

THE IMPLEMENTATION OF THE PROBLEM-BASED LEARNING METHOD TO ENHANCE GRADE 7 STUDENTS' CRITICAL THINKING SKILLS IN LEARNING MATHEMATICS AT SMP HOLLAND VILLAGE MANADO

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ABSTRACT

Critical thinking is one of the most important issues in education. However, based on field observation results it is found that students have low critical thinking skills. One reason is that learning activities in the classroom do not foster students' critical thinking skills. The purpose of this research study to enhance students' critical skills by implementing the *Problem-based Learning* (PBL) method. The research subjects were 29 grade 7 students in a junior high school in Manado. The research method used was Classroom Action Research (CAR), conducted from September 12 to November 3, 2017. The instruments used were diagnostic tests, pre-tests and post-tests, observation sheets, student interviews, checklists by observers and students, and the researcher's reflection journal. Data results were analyzed using the descriptive qualitative method. The results showed that the implementation of the PBL method was able to enhance students' critical thinking skills in learning math with the achievement percentage of students who passed the KKM for pre-test and post-test based on the overall data analysis result from cycle one to two showing an enhancement of 22% on the first indicator, 9% on the third indicator, and 2% on the fourth indicator. The second indicator showed no enhancement and there was a decrease of 8% on the fifth indicator. Therefore, the PBL method is effective in enhancing students' critical thinking skills through each stage of the method in the learning process.

Keywords: problem-based learning, critical thinking skills, school mathematics

ABSTRAK

Kemampuan berpikir kritis adalah salah satu hal terpenting dalam dunia pendidikan. Namun, berdasarkan observasi di lapangan ditemukan bahwa siswa memiliki keterampilan berpikir kritis yang rendah. Salah satu penyebabnya adalah aktivitas pembelajaran di kelas tidak melatih keterampilan berpikir kritis siswa. Adapun tujuan dari penelitian ini untuk meningkatkan keterampilan berpikir kritis siswa menggunakan metode *Problem-based Learning* (PBL). Subyek penelitian adalah 29 siswa kelas VII di suatu SMP di Manado. Metode penelitian yang digunakan adalah Penelitian Tindakan Kelas (PTK), dilakukan dari September sampai dengan November 2017. Instrumen yang digunakan adalah *diagnostic test*, *pre-test* dan *post-test*, lembar observasi, wawancara siswa, *checklist* oleh pengamat dan siswa, dan jurnal refleksi peneliti. Analisis data hasil penelitian menggunakan metode deskriptif kualitatif. Hasil penelitian menunjukkan bahwa penerapan metode PBL mampu meningkatkan keterampilan berpikir kritis siswa dalam pembelajaran matematika dengan peningkatan indikator satu sebesar 22%, indikator tiga sebesar 9%, dan indikator empat sebesar 2%. Adapun untuk indikator dua tidak mengalami peningkatan dan indikator lima mengalami penurunan sebesar 8%. Dengan demikian, metode PBL terbukti efektif

meningkatkan keterampilan berpikir kritis siswa melalui setiap tahapan metode dalam proses pembelajaran.

Kata Kunci: *problem-based learning*, ketrampilan berpikir kritis, matematika sekolah

INTRODUCTION

It is an undeniable truth that critical thinking skills has been one of the most important issues in education for many years (Schneider, 2002). Critical thinking is very important to the fact that it will protect "students from dangers of being misinformed" in midst of overwhelming amount of information (Che, 2002, p. 83-84). It is understandable that Indonesia's government expects one of the core competencies that can be earned by students from the education process in Indonesia is critical thinking skill (Kemendikbud, 2016). Nevertheless, the international study report of Trends in International Mathematics and Science Study (TIMSS) which also assess students' critical thinking skill shows that Indonesian students consistently slumped at the bottom rankings for several times (Normaya & Karim, 2015). These global surveys that have been done shows that the education quality in Indonesia remains poor, including in critical thinking skill.

Similar to those surveys, the problem that the researcher found on the teaching opportunities in the mathematics class was the students had low critical thinking skill. In the beginning, this indication was shown when the researcher proposed a question for students orally when learning about percentages, "which discount is cheaper: first, 50% + 20% or 65%?" Some of the students chose the first option, and the rest chose the second. When the researcher asked the students why they chose whether the first or the second option, the students only said, "I do not know, sir. It seems like the first option is cheaper than the second one." There was none of the students had a reasonable argument of their answers.

Based on the problem outlined above, the researcher decided to take further action in order to investigate students' critical thinking skill to prove whether the researcher's presumption was correct or not, that students have low critical thinking skill. From the test result that can measure students' critical thinking skill, it is proven that the majority of the students in the classroom had low critical thinking skill. There were only some students who passed this test.

The ability to think is given to humans by God for fulfilling their destiny on earth (Erickson, 2007) which called as *cultural mandate*. Moreover, Jesus had given humans the Great Commandment as it is stated on Matthew 22, which is to love God with their hearts, *minds* and souls, and to love their neighbors. Loving God with humans' minds means to think as the best as they can to glorify God whom they loved. Taking everything into consideration, the ability to think is necessary to do the mandate and commandment given by God.

For the purpose of doing the *cultural mandate*, humans are demanded to subdue the earth. This phrase 'subdue the earth' means to be God's representative on continuing His work on earth for developing responsibly the creation up to the ultimate state of creation

which filled by glory (Wolters, 2009). Without an ability to think comprehensively, it is impossible to develop the creation responsibly.

Based on the literature review that had been done, one of teaching methods that can enhance students' higher-order thinking skill is *Problem-based Learning*. Arends (2008) stated that one of the results can be obtained from this method is thinking and problem solving skills. He continues to explain that "skills and higher-order thinking process can be taught, and the majority of the programs and curriculum developed for this purpose many rely on the approaches that similar to *Problem-based Learning*" (p. 44). Furthermore, there are numerous researches proved that the usage of this method effectively enhanced students' critical thinking skill. For examples, there are 3 education e-journals written by Aziz, Ahyar, & Fauzi (2016), Salim, Santosa, & Fatmawati (2015), and Putri, Rinanto, & Marjono (2015) that clarify these. In this case, the researcher wants to see effects of the implementation of problem-based learning to enhance grade 7 students' critical thinking skills in learning Mathematics.

LITERATURE REVIEW

Problem-based Learning Method

PBL can be defined as a series of learning activities that emphasize on the process of solving problem faced scientifically (Sanjaya, 2008). Moreover, Duch explains that PBL is a learning model that challenges the students for learning how to study, working in group for the purpose of finding solutions of real world problems (as cited in Lestari & Yudhanegara, 2015). Furthermore, Arends (2008) explains that the essence of PBL is presenting various authentic and meaningful problem situations to students that serve as stepping stones for investigation and observation. Based on the description above, it can be concluded that PBL is a model of learning that presenting an authentic and meaningful problem for students so that they can investigate themselves in groups to find solutions related to the problem.

Moreover, Sanjaya (2008) concludes that PBL generally can be done through the following steps: realizing the problem, formulating the problem, formulating the hypotheses, collecting data, testing hypotheses, and determining the solution alternative. Besides, the syntaxes used in this research are based on a model offered by Arends (2008) which described in Table 1.

Table 1
The Syntaxes of PBL

Phase	Description	Teacher Behavior
1st Phase	Giving the orientation of the problem to the students	Teacher explains the learning objectives, describes some important logistic needs, and motivates the students to get involved into the solving-problem activities.
2nd	Organizing the students	Teacher helps students to define the

Phase	to investigate.	learning tasks and organize the learning tasks that related to the problem.
3rd Phase	Helping individual and group investigation.	Teacher encourages students to get the proper information, do the experiment, and search for the explanations and solutions.
4th Phase	Developing and presenting artifact and exhibit.	Teacher helps students to plan and prepare the right handiworks, such as report, video recording, and models, and help them to explain it to the others.
5th Phase	Analyzing and evaluating solving-problem processes.	Teacher guides students to do the reflection toward the investigation and processes that they have been used.

Source: (Arends, 2008, p. 57)

Critical Thinking Skills

There are many definitions of critical thinking given by experts. Ennis (1996, as cited in Fisher, 2009) states "critical thinking is reasonable, reflective thinking that is focused on deciding what to believe or do" (p. 4). In line with Ennis, Weissinger (2003, as cited in Tan et al., 2004, p. 43) states "critical thinking is defined as an awareness of one's own thinking (self-reflection) and the ability (foundation skills) and willingness (willingness to question) to clarify and improve understanding which aids in drawing appropriate conclusions and making the best decisions possible within a context (knowledge based)" (p.43). Not far from Ennis and Weissinger, Facione (as cited in Fristiadi & Bharata, 2015) states that critical thinking skill is a skill to make humans possible to analyze and unite information for the purpose of solving the problem in a certain situation. Moreover, John Dewey (1909, as cited in Fisher, 2009) states that "critical thinking is defined as active, persistent, and careful consideration of a belief or supposed form of knowledge in the light of the grounds which supports it and the further conclusions to which it tends" (p. 2). Last, Paul & Elder (2005, as cited in Fisher, 2009) states "critical thinking is that mode of thinking – about any subject, content or problem – in which the thinker improves the quality of his or her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them" (pp. 4-5). In conclusion, it can be defined that critical thinking is a skill of thinking that needs active interpretation and evaluation of information for the purpose of finding the best solution in solving problems.

Regarding the broadness of the critical thinking indicators and because of its usefulness in every subject of lesson, the indicators used in this study for the basis of arranging the research instruments are stated in Fristiadi & Bharata (2015): (1) recognizing the main problem; (2) gathering any relevant information related to the problem given; (3) implementing a number of strategies for solving the problem given; (4) developing conclusion related to the problem given; (5) presenting the work result.

Contribution of Problem-based Learning Method to Critical Thinking Skills

Researchers have studied the effects of Problem-based Learning (PBL) methods on kognitif behavior like critical thinking skills. Anugraheni (2018) conducted a meta-analysis on PBL in increasing critical thinking skills for elementary students. Her research showed that PBL method can improve critical thinking skills as little as 2.87%. Simanjuntak and Sudibjo (2019) explained that the PBL method can enhance critical thinking skills and problem solving skills.

RESEARCH METHODOLOGY

This study was conducted at SMP Holland Village Manado from 12th of September to 3rd of November 2017. The subject of this study was 29 students, consist of 11 male students and 18 female students. The method used in this research is Classroom Action Research (CAR). Wiriaatmadja (2009) briefly explains that CAR is an improvement effort on the learning practices undertaken by teachers where teachers can see firsthand the influence of the effort. In this study, researcher used Spiral Model of CAR from Kemmis and Taggart. Kemmis and Taggart explains that the CAR can be done in four steps, which are (1) *planning*, (2) *acting*, (3) *observing*, and (4) *reflecting*.

The researcher conducted three cycles of action. Previously, the researcher also had done the pre-cycle. The research instruments used in this research are checklist by observers and students, and reflective journal, for gathering the data of PBL method implementation. Meanwhile, pre-test and post-test are used as the primary source for gathering the data of students' critical thinking skill, and observation sheets and students' interview as the secondary source. In each cycle, the researcher processed and analyzed the qualitative data with the data analysis technique of analytic descriptive and while simple statistic for the quantitative data.

The research standard modified from the work of Tampubolon (2014), which are: (1) the standard of learning process reaches the minimum criteria of 'Good', which is above 60, (2) the standard of students' critical thinking skill reaches the minimum criteria of 'Good', which is above 60, (3) the standard of classical learning result reaches minimum 75% of the total students who passed the KKM set, which is 70.

DISCUSSION

The main purpose of this research is to know whether the implementation of PBL method is able to enhance students' critical thinking skill of grade VII students. In Figure 1 and 2 are displayed research result of students' critical thinking skill with the indicator (1) recognizing the main problem; (2) gathering any relevant information related to the problem given; (3) implementing a number of strategies for solving the problem given; (4) developing conclusion related to the problem given; (5) presenting the work result.

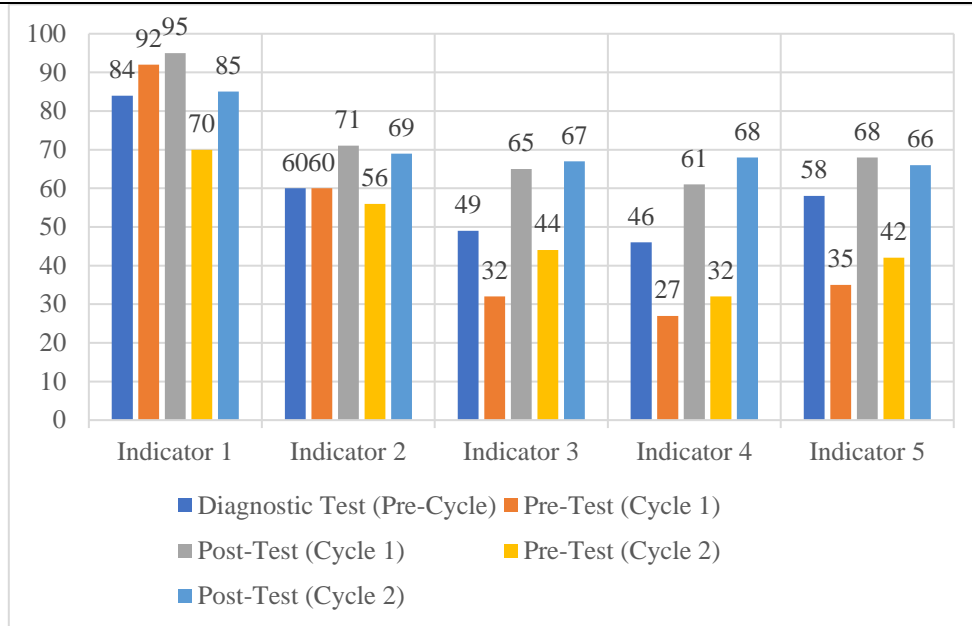


Figure 1 Comparison of Test Result in Pre-Cycle, Cycle 1 and 2

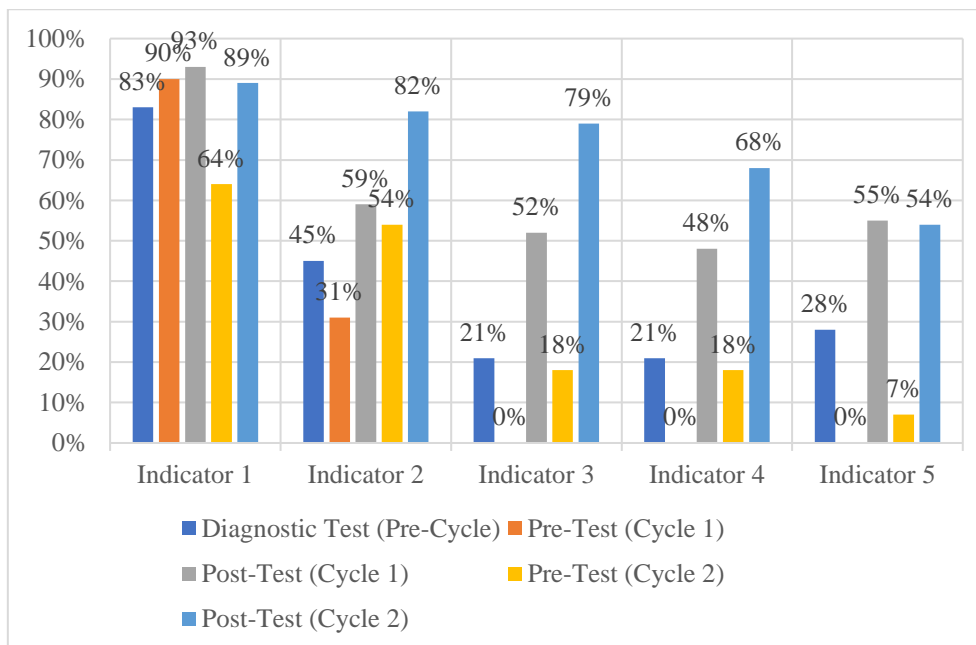


Figure 2 Comparison of Percentage of Students who Passed KKM in Pre-Cycle, Cycle 1 and 2

Based on those Figure 1 and 2, it can be seen that both of the post-test in the cycle one and two were exceeding the minimum criteria of "Good", which is 61. It yields that the second indicator of research standard was achieved. Moreover, those scores were also higher compared to the score in diagnostic test and the pre-tests. It means that there was an enhancement of critical thinking skill experienced by the students. Specifically, in comparison of pre-test and post-test in cycle one, the enhancement occurred in indicator, 1, 2, 3, 4 and 5 were +3, +11, +33, +34 and +33 respectively. While in cycle two, the enhancement occurred in each indicator were +15, +13, +23, +36 and +23. From these result,

Therefore, it can be concluded that the PBL method was able to enhance students' critical thinking skill.

Besides, from the comparison of post-test at cycle one and two, it is known that the third and fourth indicators were enhanced while the rest were not. The researcher reflected toward these findings and tried to find its causes. For the first indicator, it was because the students did not write the problem clearly. It is very important for teachers who are implementing PBL method to keep reminding students to write the problem they recognized clearly otherwise they will not able to find the best possible solution later on. For the second indicator, the cause might be because the question in the post-test at the cycle two did not use the picture. The question at the first cycle was using picture. Compared with the second cycle, using picture in cycle one had helped students to understand the question they were going to solve better. For the fifth indicator, since the average score from the first until fourth indicator will affect the score at fifth indicator, it is very reasonable that the score at fifth indicator were not enhanced.

Furthermore, in comparison of pre-test and post-test in cycle one, the enhancement of students' percentage who passed the KKM occurred in indicator, 1, 2, 3, 4 and 5 were +3%, +28%, +52%, +48% and +55% respectively. While in cycle two, the enhancement occurred in each indicator were +25%, +28%, +61%, +50% and +47%. The difference of the result of post-test compared to pre-test result in each indicator were +22%, 0%, +9%, +2%, and -8%. It can be seen that number of students who passed the KKM from the indicator one to four were enhanced. Meanwhile, at the indicator five it was decreased.

Moreover, from the explanation above, it can be seen that the percentage of students who passed the KKM at the first and second indicator were higher than the rest of indicator. It is because each indicator had been arranged based on the Revised Bloom's Taxonomy cognitive level. For the first indicator, it was included on the first level, with the key word of recognizing. For the second indicator, it was included on the second level, with the key word of gathering. For the third indicator, it was included on the third level, with the key word of implementing. For the fourth indicator was included on the fourth and fifth level, with the key word of developing. Lastly, the fifth indicator was included on the sixth level, with the key word of presenting. The third until fifth indicator was included in the HOTS based on what Clark (2010) has said, that the three levels of HOTS are analyzing, evaluating and creating (as cited in Saido, Siraj, Nordin, & Al_Amaedy, 2015). It can be concluded that the indicators that are in HOTS level are harder to achieve.

Furthermore, it can be seen whether from tests or group worksheets, the goal of all of it was to find what solutions should be taken. It implies that, critical thinking skill took place to reach this goal. This verifies what Facione (as cited in Fristiadi & Bharata, 2015) has stated, that critical thinking skill is a skill to make humans possible to analyze and unite information for the purpose of solving the problem in a certain situation. In this case, the implementation of PBL method could foster critical thinking skill for reaching this ultimate goal, which is finding the best possible solution. It clarifies what Sanjaya (2008) has said,

that the goal of learning by using PBL method is students are able to think critically (as cited in Chrismastianto, 2015).

Meanwhile, the implementation of PBL method was able to enhance students' critical thinking skill by the ways of implementing each stage of it in the learning activities. It is based on the data gathered from research instruments. In cycle one, the achievement of PBL method implementation was reaching 99.57% while in cycle two was reaching 100%. It implies that the researcher was proven implemented PBL method in learning activities at the classroom.

Moreover, based on the implementation that had been done, it can be seen that the existence of a problem was very important in PBL method. All of the learning activities were connected to the problem given. It is confirmed of what Arends (2008) has said, that the essence of PBL is presenting various authentic and meaningful problem situations to students that serve as stepping stones for investigating and observation. Moreover, it also can be seen that the role of a teacher in PBL method was more likely to be the facilitator. It means that the teacher did not directly give the answer to students. The teacher just guided students so that they could achieved the learning outcomes expected. It clarifies what Chrismastianto (2015) has written, that the roles of a teacher in PBL are as a guide and expert consultant for students that involved in that learning. Since the roles of a teacher in PBL are as a guide and consultant, it will give space for students to independently find the best possible solution for the problem. They will be open to some alternative of strategies and by doing so, at the end of the lesson, they can choose the best possible solutions to the problem from the strategies have been conducted. It is in line with the goal of critical thinking, which is to find the best possible solutions from the problems occurred.

Furthermore, learning by using PBL method was quite challenging because students were working in groups to collectively find the solutions asked. By the end of the cycle two, the researcher observed that when doing the group investigation, there were some students who hard to be cooperative with their group members. It made them hard to work out together the worksheets given for finding the solutions asked. It verifies what Duch (1995) has explained, that PBL challenges the students for learning how to study, working in group for the purpose of finding solutions of real world problems (as cited in Lestari & Yudhanegara, 2015).

CONCLUSION

Based on the research that had been conducted, there are two conclusions can be drawn to answer the research questions formulated in chapter 1. First, the implementation of PBL method is able to enhance students' critical thinking skill. From the comparison of post-test at the first and second cycle, it is obtained that two indicators, which are the third and fourth indicators, were enhanced and the rest, which are the first, second and fifth indicators, were not enhanced. Second, the implementation of PBL method is able to enhance students' critical thinking skill by implementing each stage of it in the learning activities.

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