

Improving Self-Efficacy Student Class VIIIB in SMPN 3 Kalasan with Problem Based Learning

Nurul Fitrokhoerani^{1, a)} and Atrika Anggraeni^{2, b)}

^{1,2}*Yogyakarta State University, Indonesia*

^{a)}fitrokhoeraninurul@gmail.com

^{b)}Atrikaanggi17@gmail.com

Abstract. Self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. In mathematics class, self-efficacy can increase student's motivation to succeed in achieving the learning objectives and make student survive when they have difficulties. Self-efficacy can be developed by using Problem Based Learning (PBL) in mathematics learning. PBL is a model of learning which confronts students with real and meaningful issue that can guide students in research and inquiry. PBL can increase the confidence of students toward mathematics learning because students learn with discussion and it will train students to be more courageous in presenting their ideas. This research is an action research. This research subject is 29 students class VIIIB in SMP N 3 Kalasan. This research takes place in two cycles. Cycle I consists of 3 meetings and cycle II consists of 3 meeting. The technique of data collection are observation sheets, questionnaire, and test. Observation sheet used to carry out the learning process, questionnaire used to know self-efficacy of students, while the test used to measure the basic competencies achievement of students. The results showed that students experience increased self-efficacy. It is shown by the increasing value of the average in cycle I from 61 (medium) to 76.82 (high), then in cycle II increased to 77.89 (high). The result indicates that PBL can increase self-efficacy students.

INTRODUCTION

Human resources is one of the important aspects that should be improved in order to face competition in the human life. Mathematics, as one of the sciences, play an important role in life. Mathematics given to all students, starting from elementary school students, with the aim to equip students with the ability of logical, systematic, analytical, critical, and creative thinking [1]. Therefore, mathematics is a lesson that needs to be taught in the learning process in schools so that students have the ability to acquire, manage, and utilize the information to survive in the ever-changing circumstances, uncertainty, and competitive.

In the process of learning mathematics, it is important for educators to know how their learners feel, think, and act, and toward mathematics. The influence of attitudes, value and personality characteristic on achievement outcomes and later participation in the learning of mathematics are important consideration for mathematics educator [2]. It means that Teachers need to pay attention to characteristics students by recognizing the differences of each student and knowing the factors associated with the learning process of students. There are some of the psychological factors in students, include: self-efficacy, motivation, emotion, and so on. In the process of learning, there is one factor that affected students, one of that is students' self-efficacy.

Self-efficacy is defined as the ability of a person about his/her consideration to achieve the desired performance levels or determined, that will affect the next action where he attempted to examine the level, the general, and all the action and power of context [3]. The consideration of self-efficacy would be more oriented to the tasks and specific situation, mostly contextual, and people will make decisions based on a number of goal. Someone who has self-efficacy will make an effort and believe that they can succeed in achieving the goals, they must strive to intensively and survive when they encounter difficulties. The greater self-efficacy, the greater effort, persistence, and flexibility.

Based on observations and interviews with mathematics teacher in class VIIIB in SMP N 3 Kalasan that have been carried out by researchers, the results indicate that generally, self-efficacy students in class VIIIB still not optimal in mathematics. Some students look less enthusiastic in learning activities as more listening than expressed opinions. In addition, the students' behavior also indicates the low of self-efficacy. Students don't

believe their capabilities and the results of his own work, for example looking for friends' work on the pretext that they are not able to work on, not daring to ask and stated opinions if given the chance, scared of tests, nerves when appearing in front of the class, and anxiety to face of a variety situations. Another indication that low student self-efficacy is seen from many students is less able to work on problem-based problems. When learning mathematics takes place students are less active in the learning process. This is because the mathematics learning process that is implemented in SMP Negeri 3 Kalasan is still dominated by the teacher as a learning center. Students participate less and interact optimally either with other students or with teachers so that students become less active.

Based on some of the issues that have been raised above, it required a learning approach that can involve students actively in the learning, allows students to build knowledge, and can also improve students' mathematics learning achievements, namely the problem-based learning approach (PBL). PBL is a model of learning that exposes students to real and meaningful issue that can guide students in research and inquiry. Problem-based learning begins by orienting students to a problem related to everyday life. Then the teacher guides and directs the students to discuss each other in the group, exploring the ability it has to solve the problem that is disclosed. In addition, PBL is a learning model that aims to allow students to gain confidence over its own merits [4]. PBL also works well with all students make the ideal strategy for heterogeneous classes where students with diverse abilities can develop their talents together to find a solution [5]. This is in line with the opinion of a research that shows 85% of students agree that PBL can increase their confidence [6]. This is because the discussion and achievement is done with PBL model. Based on the explanation, it can be concluded that learning by PBL model can also improve students' self-confidence in learning mathematics because in the learning activity of mathematics can be done by way of discussion and achievement so that the students train to be more daring in conveying their ideas and responsible for the task given .

Based on the descriptions above, the problems that underlying this research is how to improve the process of learning and improving self-efficacy students class VIIIB in SMP N 3 Kalasan in mathematics learning by PBL. The purpose of this research is to improve the learning process and improving self-efficacy students class VIIIB in SMP N 3 Kalasan in mathematics learning by PBL. This research is expected to help students increase self-efficacy in mathematics, to introduce students and teachers towards learning approach to problem based learning, and provide insight for researchers as well as readers.

RESEARCH METHOD

Research Design

This type of research is a classroom action research, which is done by collaborating with mathematics teacher at SMP N 3 Kalasan. This action research using the design which consists of four repeated stages, namely planning, action, observation, and reflection. The design is presented in **FIGURE 1**.

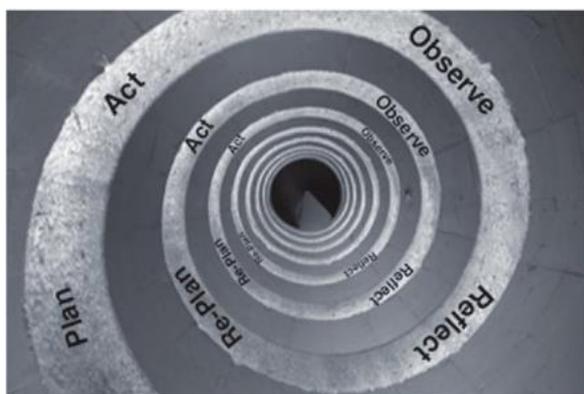


FIGURE 1. Model of Classroom Action Research [7]

Research Time and Subject

This research was conducted in the first semester of 2016/2017, precisely in 24 October 2016 to 28 November 2016 with 6 times of meeting. The subjects were 32 students class VIIIB in SMP N 3 Kalasan.

Data Collection Techniques

The data were obtained using the techniques of data collection as follows.

Observation

Observation is done by making observations regarding the enforceability of the learning mathematics by PBL in the classroom. The observations were made for each of the learning process that includes teacher and students' activity. Observations carried out by using observation sheet of enforceability learning. On the sheet, the observer can make an assessment by giving a check mark (√) in the options, which is "yes" and "no".

Questionnaire

Questionnaire is used to determine the extent of students' self-efficacy in mathematics. Questionnaires were distributed to students before and after applied the learning activities with PBL. Questionnaires consist positive and negative question with five answer options in accordance with the Likert scale, namely Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), and Strongly Disagree (SD).

Test

Tests conducted to determine the achievement of basic competencies and students' skill in mathematical knowledge. The test is given in the form of pretest and posttest. The tests are a daily test with 15 items multiple choice questions.

Data Analysis Techniques

Analysis of the data used in this research is descriptive qualitative data analysis and supported by quantitative data analysis.

Analysis of Observation Results

The data analysis technique for observation is done by giving 1 as a score for every aspect that has been completed and 0 as a score for every aspect that doesn't happen. Furthermore, the percentage of enforceability counted by the following formula.

$$\% \text{materialized} = \frac{\text{total score}}{\text{total of learning activities}} \times 100\% \quad (1)$$

Analysis of Questionnaire Results

The analysis data of questionnaire scale students' attitudes toward mathematics is done by calculating a student questionnaire scores, determine the criteria for the measurement results, and grouping students into several criteria. The following criteria measurement produce questionnaire that presented in **TABLE 1**.

TABLE 1. Categorization Guidelines for Student Attitudes Questionnaire Score Results

No.	Interval	Score (X)	Criteria
1	$Mi+1,5Si < X \leq Mi+3Si$	$80 < X \leq 100$	Very High
2	$Mi+0,5Si < X \leq Mi+1,5Si$	$67 < X \leq 100$	High
3	$Mi-0,5Si < X \leq Mi+0,5Si$	$53 < X \leq 67$	Middle
4	$Mi-1,5Si < X \leq Mi-0,5Si$	$40 < X \leq 53$	Low
5	$Mi-3Si \leq X \leq Mi-1,5Si$	$25 \leq X \leq 40$	Very Low

Information:

Mi = Mean attainable ideal instrument = $1/2$ (maximum score + minimum score)

Si = Standard deviation attainable ideal instrument = $1/6$ (maximum score - minimum score)

The data analysis technique for self-efficacy questionnaire is done by calculating questionnaire scores, determine criteria for the measurement results, and grouping students into several criteria. The criteria for measuring the result of questionnaire are presented in **TABLE 2**.

TABEL 2. Criteria of Measurement Questionnaire

Interval	Criteria
$80 < X < 100$	Very High
$67 < X \leq 80$	High
$53 < X \leq 67$	Medium
$40 < X \leq 53$	Low
$X \leq 40$	Very Low

Analysis of Test Results

The data analysis techniques to the test is done by giving a score on the answer of each student, that is 1 for a correct answer and 0 for a wrong answer. After that, calculate the score to determine the value of each student by using the following formula.

$$\text{value} = \frac{\text{total score}}{\text{ideal maximum score}} \times 100 \quad (2)$$

Criteria of Success Action

The criteria of success action in this research is presented in **TABLE 3**.

TABEL 3. Criteria of Success Action

Variable	Criteria	Target
Self-efficacy	Very High	20%
	High	50%
	Medium	30%
	Low	0%
	Very Low	0%
Cognitive/Skills	Student complete $\geq 75\%$	
The Learning Process	%enforceability $\geq 80\%$	

FINDING AND DISCUSSION

Description of The Pre-Action

Before the action is performed, researchers conduct the initial observation to find out the initial condition of students and mathematics learning activities in class VIIIB. In general, the implementation of mathematics learning in the classroom still uses the expository approach and rarely uses mathematical problems. Furthermore, the initial conditions for self-efficacy and cognitive/skills of students in mathematics is seen in **TABLE 4**.

TABEL 4. The Initial Condition

Variable	Criteria	Target
Self-efficacy	Very High	7%
	High	28%
	Medium	48%
	Low	0%
	Very Low	17%
Cognitive/Skills	Student complete = 36%	

Description of Action in Cycle I

Planning

In this planning phase, the preparations are made, such as determine the learning materials, develop learning implementation plan, compile student worksheet, develop assessment instruments, and develop learning observation sheet. Instructional material used in the cycle I is the equation of a straight line. Lessons are planned is learning by PBL with 3 meetings. At each meeting, students will be given worksheets compiled by PBL and contain stages of problem based learning, i.e. orientation on issues, organize the students to learn, guiding the investigation of individual or groups, develop and present the results of the work, analyze and evaluate the problem solving process. In addition, each meeting will be evaluated by using observation sheet to determine the enforceability of learning. Furthermore, after 3 meetings, there will be an assessment for self-efficacy, knowledge, and skills of students in mathematics. The instruments developed for the assessment are questionnaire and a written test.

Action

Implementation of the cycle I is done in 3 meetings with duration of 6 lessons hours or 240 minutes. Implementation of the learning is done by teachers and adapted to the learning implementation plan, while the researchers conduct observations. Furthermore, in order to be more effective learning, learning activities conducted by discussion in groups.

The first meeting was held on Thursday, October 27th, 2016 at 7:15 am - 8:35 am. Learning materials at the first meeting is to understand and make a straight line graph based on the coordinates and the point of intercept. The learning activities opened with greetings and pray, and then proceed with preliminary activities such as providing motivation and apperception. At the core stage, the teachers make four to five students into one group. Furthermore, each group had a discussion to resolve the issues presented on the worksheet. After that, several groups of students designated to present the results of their group discussions in class and if the results of the discussion experiencing a mistake, the teacher in charge to fix it. Before learning activities ended with a prayer, teachers and students in advance to reflect the learning activities.

The second meeting was held on Monday, October 31th, 2016 at 7:40 am - 9:00 am. Learning material at the second meeting is to understand and determine slope of the straight line equation formula and two parallel lines along two perpendicular lines. Overall, learning activities at the second meeting similar to the activity at the first meeting.

The third meeting was held on Thursday, November 3rd, 2016 at 7:15 am - 8:35 am. Learning materials at the third meeting is determine slope of straight line equation based on the direction of the line, determine slope of the line $y = mx + c$, and determine straight line equation. Overall, learning activities at the third meeting does not vary much with learning activities at the first meeting and the second meeting. In addition, at this meeting, the teacher also informs the students that on Monday, November 7th, 2016 will be carried out the tests on the material equation of a straight line.

Observation

The observations made in the form of observations of learning enforceability, self-efficacy questionnaire results, and students test results. The observation results of learning enforceability is presented in **TABLE 5**.

TABEL 5. The Observation Result of Learning Enforceability in Cycle I

Meeting	Enforceability of Teacher Activity (%)	Enforceability of Student Activity (%)
1	84	68
2	84	76
3	88	88
Mean	85,34	77,34

Furthermore, self-efficacy questionnaire results are given in **TABLE 6**.

Next, after analyzing the students tests, the results show the average values of students is 77,6 and the percentage of classical completeness 72,42%.

TABEL 6. Self – Efficacy Questionnaire Results in Cycle I

Criteria	Percentage
Very High	21%
High	72%
Medium	7%
Low	0%
Very Low	0%

Reflection

Based on the observation, it is seen that the results of research on the cycle I have achieved criteria of success action, i.e. enforceability of teachers' activities, knowledge, and skills students in math. As for the enforceability students' activity and , self-efficacy it has not yet reached the success criteria. This is due to the presence of constraints in learning, such as less active students in learning activities, student absence, time limitations and the difficulty students in solving problems.

To minimize these constraints occur in the cycle II, researchers plan to make improvements such as ask questions to students who are less active, provide better guidance and direction.

Description of Action in Cycle II

Planning

The planning stage of the cycle II is not different from the planning stage in the cycle I. However, planning is done by observing the reflection in the cycle I. Things are done at this stage is to determine the learning materials, develop lesson plans, prepare worksheets, prepare assessment instruments, and develop learning observation sheet. Learning materials that are used in the cycle II is the Pythagorean theorem.

Action

Implementation of the cycle II is done in 3 meetings with duration of 6 lessons hours or 240 minutes. Implementation of the learning is done by teachers and adapted to the learning implementation plan, while the researchers conduct observations. Furthermore, in order to be more effective learning, learning activities conducted by discussion in groups.

The first meeting was held on Monday, November 14th, 2016 at 7:40 am - 9:00 am. Learning materials at the first meeting is daily life associated with Pythagorean theorem. The learning activities opened with greetings and pray, and then proceed with preliminary activities such as providing motivation and apperception. At the core stage, the teachers make four to five students into one group. Furthermore, each group had a discussion to resolve the issues presented on the worksheet. After that, several groups of students designated to present the results of their group discussions in class and if the results of the discussion experiencing a mistake, the teacher in charge to fix it. Before learning activities ended with a prayer, teachers and students in advance to reflect the learning activities.

The second meeting was held on Thursday, November 17th, 2016 at 7:15 am - 8:35 am. Learning material at the second meeting is to find integers which form Pythagorean triple, discovered the relationship between the side length of a special triangle, and calculate the length of one side in a special triangle. Overall, learning activities at the second meeting similar to the activity at the first meeting.

The third meeting was held on Thursday, November 24rd, 2016 at 7:15 am - 8:35 am. Learning materials at the third meeting is use the Pythagorean theorem in real life. Overall, learning activities at the third meeting does not vary much with learning activities at the first meeting and the second meeting. In addition, at this meeting, the teacher also informs the students that on Monday, November 28th, 2016 will be carried out the tests on the Pythagorean theorem.

Observation

The observations made in the form of observations of learning enforceability, self-efficacy questionnaire results, and students test results. The observation results of learning enforceability is presented in **TABLE 7**.

TABEL 7. The Observation Results of Learning Enforceability in Cycle II

Meeting	Enforceability of Teacher Activity (%)	Enforceability of Student Activity (%)
1	88	84
2	92	84
3	92	92
Mean	90,67	86,67

Furthermore, self-efficacy questionnaire results are given in **TABLE 8.**

TABLE 8. Self – Efficacy Questionnaire Results in Cycle II

Criteria	Percentage
Very High	34,48%
High	55,17%
Medium	10,34%
Low	0%
Very Low	0%

Next, after analyzing the students' tests, the results show the average values of students is 79,8 and the percentage of classical completeness 79,31%.

Reflection

Observationally, seen that done learning, teachers as well as students, in cycle II have achieved success indicators are defined. This can be achieved due to the constraints on a cycle I can be overcome so the improvements happen in the learning process. But even so, there are still some constraints, as there are still some students who are less active, have difficulties at the moment of learning activities, and the presence of students who do not attend. The results obtained in cycle II shows that the implementation of learning by PBL can increase self-efficacy of students in mathematics after some improvements from cycle I to cycle II. So it can be concluded that corrective actions in this study enough and can be stop.

CONCLUSION AND RECOMMENDATION

Conclusion

Based on the results of research and discussion, we can conclude that learning mathematics with the approach of the problem based learning can improve the process of learning and improving self-efficacy of students class VIII B in SMP N 3 Kalasan in mathematics after done over several cycles.

Recommendation

The suggestions presented in this research is problem based learning approach can be used as an alternative to improve mathematics learning self-efficacy of students in mathematics as well as improve the quality of learning.

REFERENCES

1. Ministry of National Education, *Permendikbud Number 81A* (Jakarta, 2013), pp. 34-45.
2. SL Tait-McCutcheon, "Self-Efficacy in Mathematics: Affective, Cognitive, and Conative Domain Of Functioning", in *Proceedings of the 31st annual conference of the mathematics education research group of Australia*, edited by M. Goos, R. Brown, & K. Makar.
3. A. Bandura, *Self-Efficacy the Exercise of Control* (W.H. Freeman and Company, New York, 1997), pp. 234-238.
4. R. I. Arends and A. Kilcher. *Teaching for Student Learning* (Routledge, London, 2008).
5. R. Delisle, *How to Use Problem-Based Learning in the Classroom* (Association for Supervision and Curriculum Development, Alexandria, 1997), pp. 56-59.
6. Liza, Abdullah, and Yunita, The Impacts of Implementing Problem-Based-Learning (PBL) in Mathematics, **6(12)**, 2222-6990 (2011).

7. S. Kemmis, R. McTaggart, and R. Nixon, *The Action Research Planner: Doing Critical Participatory Action Research* (Springer, New York, 1988) pp. 19.
8. S. Arikunto, *et al*, *Penelitian Tindakan Kelas* (Bumi Aksara, Jakarta, 2012).
9. A. J. Nitko and S. M. Brookhart, *Educational Assessment of Student* (Pearson, Boston, 2011).
10. R. R. Skemp, *The Psychology of Learning Mathematics* (Penguin Books, Harmondsworth, 1971).