Analysis of mathematical problem-posing ability

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Abstract. Problem-posing is the ability of students to raise the problem. Problem-posing ability is important, owned by students in mathematics. It is because integrative mathematics learning students need to do scientific activities. The scientific activities comprise observing, questioning, gathering information and communicating. By having problem-posing abilities, expected students to motivate to overcome the problems raised themselves. The purpose of this research analyze problem-posing ability in mathematics in third-grade students at the elementary school levels. The method used qualitative research using descriptive analysis. Here, problem-posing ability in third-grade students in mathematics is still low. It proved this by tests conducted in two elementary schools in Sumedang and got 37.7 and 42.5 scores. Based on the analysis of students' answers, there are some difficulties experienced by students, namely unable to answer what they know, they cannot find the most important problems, they could not overcome the initial problems, and make questions. The indicators in problem-posing interrelated, that is looking for the most important problem by making questions. It is because students will make questions based on the important information which they have already known. With this research, the teacher can easily determine the teaching method by the teacher to improve students' problem-posing abilities.

1. Introduction
Mathematics is a very important subject for students both in learning and everyday life. Mathematics in low-grade elementary schools is packaged in integrative thematic learning. The Ministry of Education and Culture explains that integrative thematic learning uses themes as a unifying learning activity that combines several subjects at once in one learning [1]. Ordinarily integrative thematic learning is very well applied in elementary schools considering that in elementary school age, learning must be implemented holistically.

In this case, implementation of integrative thematic learning, the teacher can make students better understand because it delivers learning in full without obstructing the subject. In terms of time, learning becomes more effective because the teacher can convey several subjects at once through a theme. Besides, integrative thematic learning implemented by teachers in elementary schools can make students more active and directly involved in the learning process. The students find integrative learning is difficult. In thematic learning, students must be able to reconstruct their knowledge. However, this is still difficult to carry out. The fact, in line with the results that in integrative thematic learning, students felt bored in learning and asked [2]. And in the real, it is still not optimal implemented and still felt there are many obstacles.

Equally, this impacts on apply scientific learning in the classroom. And that has an impact on learning
outcomes experienced by applying scientific approaches. The scientific approach is one form of applying the 2013 curriculum [3]. In implementing a scientific approach, students need to take steps in learning to observe, ask questions, gather information, process information, and communicate. To carry out these learning steps, students must have some abilities, namely problem posing. With problem posing ability, students will present problems and solve their problems. It aims to make students more motivated to solve problems than they made themselves, rather than made by the teacher.

Problem-posing is an important ability that students must have to convey problems [4]. Either, by having the ability to think critically and problem-posing, students expected to be more sensitive in solving problems presented both in learning and everyday life. To find out students’ problem-posing ability, it conducted research to analyze the ability to think critically and problem posing in mathematics, science, and art. Logic would suggest that the earlier the teachers gain experience with problem-posing, or with seeing ways in which they can use problem-posing with their students, the more likely they will be to feel that problem-posing is a natural and fundamental aspect of the whole process of teaching and learning mathematics [5].

The teacher is important to know the types of learning barriers in a problem posing indicators. The purpose of this research is to analyze problem posing ability in mathematics in third-grade students at the elementary school levels. In addition, the choice of material in this research is theme 3 concerning of objects around me and subtheme 3, namely the change in the shape of objects. With this research, teachers can choose which indicators need to be developed in accordance with the research objectives to be achieved.

1.1. Problem posing
Problem-posing allows students to learn independently by solving problems that they propose themselves [6]. Indicators of problem-posing are as follows: recognize what is known from the situation, look for the most essential/important problems, add information but do not change the problem, modifying the initial problem or the information provided, and arrange questions [4]. Problem-posing is the act of creating one’s own problems, that the problem-posing needs to be incorporated into mathematics learning, unlike the traditional learning which solving problems generated by others [7].

The application of problem-posing in elementary schools is still difficult to apply, this is because many students are reluctant to ask questions, feel embarrassed, afraid of being teased, do not want to be perceived as not smart, do not know what to ask, and cannot focus on the situation presented [8].

1.2. Mathematics
Mathematic learning activities have a basic problem which is to involve students in real contexts and apply the mathematical content they have learned to their workplaces [9]. The characteristics of learning mathematics in elementary schools are the use of a spiral approach, learning mathematics gradually, learn mathematics using inductive methods, learning mathematics adheres to the truth of consistency, and learning mathematics should be meaningful. As for the implementation of elementary school mathematics learning, teachers often provide formulas at the beginning of learning and this makes students think not freely [10]. The teacher should only present the initial situation of learning and make students modify the problem themselves to solve the problem. It aims to make learn more constructivist.

2. Methods
This study uses qualitative research using descriptive analysis. Furthermore, the population in this study is Sumedang Regency Primary School, West Java, Indonesia. The selection of purposive samples is based on the results of interviews that there are difficulties with students in applying the thematic approach. The research subjects in this study were 2 schools in Sumedang Regency with a total of 24 students and of 20 students. Sampling in this study using a purposive sample. The school selection is done by looking at the national exam scores based on data from the Sumedang Education Department. The first selected school is a school that has a high national examination score while the second school is an ordinary school.
This aims to determine the difficulty posing problem ability in both schools that have high grades or ordinary school. This study aims to describe indicators of critical thinking skills and problem-posing of students in completing mathematics tests and science material that is packaged in integrative thematic learning. Then, the instrument used by using the test on the subject of curriculum Indonesia Tema 3 Subtema 3 was arranged based on indicators of critical thinking skills, problem posing and interviews.

3. Results and discussion
The test results got a score of critical thinking skills, and problem-posing students are still low. This proved by tests conducted in two elementary schools in Sumedang and got by 37.7 and 42.5 score. This shows that in both good and ordinary schools, the ability of problem posing is still low in elementary schools. If detailed based on the average student answers in both schools, the achiever of test results on each indicator is as follows. On the one hand, Cai et al. states that the problem-posing task as “requires the teacher or student to produce new problems and questions based on a particular situation or mathematics expression or diagram” [11].

Table 1. Achievement based on problem-posing indicators.

| Indicator of problem-posing                                      | Achievement |
|------------------------------------------------------------------|-------------|
| Recognize what is known from the situation                       | √           |
| Look for the most essential/important                           | √           |
| Adding information but not changing the problem                  | √           |
| Modifying the initial problem or information provided            | √           |
| Arrange questions                                                | √           |

Of the 5 indicators, there are still many that have not been achieved. It bases the selection of indicators on characteristics suitable for elementary school students. The indicator is also by the scientific approach according to the 2013 curriculum.

Based on the table, the analysis based on the number of questions is as follows. First, students cannot recognize what they know from situations that do not understand the concept of standard units. Then, in the text that has been present, students cannot distinguish which parts in the standard units and objects in the text.

The example answers from students.

![Figure 1. Students answer.](image)

Translation
Question: From that story, which one is included in the standard unit?
Student answers: Chocolate.

3.1. Student answer
In those answers, the student is still mistaken about the standard units examples and writes one object mentioned in the text. Second, students cannot find the most essential problems from the text has read. When in fact the conclusions in the text already exist in the previous questions. But students are cannot choose important information and make conclusions. The third is the lack of students’ ability to
change the initial problem presented by the teacher, students are asked to modify the solution of the situation presented. But it has not directed the answers at the suitability of the alternative. Fourth, students cannot arrange questions according to the information in the text. There are even some students who don’t understand the question sentence.

Based on the average student answers, the most frequent difficulty with critical thinking skills is making conclusions. Whereas the problem-posing is asking questions. This is also consistent with what the teacher said at the interview that students are still difficult to ask questions. Though asking is one step that should not be a miss in scientific learning.

In problem-posing abilities, the things that students must fill in are as follows.

| Write down any interesting information you can find from the text! |
|------------------------------------------------------------------|
| 1. ............................................................................................................. |
| 2. ............................................................................................................. |
| 3. ............................................................................................................. |

| Change the interesting information above into a question form! |
|----------------------------------------------------------------|
| 1. ............................................................................................................. |
| 2. ............................................................................................................. |
| 3. ............................................................................................................. |

Figure 2. Students’ worksheet.

In this worksheet, indicators of problem-posing ability are interrelated. First, students must be able to first look for the most essential problems and the students can change them into question sentences. Based on the results of students’ answers, the most difficulty experienced by students is on the indicators looking for the most essential. Here, students could not choose important and not important problems from the situation presented by the teacher.

Problem-posing is a counterpart of problem solving in mathematics, but mathematics has been developing in a way that puts forward problem solving more than it does problem posing. [12] Problem posing is considered being a fundamental ability in mathematical learning in elementary school [13]. The teacher’s role is very important in helping students improve their problem posing abilities [5]. The teacher can provide scaffolding in the form of methods and learning media in the classroom. The teacher’s ability to teach will make students have many abilities and learning achievements [14].

4. Conclusion
Based on the explanation, we can be concluded it that the students’ problem-posing ability in mathematics is still low. This can be seen from the 5 indicators on the test, it achieved only 1 indicator. It evidenced this by the results of tests conducted at two schools in class III. Mathematical learning is packaged in thematic learning. This is a demand for the implementation of the 2013 curriculum. The most difficult indicator for students to achieve is finding the most important information. The teacher needs to design problem-based learning and get students involved in learning.

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