# Applying Problem-Based Learning Models to Increase Responsibility and Learning Achievement in Mathematics

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**Abstract.** The aim of the study is to describe how to apply a problem based model of learning in order to increase the responsibility of pupils and the learning results in maths. This kind of research consists of the Classroom Action Research (PTC), which was carried out in two series. There are four phases in each cycle, comprising planning, realisation, observations and reflections. The subjects were sixth-graders at the SDN Tritih Kulon 09, a total of 11 students, with details from seven male and four female students. Collection of research data by means of monitoring, testing, questionaires and documentations. The data analysis was performed by means of a method of quantitatively describing analysis, i.e. data processing by the mean number (average) and percentage percentages. Results showed that pupils "learning results showed a responsible attitude towards learning under initial conditions, up to 45,45% for an average of 53,90, 72,72% for an average of 81,09 in the first cycle and 81,81% for an average of 83,45 in the second cycle. On the basis of these results, we can see that the students "responsibilities and learning results have increased in the classical way, so that we can conclude that the Problem-Based Learning Model (PSL) can increase responsibility for and learning results in mathematics among the sixth-graders at the SDN Tritih Kulon 09.

**Keywords:** Problem-Based Learning Models, Responsibility, Learning Achievement and Mathematics.

## 1. Introduction

Studying is a support that the teacher provides to the students in a learning environment, with the goal of helping the students acquire knowledge, attitude and skills. According to the number 22 of the year 2016, school learning is organized in an interactive way, it is inspirational, fun and challenging, it motivates students to participate actively, and it offers sufficient scope for initiative and creativity and independence according to the talents and interests of the students, as well as their physical and mental development. This is consistent in order to facilitate learning and development of students potential[1]. There needs to be a process of learning that focuses on student activities and shifts the responsibility for learning towards

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students in order for them to realise their potential. Therefore, each training unit conducts learning plans, conducts the process of learning and evaluates the process of learning in order to enhance the effectiveness and efficiency of attaining the skills of graduates, thereby achieving learning goals.

As a matter of principle, learning taking place in primary schools must comply with the relevant syllabus. The 2013 syllabus uses a scientific approach to learning, or that scientific approach is aimed at giving students the opportunity to more fully process their thinking skills. During learning activities they receive not only material and complete tasks but also perform mental activities in order to expand the object of their understanding.

On the basis of the above description, teachers will be called for innovation by implementing strategies and learning models which enhance learning process and results. At the level of basic education, students will be taught various areas of knowledge, with the goal of developing students "skills and abilities at an earlier stage [2]. One subject taught at primary school level is maths. Basically, mathematics is a deduction science, an axiom, a formal, a hierarchic, an abstract symbolic language, full of antics and so on, so mathematicians are able to develop a three-dimensional system of mathematics.

Mathematics plays an important part that someone must learn from a very young age, because by learning math, a person is able to enhance his or her ability to think. This is consistent with the goals of mathematics learning, which is to teach students the skills of logical, analytical, systematic, critical and creative thinking and the willingness to collaborate. Improving students "thinking skills will help them to solve a variety of problems in their daily lives, in particular those associated with mathematical approaches.

Results of the observations at Elementary School of Tritih Kulon 09 project show, that the abilities of the sixth students in the 2016-2017 school year in math are still relatively small. First of all, the lack of responsibility on the part of the students during the learning process, less than half of the eleven students have a great sense of accountability, many are still lazy about asking the questions when dealing with practical questions, many are still cheating, not doing homework, and are still working individually in the group or relying on pupils who are shrewd. Secondly, there is still a greater focus on teacher learning, i.e. Teachers are more actively involved than pupils.

The Teacher explains the material, while the pupils sit passively and uncritically and listen to the explanations of the Teacher. This situation leads to students using mathematical formulae without understanding how and where these formulae are created. As a result, students' motivation to participate in learning is weakened, with many students performing worse than those of the KPM. The minimum completeness criteria (RCM) for maths are 70. And, third, students see learning math as a hard lesson, which is why they fear it. Out of this fear, math becomes a reprehensible subject and, as a consequence, results are not optimal. And if it is left unchanged, it will affect quality of teaching and will not achieve the objectives of maths learning. Problems encountered in mathematics learning can be solved by using a model of learning that meets the students "learning needs.

Problem-based learning is a method of learning which interprets the problems of the real world as the environment in which students learn to critically think and solve a problem in order to extract knowledge and ideas from the topic. The benefits of problem-based learning according

to problem-based learning include: (1) Troubleshooting is a great technique to understand learning better; (2) it can inspire and offer satisfaction in order to find different knowledge for the students; (3) it helps the students develop and assume responsibility for learning that they are doing, learning is more fun; (4) it can encourage the students to be critical by experiencing directly the knowledge, or problems, that they are experiencing in real world[3]. The steps in the problem-based learning model are: 1) problem orientation for students; 2) student organization for learning; 3) conducting single and group surveys; 4) development and presentation of work; 5) analysis and evaluation of problem-solving processes.

Problem that student include: 1) when students have no interest or confidence, the problems examined are hard to solve, Students will hesitate to give it a try; 2) Success in this learning will take a great deal of time; 3) Unless they understand why they're trying to resolve the problem they're trying to investigate, students won't be learning what they're trying to learn[4].

Responsibility is a person's attitude and conduct in the fulfillment of the obligations and duties that he or she ought to fulfil to himself or herself, to society, to the environment, (of course, socially and culturally), to the state, and to God the almighty[5]. Responsibility means having the guts to take on all the risks arising from behaviour, action or anything that is being done [6].

It can be deduced from the above statement that accountability is the attitude of responsibility for your own actions with regard to behaviour as an expression of a sense of obligation. The following indices of successful accountability are: (1) do your homework and tasks well, (2) be accountable for all your actions, (3) picket in accordance with a set timetable, (4) do group tasks jointly[7]. The attributes of the responsible person, include: (1) Choosing the Straight Path; (2) Always Showing Yourself; (3) Maintaining Self-esteem; (4) Always Being Attentive 5) Commitment to Task 6) Fulfillment of Task to the Best of Standards 7) Admitting to All His Actions 8) Keeping Promises 9) Daring to Take Risks for His Actions and Words[8].

Responsibility is not only a lesson to be taught and introduced, it is also a lesson to be taught to pupils, both at preschool and at school. Students, who are educated or who have imparted values of accountability, will later grow up to be individuals serious about the exercise of their different activities. It is that honesty and responsibility which ultimately leads him to the success he desires, particularly in schools. The values of accountability are things which must be imparted by a teacher.

Observes that learning performance is a result of the measurement and evaluation of learning efforts. Gives limitations to learning success, i.e. the results from learning activities, expressed in terms of icons, letters, or sentences, achieved by every student in a given period of time. Learning performance is a person's content and ability. It's about the results someone gets after a certain training or education. This may be established by a test carried out after completion of the training.

It may be concluded from the above opinion that learning performance is the product of student efforts that can be attained in the shape of mastering knowledge, skills, habits, skills and attitude after participation in learning, as can be demonstrated by test scores. Learning performance is something students must know what skills they gain through an activity known as learning.

Research that has already been carried out entitled "The effectiveness of problem-based learning models for problem solving competence of pupils in mathematical learning," shows that applying the learning model to primary school pupils "mathematical problems solving skills is more effective than the traditional model. The following research has been carried out in, entitled "The effectiveness of problem based learning and problem-solving in terms of the mathematical problem-solving ability of fourth-grade primary school pupils." This research that led to results that indicated that there was a difference between the different types of models in comparison, in the case of rounding materials and the evaluation of 2 integers and fragments, that the Problem based Learning Model (PSL) was better and effective than that of the problem solution model. This same research has also been conducted with the title "The effectiveness of problem-based learning in terms of ability to solve problems[9].

Mathematical problems in primary schools, using the findings of its research, which states that the Problem-Based Learning Model (PBL) has had a significant impact on students ability to solve problems, particularly in the fourth grade. Based on previous research results, the researchers intend to conduct research on the topic of "Application of problem-based learning models to increase responsibility and learning success in mathematics."

This study aims to describe how to apply a problem based model of learning in order to increase students "responsibility and results in mathematics. This study is based on the assumption that the cognition of students can be affected by the use of problem based models of learning. Students will then be able to participate more actively in the classroom learning process and be empowered to resolve a problem.

## 2. Research Methods

This is classroom action research (CSR). PTC is a research activity conducted by teachers within their own classroom, conceptualizing actions in multiple cycles, in a cooperative and participative manner, and which aims at improving or improving the level of learning within their classroom [10]. Each of the CAR models has different conversion steps. This study uses Objectives include: (1) Planning, (2) Measures, (3) Observation, (4) Reflection.

The research was carried out in two cycles according to CAR steps according to. Each cycle consists of one meeting, each meeting is 3 x 35 minutes. This research was tested on class VI students of SDN Tritih Kulon 09 Cilacap, totaling 11 students consisting of 7 boys and 4 girls. The implementation time is in semester II of the 2016/2017 school year from 22 February to 15 March 2017. The implementation of cycle 1 and cycle 2 in the study is described as follows: 1) The planning activities that are carried out in the planning phase are: (a) discussions among researchers and teachers, observers, and colleagues about preparing and conducting research activities; (b) development of curricula based on a problem-oriented learning model that prepare several research tools, i.e. worksheets; student achievement sheets; practice sheets; observational sheets for activities of teachers and students; (c) preparation of media and documentary tools; 2. actions: (a) the teacher performs an appraisal and then communicates the learning goals to be accomplished, motivating the students to do well in the lesson; (b) the teacher divides the students into three groups; (c) the teacher hands out learning materials; (d) the teacher hands out pupil worksheets containing problems; (e) the teacher hands out exercise or assessment sheets; (f) the teacher gives assessments and conclusion from the activities

conducted: 3. observation, observers, notably colleagues and classroom teachers, observing the learning processes with prepared observation leaflets.

Aspects observed include student activity and research skills in learning using problem-based models in the data processing materials 4. reflection, a period of reflection during which the researcher investigates, sees and takes into account the outcomes or effects of actions based on various criteria. Reflections are an activity that critically questions the changes which have taken place, for both students, classroom atmospheres and researchers. At this point, reflect on what was put into practice. If the action results in a good result, the next operation can be resumed, but when the action has to be improved, the action must be repeated in its entirety. During the period of reflection, the researcher had a conversation with the viewer at the conclusion of each activity. The discussion took place on the basis of the findings of the observations.

In addition, in order to arrange other actions, the researcher reflected upon himself by examining the observation data to see whether or not the activities undertaken had hit their target.

The data analysis was performed by means of a method of quantitatively describing analysis, i.e. data processing by the mean number (average) and percentage percentages. The data-gathering techniques used for this study include monitoring, testing, surveys, and documentary. Observation is used to gather data on teacher and pupil learning activities, as well as implementation of issue-based models of learning during each cycle. This test was carried out to measure students' performance after they had completed mathematical learning activities based on a problem learning model. The applied test is the written test, in the shape of a descriptive text, which is given at end of every cycle. Questionnaire is used to gauge the degree of responsibility of students in the learning and teaching process of mathematics using a problem oriented learning model. This form will be submitted once in the cycle. In the meantime, the documentation will be used to authentically prove that the process of learning has been carried out in every learning process on the basis of a problematic learning model. documentation in form of photographs during learning activities.

## 3. Research Results and Discussion

### 3.1 Pre-Cycle

Pre-cycle can be seen in the figure in the below:

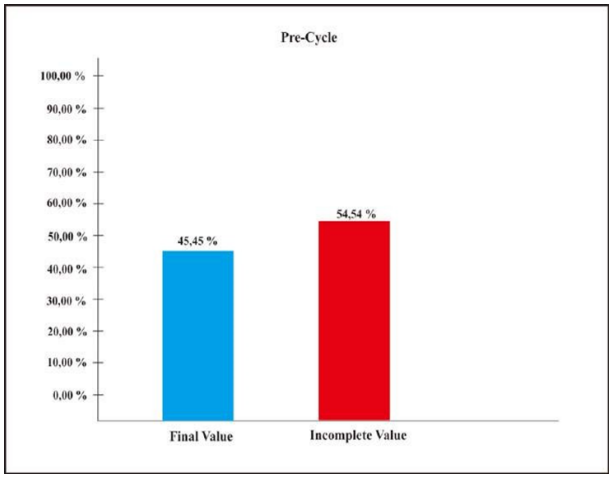


**Fig. 1.** Percent of student learning outcomes in the pre-cycle

The chart above shows that the pass rate of sixth grade students at the Tritih Kulon 09 public elementary school who had graduated was just 5 students, or 45,45%, out of 11, whereas those who had not graduated were 6, or 54,54%. In the preceding cycle, the average grade was 53,90, with a lowest score of 21 and a highest score of 93.

This still puts students at 70, which means that they are not yet fully in the maths learning process. This is because the students are not motivated to learn what the teacher is doing. The method used for learning tends to be teacher-centric (conventional), so the students are prone to being passive, and easily bored when taking part in the learning and teaching process. To improve the learning and teaching process it is therefore necessary to use a model of learning which can increase the responsibility and performance of the students. Therefore the researchers then carried out Cycle I.

### 3.2 Cycle I

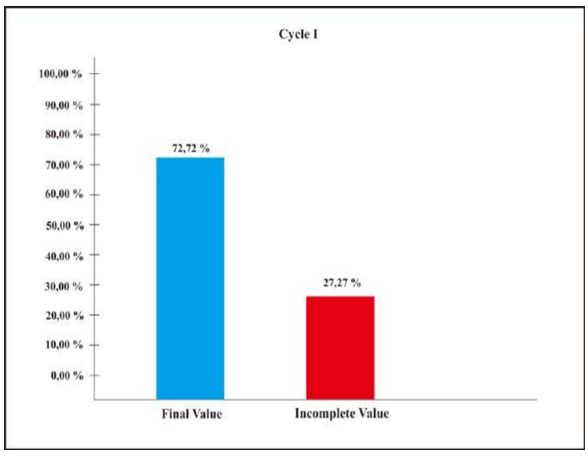


**Fig. 2.** Percent of student learning outcomes in cycle I

The graph above shows that the total number of undergraduates is 8 (72,72 percent) and the total number of undergraduates is 3 (27,27 percent). In Cycle I the average grade was 81,09, with lowest score 45 and highest score 100. Students' scores were as low as 70, which means that sixth-graders at the Tritih Kulon 09 public elementary school were not yet fully learning math. This is due to the fact that students still find it difficult to understand data processing materials in math, do not focus on hearing the explanations of the teachers and the students. They are not used to adapt to learning activity that uses problem based models of learning in the classroom.

### 3.3 Cycle II

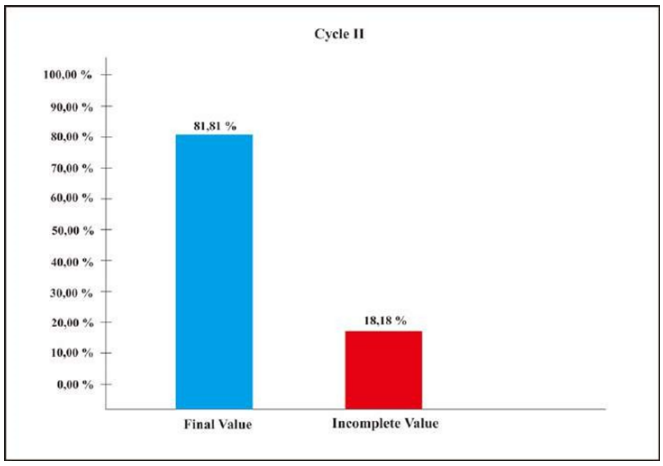


**Fig. 3.** Percent of student learning outcomes in the second cycle

The chart above shows that the student completion rate increased, i.e. 9 students, or 81,81%, reached completion, whereas students still in the KPM had only 2 students, or 18,18%. In the second cycle the lowest scores were 46 and highest scores were 100, which shows significant increases, so it is safe to say that applying the problem based model of learning can increase the students responsibility and performance in maths for the students of Public Elementary School Tritih Kulon 09. A comparison of pre-cycle, cycle I, cycle II is shown in the figure below:

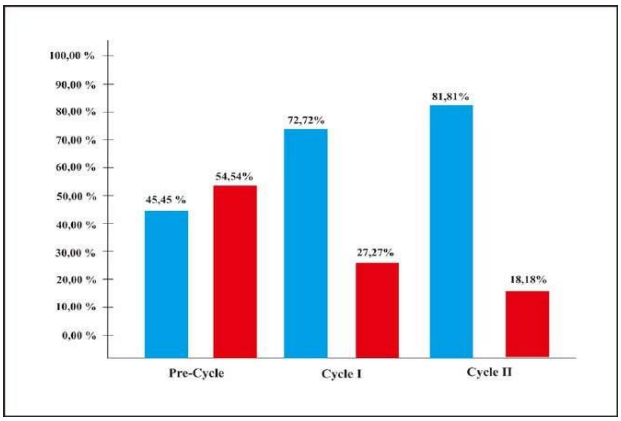


**Fig. 4.** Percent of student learning outcomes in the second cycle

The graph above shows that there was a 27% increase of student performance in the preceding cycle to Cycle I, i.e. the inclusion of students that had completed the learning from five students to eight students (a rise of three students). Between Cycle I and Cycle II the graduation rate rose by 9 per cent, i.e. the number of students graduating from 8 to 9 (a rise of one student).

**Fig. 5.** Photo of Learning activities of Problem-Based Learning Model in Classroom

## 4. Conclusion

Results of the studies carried out showed that the results achieved in the previous cycle were only 5 pupils, or 45,45%, out of 11 pupils, who achieved an average score of 53,90. And after using the problem-based learning model Cycle I, students "learning results improved but were less than optimal, with only 8 pupils, or 72,72%, scoring above the RKM, averaging 81,09. In the 2nd cycle of students "learning results, there was significant growth and achievement of

the target, and the cycle stopped, with the proportion of students completing the cycle reaching 9 or 81,81%, averaging 83,45 of the 11 students.

It has been shown that learning can increase the responsibility and performance of students by the use of problem-based models in mathematically taught computing materials. It is advisable to continue this research in order to prove the usefulness of problem-based learning when it is organised in other disciplines.

Problem-oriented models of learning can help pupils master subjects. This can transform the role of the teacher in a positive and more productive direction. Teachers aren't the only resource for students to learn. Teachers do not need to teach discipline all the time, because they can share learning roles with the students. This gives the teacher time to concentrate on other parts of the class, such as: For example, to support people who have learning disabilities, their personal development and motivation. Pupils and students can enhance their learning performance.

## 5. Acknowledgements

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