

Enhancing Elementary School Students' Question Story Solving Skills Using *Problem Based Learning* Approach

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1. Abstract

Mathematics is a subject that studied all participants study from elementary school to college. One of the most important skills a student should possess is the ability to solve mathematical problems. Learning mathematics is very useful in daily life. This study aims to improve the understanding of mathematics to solve the question of perimeter and area of square and rectangle in elementary school by applying the problem-based learning model. The research was conducted in an elementary school in Yogyakarta. The subjects in this research were 28 students in class IV A. The research method used is Classroom Action Research Collaborative, which uses Kemmis and Mc Taggart's model and consists of planning, action, observation, and reflection. The data analysis techniques used by the researchers are quantitative descriptive and qualitative descriptive. The results of the research show that the skills of solving the two-dimensional question story were improved. Pre-cycle scored 40% in the deficient category, Cycle I scored 63,75% in the sufficient category, and Cycle II scored 84,286% in the good category. Based on the results, it can be concluded that mathematical understanding of solving two-dimensional questions can be improved by using the problem-based learning model.

Keywords: question story, *mathematics, problem based learning, elementary school*

2. Introduction

The world of education has now entered the 21st century, where 21st century learning (Ministry of Education and Culture (2017a: 5) emphasizes that students must master the 4Cs (Critical Thinking and Problem Solving, Creativity and Innovation, Communication, Collaboration). In line with this matter, (Ministry of Education and Culture (2017b: 5) stressed that mathematics is one of the subjects in elementary school that emphasizes learning: 1) encourage students to find out different sources; 2) able to formulate problem; 3) practice students to think logically and creatively, not just think mechanically; and 4) able to work together and solve problems in mathematics is a basic subject competence at all levels of education that need to be mastered, including elementary school level. Cockcroft (1982) believes that mathematics must be taught because it is important and useful in a variety of areas, serves as a means of communication, can represent information in a variety of ways, and provides satisfaction when solving problems. Problem solving, which includes the ability to understand problems, design mathematical models, complete models, and interpret the solutions obtained, is one of the goals of teaching mathematics from elementary school to high school (Ibrahim and Suparni (2012:36) Learning to solve problems is one of the reasons for learning mathematics (Bennett et al., 2016). Problem solving skills are the ability to perform thinking processes to find a way out to achieve goals that require willingness, creativity, knowledge and skills and their application in everyday life (Hadi and Radiyatul, 2014). Hendriana and Utari Soemarmo (2014: 23) stated that problem solving is the most important element in learning mathematics. Problem solving becomes important for the goals of teaching mathematics (Anwar et al., 2016). This is because humans need to solve problems in their daily lives. The weakness in problem solving is that students are weak in analyzing problems, monitoring the process of processing, and evaluating the results (Prasetyani et al., 2016). In line with this matter, (Nurhayati, 2013) stated that one of the difficulties students

experience in learning mathematics is solving question story. Marlina (2013) states that students need to solve problems through the question story by being able to understand, design, and solve the question story.

Questions story are issues that are difficult for students in Indonesia and in other countries (Hidayati, 2019). Students need more time to understand difficult problem texts because they need to pay attention, visualize information to remember, and understand what is being read (Yuwono et al., 2018). Harvey and Goudvis (2007) explain that reading comprehension is a continuous process and evolves depending on what the reader is thinking. This is evident from the results of observations and interviews with teachers and students in solving the question story by the class teacher. Students have difficulty in understanding the perimeter and area of a two-dimensional figure, and it takes a long time to understand a task. Therefore, it is necessary to apply the correct learning model to help students solve problems so that they are able to solve question story.

According to (Reski et al., 2019), overcoming students' low ability to solve mathematical problems consists in selecting and applying a learning model that is able to promote students' ability to solve mathematical problems in learning mathematics. The learning model of problem-based learning is one of the learning models that is suitable for helping students solve word problems. The learning model of problem-based learning emphasizes problem-based learning to enable students to solve problems in everyday life. There are three main characteristics of problem-based learning. First, problem-based learning is a learning activity, which means that in the implementation of problem-based learning, there are a series of activities that students need to do. In problem-based learning, students are not expected to just listen, take notes, and memorize the material, but to actively think, communicate, search, process data, and draw conclusions (Hamruni, 2012: 107). According to the theory of constructivism, thinking skills and

problem solving can be developed when learners do it themselves, discover and transfer the complexity of existing knowledge (Lestari, Ansori, and Karyadi, 2017). Problem-based learning is a learning method that uses problems as the first step in acquiring and integrating new knowledge (Muhson, 2009). In line with this, Yuan (2008) identifies learner-centered learning models that enable learning, participation, and mastery of solution situations in small group work during the learning process. According to Siregar (2016), in problem-based learning, teachers act more as facilitators and moderators to help students actively construct knowledge.

This is in line with the learning syntax of the problem-based learning model proposed by Hariyanto (2013: 150).

1. Orienting students to the problem

The activities carried out in this step convey the learning objectives to be achieved. Describe the requirements needed to solve the problem. Motivate students to actively participate in problem solving.

2. Identify problem and organize students for study

The teacher assists students in identifying problems and organizing student tasks in solving problems.

3. Guide independent investigations and group investigations

Teacher motivates and encourages students to hypothesize, gather information and data relevant to problem-solving tasks, conduct experiments to obtain information, and solve problems.

4. Develop and present results

The teacher helps students plan and prepare relevant work, such as writing reports or completing assigned tasks, and helps them share the tasks with friends in their groups and others and present the work as evidence of problem solving.

5. Reflection and Assessment

The teacher guides students to reflect, understand the strengths and weaknesses of their findings, and note important points or concepts related to problem solving, analyze, and evaluate processes based on the results of problem investigations. In addition, the teacher prepares further investigations related to the problem solving results.

The advantages of the problem-based learning model include: (a) students later become accustomed to dealing with a problem and feel challenged to solve an existing problem, which is not only related to classroom learning but also to the daily life of the students themselves, (b) can foster a high level of social solidarity among students by getting them accustomed to discussing with their friends in a group and then discussing with their classmates, and later the students will read the obtained results in front of the class under the eyes of the other students and the teacher concerned, c) increasingly creates an atmosphere of familiarity of the teacher with the students in the class, d) and can familiarize the students with the use of experimental methods later at different times (Gunantara, Suarjana, & Riastini, 2014). Then, the advantages of problem-based learning model are also explained according to (Mudlofir, Ali and Rusydiyah, Evi Fatimatur, 2016: 76): a) Problem-based learning model can stimulate students' abilities and make them enjoy finding and developing new knowledge. b) Problem-based learning model can stimulate students' critical thinking and innovation skills, increase students' motivation to learn, and develop students' ability to deal with new knowledge; (c) problem-based learning models can provide students with opportunities to apply their knowledge in the real world; (d) problem-based learning models can encourage students to learn for life; and (e) problem-based learning models not only make students aware that learning does not depend on the teacher's presence, but also on students' intrinsic motivation.

Based on the above description, it is necessary to conduct a Classroom Action Research

Collaborative using the problem-based learning model for elementary students in mathematics and non-fiction subjects. Therefore, the researcher chose the research title "Enhancing Elementary School Students' Question Story Solving Skills Using Problem Based Learning Approach".

3. Methods

3.1. Participants and context

The subject of this research was 28 fourth grade elementary school students, consisting of 10 males and 18 females. This study is based on the results of observations, interviews, and pre-cycle tests, which show that students' ability to solve mathematical problems is still low. The research was conducted using multiple qualitative Classroom Action Research Collaborative (CARC) method. The CARC model used is that of Kemmis and Mc Taggart, which consists of four phases, namely: planning, action, observation, and reflection (Prihantoro, Agung, 2019:56).

3.2. Material

Data collection instruments used by the researchers in collecting the data are observation and essay test questions. Observation guidelines are used by the observers to observe aspects of solving questions in learning activities according to the *Problem Based Learning* model. Then, essay test questions were used to measure students' ability to solve word problems in the pre-cycle, first cycle, and second cycle.

3.3. Data Collection and analysis

Kemmis McTaggart's (2014) CARC model with the four phases of planning, action, observation, and reflection was used for the research. CARC research consists of two cycles, that are cycle one and cycle two. The data analysis technique used in this research is descriptive qualitative and descriptive quantitative in the form of observation and testing. Observation techniques used to observe aspects of solving questions in learning activities using the problem-based learning model. Essay test technique was used to measure students' question story solving skills. Scoring is based on the sum of the scores obtained by the students. It is then divided by the number of students in the class to determine the class average. The class has completed the study when it has achieved a score of 75%. The calculation of the average is formulated as follows:

$$\bar{X} = \frac{\sum X}{\sum N} \times 100$$

Description :

\bar{X} =average value

$\sum X$ = sum of all mark student

$\sum N$ = number of students

100 = constantly number

Berdasarkan persentase yang diperoleh, maka dapat diinterpretasikan dan diklasifikasikan sesuai dengan tabel sebagai berikut (Purwanto, 2010).

Table 1. Students' Question Story Solving Skills

No.	Presentase	Kategori
1.	86% - 100%	Excellent
2.	76% - 85%	Good
3.	60% - 75%	Sufficient
4.	55% - 59%	Deficient
5.	0% - 54%	Very Deficient

3.4. Limitations to the Study

The Classroom Action Research Collaborative (CARC) on Mathematics on the Perimeter and Area of a Two-Dimensional Figure on Elementary Fourth Graders has several limitations that can be used as a reflection. The limitation of the research conducted was that the number of subjects was limited to 28 students. The next limitation is that the object of the research is limited to mathematical subject topics on the perimeter and area of a two-dimensional figure.

4. Results and Discussion

Classroom Action Research Collaborative (CARC) from the pre-cycle (Pre-Action), cycle I and cycle II showed that elementary students solve the question history skills with problem-based learning approach outlined as follows:

4.1. Pre-cycle

Cycle action planning begins with the implementation of the pre-cycle. Pre-cycle or pre-

action conducted to find out the extent to which students are able to solve perimeter and area of two-dimensional figure question history mathematics. The instrument used was a test instrument with 5 essay questions. Based on the results of the pre-cycle test, it was found that many students in the class IV A were not able to solve the questions correctly.

Table 2. Value data pre-cycle

NO.	NAME (INITIALIZED)	PRE-CYCLE VALUE
1	ARES	60
2	AA	20
3	AFKR	50
4	ANH	20
5	ADS	80
6	ASD	50
7	ADEP	40
8	AJS	70
9	APT	40
10	AAN	50
11	AZM	10
12	BNA	60
13	CCS	30
14	DRA	20
15	DR	30
16	DAR	70
17	DKI	20
18	ER	20
19	FAS	70
20	FHA	30
21	FNA	10
22	FRA	10

NO.	NAME (INITIALIZED)	PRE-CYCLE VALUE
23	GA	50
24	GRDC	80
25	GQL	20
26	GAJ	40
27	JPA	40
28	RRD	30
Number		1120
Average (%)		40

4.2. Cycle I

a. Action Planning Phase

Cycle I planning was prepared according to the syntax of the *Problem Based Learning* model. In this phase, the following actions were taken by the researchers: a) arrange of learning materials according to the model of problem-based learning, b) preparation of learning materials corresponding to the perimeter and area of the square and rectangular two-dimensional figure, i.e., ruler, paper, and objects in the classroom/school in the form of squares and rectangles, c) implementation of assessment for data collection.

b. Implementation of the Actions Phase

Learning Cycle I was implemented using the problem-based learning model. The learning activities consist of: 1) orienting students to the problem; 2) identifying the problem and organizing students for investigation; 3) guiding independent investigation as well as group investigation; 4) developing and presenting results; 5) reflection and assessment. Learning Cycle I is implemented as follows: (1) students observe the school and classroom and look

for square objects. Then, students measure the objects to calculate the area; and (2) students discuss in a group with a tablemate to ask and answer questions about the perimeter of the square. Through the learning activities in Cycle I, students learned to understand the concept of area and perimeter of a square by making independent observations and asking the questions story. Direct observations can provide experiences and enhance students' understanding of the area of a square. Group discussions to develop and answer questions story practice students to understand questions story well.

Table 3. Value data cycle I

NO.	NAME (INITIALIZED)	CYCLE I VALUE
1	ARES	60
2	AA	75
3	AFKR	100
4	ANH	70
5	ADS	100
6	ASD	100
7	ADEP	50
8	AJS	75
9	APT	100
10	AAN	100
11	AZM	25
12	BNA	100
13	CCS	70
14	DRA	20
15	DR	90
16	DAR	70
17	DKI	20
18	ER	100

NO.	NAME (INITIALIZED)	CYCLE I VALUE
19	FAS	25
20	FHA	25
21	FNA	30
22	FRA	20
23	GA	70
24	GRDC	85
25	GQL	25
26	GAJ	50
27	JPA	100
28	RRD	30
Number		1785
Average (%)		63,75

c. Observation Phase

Conduct observations during the learning process using the problem-based learning model.

d. Reflection

Reflection must be carried out to find out the advantages and disadvantages that need to be improved in the implementation of the actions in Cycle I. Based on the reflection conducted, it is known that: a) students participate in the learning activities with greater enthusiasm, b) students develop greater learning readiness to be able to solve the given problems through PBL learning based on problem solving and observation, and c) the results of the evaluation conducted show an improvement in the results of the practice cycle.

4.3. Cycle II

a. Action Planning Phase

Cycle II planning was prepared according to the syntax of the *Problem Based Learning* model. In this phase, the following actions were taken by the researchers: a) arrange of learning materials according to the model of problem-based learning, b) preparation of learning materials corresponding to the perimeter and area of the square and rectangular two-dimensional figure, i.e., ruler, paper, and objects in the classroom/school in the form of squares and rectangles, c) implementation of assessment for data collection.

b. Implementation of Actions Phase

Learning Cycle II was implemented using the problem-based learning model. The learning activities consist of: 1) orienting students to the problem; 2) identifying the problem and organizing students for investigation; 3) guiding independent investigation as well as group investigation; 4) developing and presenting results; 5) reflection and assessment. Learning Cycle II is implemented as follows: (1) students observe the school and classroom and look for rectangular objects. Then, students measure the objects to calculate the area; and (2) students discuss in a group with a tablemate to ask and answer questions about the perimeter of the rectangular. Through the learning activities in Cycle II, students learned to understand the concept of area and perimeter of a rectangular by making independent observations and asking the questions story. Direct observations can provide experiences and enhance students' understanding of the area of a square. Group discussions to develop and answer questions story practice students to understand questions story well.

Table 4. Data Cycle II

NO.	NAME (INITIAL)	CYCLE II VALUE
1	ARES	70
2	AA	100
3	AFKR	100
4	ANH	70
5	ADS	100
6	ASD	100
7	ADEP	90
8	AJS	100
9	APT	100
10	AAN	100
11	AZM	70
12	BNA	100
13	CCS	80
14	DRA	70
15	DR	100
16	DAR	80
17	DKI	60
18	ER	100
19	FAS	90
20	FHA	70
21	FNA	70
22	FRA	60
23	GA	100
24	GRDC	100
25	GQL	60
26	GAJ	90
27	JPA	100

NO.	NAME (INITIAL)	CYCLE II VALUE
28	RRD	30
Number		2360
Average (%)		84,286

c. Observation Phase

Conduct observations during the learning process using the problem-based learning model.

d. Reflection

Reflection must be carried out to find out the advantages and disadvantages that need to be improved in the implementation of the actions in Cycle I. Based on the reflection conducted, it is known that: a) students participate in the learning activities with greater enthusiasm, b) students develop greater learning readiness to be able to solve the given problems through PBL learning based on problem solving and observation, and c) the results of the evaluation conducted show an improvement in the results of the cycle I.

Table 5. research data

No.	Learning Activity	Average (%)	Category
1.	Pre-cycle	40	deficient
2.	Cycle I	63,75	sufficient
3.	Cycle II	84,286	good

Based on the results of Pre-Cycle, Cycle I, and Cycle II, it is known that students' question solving skills have improved using the Problem Based Learning approach. The average percentage in the pre-cycle is 40% in the "deficient" category. After Cycle I was

implemented, the average percentage was 63,75%, with a 23,75% increase in the "sufficient" category. The results of cycle I showed results of less than 75%, so it was necessary to perform another cycle, cycle II. In the cycle II the average percentage was 84.286% in the "good" category.

5. Conclusion

The Collaborative Classroom Action Research conducted with fourth-grade Elementary School suggests that students' question story solving skills can be improved through the *Problem Based Learning* model. This is evidenced by the improvement in scores in Pre-cycle, Cycle I, and Cycle II. By using the *Problem Based Learning* model, students can learn directly through experiences with learning activities that involve problem solving.

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