

# The Application of Problem Based Learning to Improve Students' Self-efficacy

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**Submission date:** 27-Feb-2020 09:14AM (UTC+0700)

**Submission ID:** 1264951792

**File name:** g\_Scopus\_Application\_of\_PBL\_AIP\_Conf.\_Series\_020024\_Th.\_2018.pdf (788.53K)

**Word count:** 3499

**Character count:** 19061

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Citation: *AIP Conference Proceedings* **2014**, 020024 (2018); doi: 10.1063/1.5054428

View online: <https://doi.org/10.1063/1.5054428>

View Table of Contents: <http://aip.scitation.org/toc/apc/2014/1>

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# The Application of Problem Based Learning to Improve Students' Self-efficacy

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**Abstract.** The learning process should be interactive, inspiring, fun, challenging, and motivating students to actively participate. Such learning can be accomplished if students have belief in their skills or are often called as self-efficacy. One approach that can facilitate students to build their knowledge and improve student self-efficacy is Problem Based Learning (PBL). PBL helps students to develop thinking skills and problem-solving skills, learn the roles of adults, and become self-sufficient learners. The purpose of this research was to improve students' self-efficacy using PBL on the material of enumeration rules. The action of this research will be successful if students' self-efficacy increased with very high category become 3.3% (1 student), high category become 26.7% (8 students), and moderate category become 46.7% (14 students). The average of students' self-efficacy is in the moderate category. This research was classroom action research consisting of four stages, namely planning, action, observation, and reflecting. The subject was 30 students grade XII of Senior High School 1 Sedayu, Argomulyo, Bantul, Special Region of Yogyakarta. The result showed that after several cycles, students' self-efficacy improved. Student self-efficacy increases and meets the targets set in cycle II. The target and increase of each cycle can be seen in table 1. In cycle II, students' self-efficacy improved and fulfilled the predetermined target because of the reflection of cycle I which was then taken into consideration for action in cycle II. Based on the results, the application of learning with PBL approach can improve student self-efficacy.

## INTRODUCTION

Education is one effort that can be done to improve the quality of human resources in this era. It can be done with the learning process in school, including the learning process on mathematics. The learning process at each elementary and intermediate unit should be interactive, inspiring, fun, challenging, and motivating students to participate actively, and provide sufficient space for an initiative, creativity, and independence according to students' physical and psychological talents, interests, and development [1]. This indicates that students' beliefs in their skill are required for interactive, inspirational, and other learning processes to be accomplished. The student's belief in his ability is known as self-efficacy.

Self-efficacy was first introduced by Albert Bandura. He said that self-efficacy is a person's belief in his skill to organize and implement the sequence of actions required to produce the desired achievement [2]. Furthermore, self-efficacy is a person's belief in his ability to organize and implement the actions required to perform behaviors at some level [3]–[5]. Specifically, self-efficacy is a person's belief in his skill to accomplish tasks, set goals, and achieve the goals that he has arranged before [6]–[10].

Self-efficacy level in each person is divided into two, high and low. Students with high self-efficacy will feel more confident, persistent, and motivated in dealing with difficult problems [4], [11]. Students with low self-efficacy will waste a lot of time, less effort in learning, and low achievement [12]–[14]. Some aspects that can be scaled to measure a person's level of self-efficacy are level, generality, and strength. The level is a person's belief in his skill to level the

difficulty of the task he encounters. Generality is a belief that applies to various activities or conditions. Strength is the power level of one's belief or expectation of his skill [2].

But the reality in the self-efficacy of students class XII IPS 3 in Senior High School 1 Sedayu is not in accordance with the expected. It can be seen by the questionnaire results of students' self-efficacy as follows. Interval and category of the data have been calculated based on Widyoko's [15].

TABLE 1. Initial Data of Students' Self-efficacy

Interval	Category	Initial Condition	Student Number
$X > 126$	Very High	0.0%	0
$102 < X \leq 126$	High	0.0%	0
$78 < X \leq 102$	Moderate	23.3%	7
$54 < X \leq 78$	Low	33.3%	10
$X \leq 54$	Very Low	43.3%	13
Average		63.97 (Low)	

Based on the above table shows that the overall self-efficacy of students are in the low category. However, there are still 43.3% of students in class XII IPS 3 whose self-efficacy students are in the very low category. Meanwhile, if it is associated with the characteristics of the school as one of the favorite schools in Bantul, then the self-efficacy of each student in mathematics learning should be in the medium minimum category. More than half the number of students whose self-efficacy is in the low category indicates that there is still something to be improved in the process of mathematics learning in the classroom. Therefore, the researcher felt that the results were not satisfactory, so the self-efficacy of class XII IPS 3 students still needed to be improved.

One approach that can facilitate students to improve student self-efficacy is the Problem Based Learning (PBL) approach. PBL is a learning that confronts students with authentic problems that can guide students in investigation and inquiry [16]. The problems presented in the PBL are a real problem that exists in the student environment, so as to develop critical thinking skills, problem-solving, high-level thinking, and student independence [16]–[18]. There are characteristics of PBL, that is: 1) a real problem as the basis of learning; 2) student asks the question of the problem; 3) the students are asked to solve the problem; 4) the students obtain information and knowledge from various sources to solve problems; 5) the students learn in small groups; 6) teacher as a learning facilitator; and 7) the students present the results/solutions to problem-solving [19]–[22].

PBL reorients traditional teacher-student interaction toward active and self-directed learning by the student that can make students more active in classroom learning [23]. PBL can improve students to develop their skill to adapt to their surroundings and to have self-control by giving the opinion, thinking positively, and be communicating in class [24], [25]. PBL also makes students to find information, coordinate actions, reach goals, and monitor understanding [26]. Moreover, by discussing and listening to other students in PBL activities, students can revise their ideas and realize the deficiencies in their thought [27].

TABLE 2. The relation of PBL and self-efficacy

No	The syntax for PBL are [16]:	Self-efficacy can be improved by:
1.	students are oriented to the problems;	posing students a learning that based on real-world problems [28];
2.	students are organized to study tasks related to the problems;	making students actively in conducting learning activities [29];
3.	students are being active by gathering information, conducting experiments, and searching for explanations and solutions in group investigation;	engaging students in investigation activity in the learning process [30]; and
4.	students develop, present, and share their findings with others; and	making students build, justify, and reflect their arguments [31].
5.	students analyze and evaluate their findings.	

Based on the table above, it can be concluded that syntax of PBL relates to the improvement of self-efficacy. Instructional kits that use in PBL learning to improve students' self-efficacy are lesson plans and student worksheets with PBL approach. Inside the student worksheet, it can be found the panel of self-efficacy quotes.

**STUDENT WORKSHEET 1**

Group: \_\_\_\_\_  
Member(s):  
1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_  
4. \_\_\_\_\_  
5. \_\_\_\_\_

Class Semester: XII IPS 1  
Time: 100 minutes

**Learning Objectives**

1. Student can understand the addition rules through contextual problems.
2. Student can understand the multiplication rules through contextual problems.

**Directions:**

1. Read every directions in the student worksheet.
2. Discuss the solution with your group-mate.
3. The exercises must be done by yourself.
4. Ask the teacher if any sentences are less clear.
5. Submit your student worksheet after you have finished.

*Believing in your skills is the first step to success.*

**THE APPLICATION OF ENUMERATION RULES**

**Do you know?**  
Vehicle number codes in Indonesia use 4 combinations of numbers combined with one or two letters in front and back. The letter in front serves as a marker area where the vehicle is registered. How do you determine the maximum number of vehicles in Yogyakarta can use different number codes with all the combinations of numbers except the first number should not be 0?

**Write your discussion results:**

AB                    IS

**NOTE: ENUMERATION RULES**  
The enumeration rule is a way of calculating all the possibilities that can occur in a particular experiment. Enumerating can also be called by counting and registering.

(a)

**PROBLEM 1**

An **Agus** home, there are 5 different types of cars, 2 different types of airplane, and 1 type of truck. If **Agus** wants to travel, how many ways **Agus** uses his vehicle?

**1** Write your group-discussion result

*You can learn anything as long as you believe.*

**PROBLEM 2**

Amanda has 3 patterned shirts (lines, squares, and circles-dot), 2 pants (long and short), and 3 shoes (sneakers, flat, heels). Determine how many ways he is fully dressed?

**2** Write your group-discussion result

*Do not let your doubts fight with your beliefs.*

(b)

FIGURE 1. Student Worksheet with PBL Approach and Self-Efficacy Quotes

## METHOD

This research was classroom action research. The action of this research was the application of PBL approach to improving students' self-efficacy. The subject of this research was 30 students in class XII IPS 3 in Senior High School 1 Sedayu. The age of the students was between 16-18 years old. They were divided into 7 groups in which two groups consisted of 5 students and the other groups consisted of 4 students. The instruments consisted of self-efficacy questionnaire and observation sheet. There were four stages of this research, namely planning, action, observation, and reflecting [32].

This research was conducted in 2 cycles. The target is achieved at the end of cycle 2. The procedure of each cycle as follows: 1) Planning Stage. Some activities that were conducted in planning stage were: a) observing the location and subject of this research, b) consulting with mathematics teacher, c) preparing lesson plans and student worksheets based on PBL approach, d) arranging observation sheet, and e) preparing self-efficacy questionnaire; 2) Action. The actions that had been planned in the previous stage will be applied in the classroom learning; 3) Observation. The observation was done by the observer by filling out the observation sheet about the students and teacher activities during the learning process. 4) Reflecting. Reflection was done after the researchers collect data at each end of the cycle. The data are self-efficacy questionnaires filled out by students and the results of observation sheet. Reflection aimed to: a) analyze weaknesses and obstacles, b) evaluate them, and c) know the achievement of targets. The procedure implemented in cycle 2 is the same as in cycle 1. But in the second cycle, the stage of planning refers to the results of reflection in the first cycle.

The study was said to be successful when meeting the targets: 1) self-efficacy of students increased with very high category breakdown to 3.3% (1 student), the high category to 26.7% (8 students), and moderate category 46.7% (14 students). The average student self-efficacy is in the moderate category; and 2) the learning process was done at least 90%. This is seen from the observation sheet. Table 2.1 is a way to determine very high, high, moderate, low, and very low self-efficacy.

2  
**TABLE 3.** Measurement Scale of Students' Self-efficacy Category [15]

No	Interval	Category
1	$X > \bar{X}_i + 1,8 SBi$	Very High
2	$\bar{X}_i + 0,6 SBi < X \leq \bar{X}_i + 1,8 SBi$	High
3	$\bar{X}_i - 0,6 SBi < X \leq \bar{X}_i + 0,6 SBi$	Moderate
4	$\bar{X}_i - 1,8 SBi < X \leq \bar{X}_i - 0,6 SBi$	Low
5	$X \leq \bar{X}_i - 1,8 SBi$	Very Low

Note:

- $\bar{X}_i$  : Average of self-efficacy scores  
 $SBi$  : Standard deviation of self-efficacy scores  
 $X$  : Students' self-efficacy scores

## RESULT AND DISCUSSION

Self-efficacy category was obtained based on the total score of the self-efficacy measurement scale. Based on that measurement, the score  $X > 126$  is a very high self-efficacy,  $102 < X \leq 126$  is a high self-efficacy,  $78 < X \leq 102$  is a moderate self-efficacy,  $54 < X \leq 78$  is a low self-efficacy, and  $X \leq 54$  is very low self-efficacy. Student self-efficacy questionnaires were used to identify students' self-efficacy using PBL approach. Questionnaires are given to the students twice, before the treatment which aimed to measure the initial condition of the student's self-efficacy and after the treatment aimed to find out whether the student's self-efficacy has reached the target. The questionnaire consisted of 30 statements based on the aspect of level, generality, and strength [2].

This classroom action research began with pre-research observations in order to observe the situations and processes of teaching and learning activities in the classroom, and also to get information about the initial conditions of student self-efficacy. The results of these observations were made into the initial analysis to determine the alternative actions to be given at the time of the study. Data obtained from the results of questionnaires self-efficacy before being given the action was the average of XII IPS 3 students' self-efficacy was still relatively low, so improvement was still needed in the learning process. After knowing the initial condition of student self-efficacy, the class action research was done to improve self-efficacy of student XII IPS 3. The target of improvement achieved in this research is as follows.

**TABLE 4.** Achievement Target of Students' Self-efficacy

Variable	Interval	Category	Target	Student Number
<i>Self-efficacy</i>	$X > 126$	Very High	3.3%	1
	$102 < X \leq 126$	High	26.7%	8
	$78 < X \leq 102$	Moderate	46.7%	14
	$54 < X \leq 78$	Low	23.3%	7
	$X \leq 54$	Very Low	0%	
			Moderate	
<b>Learning process</b>	Done $\geq 90$ %	Learning Succeeded	90%	

### Cycle 1

Cycle 1 was held in three meetings. The first and second meetings were conducted by using lesson plan and student worksheet based on the PBL approach, while at the third meeting a self-efficacy questionnaire was completed. Each meeting lasts for  $2 \times 45$  minutes. During the learning process, researcher acted as an observer who observed the learning process and fill in the observation sheet. The result of observation in cycle 1 is known that the percentage of learning process implementation, on teacher activity reaches 90.4% and student activity reach 92.3%. Meeting 1 there are 2 teacher activities and 1 student activity that has not been done, while at meeting 2 there are 3 activities of teacher and student that have not been done.

The results of reflection on the action in cycle 1 indicate the weaknesses or obstacles that resulted in the failure of some activities. Those are: 1) the design of time allocation is not appropriate, 2) the group division is randomly ineffective, and 3) the students are embarrassed to present the results of their work. Based on the third point, we can know that there are still students who self-efficacy is low. This is evident from the results of students' self-efficacy in cycle 1 below.

**TABLE 5.** The Result of Students' Self-efficacy Cycle 1

Variable	Interval	Category	The End of Cycle 1	Student Number
<i>Self-efficacy</i>	$X > 126$	Very High	0%	0
	$102 < X \leq 126$	High	10%	3
	$78 < X \leq 102$	Moderate	60%	18
	$54 < X \leq 78$	Low	30%	9
	$X \leq 54$	Very Low	0%	0
The Average = 84.4			Moderate	

The result of the questionnaire in cycle 1 shows that students' self-efficacy attitude in mathematics learning is in the "moderate" category with an average score of 84.4. However, these results have not met the determined target so it needs to be conducted the cycle 2.

## Cycle 2

Cycle 2 was held in three meetings. The first and second meetings are implemented by using lesson plan and student worksheet based on the PBL approach, while at the third meeting a self-efficacy questionnaire is completed. Each meeting lasts for  $2 \times 45$  minutes. During the learning process, researcher acted as an observer who observed the learning process and fill in the observation sheet. The result of observation in cycle 2 is known that the percentage of learning process implementation, on teacher and student activity reaches 96.2%. Meeting 1 there are 2 activities of teachers and students that have not been implemented, while at the second meeting there is no teacher activity and student activities that have not been done.

The result of reflection on the action in cycle 2 shows that the learning in cycle 2 has met the target. This is evident from the results of student self-efficacy in cycle 2 below.

**TABLE 6.** The Result of Students' Self-efficacy Cycle 2

Variable	Interval	Category	The End of Cycle 2	Student Number
<i>Self-efficacy</i>	$X > 126$	Very High	3,3%	1
	$102 < X \leq 126$	High	36,7%	11
	$78 < X \leq 102$	Moderate	43,3%	13
	$54 < X \leq 78$	Low	16,7%	5
	$X \leq 54$	Very Low	0%	0
Rata-rata = 97.03			Moderate	

The result of questionnaire Cycle 2 shows that students' self-efficacy attitude in mathematics learning is in the "moderate" category with an average score of 97.03.

Based on initial conditions, cycle 1, and cycle 2 it can be stated that student self-efficacy has increased significantly. Therefore, the provision of action in the form of application of the PBL approach has succeeded in improving student self-efficacy and meeting achievement targets. This is in line by some previous studies that said PBL is effective in students' skill in solving complex problems, enhancing their confidence in deciding alternative solutions to solving problems, and improving interpersonal and professional skills [33]–[35]. This is because students are given real problems to understand a mathematical concept, so students become aware of how the application of the material they are learning.

Furthermore, the existence of group discussion and presentation is a variation of learning activities that have never been implemented before in class XII IPS 3 in Senior High School 1 Sedayu. Besides aiming to give students the

opportunity to be actively involved in the learning process, the discussion and presentation activities are the main attraction for the students and make the students motivated to be confident in their ability to solve a problem (self-efficacy). In addition, there are also appreciation activities from teachers and friends to give impact to the increase of student self-efficacy.

## CONCLUSION

Based on the result and discussion of this research obtained the conclusion that after several cycles, student self-efficacy increased. Student self-efficacy increases and meets the targets set in cycle 2. In Cycle 2, students' self-efficacy improved and fulfilled the target because of the reflection of cycle 1 which was then taken into consideration for action in cycle 2. Based on the results of this research can be concluded also that the application of learning with PBL approach can improve student self-efficacy.

## ACKNOWLEDGMENTS

This research cannot be carried out without permission from Yogyakarta State University. It can also be done with the help from the parties of Senior High School 1 Sedayu, Argomulyo, Bantul from the principal, teachers and students.

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