is suitable to be used as a tool to obtain data because the instrument is already good. It is said to be reliable if the Cronbach's Alpha value is >0.6

Table 9. Instrument Reliability Test Results

Cronbach's Alpha	**N of Items**
0,816	5

Based on table 9, it is known that the reliability of the test instrument after being tested using Cronbach's Alpha 0.816> 0.6 so that it can be stated that the data is reliable. The score indicates that the test instrument is reliable or consistently used to measure the critical thinking skills of fifth-grade elementary school students.

➢ *Analysis Prerequisite Test Results*

- *Normality test*

The normality test is used to determine whether the sample data comes from a population that is normally distributed or not. Testing for normality using the Kolmogorov Smirnov test with the help of SPSS 25.0 for Windows. The following are the results of the normality test analysis of the experimental and control classes presented in Table 10.

Table 10. Normality test result

Test of Normality							
Group		**Kolmogorov-Smirnov[a]**			**Shapiro-Wilk**		
		Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Pretest	Control	.152	31	.067	.942	31	.092
	Experiment	.150	30	.083	.964	30	.396
Posttest	Control	.122	31	.200	.971	31	.558
	Experiment	.157	30	.058	.940	30	.091

Data is normally distributed if it has a significance value > 0.05. From the results of the Kolmogorov Smirnov and Shapiro-Wilk normality test above, the data can be concluded that the data is usually distributed because there is no significant value of the data <0.05. Then the next test is the homogeneity test.

- *Homogeneity Test*

A homogeneity test was carried out to test whether the two sample groups in this study came from the same population and had homogeneous data variants. The homogeneity test used is Lavene's statistic test with the help of SPSS 25.0 for windows. The results of the analysis of the homogeneity of interest in learning science are presented in table 11.

Table 11. Homogeneity test result

Test of homogeneity of variance					
		Levene Statistic	**df1**	**df2**	**Sig.**
Pretest	Based on mean	.983	1	59	.325
	Based on median	.540	1	59	.466
	Based on median and with adjusted df	.540	1	50.910	.466
	Based on trimmed mean	.892	1	59	.349
Posttest	Based on mean	.549	1	59	.462
	Based on median	.412	1	59	.523
	Based on median and with adjusted df	.412	1	50.339	.524
	Based on trimmed mean	.552	1	59	.461

Data is homogeneous if it has a sig level > 0.05. The results of the homogeneity test above show that the data is homogeneous because there is no significance <0.05. Then the T-test was carried out with a parametric test, namely the Independent Sample t-Test.

- *Average Difference Test*

This average difference test was conducted to determine whether the experimental and control classes had the same or different initial abilities. The average difference test in this study used an independent sample t-test with the help of SPSS 25.0 for windows. The average difference test of interest in learning science in the two classes is presented in table 12.

Table 12. Descriptive Statistics test result

Descriptive Statistics							
	N	**Minimum**	**Maximum**	**Sum**	**Mean**	**Std. Deviation**	**Variance**
Prestest control group	31	20	75	1315	42.42	13.532	183.118
Prestest experiment group	31	40	90	2095	67.58	11.319	128.118
Posttest control group	30	20	65	1230	41.00	10.372	107.586
Posttest experiment group	30	70	100	2590	86.33	9.091	82.644
Valid N (listwise)	30						

Based on Table 12, it is known that the number of respondents in the experimental class is 30 students, and the control class is 31 students. The initial average score for each class was 42.42 for the experimental class and 67.58 for the control class. Descriptive statistics data shows an average difference between the experimental class and the control class. A test was conducted with the independent sample t-test to determine the significance of the data, in table 13.

Table 13. The Results of the Differences in the Average Critical Thinking Ability of Class V

Independent samples test								
							95% confidence interval of the difference	
		t	**df**	**Sig. (2-tailed)**	**Mean difference**	**Std. error difference**	**lower**	**Upper**
Pretest	Equal variances assumed	-.459	59	.648	-1.419	3.094	-7.611	4.773
	Equal variances not assumed	-.461	56.095	.647	-1.419	3.081	-7.591	4.753
Posttest	Equal variances assumed	7.120	59	.000	18.753	2.634	13.482	14.023
	Equal variances not assumed	7.145	57.085	.000	18.753	2.624	13.498	24.008

From the different test results above, it can be concluded that there is no difference in the initial value between the control group and the treatment group when viewed from a significance value of more than 0.05. With an average initial value for the control group of 42.42 and the average initial value of the experimental group, which is 41.00 with an average difference test significance of 0.648> 0.05, it is stated that there is no significant difference for the average value—baseline between the control group and the experimental group.

Meanwhile, from the average final score, the control group has an average value of 67.58. The average for the experimental group is 86.33. It has a significant difference test value of 0.000 <0.05. There is an average difference in the average of the final results for the control and experimental

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groups, where the average value of the experiment is higher than the average of the control group.

The increase (gain score) interest in learning science is obtained from the difference in the percentage before the treatment (pretest). After the treatment (posttest), normalized Gain (N-Gain) calculations were used To determine the effectiveness of using PBL-based learning videos in the experimental and control classes. The results of the calculation of N-Gain for the experimental class and the control class can be seen in table 14.

Table 14. N-gain Score Normality Test Calculation Results

Test of normality							
Group		**Statistics**	**df**	**Sig.**	**Statistics**	**df**	**Sig.**
nGain	Control Group	.095	31	.200*	.966	31	.415
	Experiment Group	.113	30	.200*	.957	30	.266

Data is normally distributed if it has a significance value > 0.05. From the results of the Kolmogorov Smirnov and Shapiro-Wilk normality test above, the data can be concluded that the data is usually distributed because there is no significant value of the data <0.05. Then the next test is the homogeneity test.

Table 15. Calculation Results of the N-gain Score Homogeneity Test

Test of homogeneity of variance					
		Levene Statistic	**df1**	**df2**	**Sig.**
nGain	Based on mean	3.517	1	59	.066
	Based on median	3.246	1	59	.077
	Based on median and with adjusted df	3.246	1	51.784	.077
	Based on trimmed mean	3.555	1	59	0.64

Data is homogeneous if it has a sig level > 0.05. The results of the homogeneity test above show that the data is homogeneous because there is no significance <0.05. Then the T-test was carried out with a parametric test, namely the Independent Sample t-Test.

Table 16. Descriptive Statistics Test Results for Experiment Class and Control Class

Group Statistics					
Group		**N**	**Mean**	**Std. Deviation**	**Std Error Mean**
nGain	Experiment group	30	.7570	.16834	.03073
	Control group	31	.3997	.24094	.04327

From table 14, the results of Group Statistics calculations, the number of respondents tested came from two different classes, with 30 respondents from the experimental class and 31 respondents from the control class. With an average N-Gain Score for the control class of 0.3997 and the experimental class of 0.7570, the control group is in the less effective category, while the experimental group is in the practical category because the mean value is >70.

Table 17. Test Results Independent Sample T-Test

Independent samples test								
							95% confidence interval of the difference	
		t	**df**	**Sig. (2-tailed)**	**Mean difference**	**Std. error difference**	**lower**	**Upper**
nGain	Equal variances assumed	6.694	59	.000	.35732	.05338	.25050	.46414
	Equal variances not assumed	6.732	53.751	.000	.35732	0.5308	.25090	.46375

Based on table 15 independent sample t-test output, it is known that the value of Sig. (2-tailed) of 0.000 <0.05, then as the basis for decision making in the independent sample t-test, the results obtained, Ho was rejected, and Ha was accepted. For the average difference test of the N-Gain score, which shows a significance of 0.000 <0.05, it can be stated that there is a significant difference between the group that does not use PBL-based learning videos and classes that use PBL-based learning videos.

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IV. CONCLUSION

Based on the results of research that has been carried out on the development of PBL-based learning videos to improve students' critical thinking skills in science subjects in elementary schools, namely:

- The PBL-based learning video with subject matter changes in the shape of objects has been valid from the validation results by material experts, media experts, and language experts, so it is proven to be very feasible. It can be used as a learning resource.
- The PBL-based learning video developed can improve students' critical thinking skills in science learning in elementary schools, as evidenced by the posttest results of the experimental group, which are higher than the control group

REFERENCES

[1]. Abidin. (2013). Model Pembelajaran dengan Pendekatan Sains.

[2]. Acesta, A., Sumantri, M. S., Fahrurrozi, F., Iasha, V., & Setiawan, B. (2021). Natural Scıence Learnıng Module Based on Multıple Intellıgences in Elementary Schools. *Psychology and Education Journal*, *58*(4), 739–749.

[3]. Ahmad Rohani dan Abu Ahmadi. Pengelolaan Pengajaran, Rineka Cipta, Jakarta, 1991, hlm.1.

[4]. Amir, M. Taufik. Inovasi Pendidikan Melalui *Problem Based Learning* . Jakarta: Kencana. 2009.

[5]. Aningsih, Zulela, M. S., Neolaka, A., Iasha, V., & Setiawan, B. (2022). How is the Education Character Implemented? The Case Study in Indonesian Elementary School. *Journal of Educational and Social Research*, *12*(1 SE-Articles), 371. https://doi.org/10.36941/jesr-2022-0029

[6]. Anitah, Sri. (2012). Media Pembelajaran. Surakarta: Yuma Pustaka.

[7]. Anugraheni, 1. Meta Analisis Model Pembelajaran *Problem Based Learning* dalam Meningkatkan Keterampilan Berpikir Kritis di Sekolah Dasar. A Journal of Language, Literature, Culture, and Education POLYGLOT Vol.14 No.1 Januari 2018.

[8]. Arif S Sadiman, Media Pendidikan, Pengertian, Pengembangan, dan Pemanfaatannya, Raja Grafindo, Jakarta, 2003.

[9]. Arifin, Z. 2017. Mengembangkan Instrumen Pengukur Critical Thinking Skills Siswa pada Pembelajaran Matematika Abad 21. Program Studi Pendidikan Matematika, Universitas Majalengka. Vol 1 No. 2, hal. 92-100. Jurnal THEOREMS (The Original Research of Mathematics).

[10]. Azmy, B., Juniarso, T., & Setiawan, B. (2022). Pengembangan Kuis Interaktif Berbasis IT: PPM Bagi Guru SDN Sumur Welut III/440 Surabaya. *Kanigara*, *2*(1), 8–15.

[11]. Baratha, H dan Restu F. Meningkatkan Kemampuan Berpikir Kristis Siswa dengan *Problem Based Learning* . 2015.

[12]. Cheppy Riyana, Pedoman Pengembangan Media Video, P3AI UPI , Jakarta, 2007.

[13]. Eggen, Paul Don Kouchak. 2012. Strategi dan Model Pembelajaran. Jakarta: PT Indeks.

[14]. Eni Fariyatul F dan Nurdyansyah. Inovasi model pembelajaran sesuai Kurikulum 2013, Nizamial Learning Center, Sidoarjo 2016, hlm. 3.

[15]. Fuasi, A.S, & Muchon, M (2020). Penerapan Model Pembelajaran *Problem Based Learning (PBL)* pada Masa Pandemi Covid 19 Dalam Meningkatkan Aktivitas dan Hasil Belajar Siswa Pada Mata Pelajaran Produk Kreatif Dan Kewirausahaan

[16]. Harsanti, A. G. (2018). PENGEMBANGAN PERANGKAT PEMBELAJARAN DENGAN MENGGUNAKAN OUTBOND UNTUK PENINGKATAN PERILAKU SOSIAL SISWA KELAS IV SDN 01 TAWANGREJO. *Buana Pendidikan: Jurnal Fakultas Keguruan Dan Ilmu Pendidikan*, *14*(25 SE-), 21–29. https://doi.org/10.36456/bp.vol14.no25.a1461

[17]. Iasha, V. (2018). Peningkatan Proses Pembelajaran Tematik Terpadu Menggunakan Pendekatan Scientific di Sekolah Dasar. *Jurnal Pendidikan Dasar*, *2*(1), 18–36.

[18]. Kariani, M. Pengaruh Penerapan Strategi Inkuiri Terhadap Kemampuan Berpikir Kritis Siswa Pada Mata Pelajaran PPKn di 1 Pujut. 2013

[19]. Kurniasih, I. dan Berlin S. (2014).Sukses mengimplementasikan kurikulum 2013 memahami berbagaiaspek dalam kurikulum 2013. Jakarta: Kata Pena.

[20]. Kusairi, S. dkk. Penerapan *Problem Based Learning* untuk Meningkatkan Kemampuan Berpikir Kritis dan Hasil Belajar Siswa Kelas III. 2018. Jurnal Pendidikan, Vol. 3, No. 12.

[21]. Lestari Y.P, dkk. Penerapan PBL (*Problem Based Learning*) Berbantuan Media Papan Catur Untuk Meningkatkan Hasil Belajar Matematika Kelas 4 Sd. Vol.4 No.1, hal.54-62. Jurnal Pendidikan Dasar Perkhasa. 2014

[22]. Lilis Lismaya. 2019. Berpikir Kritis & PBL (*Problem Based Learning*). Surabaya: Media Sahabat Cendekia.

[23]. Moh. Ayip S, Efektivitas Penggunaan Media Video Animasi dalam Proses Pembelajaran Fisika, Skripsi Upi, Tidak Diterbitkan, Bandung, 2003, hlm.65.

[24]. Nana Sudjana , Teknologi Pengajaran, Sinar Baru Algesindo, Bandung, 2007

[25]. Ningrum, K. D., Utomo, E., Marini, A., & Setiawan, B. (2022). Media Komik Elektronik Terintegrasi Augmented Reality dalam Pembelajaran Sistem Peredaran Darah Manusia di Sekolah Dasar. *Jurnal Basicedu*, *6*(1), 1291–1300. https://doi.org/10.31004/basicedu.v6i1.2289

[26]. Nurjanah, N., Cahyana, U., & Nurjanah, N. (2021). Pengaruh Penerapan Online Project Based Learning Dan Berpikir Kreatif Terhadap Keterampilan Proses Sains Siswa Kelas IV Pada Pelajaran IPA Di SD Nasional 1 Kota Bekasi . *Buana Pendidikan: Jurnal Fakultas Keguruan Dan Ilmu Pendidikan*, *17*(1 SE-), 51–58. https://doi.org/10.36456/bp.vol17.no1.a3161

[27]. Oemar Hamalik, Proses Belajar Mengajar, Bumi Aksara, Jakarta, 2003, hlm.54

[28]. Sari, Y., Yustiana, S., Fironika, R., Ulia, N., Iasha, V., & Setiawan, B. (2022). The Design of Religious Value-Based Teaching Materials in Increasing Students' Learning Achievement Elementary School. *Jurnal Basicedu*, *6*(1), 1171–1180. https://doi.org/https://doi.org/10.31004/basicedu.v6i1.2235
[29]. Setiawan, B., Apri Irianto, S. H., & Rusminati, S. H. (2021). *DASAR-DASAR PENDIDIKAN: Kajian Teoritis Untuk Mahasiswa PGSD*. CV Pena Persada.
[30]. Sudrajat, A., Iasha, V., & Femayati, F. (2018). The Influence of the Use of Cooperative Learning Model Jigsaw & Two Stay Two Stray and the Learning Interest Result on 5th Grade Social Science. *ICEAP*, *2*(2), 28–33.
[31]. Sugiyono (2015). Metode Penelitian Kombinasi (Mix Methods). Bandung: Alfabeta
[32]. Supinah dan Titik S. 2010. Modul Matematika SD Program Bermutu, Pembelajaran Berbasis Masalah Matematika di SD/MI. Kemdiknas, Yogyakarta.
[33]. Suryosubroto. 2009. Proses Belajar Mengajar di Sekolah. Jakarta: Rineka cipta.
[34]. Susiani T.S, dkk. Critical Thinking Skill: Konsep dan Inidikator Penilaian. Vol 1 No.2, hal 1-7. Jurnal Taman Cendekia.
[35]. Tanzeh, Dkk. *Ilfluence Learning Model PBL (Problem Based Lerning) on The Activities And Student Results.*
[36]. Trianto. 2007. Model Pembelajaran Terpadu dalam Teori dan Praktek. Jakarta: Prestasi Pustaka
[37]. Utomo, G. M., Setiawan, B., Rachmadtullah, R., & Iasha, V. (2021). What Kind of Learning Media do You Want? Need Analysis On Elementary School Online Learning. *Jurnal Basicedu*, *5*(5), 4299–4305.
[38]. Wahyudiana, E., Sagita, J., Iasha, V., Setiantini, A., & Setiarini, A. (2021). PROBLEM-BASED LEARNING-BASED IPA PRACTICUM MODULE TO IMPROVE PROBLEM-SOLVING ABILITY. *Buana Pendidikan: Jurnal Fakultas Keguruan Dan Ilmu Pendidikan*, *17*(2), 161–167.
[39]. Wantika, R. R. (2017). Pembelajaran Kooperatif Tipe TAI Berdasarkan Teori Beban Kognitif. *Buana Pendidikan: Jurnal Fakultas Keguruan Dan Ilmu Pendidikan*, *13*(23), 41–46.
[40]. Yustitia, V., Fanny, A. M., Kusmaharti, D., & Setiawan, B. (2021). Aplikasi Pembelajaran Tematik Berbasis TIK: PPM Bagi Guru SD Hang Tuah X Sedati. *Manggali; Vol 1 No 2 (2021): ManggaliDO - 10.31331/Manggali.V1i2.1692* . http://e-journal.ivet.ac.id/index.php/manggali/article/view/1692