

Developing problem based learning to improve students' critical thinking skill in integrated thematic learning at elementary school

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ABSTRACT

This writing aims to be able to develop LKPD based on Project Based Learning (PjBL) which is suitable for use to improve students' critical thinking skills in integrated thematic learning in grade IV and also to analyze the effectiveness of LKPD based on Project Based Learning (PjBL) in improving skills students' critical thinking in integrated thematic learning in Class IV. This is a descriptive piece employing a quantitative approach. This is an example of R&D (Research and Development) writing. Sampling at the time of writing using a method of purposive sampling. At the time of writing, the population consists of fourth graders from SD Negeri 2 Pinang Jaya Kemiling Bandar Lampung. Data collection at this writing uses documentation techniques, written assessments, and questionnaires. Using SPSS 24.0 for Windows and a significance level of 0.05, the instrument used in this paper has been evaluated for validity and reliability. In addition, the data were analyzed using an independent sample test. The result shows that PjBL-based LKPD products have influence and are suitable for use in enhancing students' critical skills in thematic learning, specifically material experts of 0.97 (very valid), media experts of 0.95 (very valid), and linguists of 0.96 (very valid) and the devised PjBL-based worksheets are efficacious with a posttest score of 0.56 and a pretest score of 0.21.

KEYWORDS

Critical Thinking Skill; LKPD; PjBL

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Introduction

The development of science, technology, and art in millenium era and Industry Revolution 4.0 requires acceleration and development of activity in all fields of life. In education world, the students must acquire literacy, high order thinking, and various intelligences. Education is one of factors which determine the quality of a nation in reformation era which is also followed by the implementation of regional autonomy based on The Law Number 2 Year 1999 and The Law Number 25 about central financial balance and the region has impact on regional authority which becomes more autonomous, included in it related to education in producing human resources (SDM) which becomes more important in order to have the skills needed by the world. In reformation era which is also followed by the implementation of regional autonomy based on The Law Number 2 year 1999 and The Law Number 25 about central financial balance and the region has impact on the regional authority which becomes more autonomous, included in it related to education.

The demand of Science and Technology (IPTEK) development in the 21st century makes the role of education in producing human resources becomes important in order to have the skill needed by the world. It becomes clearer that science only is not enough to prepare the students in following the world development. Bialik (2015) states that the skills that must be owned by students in the 21st century are Creativity, Critical Thinking, Communication, and Collaboration (4Cs). Education in the 21st century needs (1) critical thinking skill and problem solving skill, (2) cooperation, (3) good communication, (4) creative and innovative thinking skill, (5) social responsibility, and (6) work (Sylvia, et.al., 2019). Curriculum 2013 and Regulation of [Ministry of Education and Culture Number 24 Year 2016](#) about Core Competence and Basic Competence of Curriculum 2013, learning implementation at Primary School/Islamic Senior High School (henceforth SD/MI) is conducted through integrated-thematic learning approach, except for integrated thematic subject and Health, Sport, and Physical Education (PJOK) as an independent subject for grade IV, V, and VI. The implementation of Curriculum 2013 and the right teaching method are required to develop students' thinking skill thoroughly, especially students' critical thinking skill.

Besides, Curriculum 2013 learning model needs to be supported by learning media. Learning media is everything which can be used to distribute the message from the sender to the receiver until it can stimulate the thought, feeling, attention, and interest of students until learning process occurs (Sardiman, 2008). One example of learning media is teaching material. Prastowo (2015) proposes the materials arranged systematically until occurs a situation which supports the students to learn. Ministry of National Education (2010) explains that teaching material is all forms of materials which are used to help students in the learning process. The similarly previous research by Ratna (2020) showed that students' worksheet (henceforth; LKPD) was effective to improve critical thinking skill and higher order thinking skill. Based on the research carried out by Nurrohim (2021) stated that the learning by using LKPD teaching material based on Project Based Learning (henceforth; PjBL) can resulted students' critical thinking skill to be higher compared to the learning which does not use PjBL model. PjBL is one of learning model based on project in its learning process and centered on the students (Afifah et al., 2019). Project based learning can make a more innovaitve learning which centered on contextual learning with complex learning activity. This model involves students in investigating problems and meaningful tasks, giving the chance to students to work independently to construct their own knowledge, and achieve the peak by producing the real product (Insyasiska et. al., 2015). The explanation above showed that this model is strongly relevant to improve students' critical thinking skill at elementary school (Hartini, 2017).

The analysis result of LKPD used in the learning of grade IV students at group 1 State Elementary School (henceforth; SDN) within Kemiling Sub District namely SDN 1 Pinang Jaya, SDN 2, SDN 3, and SDN 3 Sumberejo, Kemiling Sub District, Bandar Lampung City is critical thinking skill. Based on the previous research which had been conducted, the educators had used self-made teaching materials and the package book from the school but they were not sure yet that the content of their teaching material had been suitable with the regulation in Curriculum 2013. The interview result also showed 100% educatos stated that project based learning and its content could not redevelop and comprehend the material well. Based on the result of this interview, the researcher was interested to give solution by developing Project Based Learning (PjBL) LKPD. Abidin (2014) explained that project based learning is a learning model developed based on the level of students' thinking development and centered on the students' learning activities until it enables them to be active in line with their skill, comfort, and learning interest. Based on the explanation above, the researcher carried out project based learning LKPD development. This LKPD is later expected to become a learning media for students and ease educators in giving the learning material.

Methods

The type of research used in this research was Research and Development (R and D); a method which developed PjBL based LKPD in Thematic Subject at Class IV of Elementary School. Sugiyono (2008) explained that R and D is the research method to generate a product and to test certain product effectiveness. The researcher employed Borg and Gall (1983) design model in developing PjBL based LKPD. The research activity was conducted to gain information about users' needd (needs assessment), and the development activity conducted to make PjBL based LKPD. This research was meant to improve the critical thinking skill of Grade IV students at elementary school. This *research* was conducted at Class IV of SDN 2 Pinang Jaya Kemiling Bandar Lampung academic year 2022/2023 because this far the dominant teaching material used was the package book. The grade IV students at SDN 2 Pinang Jaya were 53 students distributed into 2 classes. The class distribution was based on the learning outcomes in grade III in semester 2 based on students' ability and gender until they have similar skill in each class, and have heterogeneous ability in another class. The research implementation was during the odd semester.

The techniques of data collection used in this research were documentation, written test, and questionnaire. In the implementation of preliminary research, the researcher employed documentation technique to gain data on the number of students and their weekly test score on theme 1 at class IV of SDN 2 Pinang Jaya Kemiling Bandar Lampung City. The data analysis techniques used in this research were validity test, reliability test, and effectiveness test. There were two validity tests in this research namely content validity and expert judgment or the expert decision in assessing LKPD based on the perspective of material expert, media expert, and language expert, and construct validity test with product moment formula for test instrument in the pre-test and post-test activity. While for the reliability test was carried out by using Cronbach Alpha formula with the assistance of SPSS 26 statistics application.

Result and Discussion

Research and data collection

In this stage, the researcher carried out observation to the school to assure the condition of integrated-thematic learning process and the need which is necessary to improve students' critical thinking skill. Based on the result of observation and interview on the teachers at the school showed that the teaching materials were not varied yet until the students foud it difficult to understand the learning and they could not improve the students' critical thinking skill yet which is now must be developed in the learning. Therefore, the researcher considered that the learning

process at the school needs PjBL based LKPD to improve students' critical thinking skill especially in integrated-thematic learning.

Planning

In this stage, the researcher started to plan the arrangement of PjBL based LKPD to improve critical thinking skill. The selected theme was theme 2 of grade IV at elementary school and collected the reference related to the material. This theme contained many activities in its learning process until it was suitable to be integrated in project learning in order to improve students' critical thinking skill.

Developing initial product

After determining the theme, the researcher started to develop the product by determining the competence, indicator, purpose, and stages of learning and designed PjBL model in the lesson plan adjusted with the theme. Then, the researcher started to make LKPD which was adjusted with the material in theme 2 and lesson plan had been designed. LKPD was designed attractively and adjusted with the condition of grade IV students of elementary school. Therefore, the researcher needed the opinions from the expert in the aspect of material, media, and language to assess the product which had been made.

Initial Field Trial

After LKPD was made, then initial trial with small scale was carried out. Before that, it was assessed first by the expert of material, media, and language. The following is the result of expert assessment based on content validity analysis and expert judgement:

Table 1. Expert assessment analysis result

No	Indicator	V	Description
1	LKPD contains the problem developed by the students	0.92	Strongly Valid
2	LKPD is carried out cooperatively	0.94	Strongly Valid
3	LKPD produces the product which can be presented	1.00	Strongly Valid
4	LKPD makes students more responsible	0.96	Strongly Valid
5	The activity in LKPD uses constructivism scientific procedure	0.95	Strongly Valid
6	The learning material in LKPD refers to Basic Competence	0.96	Strongly Valid
7	LKPD presents teaching material or material that ease students to interact with the given material	0.98	Strongly Valid
8	The content of LKPD gives experience from learning activity	1.00	Strongly Valid
9	The type of activity in LKPD is hand on (directing students to be active)	1.00	Strongly Valid
10	The questions in LKPD is productive	1.00	Strongly Valid
Average		0.97	Strongly Valid

Based on the table above, it showed that LKPD was strongly valid according to the material expert. Therefore, LKPD was assessed feasible to be used in integrated-thematic learning process at grade IV of elementary school based on PjBL to improve the critical thinking skill.

The assessment from other experts namely media expert with the analysis results as follows:

Table 2. Media expert analysis results

No	Indicator	V	Description
1	Drafting of LKPD is universal	0.94	Strongly Valid
2	LKPD emphasizes on the process of finding concept	0.94	Strongly Valid
3	LKPD teaches students to be active in the learning process	0.94	Strongly Valid
4	LKPD develops the ability of communication, social, emotional, moral, and esthetics	0.94	Strongly Valid
5	Language Usage of LKPD	0.94	Strongly Valid
6	Sentence Usage of LKPD	1.00	Strongly Valid
7	Difficulty and clarity of LKPD	1.00	Strongly Valid
8	Writing	1.00	Strongly Valid
9	Picture	1.00	Strongly Valid
10	LKPD Display	0.83	Strongly Valid
Average		0.95	Strongly Valid

The table above showed that LKPD was strongly valid according to the opinion of media expert. Therefore, this PjBL based LKPD media is assessed feasible to be used in integrated-thematic learning process at grade IV of elementary school to improve critical thinking skill.

Another expert assessment was from media expert with the analysis result as follows:

Table 3. Media expert result analysis

No	Indicator	V	Description
1	Accuracy of sentence structure	1.00	Strongly Valid
2	Sentence effectiveness	1.00	Strongly Valid
3	Term ambiguity	1.00	Strongly Valid
4	Message readability	1.00	Strongly Valid
5	Accuracy of using language grammar	0.75	Strongly Valid
6	The ability to motivate message or information	0.88	Strongly Valid
7	The ability to encourage critical thinking	1.00	Strongly Valid
8	Suitability of students' intellectual development	1.00	Strongly Valid
9	Suitability with the level of students' emotional development	1.00	Strongly Valid
10	The coherence and cohesiveness among learning activities	1.00	Strongly Valid
11	The coherence and cohesiveness among paragraphs	1.00	Strongly Valid
12	The consistency of term usage	0.88	Strongly Valid
Average		0.96	Strongly Valid

The table above showed that LKPD was strongly valid according to the opinion of the language expert. Therefore, the language used in this PjBL based LKPD is assessed feasible for students in integrated-thematic learning process at grade IV of elementary school to improve the students' critical thinking skill. After conducting the assessment by the experts, then trial with small scale was conducted on the LKPD. The effectiveness of LKPD was measured through pre-test and post-test activity in small scale with n-gain formula. The result of small-scale trial analysis with total 6 students are presented in the following table:

Table 4. Small-scale trial analysis result

No	N-Gain	Description
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

Based on the analysis result above showed that there was improvement in students' learning outcomes who used PjBL based LKPD with medium category. Therefore, LKPD needs to be revised in accordance with the suggestion from the experts to improve the students' learning outcomes.

The revision of initial field trial result

In this stage, the researcher carried out revision based on the comments from each expert. The revision given by each expert is presented as follows:

Material expert

Based on the assessment from 2 material experts who assessed this PjBL based LKPD, the part that needed to be fixed was adding the activity which could develop more of students' knowledge and need to pack the material more attractively so that the students are interested to read.

Media Expert

Based on the assessment from 2 media experts gave suggestion to give LKPD background with more attractive color and make more attractive cover design which is in line with the elementary school students.

Language Expert

Based on the assessment from 2 language experts, the researcher needed to fix the usage of punctuation and change the sentence to be more effective, and LKPD needs to be consistent between the pages, the title, and the preface.

Based on the suggestions from the expert, then the researcher concluded that the initial product of this LKPD development was assessed less attractive until the researcher revised the content to be more attractive to improve students' knowledge and the content is adjusted with the need of elementary school students.

The main field trial

This stage was conducted after the revision of initial process was completed. The result of the main field trial is conducted to see the improvement of students' critical thinking skill obtained from pre-test, post-test, and N-gain test based on the test questions with 4 essay questions. The effectiveness test was conducted by comparing the experimental group and the control group then were analyzed by using independent sample t-test. The tested hypotheses are as follows:

- H0: Development of PjBL based LKPD is not effective to improve students' critical thinking skill in integrated-thematic learning of grade IV.
 H1: Development of PjBL based LKPD is effective to improve students' critical thinking skill in integrated-thematic learning of grade IV.

The test criteria; if obtained Sig (2-tailed) < 0,05, then Ha is accepted and if obtained Sig (2-tailed) > 0,05 then Ha is rejected. The result of hypotheses test on critical thinking skill could be seen in the following table.

Table 5. Hypotheses test result

Data	Class	$\bar{X} \pm Sd$	Normality Test	Homogeneity Test	Independent Sample t-Test	Desc.
Pretest	E	45 ± 19,3	Sig.0,140 > 0,05	Sig. 0,71 > 0,05	Sig.0,00 < 0,05	There is difference
	K	42 ± 11,9	Sig.0,100 > 0,05			
Posttest	E	78 ± 14.77	Sig.0,233 > 0,05	Sig. 0,332 > 0,05	Sig.0,01 < 0,05	Significantly different
	K	51 ± 11,36	Sig.0,124 > 0,05			
N-gain	E	0,65 ± 14.7	0,717 > 0,05	Sig. 0,332 > 0,05	Sig.0,01 < 0,05	Significantly different
	K	0,11 ± 11.3	.148 > 0,05			

The interpretation result of the table above, it is known that there is improvement of students' critical thinking skill seen from the score of pre-test, post-test, and N-gain test. In normality test showed that pre-test and post-test in experimental class and control class with normal distribution with value (Sig.) > 0,05 suitable with the test criteria, then it could be stated that this research is in normal distribution. The data variant of post-test in experimental class and post-test class in control class is the same or homogeneous (Sig. 0.71 > 0.05).

The result of post-test independent sample t-test of the experimental group and control group in table 4.5 showed that the students' average score between the experimental group and the control group (Sig. 0.00 < 0.05). Further, N-gain test was conducted by counting the difference between pre-test and post-test score and could be stated that there is significant improvement from the implementation of PjBL based LKPD on students' critical thinking skill. The result of N-gain independent sample t-test in table 4.5 could be stated that there is significant difference from the implementation of PjBL based LKPD on students' critical thinking skill during the learning (Sig. 0.01 < 0.05), with N-gain of experimental class is 0.65 included into medium category. The test criteria; if gained Sig (2-tailed) < 0.05 then Ha is accepted and if obtained Sig (2-tailed) > 0.05 then Ha is rejected. Based on the calculation obtained Sig (2-tailed) in the amount of 0.000 < 0.05, therefore Ha is accepted and Ho is rejected. Therefore, PjBL based LKPD development is significantly effective to improve students' critical thinking skill in integrated-thematic learning at grade IV. Until it can be concluded that there is difference of students' critical thinking skill between those who used PjBL based LKPD with those who did not use it at grade IV students of elementary school. Based on those data, it can be concluded that there is improvement of students' critical thinking skill at class IV in thematic learning theme "Always Saving Energy" Sub-theme 1 "Energy Source".

Accomplishment of trial result

This stage was conducted if there is awkwardness when implementing the main field trial test. The result of trial test showed that PjBL based LKPD for improving students' critical thinking skill is effective to improve the learning outcomes of students integrated-thematic learning at elementary school. Therefore, the researcher does not need to do revision and could continue the LKPD as the researcher's copy right, until it can be used in the learning process at schools.

Developing PjBL based LKPD product

The analysis result that had been conducted in this research showed that there are requirement and potential which support the development of PjBL based LKPD at SDN 2 Pinang Jaya to improve students' critical thinking skill. The observation result showed that students' skill is a supporting potential in developing PjBL based LKPD. In developing this PjBL based LKPD focused on integrated-thematic learning faced by grade IV students at elementary school which is elaborated as follows: development of PjBL based LKPD in this research adopted research and development design proposed by Borg and Gall (1983). Based on the testing which had been conducted, then it can

be concluded that PjBL based LKPD can be utilized or is feasible to be used to improve students' learning outcomes in line with the research and development from Borg and Gall (1983) is valid or feasible to be used to fulfill the material aspect, media/design aspect, and language aspect.

From the experimental result in some students who have average improvement N-gain obtained the score 0.56 with "medium" category. Therefore, it could be inferred that in experimental group resulted improvement after the students followed the learning using PjBL based LKPD which in the pre-test obtained the result with average score 53.39, which then increased in the post-test with average score 78.39 with "medium" category. While in the control group students showed increase in the result of average score in the pre-test 52 and in the post-test resulted the average score 62 with "low" category. From those results then it could be seen that there is improvement in the learning outcomes based on the students' critical thinking skill by using PjBL based LKPD in thematic learning. Therefore, the usage of PjBL based LKPD is strongly feasible to be used in the learning process especially in this research is for thematic learning. It is because this PjBL based LKPD is proven capable of improving students' critical thinking skill. Before this research was implemented, the students' ability to think critically was in low category, while after conducting this research then the students' critical thinking improved to medium category.

The effectiveness of PjBL based LKPD

To find out the influence of PjBL based LKPD on students' learning outcomes related to critical thinking skill, then effectiveness test was carried out on the students. To assess the critical thinking skill and learning outcomes of the students who were in the amount of 53 students at SDN 2 Pinang Jaya then effectiveness test was conducted. LKPD tested in this research covered curriculum analysis theme, LKPD map arrangement, and determining LKPD title. To do the effectiveness was carried out by conducting normality test, homogeneity test, and t-test. In normality test for the experimental class obtained the value in the amount of 0.062 with "normal" category which means that the influence of PjBL based LKPD on students' learning outcomes has relation to critical thinking and it is significant, while in the control class obtained the score in the amount of 0.392 with "homogeneous" category. Then homogeneity test obtained the value in the amount of 0.392 with "homogeneous" category which means that the homogeneity assumption has been fulfilled or the variance in both learning groups had the same variance or homogeneous.

While for the t-test showed that the students' learning outcome is significant or there is difference of learning outcomes between the experimental class and the control class with value 0.000 in "significant" category. Then in effectiveness test using N-gain the result of critical thinking skill after using PjBL based LKPD showed improvement compared to before using PjBL based LKPD, the calculation of N-gain obtained the value in the amount of 0.56 for the experimental class and 0.21 for the control class. From the explanation in the previous paragraph, then it could be seen that PjBL based LKPD can improve students' learning outcomes with critical thinking skill. This result is in line with the previous research by Maryani (2017) who stated that PjBL based LKPD could improve self-efficacy and KPS of students who have high effectiveness in the learning, besides PjBL based LKPD can improve students' skill in critical thinking because the students skill to think critically becomes higher. Therefore, PjBL based LKPD is feasible and effective to be used in thematic learning because it can improve students' skill to think critically.

The advantages of PjBL based LKPD

There are four (4) advantages of PjBL based LKPD namely:

1. PjBL based LKPD can improve learning activeness until it can grow students' critical thinking skill. Through the occurrence of students' activeness then the learning is stated attractive and liked by the students. It is because they can do many practical method and not only discussion in the learning process.
2. PjBL based LKPD refers to the stage of Project Based Learning such as; determining the project, designing the project, arranging the schedule, finishing the project, arranging the report and evaluating the project. From those stages, then it can grow students in finding the concept. Besides, PjBL based LKPD is more variative and innovative in the learning process.
3. PjBL based LKPD is an LKPD in line with Curriculum 2013 the last revision version. It is because in that curriculum the students are expected to be more active and think critically. Besides, through the presence of this critical thinking, then students can obtain maximal learning result.
4. LKPD based on Project Based Learning (PjBL) contains more simple learning material, clear, and easy to understand by students. Besides, this PjBL based LKPD makes students not easily bored towards the learning process.

Research limitation and development of PjBL based LKPD

There are some limitations experienced by the researcher in carrying out the research and development of PjBL based LKPD such as:

1. In this research, the researcher could only conduct PjBL based LKPD development research in one school namely State Elementary School 2 Pinang Jaya.
2. In this research, the researcher could only conducted R&D method until stage 7th because of time limitation when carrying the research.

3. Small group test or small-scale test was in the amount of 6 students, while in big scale was 53 students existed at State Elementary School 2 Pinang Jaya.

PjBL based LKPD developed by the researcher could only be used or applied in some learning materials and must be remodified suitable with the material which will be delivered to the students.

Conclusion

Based on the research and development results, then it could be concluded that PjBL based LKPD product which had been developed is feasible to be used. It is proven by the validation result from material expert which gained “strongly valid” value, validation from media expert gained entrance value in “strongly valid” category, and the last is validation from language expert that gained “strongly valid” value. Based on the result of those validation and suggestion, then PjBL based LKPD is feasible and could be used in teaching and learning process. PjBL based LKPD which had been developed by the researcher is effective to be used in the teaching and learning process of students at grade IV of State Elementary School 2 Pinang Jaya, Kemiling, Bandar Lampung. It could be proven by the result of students’ learning outcomes which obtained score or posttest score with N-Gain in the amount of 0,56 with “medium” category in experimental class, and pretest gained score or N-Gain score in the amount of 0,21 with “low” category in the control class.

The results of this research and development could be used as the reference and input for educators to develop science especially concerning PjBL based LKPD to improve students’ critical thinking skill in integrated learning at elementary school. Improving the professional ability of educators in developing PjBL based LKPD with an effective and suitable learning model as the form of an effort to increase students’ critical thinking skill. For the school, it is expected that it can become a reference and recommending the teachers to improve education quality in the effort to develop PjBL based LKPD to increase students’ critical thinking skill. The future researchers are expected to develop a more complex and larger PjBL based LKPD in order to be utilized as the reference in the future and it is expected to lessen and minimize the obstacles of students and educators in thematic teaching and learning process at elementary school.

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