



## The Effect of Problem Based Learning (PBL) Method on Students' Critical Thinking Ability in Fifth Grade Science Learning in Elementary Schools

Siti Pridayanti, Fitri Alyani✉

DOI: <http://dx.doi.org/10.15294/usej.v11i2.57386>

Universitas Muhammadiyah Prof.Dr.Hamka, Indonesia

### Article Info

Submitted 2022-06-12

Revised 2022-07-12

Accepted 2022-08-20

### Keywords

students' critical thinking skills,  
solution to problem, PBL, sci-  
ence education

### Abstract

This research was conducted in elementary schools to determine the effect of the PBL method on the critical thinking skills of fifth grade elementary school students using the PBL method in science subjects. In this study with a population consisting of 59 fifth grade elementary school students, the sample in this study was divided into 2 classes. A few of them; First, the experimental class. Second, the control class. The sampling technique used is a non-probability sampling technique. The design of this study used a posttest only design. In this study, the data collection process used 10 essay questions, the validity test used the product moment formula as many as 10 essay questions with the results of 8 valid questions and 2 drop questions. To test the reliability using Cronbach's alpha. Data analysis using t-test proves that the value of  $t_{count}$  is greater than  $t_{table}$   $3,645 > 2,002$ , this research can be concluded that "there is the thinking ability of fifth grade elementary school students in science subjects by applying the Problem-based method (PBL) method".

### How to Cite

Pridayanti, S., & Alyani. F. (2022). The Effect of Problem Based Learning (PBL) Method on Students' Critical Thinking Ability in Fifth Grade Science Learning in Elementary Schools. *Unnes Science Education Journal*, 11(2), 84-89.

## INTRODUCTION

Critical thinking in students according to (Saputri, 2020) is an activity to encourage students to be in order to have a soul that is steadfast to the establishment, active and always carefully. Then students are able to conclude, analyze and evaluate from a problem that is obtained based on logical thinking. A participant during the learning process must be necessary to have the skills to develop a critical mindset, because then the learning environment in the classroom can be active and fun so that students do not feel bored. Students are able to solve problems and analyze and evaluate the problems they are facing in the form of knowledge. Critical thinking is done to make a decision, and evaluate the truth of a statement (Ejin, 2016).

In critical thinking there are activities in it, like solving a problem, then analyzing an assumption to make a decision, and conducting research and solving problems that are being faced. According to (Alimirzaloo & Hashemnezhad, 2016) Basically, critical thinking is an activity that requires high-level thinking in solving a problem and in making decisions. (Tan, 2004) revealed that the challenged is learned that required students to focus on a problem in order to be capable to solve the problem in the form of a solution. Students develop critical thinking skills, because deeper levels of critical thinking skills are needed to produce appropriate problem solving skills. According to research conducted by (Saeed & Rousta, 2013) by providing students with problem-based activities, students can better influence students' critical thinking ability.

PBL is a problem based method to help students and encourage students to develop in solve a problem by thinking critically to students' dailies, and dare to express their opinions, Thus in solving a problem by students are required to be active in information solicit about the problem, and research from these problem (Lestari & Projosantoso, 2016)(2. In developed students' critical thinking skills to solve problems in elementary schools, namely by used Problem Based Learning as a learning-based method. Thus, students will focus on solve badly complex problems so that students are capable to find solutions to solve these problems, either individually or in groups (Muslim et al., 2015).

According to (Susilo, 2012) Natural science (IPA) is either of the main subjected in elementary schools in the education curriculum in Indonesia, science or science is one of the subjects that are considered important. Science learning is

learning related to natural phenomena. Science learning is not only about students who are able to capture phenomena, but also the discovery process (Ardiyanti & Winarti, 2013). The learning process to achieve the goal is for students to learn actively and think broadly in order to be able to understand concepts, principles, and develop their knowledge. in studying the needs of science students are very critical to be capable to solve problems. Critical thinking is an act of thinking that aim students to be capable to analyse by exploring intellectual potential and thinking the decision is right (Zunanda & Sinulingga, 2015).

Based on the learning objectives of natural science, that science learning requires students to think critically, critical thinking is a thinking skill by (Elder & Paul, 2007) defined as "self-guided, self-disciplined thinking which attempts to reason at the highest level of quality in a fair-minded way" critical thinking is an intellectual process of applying, analyzing, conceptualizing, synthesizing, and actively evaluating information obtained from observation, experience, thought, reflection or communication as a guide for believing, and act (Amalia & Pujiastuti, 2013).

According to (Santiani et al., 2017) Problems are often found in everyday life, if you pay attention to how they relate to science, both from the way of thinking and how to solve a problem, this can be understood because learning science can be used as a means of thinking and can provide benefits and convenience in everyday life. a day. In learning science, there are still many obstacles in its implementation. The limitations of facilities and infrastructure cause teachers to only rely on their knowledge in every learning process, teachers still use the lecture method (conventional). One method that is still widely used by teachers in teaching is the lecture learning method (conventional). By using the lecture method, the teacher looks more active while the students solely listen while sitting (Wasiso, 2013). Absorption of material does not last long because students only rely on the auditory aspect of the teacher. And in expressed opinions, students are not given the opportunities by the teacher so that there is no activeness of students during the learned process. The lecture method used by the teacher in conveying abstract concepts makes it difficult for students who are still thinking concretely to understand what material has been conveyed by the teacher (Tiarini et al., 2019).

This reflects the low understanding and absorption of students towards science learning at school, besides the role of the teacher is still very dominant who is the center of information in te-

aching and learning activities in the classroom and only makes students as recipients of information, because teachers still use the lecture method or conventional). Teachers also do not associate learning materials with real problems in everyday life or problems that exist around us, so that in science subjects, students tend to find it difficult to understand on the grounds that the teacher does not support students to play an active roles in expressed opinion (Agustin, 2013).

In this research, researchers have reasons for chooses science subjects, where that selection is because researchers consider that students tend to have difficult understanding these subjects, especially in terms of expressed opinion or idea, and teachers at fifth grade of elementary school West Jakarta had never applied other science subjects. method other than using the lecture method, in this study the researcher will try to apply another learning method, namely by using the PBL method, in this study the researcher chose class V because the class V teacher did not provide opportunities for students to think critically, play an active role in the learning process and able to solve problems in learning science in grade V elementary school, especially with heat and temperature transfer materials.

Based on Ahmad Farisi's research in the journal *Elementaria Pendidikan* in 2017 with the research title "The effect of problem based learning (PBL) learning models on critical thinking skills in improving student learning outcomes" which has been proven by using PBL in elementary school he describes understanding using the PBL model that succeeded in changing the understanding of students who did not understand the material to understand the material, the material not only listened to the teacher but applied the material in their lives. so that research using PBL can encourage students to play an active role and be able to solve problems in science learning in real life, and be able to express ideas (Farisi et al., 2017).

For this reason, it is expected that teachers can apply methods that make students more active and train students' critical thinking skills in solving problems in real science learning. This can make students understand the material presented by the teacher in a meaningful way, namely through the use of a problem based learning model, which is expected to improve students' critical thinking skills, encourage students to be more active and be able to solve problems systematically with heat transfer material for class V students through In this study, researchers used quantitative experiments with the title the effect

of problem based learning(PBL) on students' critical thinking skills in science learning in class V in elementary schools.

## METHOD

### Research Design

This research was using a *quantitative* research with a *quasi experimental* type of research, the design of this study uses a post-test design only.

**Table 1.** Research design

Group	Treatment	Post-test
Eksperimen class	X	O <sub>1</sub>
Control class	-	O <sub>2</sub>

O<sub>1</sub>: post-test in the experimental group after participating in learning using the problem based learning(PBL) method

O<sub>2</sub>: post-test in the control group after participating in learning using conventional methods.

X : the treatment in the experimental group is given learning using the problem based learning(PBL) method

- : treatment in the control group is given learning using conventional methods.

### Procedure

The steps in the preparation stage are: (1). conducting observations to determine the condition of the school and the science learning process by the teacher at the school., (2). identifying problems based on pre-research results., (3). making learning tools, as follows syllabus, RPP, LKPD, the assessment sheet and make student activities during the learning process., (4). Validate research instruments., 5) Revise research instruments after validating., (6). Conduct test questions in the control class and experimental class.

The stages of implementation in research: (1) carry out learning in accordance with RPP., (2) Provide learning activities using the *PBL* method., (3) Give final test questions after conducting research to determine students' critical thinking skills in solving a problem in learning science.

This research was conducted in an elementary school, where in the selection processed the researcher observed that school had not used problem based learning as a learning method. Quantitative experiment is a type of research used by researchers with a quasi-experimental method used a pottest only control as a type of design. In this research, the sampled is classified into twos, namely: First, the experimental class. Second, the control class (Sugiyono, 2015). As

long as to the learn processed, which consisted of 59 people who were divided into two samples, the researchers used distinct methods. The control class uses conventional as the method, and the experimental class uses problem based learning as the method. The researcher used the normality which was supported by the *Lilifors* test and the homogeneity test which was supported by the *Fisher* exact test.

Sampling of data in this study using *non-probability* sampling. Before conducting the research, the researcher conducted a validation test first to find out whether the instrument was valid or drop. Researchers used product moment as a validities test and Cronbach's Alpha formula as a reliabilities test. Posttest-only control design is a type of experiment that is used by researchers as a research design, where that design will be realized on two samples, namely the control class and the experimental class.

## RESULT AND DISCUSSION

**Table 2.** Validity test results

Classification	Number of essays	no item
Valid	8	1,2,3,5,7,8,9,10
Not valid	2	4,6

Based on the table 2. the results of the validation calculations, the results of the value for 30 students or  $n = 30$  at a significant level of 0.05%, namely 0.361. The value of the *product moment* correlation coefficient is compared with the *product moment* correlation  $r$  value with  $n = 30$  at a significant level of 5%, namely 0.361. The conditions for each item that are counted as valid are  $>$

Classification of validity test questions of the 10 questions tested there are 8 valid questions and 2 *drop* questions, in this study the researchers only used 8 questions so as not to burden students. The reliability test was carried out after knowing questions that were already valid. After knowing the valid questions totaling 8 questions, the researcher calculated the instrument reliability test using the *alpha Cronbach* formula. Reliability serves as a measuring tool that describes the accuracy of the test takers to answer the questions, the instrument is said to be  $>$ . After calculating using the Cronbach alpha formula, it is obtained the value of as follows:

**Table 3.** Reliability test results

Score	Score	description
1,020	$N = 30$ $a = 0,05$ 0,361	$>$ Reliable instrument

Based on the table 3. After calculating the results, it is concluded that  $= 1.020$ . At  $r_{table}$  at a 0.05.  $N = 30$  is 0.361.  $= 1.020 > 0.361$  So that science subjected that uses students' critical thinking skills can be said to be "reliable" and classified as high relabel and suitable for use as research.

**Table 4.** the results of the experimental class and control class

Description	Experimental class scores	Control class scores
Total students	29	30
Mean	88,00	80,67
Median	94,5	81,87
Modus	94	80,59
Standard deviation	8,61	9,43

Accord to table 4. which has been described above, the two samples used by students in science subjects in this research were the experimental class uses the PBL method which aims to improved students' critical thinking skills and the control class using conventional as a method.

In this research, when is a requirement in determining the normal or abnormal distribution is by used the normalities test. In this research uses the normalities test using *Liliefors* test at a significant initial of 0.05.

$H_0$ : Data comes from a normally distributed population

$H_1$ : Data comes from population with abnormal distribution.

Accoord to table 5. The normality test for the control class after data processing is  $L_o = 0.0676$  with  $n = 30$  and a significance rate of  $a = 0.05$ . Because  $L_o < L_{table}$  is  $0.0676 < 0.1610$ . So  $H_o$  is obtained, that the author can conclude that a normally distributed population is used for the sample.

Accord to table 5. Test the normality of

**Table 5.** Normality test calculation results

Class	N	$L_o$	$L_t$	Criteria	Description
Control class	30	0,0676	0,1610	<	Data is normally distributed.
Experiment class	29	0,0869	0,2490	<	Data is normally distributed.

**Table 6.** Homogeneity test calculation results

Group	N	variance	$f_{count}$	$f_{table}$	Criteria	Description
Experiment class	29	77,509	1,130	1,868	$F_h < F_t$	Homogeneous sample data
Control class	30	68,595	68,595			

the experimental class after data processing, namely  $L_o = 0.0869$  with  $n = 29$  and a significance rate of  $\alpha = 0.05$ . Because  $L_o < L_{table}$  is  $0.0869 < 0.2490$ . So  $H_o$  is obtained, that the author can conclude that a normally distributed population is used for the sample.

$H_o$ : The variance of the two sample data is homogeneous

$H_1$ : The variance of the two sample data is not homogeneous

Based on the table 6. From the control class and experimental class data obtained = 77,509 and = 68,595 with a significant  $\alpha = 0.05$  with  $dk$  in the numerator =  $29 - 1 = 28$  and  $dk$  in the denominator =  $30 - 1 = 29$ . Then  $\alpha = (0.05, 28, 29)$   $F_{table} = 1.868$  Because  $F_{count}$  is smaller than  $F_{table}$ , namely  $1.130 < 1.868$ , it can be concluded that  $H_o$  is accepted that the variance of the two groups is homogeneous.

**Table 7.** Hypothesis test calculation results

$t_{count}$	$t_{table}$	Description
3,645	( $\alpha = 0,05$ ), $Dk = 57$ 2,002	$t_{count} \neq t_{table}$ Reject $H_o$ with the conclusions on the effect of problem based learning (PBL) methods on students' critical thinking ability in science learning in elementary schools

$H_o$ : There is no effect of the problem based learning method on the critical thinking skills of fifth grade students on heat transfer material at an elementary school in West Jakarta.

$H_1$ : There is an effect of the problem based learning method on the critical thinking skills of fifth grade students on heat transfer material at an elementary school in West Jakarta.

Based on the table 7. The results of the t-test calculation in table 6 can be seen that uses a

significant neural value of  $\alpha = 0.05$  with  $dk = 59$ ,  $dk = 59 - 2 = 57$ , so the value of  $t$  is 2,0002. while  $t$  is 3.645. then  $t > T_{table}$  which is  $3,645 > 2,002$ . then based on the test criteria  $H_o$  is rejected and is accepted. The conclusion in this study is that is accepted, which states that there is an effect of the problem-based learning method on students' critical thinking skills in science learning class V in elementary schools.

This research proves that by applied the problem based learning method can activated the roles of students in solving a problem, where by used that method, students are trained to find solutions to every problem in everyday life. This can be proven by the final results of science learning which were analyzed by researchers regarding the value obtained by each class. the control class got 80,100 acquisition and the experimental class got 86,655 acquisition. Mental development, social development in students, cognitive development in students and the development of science or science. Because every human being grows differently and to grow and develop in critical thinking, because in learning takes place critical thinking in students is very necessary when learning takes place such as reasoning and daring to explain ideas or daring to express an opinion or idea that students have (Susilo, 2012).

From the research results according to Shofiyah Maqbullah, Tati Sumiati, Idat Muqodas. Based on the results of this study, they were: actively participating in solving problems posed by the teacher, students also conducting group experiments, conducting scientific experiments, and conducting individual and group questions and answers. group. In addition, students discuss solutions to analyze and evaluate problems. Students' critical thinking skills have increased very satisfactorily in each cycle by using the Problem Based Learning method (Maqbullah et al., 2018).

Thus the value obtained by the experimental class is superior to that obtained by the control class. This is reinforced by the acquisition of the t-test which shows the value of  $t$  is greater than  $t$  (3.645 > 2.002).



Therefore, the PBL method can significantly affect 5th grade students in science subjects related to critical thinking ability.

## CONCLUSION

Based on the explanation of the results of this researched, it can be concluded that what was obtained by the fifth grade elementary school students in science subjects with the theme of heat transfer and temperature in the experimental class and the control class. the results of the experimental class scores are superior to the control class. This is based on the fact that research using the Problem Based Model (PBL) in the experimental class states the existence of critical thinking skills in fifth grade students in elementary school in science learning until students in that class are able to think critically with test results that represent the value of is greater than (3,645 > 2,002).

## REFERENCES

- Agustin, V. N. (2013). Peningkatan aktivitas dan hasil belajar siswa melalui model problem based learning (PBL). *Journal of Elementary Education*, 2(1).
- Alimirzaloo, E., & Hashemnezhad, H. (2016). An investigation on the relationship between critical thinking skills, language learning strategies, and thinking styles of Iranian EFL learners. *International Journal of Research Studies in Language Learning*, 5(2), 57–74.
- Amalia, N. F., & Pujiastuti, E. (2013). Kemampuan berpikir kritis dan rasa ingin tahu melalui model pbl. *Seminar Nasional Matematika X Universitas Negeri Semarang 2016*.
- Ardiyanti, F., & Winarti, W. (2013). Pengaruh model pembelajaran berbasis fenomena untuk meningkatkan keterampilan berpikir kritis siswa sekolah dasar. *Jurnal Kaunia*, 9(2), 27–33.
- Ejin, S. (2016). Pengaruh Model Problem Based Learning (PBL Terhadap Pemahaman Konsep dan Keterampilan Berpikir Kritis Siswa Kelas IV SDN Jambu Hilir Baluti 2 Pada Mata Pelajaran Ilmu Pengetahuan Alam. *JP (Jurnal Pendidikan): Teori Dan Praktik*, 1(1), 66–72.
- Elder, L., & Paul, R. (2007). *Critical thinking*. Retrieved.
- Farisi, A., Hamid, A., & Melvina, M. (2017). Pengaruh Model Pembelajaran Problem Based Learning terhadap Kemampuan Berpikir Kritis dalam Meningkatkan Hasil Belajar Siswa pada Konsep Suhu dan Kalor. *Jurnal Ilmiah Mahasiswa Pendidikan Fisika*, 2(3), 283–287.
- Lestari, D. I., & Projosantoso, A. K. (2016). Pengembangan media komik IPA model PBL untuk meningkatkan kemampuan berfikir analitis dan sikap ilmiah. *Jurnal Inovasi Pendidikan IPA*. <https://doi.org/10.21831/jipi.v2i2.7280>
- Maqbullah, S., Sumiati, T., & Muqodas, I. (2018). Penerapan Model Problem Based Learning (Pbl) Untuk Meningkatkan Kemampuan Berpikir Kritis Siswa Pada Pembelajaran Ipa Di Sekolah Dasar. *Metodik Didaktik*. <https://doi.org/10.17509/md.v13i2.9500>
- Muslim, I., Halim, A., & Safitri, R. (2015). Penerapan Model Pembelajaran Pbl Untuk Meningkatkan Penguasaan Konsep Dan Keterampilan Berpikir Kritis Siswa Pada Konsep Elastisitas Dan Hukum Hooke Di Sma Negeri Unggul Harapan Persada. *Jurnal Pendidikan Sains Indonesia (Indonesian Journal of Science Education)*.
- Saeed, S., & Rousta, S. N. (2013). The effect of problem-based learning on critical thinking ability of Iranian EFL students. *Journal of Academic and Applied Studies*, 3(7), 1–14.
- Santiani, N. W., Sudana, D. N., & Tastra, I. D. K. (2017). Pengaruh Model PBL Berbantuan Media Konkret terhadap Hasil Belajar IPA Siswa Kelas V SD. *E-Journal PGSD Universitas Pendidikan Ganesha*.
- Saputri, M. A. (2020). Penerapan Model Pembelajaran Problem Based Learning untuk Meningkatkan Kemampuan Berfikir Kritis Siswa Kelas V Sekolah Dasar. *Jurnal Pendidikan Dan Konseling (JPDK)*, 1(2), 110–116.
- Sugiyono. (2015). *Metode Penelitian Kuantitatif, Kualitatif*.
- Susilo, A. B. (2012). Pengembangan model pembelajaran IPA berbasis masalah untuk meningkatkan motivasi belajar dan berpikir kritis siswa SMP. *Journal of Primary Education*, 1(1).
- Tan, O. S. (2004). *Enhancing thinking through problem-based learning approaches: international perspectives*. Cengage Learning Asia.
- Tiarini, N. P., Dantes, N., & Yudiana, K. (2019). Pengaruh Model Pembelajaran Problem Based Learning (PBL) Berorientasi Tri Hita Karana Terhadap Hasil Belajar IPA. *Mimbar Ilmu*, 24(3), 299–309.
- Wasiso, S. (2013). Implementasi Model Problem Based Learning Bervisi Sets Untuk Meningkatkan Kemampuan Pemecahan Masalah Ipa Dan Kebencanaan Oleh Siswa. *Journal of Innovative Science Education*.
- Zunanda, M., & Sinulingga, K. (2015). Pengaruh Model Pembelajaran Berbasis Masalah dan Kemampuan Berpikir Kritis Terhadap Keterampilan Pemecahan Masalah Fisika Siswa SMK. *Jurnal Pendidikan Fisika*, 4(1), 63–70.