Analysis of Students' Incorrect Answer on Two-Dimensional Shape Lesson Unit of the Third-Grade of a Primary School

Ulfah[1] and A Jupri[2]

[1]Departement of Primary Education, Postgraduate Student, Universitas Pendidikan Indonesia, Jl Dr. Setiabudi 229, Bandung 40154, Indonesia
[2] Departement of Mathematics Education, Faculty of Mathematics and Science Education, Universitas Pendidikan Indonesia, Jl Dr. Setiabudi 229, Bandung 40154, Indonesia

E-mail: ulfah.pgsd@gmail.com

Abstract. This research aims to analyze a comparison between predictionsmade by researchers and the actual facts occurred in the real classroom situation. This study useda qualitative method, and involved 37 third-grade students from a primary school in Bandung. We analyzed students' responses to questions that are given by the teacher on the topic of two-dimensional shape. The results of this research showed that the learning method used by the teacher influenced students' written responses. It can be another approach for the teacher to be used according to the lesson unitsthat are being presented, therefore the learning processes wouldrun optimally and the learning goals can be achieved. Based on the results, we conclude that: (1) Students' incorrect responsesare not only influenced by the teaching method used by the teachers,but also influenced by otherintricate factors; (2) The teachers need to comprehend that every student has some different ways of thinking in answering the given problems.

1. Introduction

Mathematics is a science which plays an important role in human life and will not be separated from everyday life. Various activities that we do is always associated with mathematics, such as buying and selling activities in the market, the use of money for transportation, payment of bills, etc. In addition, mathematics is also a means for a person to think in order to develop logical, critical and systematic thinking. It helps people to be able to anticipate, plan, decide, and properly solve each problem in daily life [1]. Therefore, mathematics is used as a subject that has to be studied by students ofprimary education [2].The mathematics concepts that should be learned by primary students are including the aspects of numbers, geometries and measurements, and data processing. Square and rectangular perimeters are thelesson units that belong to the aspects of measurements and geometries. These lesson units are studied in the second semester of the third grade. In general, the learning conducted by the teachers use a classical model so the students are directly told the formula of square or rectangular perimeters. Instead, the teachers need to invite students to find the definition of perimeter and the formula of rectangleby themselves. The learning activities that get the students to discover the learning purpose of the lesson unit. As Bruner [3] states in his principle, he assumes that learning to discover what is appropriate to the preferred knowledge actively by one'sown self will give the best results. Besides that, trying independently to resolve problems and the knowledge that is attached with it produces a meaningful knowledge.

When a learning process is meaningful, students will be able to easily remember the definition and the formula they have been applied in learning. To calculate square and rectangularperimeters, the knowledge about the length and the width of a figure and the formula which should be used is definitely required. Moreover, the precision in using the formula and the calculation of thelesson units are also needed. If the students are not precise in using the formula and the calculation, the final results would be incorrect. Therefore, it is also important for the students to be able to comprehend basic addition, subtraction, multiplication and division. The lesson units at mathematics would be all connected.If those basic lesson units could not be comprehended, the students would find difficulties in studying the further lesson units. In overcoming the students' problems, the teachers need to use a certain model, method approach, technique, and learning strategy to improve the students' ability in understanding the lesson units.

Learning model is a system that is used to conduct a learning process by applying a particular procedure. While an approach is a way that is used by teachers in elaborating the learning process to achieve the learning goals. Furthermore, a method is a way to convey the subject's materials to the students that can be applied for every subject. While a technique is a method that requires a specificway for certain subjects. Meanwhile a strategy is a specific way to teach a main substance of a certain material. Despite there are many required procedures, according to Nisbet [4], it is said that there are no (single) most correct learning ways and no best teaching ways. Every person has a different intellectual ability and different characteristic and personality, so they tend to adopt different characteristic approaches for learning. Therefore, in using a learning method, teachers needto adjust to the materials that would be conveyed and to the students' different characteristics.

On learning activities, students are taught how to solve the problem. The teacher always gives examples of how to solve a mathematics problem without giving an opportunity to students to try to discover a way by themselves. It made the students to be likely less creative in solving problems. Therefore, it is necessary to conduct a research on the influence of the learning process which is carried out with the students' ability to solve problems or to answer questions. The study was conducted to predict the models, methods, techniques, learning strategies used by teachers and the predictions of how students solve problems. The difficulties faced by students could be analysed, so we could give solutions to overcome those problems. The results of the analysis could be used to assess teachers' enhancement performances, learning processes and improvement of exercises that are given to the students.

Based on this problems, the formulation of the problem for this research are (1) Is the learning process that teachers use in the classroom similar to the predictions made by researchers?; (2) What are the factors that cause students having difficulty in answering the questions?

2. Experimental Method

To address the research questions, we carried out a qualitative study through administering an individual written test on the topic of geometry. The data was collected through explorative abilities of primary students at two-dimensional shape lesson unit. The participants of the research were 37 third-grade students of a primary school in the city of Bandung. The instruments included a written test consisted of ten questions about the perimeter of rectangle and were taken from the school's textbooks.

The procedure of this qualitative research was the following. Firstly, researchers made predictions towards the learning sessions that would be conducted by the teacher and made predictions about the exercise's answers that would be emerged from students. Secondly, we collected data of the students' answers. Data analysis was done by comparing our predictions with the reality that occur in the classroom, that is the learning performed by the teacher and students' exercises answers. Finally, we made conclusions and recommendations.

3. Results and Discussions

3.1. Learning Process

When the learning was being conducted, teachers began the class by making perceptions about square and rectangularperimeters on the next meetings. Then, the teachers invited students to remember its formula. The teachers wrote the formula of squares and rectangles on the class' board and gave the students the exercise examples. The students answered the given exercise questions. After the students understood, the teachers give exercise questions for about ten questions. The students answered the questions individually. However, there were still many students going to the teachers to ask about the way to solve the math problems. The students were given approximately 30 minutes to answer the questions. When there were students who have finished answered the questions, the teachers allowed them to take a break outside the class. So in the last session of the learning activity, teachers do not dismiss the activity or conclude it.

After the observation has been conducted, the researcher tried to compare the predictions of learning methods with the actual data that is discovered in the classroom. The elaboration about predictions and the actual data are explained in the Table 1 below.

Table 1. Comparison of Predictions of the Usage of Learning Model with the Actual Data

Usage of Learning Model	Prediction(s)	Actual Data
Model	Classical	Classical
Approach	Contextual	Expository
Method	Lectures, Questions and Answers, Exercises	Lectures, Questions and Answers, Exercises
Technique	Expository	Expository
Strategy	Papers, books, rulers	X

According to the observation results that have been conducted, learning model used is the classical models. This is similar to the predictions that have been made previously. The classical model which is used seem to be traditional, for example a teacher explained mathematical concepts with corresponding examples and given exercise (mainly bare mathematics tasks), while students paid attention, took notes and did the exercises. This teaching approach is quite common in Indonesia [5]. However, to be considered in the classical model of a teacher should be a good model in accordance with the theory expressed by Baruda [6]. If a teacher has a good hand writing and speaks with a good manner, explains clearly and systematically, then students will emulate them. Hence, the teacher shouldtake those things into consideration while teaching. When the teacher explained that in answering the questions,the first thing that need to be done is to write the length and width which are known in the matter. After that, the teacher also wrote the formula and how it is calculated. The students imitate the teacher's command, as seen from the students' answers which are almost entirely similar to the examples of the answers written by the teacher.

The learning approach used by teacher is expository approach. This is not the same with the predictions that have been made based on the contextual approach. At the time of learning, the teacher dominated and became an information center for the students.

The learning method used by teacher were lectures, discussion and exercises. This is consistent with the predictions that have been made previously. The teacher dominated teaching and learning activities, definitions and formulas about two-dimensional shape lesson units. The teacher explained to the students what should they do, gave the example problems and told how to solved the problems.

Learning techniques used by teacher is expository. This is similar with the predictions that have been made previously. This technique is chosen because there are a lot of number of students and the time is relatively short, so that the use of expository technique is suitable.
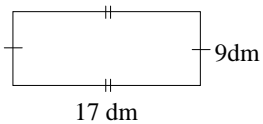
The teachers did not use learning strategies. This is not consistent with the predictions that have been made. The reason is because two-dimensional shape lesson units have been discussed for four

times previously. Therefore, the teachers did not use instructional media. The possibility of using instructional media is done in the beginning of the discussion of the lesson material.

3.2. Student' Answer Analysis at Two-Dimensional Shape Problems
After making predictions about students' answers, the next step is the analysis of student' answers at two-dimensional shape problems. This part will explain about the possible reasons why the students' answer the question, how many students answered correctly and incorrectly, and how the comparison between predictions with actual data. Here is a Table 2 on the analysis of students' answers to questions provided by the teacher. The questions whichare given by the teachers are ten questions. But this article will only discuss one question that is Question 1. Question discussed representative of the matter as a whole.

Table 2. Students' Answer Analysis

Problems	Prediction(s)	Students' actual strategies	n/N
1. *(rectangle: 9dm height, 17 dm width)* Perimeter = . . .	a. $l = 17$ dm $w = 9$ dm $p = 2 \times (l + w)$ $= 2 \times (17 + 9)$ $= 2 \times 26$ $= 52$ dm	- a answer appear - b answer appear - c answer appears - There are four students who answer no prediction - d, e, and f answers not appear	25/37 7/37 1/37 4/37
	b. $l = 17$ $w = 9$ $p = 2 \times (l + w)$ $= 2 \times (17 + 9)$ $= 2 \times 26$ $= 52$		
	c. $p = 2 \times (l + w)$ $= 2 \times (17 + 9)$ $= 2 \times 26$ $= 52$ dm		
	d. $l = 17$ dm $w = 9$ dm $p = 2 + (l + w)$ $= 2 + (17 + 9)$ $= 2 + 26$ $= 28$ dm		
	e. $l = 17$ dm $w = 9$ dm $p = 2 \times (l - w)$ $= 2 \times (17 - 9)$ $= 2 \times 8$ $= 16$ dm		
	f. $l = 17$ dm $w = 9$ dm $p = 2 + (l - w)$ $= 2 + (17 - 9)$ $= 2 + 8$ $= 10$ dm		

Note: n = number of students used a kind of strategies; N = number of all students

Based on observations of the students' answer, overall at this number, many students answered correctly. The answers above are similar with the researchers' predictions. In the actual data, there are 25 students who answered correctly in its process of writing formulas up to the final result. The students also wrote the length and width which are known in the matter, such as l = 17 and w = 9 dm. In addition, the students also wrote a calculation formula appropriately, i.e. p = 2 x (l + w) with the

final result 26 dm (see Figure 1). The students also did not forget to write the length unit in accordance with a matter that is decimetre (dm).
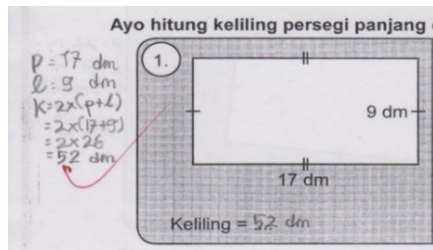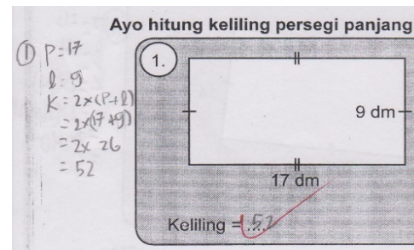

Figure 1. An example of a answer
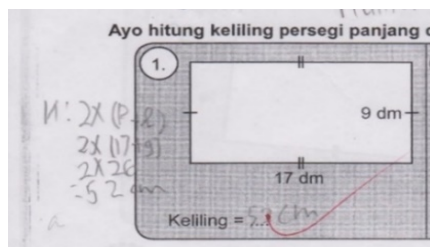

Figure 2. An example of b answer

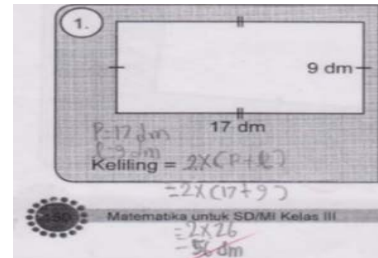**Figure 3.** An example of c answer

Figure 4. An example of student answer that are not in the prediction

Note: p = panjang (length), l = lebar (width), k = keliling (perimeter)

The students' answer that has been predicted to likely appear is b answer. It was found in seven students. Both students wrote an answer without using the length unit, like just wrote l = 17 and w = 9 (see Figure 2). Meanwhile, five other students hadsome errors in the writing of length unit, there was incomplete answer and some students who wrote cm instead of dm. For example there was a student who wrote l = 17 cm and w = 9 cm. The students wrote the formulas and calculations correctly. Meanwhile they wrote the length unit incorrectly.

One student chose c choice, yet he did not write the length and the width. Writing formulas and the final result were correct, but the writing of length unit was incorrect. The student wrote 52 cm, while the correct answer was supposed to be 52 dm (see Figure 3).

There were four students who did not answer as whathas been predicted. One of the students wrote the numbers incorrectly. Meanwhile, three other students made incorrect answers in the calculation (see Figure 4). The students did not do comprehensively in completing multiplication of arithmetic operation task. Difficulties can occur when students do calculation. In this case students calculated with pencil and paper methods.

Based on the result of predictions that have been made, there are three predictions which do not appear such as d, e, and f answers. The student did not answer similar with the prediction probably because the students were already familiar with the perimeterof rectangular formula. That is why no student who wrote the formula incorrectly. Therefore, only three of the six responses that appeared on the students' answers.In general, the students be able toanswer the question, but students look like just understand as 'instrumental understanding'.Skemp [7, 8] describes two kinds of understanding as instrumental understanding and relational understanding. Instrumental understanding is manifested when students know rules and formula and have the ability to use them without reason, not knowing where those rules and formula come from. For example, many students know that the formula to calculate the perimeter of a rectangle is 'two multiplied by length and width', but they do not know

why this is so. He argues that students should develop a relational understanding of perimeter. In other words, students should know both 'what' to do and 'why' when dealing with problems that involve perimeter [7, 8]. This also implies that learners should be able to associate or relate the concepts of perimeter with other mathematical concepts and their everyday life experiences. Teacher must teach wisely, helping students deepen their understanding of rectangular perimeter from simple recognition to analysing and justifying geometric statements and to solving problem involving geometry. Geometry is a topic that is often neglected in primary school, yet it has many benefits for children. Geometry is used to help us represent the space in which we live and to describe the movements and the relationships between objects in space [9].

4. Conclusion
There is no learning method is the best method. All the methods used by the teacher is good because the use of models, approaches, methods, techniques, and strategies cannot be separated from the relation to the lesson unit that will be taught. But it is quite good that the teacher used lesson plans for each lesson, so that the teaching and learning are well planned. In addition, the teachers should useparticular instructional strategies to improve student learning outcomes. The teacher can also use instructional media that are in the surrounding so that learning will be more meaningful for students.

Based on the results of comparative analysis between the predictions and the actual data that is found in the field on students' answers on the topic of two-dimensional shape problems, we found that the result of the conducted research is similar with the predictions that have been made. But there are also answers that are not in the prediction appear on students' worksheets. The unexpected answers mostly arise because students are not conscientious in performing arithmetic operations that led to the error final result. In general, the students already know the formula of rectangular perimeter, an error occurred in miscalculations and the writing oflength unit. But the students who made incorrect answer in writing the length unit are justified by their teacher. However, the teachers should thoroughly correct the students' answers and remind them to always see the length unit in every answer of question. In addition, to improve student learning, the teachers should always analyze the student' answers for questions that have been given. Therefore the future problems in student learning barriers can be overcome.

Based on these results, we consider that (1) The error responses of the students are not only influenced by the teaching methods used by the teachers, but also influenced by other complex factors. So, we recommend further research can assess students' answer errorscaused by other factors; (2) The teachers need to understand that every student has different ways in answering the question, so that the teachers can be more prudent in assessing the students' answers.

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