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Development of Student Worksheet (LKPD) Based on Project Based Learning to Improve Students' Critical Thinking Skills in Integrated Thematic Learning in Elementary Schools

Aisya Maqdisiana[1]* , Sugeng Widodo [2], Pargito [2]
[1] Dinas Pendidikan Kota Bandar Lampung, Bandar Lampung, Indonesia
[2] Department of Geography Education, Universitas Lampung, Bandar Lampung, Indonesia
*E-mail: aisyamaqdisiana47@guru.smp.belajar.id

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Correspondent Author:
Aisya Maqdisiana,
Dinas Pendidikan Kota Bandar Lampung, Bandar Lampung, Indonesia,
E-mail: aisyamaqdisiana47@guru.smp.belajar.id

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ABSTRACT

The average thinking skills of chitis in elementary school students are still relatively low, this can be seen during integrated thematic learning. To overcome these problems, LKPD will be developed based on Project Based learning (PjBL). This study aims to: 1) develop PjBL-based LKPD that is feasible to be used to improve students' critical thinking skills in integrated thematic learning in grade IV, 2) Analyze the effectiveness of PjBL-based LKPD in improving students' critical thinking skills in integrated thematic learning in Class IV. This research is a Research and Development research. Sampling using purposive sampling technique. The population in this study was grade IV students of SD Negeri 2 Pinang Jaya Kemiling Bandarlampung. Data collection using documentation techniques, written tests, and questionnaire dissemination. The instrument used is a test that has been tested for validity and reliability using the help of the SPSS 24.0 for windows program with a significance level of 0.05. Furthermore, the data is processed using an independent sample-test. The research results are (1) PjBL-based LKPD are suitable for use and (2) PjBL-based LKPD are effective for use.

INTRODUCTION

Critical thinking skills are very important in making decisions to solve problems faced by students, both small and big problems according to the level of education. Spliter (in Komalasari, 2010: 266) suggests that critical thinking skills are reasoning and reflective thinking skills that are focused on deciding things to believe and do. Ennis (in Fisher, 2009: 5) suggests that critical thinking is a process that aims to make reasonable decisions, so what is thought is the best of the truth that can be done correctly. Based on preliminary data, the critical thinking ability of elementary school students is still relatively low, especially in integrated thematic materials. To overcome these problems, LKPD (Student Worksheets) based on Project Based Learning (PjBL) will be developed.

LKPD is one of the teaching materials used by educators to convey information more interestingly and allow students to be more active. Toman (2019: 174) Worksheets are one of the teachingmethods which can be done individually or in group work and enableconceptual development. LKPD is a tool used as a learning method that can be done individually or in groups. Trianto (2018: 222) explained that LKPD is a student activity sheet is a student guide used to carry out investigation or problem-solving activities in the form of experimental or demonstration guides. LKPD not only contains questions but there is also information that makes it easier for students to understand the material (Wijaya et al, 2023).

The results of the analysis of LKPD used in the learning of grade IV students in cluster 1 of SDN Kemiling sub-district, namely SDN 1 Pinang Jaya, SDN 2 Pinang Jaya, SDN 2 Sumberejo and SDN 3 Sumberejo Kemiling Bandar Lampung sub-district have not been oriented towards critical thinking based on PjBL with integrated thematic learning materials. This leads to a lack of critical thinking skills in learners. The following are the results of interviews with 10 grade IV educators in November 2022 in cluster 1 of SDN Kemiling District, which is then used as a reference for needs analysis in this development research.

Based on the results of the needs analysis, it shows that educators have used teaching materials in the form of self-made LKPD and package books from schools, but educators themselves are not sure that the content of teaching materials is in accordance with the rules / regulations. It is shown that only 20% of educators consider LKPD appropriate. Learning outcomes also show that only 20% of students can understand the material well using the LKPD. The interview results also showed that 100% of educators said that the teaching materials had not implemented PjBL-based learning and the content had not been able to develop students' critical thinking skills. Therefore, educators in this case researchers agree that project-based teaching materials are needed to support learning that can improve critical thinking skills.

Based on the results of the interview, researchers are interested in providing solutions by developing LKPD based on Project Based Learning. Abidin (2019: 169) explained that project-based learning is a learning model developed based on the level of development of students' thinking by focusing on student learning activities so as to allow them to move according to their skills, comfort, and learning interests. Based on the description above, researchers will develop LKPD based on the project base learning model, this LKPD is expected to be a learning medium for students in critical thinking.

The aim of this research are (1) to develop Project Based Learning based LKPD on "integrated thematic" learning to improve critical thinking of grade IV students and (2) to test the effectiveness / feasibility of Project Based Learning based LKPD on "integrated thematic learning" to improve critical thinking of grade IV students.

METHOD

This research uses research and development (R&D) method. This research aims to develop a product in learning. Meanwhile, the scope is the Development of Project-Based Learning Based LKPD to improve critical thinking in integrated thematic learning grade IV at the elementary school level. The stages of research to be carried out can be explained in the following flow chart.

The results and discussion are as much as 50-75% of the article length. Results are the main part of scientific articles that contain the results of data analysis and results of hypothesis testing. To clarify the results verbally the data can be presented in the form of tables or pictures (graphs are categorized as pictures). The title of the table is placed at the top, composed of three horizontal lines, without vertical lines. The title of the image is written at the bottom. The discussion is the most important part of the entire contents of scientific articles, containing answers to research problems, interpreting findings, integrating asian findings from research into existing knowledge collections, compiling new theories or modifying existing theories.

The results and discussion writing using Times New Roman, 11 pts, and single space. The beginning of each paragraph is typed indented 1 cm. Between the first paragraph and the main chapter is separated by one tap. The numbering of chapters, sub chapters, and so on is adjusted. All of figures and tables should be given continuing numbers and must be referred in the article.

First, research planning. This stage aims to maturation of concepts so that it will be more focused on research on development problems, especially those related to project-based learning LKPD and students' critical thinking skills, as well as reviewing research that has been done by authors and other researchers for reference. Second, the study of literature. Maturation of concepts by searching literature on the development of project-based learning-based LKPD related to "integrated thematic learning" so that students can have critical thinking. Third, Designing Instruments and Product Trials. Activities to design research instruments include conducting Group Discussion Forums with teams that master development research instruments. The results of this Group Discussion Forum will be an instrument that will be used in research trials. Fourth, product revision. In this activity, a revision of LKPD based on project-based learning will be carried out. The revision of LKPD will follow the rules of the Ministry of Education and Culture or based on national standards so that students are able to think critically. Fifth, Trial/Research Report. Activities at this stage include taking field data and processing research data, then making research reports on the development of LKPD based on project-based learning.

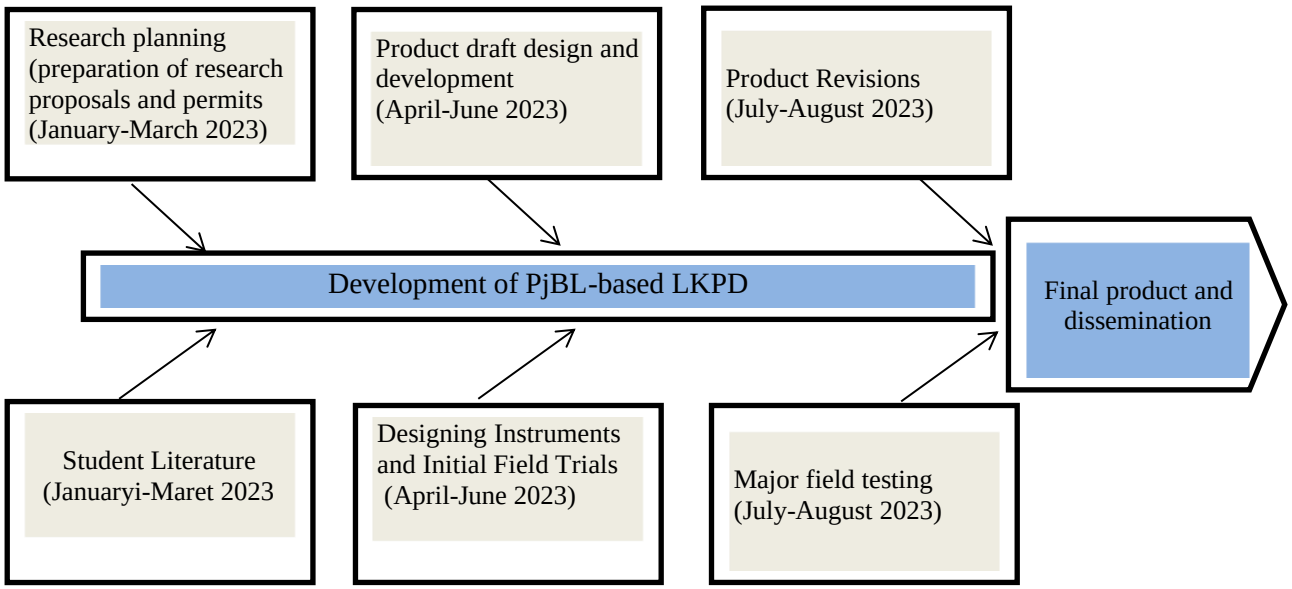

Figure 1. Research Design Model

RESULTS AND DISCUSSION

Research and Data Collection

At this stage, researchers make observations to schools to ascertain the conditions of the integrated thematic learning process and the needs needed to improve students' critical thinking skills. Based on observations and interviews with educators in schools presented in Figure 1. This shows that teaching materials have not varied so that students are still difficult to understand learning and have not been able to improve students' critical thinking skills that currently must be developed in learning. Therefore, researchers consider that the learning process in schools requires PjBL-based LKPD to improve critical thinking skills, especially in integrated thematic learning.

Planning

At this stage, researchers begin planning to compile PjBL-based LKPD to improve critical thinking skills. The theme chosen is theme 2 grade IV elementary school and collects references to the material. The theme contains many activities in the learning process so that it is suitable to be integrated in learning projects in order to improve students' critical thinking skills.

Developing Initial Products

After determining the theme researchers begin to develop products by determining competencies, indicators, objectives, learning steps and designing PjBL models in RPP adapted to the syllabus (Appendix 3). Then, researchers began to make LKPD that was adjusted to the material on theme 2 and the RPP that had been designed. LKPD is designed attractively and adapted to grade IV elementary school students. Therefore, researchers need expert opinions on aspects of material, media, and language to assess products that have been made.

Initial Field Trials

After the LKPD was completed, initial trials were carried out on a small scale. Prior to that, LKPD was assessed first by experts in material, media, and language (Appendix 4). The following are the results of the experts' assessment based on the analysis of the validity of the content with expert judgment:

Table 1.
Results of Aiken Analysis V Material Expert Assessment of PjBL-Based LKPD

No	Indicator	V	Information
1	LKPD Contains problems developed by students	0,92	Strongly Valid
2	LKPD is carried out cooperatively	0,94	Strongly Valid
3	LKPD produces products that can be presented	1,00	Strongly Valid
4	LKPD makes students more responsible	0,96	Strongly Valid
5	Activities in LKPD use the scientific procedures of constructivism	0,95	Strongly Valid
6	Learning materials in LKPD refer to Basic Competencies	0,96	Strongly Valid
7	LKPD presents teaching materials or materials that make it easier for students to interact with the material provided	0,98	Strongly Valid
8	The contents of LKPD provide experience from learning activities	1,00	Strongly Valid
9	The type of activity in LKPD is *hands on* (directing students to activities)	1,00	Strongly Valid
10	Questions in LKPD are productive	1,00	Strongly Valid
	Average	**0,97**	**Strongly Valid**

Source: Research result, 2023

Based on Table 1 shows that LKPD is very valid in the opinion of material experts. Therefore, LKPD is considered feasible to be used in the integrated thematic learning process of grade IV PjBL-based elementary schools to improve critical thinking skills. Other expert assessments, namely media experts with the following analysis results.

Table 2.
Results of Aiken V Analysis of Media Expert Assessment of PjBL-Based LKPD

No	Indicator	V	Information
1	The preparation of LKPD is universal	0,94	Strongly Valid
2	LKPD emphasizes the concept discovery process	0,94	Strongly Valid
3	LKPD invites students to be active in the learning process	0,94	Strongly Valid
4	LKPD develops communication, social, emotional, moral, and aesthetic skills	0,94	Strongly Valid
5	Use of LKPD language	0,94	Strongly Valid
6	Use of the sentence LKPD	1,00	Strongly Valid
7	Difficulty and clarity of LKPD	1,00	Strongly Valid
8	Text	1,00	Strongly Valid
9	Picture	1,00	Strongly Valid
10	LKPD appearance	0,83	Strongly Valid
	Average	**0,95**	**Strongli Valid**

Source: Research result, 2023

Table 2 shows that LKPD is very valid in the opinion of media experts. Therefore, the media in the form of PjBL-based LKPD is considered suitable for use in the integrated thematic learning process of grade IV elementary schools to improve critical thinking skills. Other expert assessments, namely media experts with the following analysis results.

Table 3.
Results of Aiken V Analysis of Linguist Assessment of PjBL-Based LKPD

No	Indicator	V	Keterangan
1	Accuracy of sentence structure.	1.00	Strongly Valid
2	Sentence effectiveness.	1.00	Strongly Valid
3	Sentence formality.	1.00	Strongly Valid

4	Message readability	1.00	Strongly Valid
5	Accuracy of use of language rules.	0.75	Strongly Valid
6	The ability to motivate messages or information.	0.88	Strongly Valid
7	The ability to encourage critical thinking.	1.00	Strongly Valid
8	Suitability of intellectual development of learners	1.00	Strongly Valid
9	Compliance with the level of emotional development of learners.	1.00	Strongly Valid
10	Demands and integration between learning activities	1.00	Strongly Valid
11	Tightness and cohesiveness between paragraphs	1.00	Strongly Valid
12	Consistency of use of terms	0.88	Strongly Valid
	Average	**0.96**	**Strongly Valid**

Source: Research result, 2023

Table 3 shows that LKPD is very valid in the opinion of linguists. Therefore, the language used in PjBL-based LKPD is considered feasible for students in the integrated thematic learning process in grade IV elementary schools to improve critical thinking skills. After an assessment by experts, LKPD was tested on a small scale first. The effectiveness of LKPD is measured through pretest and postes activities on a small scale with the n-gain formula. The results of the analysis of small-scale trials with a total of 6 students are presented in the table as follows.

Tabel 4.
Results of Analysis of Small-Scale Trials

No	N-Gain	Information
1	0.40	Medium
2	0.50	Medium
3	0.56	Medium
4	0.50	Medium
5	0.56	Medium
6	0.56	Medium
Average	**0.51**	**Medium**

Source: Research result, 2023

Based on the results of the analysis, it shows that there is an increase in student learning outcomes using PjBL-based LKPD with a moderate category. Therefore, LKPD needs to be revised in accordance with the advice of experts to further improve the learning outcomes of students.

Revision of Preliminary Field Trial Results

At this stage, researchers make revisions according to the comments of each expert (Appendix 4). The revisions given by each expert are presented as follows. First, material experts. Based on the assessment of 2 material experts who assessed this PjBL-based LKPD material, the thing that needs to be improved is to add activities to be able to further develop students' knowledge and need to package the material more attractively so that students are interested in reading. Second, media experts. Based on the assessment of 2 media experts, they gave suggestions to provide LKPD backgrounds with more attractive colors and make more attractive cover designs that suit elementary school students. Third, linguists . Based on the assessment of 2 linguists, researchers need to improve the use of punctuation and replace sentences with effective sentences, and LKPD needs to be consistent between the title page and the preface. Based on the suggestions of these experts, researchers concluded that the initial product of LKPD development was considered less attractive so that researchers revised the content more attractively to increase students' knowledge and content tailored to elementary school students.

Major Field Trials

This stage is carried out after the initial product revision process is complete. The results of the main field trial were carried out to see the improvement of students' critical thinking skills obtained from the pretest, posttest and N-gain based on a question test of 4 description questions. The effectiveness test was carried out by comparing experimental and control groups analyzed using an independent sample t-test. The hypotheses tested are as follows.

H0 : The development of LKPD based on Project Based Learning (PjBL) is not effective for improving students' critical thinking skills in Grade IV integrated thematic learning.
H1 : Development of LKPD based on Project Based Learning (PjBL) is effective to improve students' critical thinking skills in integrated thematic learning Class IV.

The test criteria if Sig (2-tailed) is obtained < 0.05 then Ha is accepted and if Sig (2-tailed) is obtained > 0.05 then Ha is rejected. The results of the calculation, it is known that the improvement of students' critical thinking skills is seen from the pretest, posstest and N-gain scores. The normality test shows that the pretest and posttest in the experimental and control classes are normally distributed with a value of (Sig.)>0.05 in accordance with the test criteria, it can be stated that the study is normally distributed. The variance of experimental class posttest data and control class posttest data is equal or homogeneous (Sig.0.71>0.05).

The results of the independent test sample t-test posttest experimental group and control group in table 4.5 showed that the average value of learners between the experimental group and the control group (Sig. 0.00<0.05). Furthermore, the N-gain test is carried out by calculating the difference between pretest and posttest scores, it can be stated that there is a significant increase from the application of Project Based Learning (PjBL)-based LKPD to students' critical thinking skills. The results of the independent sample t-test N-gain in table 4.5 can be stated that there is a significant difference from the application of Project Based Learning (PjBL)-based LKPD to students' critical thinking skills during learning (Sig. 0.01 <0.05), with experimental class N-gain of 0.65 including the medium category.

The test criteria if Sig (2-tailed) is obtained < 0.05 then Ha is accepted and if Sig (2-tailed) is obtained > 0.05 then Ha is rejected. Based on calculations obtained Sig (2-tailed) of 0.000 < 0.05 then Ha is accepted and Ho is rejected. Thus, the development of Project Based Learning (PjBL)-based LKPD is effective in improving students' critical thinking skills in Class IV integrated thematic learning is tested significantly.

So it can be concluded that there are differences in students' critical thinking skills using Project Based Learning (PjBL)-based LKPD with those that do not use in grade IV elementary school students. Based on these data, it can be concluded that there is an increase in critical thinking skills of grade IV students in thematic learning theme 2 "Always Save Energy" Subtheme 1 "Energy Sources."

Improved Trial Results

This stage is carried out if there are irregularities during the main field trials. The results of the trial showed that PjBL-based LKPD to improve critical thinking skills was effective in improving integrated thematic learning outcomes of elementary school students. Therefore, researchers do not need to revise and can continue LKPD as the researcher's copyright, so that LKPD can be used in the learning process in schools.

Discussion

The results of the analysis that has been carried out in this study, obtained and explained that there are conditions and potentials that support the development of Project-Based Learning-based LKPD in State Elementary School 2 Pinang Jaya to improve students' critical thinking skills. The results of observations that have been made by researchers, the skills of students are a potential support in developing PjBL-based LKPD.

In the development of PjBL-based LKPD focuses on integrated thematic subjects pursued by grade IV elementary schools, which are described as follows: The development of PjBL-based LKPD in this study adopts the development design model proposed by Borg and Gall (1983.

The first phase, research and information collection is carried out by researchers to recognize and look for problems faced by researchers. In this phase, researchers collect data by conducting interviews and questionnaires to educators and students to find out what shortcomings are contained in learning. In addition, in this first phase, researchers made observations on students' skills in critical thinking.

In the second phase, researchers plan to develop LKPD which will be used as a tool to measure students' skills in critical thinking. In addition, LKPD aims to improve students' skills in critical thinking based on learning outcomes.

The third phase carried out by researchers is to develop LKPD products. At this early stage of development, researchers conduct and determine what plans will be used in the development of PjBL-based LKPD to improve learners' skills in critical thinking on learning outcomes.

In the fourth phase, researchers conduct initial field tests by validating products carried out by material experts, design experts and linguists. Initial products that have been professionally tested are checked by individual tests. Personal tests are designed to determine the attractiveness of LKPD individually or separately. The attractiveness test is carried out by filling out a questionnaire that has been prepared by the researcher. Then continued with product trials in small groups with a total of 6 students who were in grade IV SD Negeri 2 Pinang Raya.

In the fifth phase, researchers make improvements to the main product by referring to suggestions and input from field test results that have known weaknesses. Some aspects that need to be improved are aspects of material, media and linguists so that they can be validated and tested based on product development requirements. The validation results include; (a) expert validation of assessment materials using PjBL-based LKPD obtained a total value of 0.97 which means that the value is "valid". This can be interpreted that the material in the LKPD is valid or suitable for use in the learning process based on the assessment of material experts. (b) Media expert validation in PjBL-based LPKD validation obtained a total value of 0.95 which means that the value is "valid". This means that LKPD packaged in the form of learning media is valid or suitable for use in the learning process based on the assessment of media experts. (c) Linguist validation involves several indicators, namely straightforward, commuticative, interactive and dialogical that are adjusted to coherence and integration with the flow of thought. In validation, it gets a value of 0.96 which means that the value is "valid". This can be interpreted that LKPD is valid or feasible to be used linguistically in the learning process.

The sixth phase, namely conducting major field trials and obtaining the results of PjBL-based LKPD testing can improve students' critical thinking skills. In the test, it was shown that the value in the experimental class was 0.56, and in the control class it had a value of 0.21 which means that the test results stated that PjBL-based LKPD was able to improve students' critical thinking skills in improving learning outcomes.

The seventh phase of the research was not carried out improvements or revisions, this is because the PjBL-based LKPD showed a positive value for increasing students' critical thinking in improving integrated thematic learning outcomes at SD Negeri 2 Pinang Raya.

Based on the results of the elaboration of the paragraph above, a conclusion can be drawn that PjBL-based LKPD can be used or feasible to be used to improve student learning outcomes in accordance with development research derived from Borg and Gall is valid or feasible to be used to meet aspects of material, media / design and language.

From the results of experiments on several students who had an average increase in N-Gain obtained a value of 0.56 with the "medium" category. So it can be concluded that the experimental group produced an increase after students or students participated in learning using PjBL-based LKPD on the pretest which initially resulted in an average score of 53.39, which then increased in the posttest with an average score result of 78.39 with the category "medium". While in the group of students / control students showed an increase with the results of the average score on the pretest of 52 which then in the posttest resulted in an average score of 62 with the category "low". From these results, it can be seen that there is an increase in learning outcomes based on students' critical thinking skills using PjBL-based LKPD in thematic learning.

Therefore, the use of PjBL-based LKPD is very feasible to be used in the learning process especially in this research for thematic learning. This is because PjBL-based LKPD is proven to improve students' skills to think critically. Before this research was carried out, the ability of students to think critically in the low category, while after the implementation of the research, students could improve their skills in critical thinking.

Effectiveness of PjBL-based LKPD

To determine the effect of PjBL-based LKPD on student learning outcomes related to critical thinking skills, effectiveness tests were conducted on students. To assess critical thinking skills in the learning outcomes of students with a total of 53 students at SDN 2 Pinang Jaya, an effectiveness test was conducted. The LKPD tested in this study includes the theme of curriculum analysis, preparation of LKPD maps, and determination of LKPD titles. To conduct an effectiveness test, it is carried out by conducting a normality test, homogeneity test and T test. In the normality test for the experimental class, a value of 0.062 was obtained with the "normal"

category, which means that the influence of PjBL-based LKPD on student learning outcomes has a significant relationship with critical thinking skills, while in the control class, a value of 0.107 was obtained with the "normal" category. Furthermore, in the homogeneity test, a value of 0.392 was obtained with the category "homogeneous" which means that the homogeneity assumption has been fulfilled or the variance in both learning groups already has the same or homogeneous variance. As for the T test, it shows that the learning outcomes of students are significant or there is a difference in learning outcomes between the experimental class group and the control class group with a value of 0.000 with the "significant" category. Furthermore, in the effectiveness test using N-Gain, the results of learning critical thinking after using PjBL-based LKPD showed an increase compared to before using PjBL-based LKPD, the calculation of the N-Gain test obtained a value of 0.56 for the experimental class and a value of 0.21 for the control class.

From the description in the previous paragraph, it can be seen that PjBL-based LKPD can improve the learning outcomes of students with critical thinking skills. These results are in line with research conducted by Lili Maryani (2017) which states that PjBL-based LKPD can increase self-efficacy and PPP students who have high effectiveness in learning, besides that PjBL-based LKPD can improve students' skills in critical thinking, because students' skills to think critically become high. Therefore, PjBL-based LKPD is feasible and effective to be used in thematic learning because it can improve students' skills in critical thinking.

Advantages of PjBL-based LKPD

The advantages of PjBL-based LKPD include: (a) PjBL-based LKPD can increase learning activity so that it can grow students' critical thinking skills. With the occurrence of student activity, learning can be declared interesting or liked by students. This is because students have to do practical methods, and not only discussions in the learning process. (b) PjBL-based LKPD refers to the stages of Project Based Learning which include; project determination, project design, schedule preparation, project completion, report preparation and project evaluation. From these stages, it can grow students in finding the concept. In addition, PjBL-based LKPD is more fariative and innovative in the learning process. (c) PjBL-based LKPD is an LKPD that is in accordance with the latest revised version of the 2013 curriculum. This is because in the curriculum students are expected to be more active and think critically. In addition, with the skills to think critically, students will get maximum learning results. (d) PjBL-based LKPD contains learning materials that are simpler, clearer and easier to understand by students. In addition, this PjBL-based LKPD makes students not easily saturated with the learning process.

Limitations of PjBL-based LKPD Research and Development

There are some of the difficulties experienced by researchers in conducting research and development of PjBL-based LKPD including: (a) in this study, researchers can only conduct PjBL-based LKPD development research in one school, namely SDN 2 Pinang Jaya. (b) In this study, researchers can only carry out R&D methods up to stage 7, this is due to time constraints when conducting research. (c) In small group testing or on a small scale there are 6 students, while on a large scale there are 53 students at SDN 2 Pinang Jaya. (d) PjBL-based LKPD developed by researchers can only be used or applied in some learning materials and must be modified again according to the material to be delivered to students.

CONCLUSION

Based on the results of research and development that researchers have done, it can be concluded that: (a) PjBL-based LKPD products that have been developed are suitable for use, this has been proven by the validation results of material experts who obtained a value of 0.97 with the category "very valid", validation from media experts who obtained a value of 0.95 with the category "very valid", And the last is the validation of linguists who obtained a score of 0.96 in the category "very valid". Based on the results of these validations and suggestions, PjBL-based LKPD can and is feasible to use. (b) PjBL-based LKPD that has been developed by researchers is effective for use in the learning process of students in grade IV SD Negeri 2 Pinang Jaya Kemiling Bandar Lampung. This can be proven by the learning outcomes of students who obtained a score or score on the posttest getting an N-Gain of 0.56 with the "medium" category in the experimental class, and in the pretest obtained an N-Gain score of 0.21 with the "low" category in the control class.

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