Logical thinking skills of primary school teachers

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Abstract. Logical thinking is an ability that everyone needs, without exception. Someone who has good logical thinking will be able to finish their problem with the right strategy. As a teacher, this ability is very important, especially if they teach in primary school. The existing phenomenon in mathematics lessons is that they always teach just procedural work, however, a teacher shouldn’t be like that. A teacher that couldn’t explain a mathematics concept can be said they don’t have sufficient logical thinking skills. The aim of this research is to prove whether that phenomenon is right or not. In order to do so, we used descriptive qualitative methods by took some active primary school teachers then provided some simple mathematics questions to see whether they can explain a mathematical concept or they just use a procedural work. The result shows that most of the teachers used procedural work to answer the questions. This means that they do not have sufficient logical thinking skills. So, the phenomenon right exists. Therefore, to reduce this phenomenon, a teacher should understand well the concept that they will teach, especially in mathematics lessons.

1. Introduction
Everyone will often have problems in their life, whether they are big or not. Because we will thrive and become the best of our version if we have problems then we can solve it. In solving problems, we need to make the best strategies. Therefore the best way to develop it is through the learning process, whether at school, home, or social life. However, to achieve that goal we need the best strategies for the education systems.

There are many phenomena in our education systems that still need to be completed. One of the phenomena which still often happens in our education systems is teachers dominant active convey a lesson concept but students still passive. They just listen and write what their teacher conveyed without train their reasoning, so that the memorization concept occurs, the not understanding concept [1], something like this is not desirable at every education institution. The memorization process will be embedded in students and they just get how to solve a question, not understanding that whole concept. This is the reason that can make our students cognitive are different even inclined categorized average and deficient [2].

The result of the memorization process will be influencing students, especially in their learning process. Many students just using a concept to solve certain questions they already knew. If their teacher extends more to the question but still using that concept, they won’t finish it. Moreover, there are still many mistakes when they are understanding a concept, whether it’s teachers’ fault or students’ fault. Therefore, many students are having trouble to understand the next stage concept and they will not have progress yet [3].
Every teacher needs to have a good strategy in learning process, especially primary school teachers. Because the basis of a concept will be taught in primary school and it make students can step into the next stage of a concept. Therefore, the basis of a concept is very important and the teacher should understand it very well to makes it easier for students to understand the whole basic concepts. Memorization phenomenon not only among students, but many teachers also don’t understand whole concepts yet that they will teach. Also, many teachers conveyed a concept only based on what they learn when they’re still in primary school. This is the tradition from generation to generation, so this education is not good yet.

Besides that, bad education systems can happen because many teachers should teach a subject which is not corresponding with their education background. For instance, a teacher that has a social education background should teach mathematics in a class. It is rarely happening in these education systems, so it makes teachers’ initial ability to teach that lesson still not satisfied [4]. So, they have to relearn about a concept that will be taught to their students.

To solve all the problems, we should have a good strategy. One of skill which can support to make good strategies is a logical thinking skill. It is a process that uses reasoning and mathematical logic consistently so we can obtain an expected conclusion [5]. Logical thinking skills is one of the abilities which very important for everyone because they need for every problem in their daily life. Someone who has a good logical thinking skill will solve problems with a good strategy.

Logical thinking skills should be built since childhood so one day they will have a good logical thinking skill to deal with their daily life problems. Primary school students should start developing their logical thinking skills by their teacher. The result of Fadianas’ research said that many junior high school students still in concrete operational for their cognitive development [6]. Even though they should be on formal operational for their cognitive development, however many of them not reach that level.

Cognitive development theory discovered by Jean Piaget. The theory said that there are four cognitive development stages for everyone [7]. The first stage is sensor motoric that should be at 0-2 years old, then at 2-7 years old get into pre-operational stage. The third stage is concrete operational at 7-11 years old, and the last is the formal operational stage at 11 years old until now. So primary school students should have been in the concrete operational stage, and when they graduated from primary school they should have been on the formal operational stage. It can be reached if their teacher can make them get the whole concrete operational stage.

The logical thinking skills of students will good if their teacher can develop it. However, the phenomenon that happens now is there are many teachers that still not have a good logical thinking skill. As we said before, teachers only convey a concept that students just memorize it, not understand it. This thing happened because teachers do not understand the concept too, they also just memorize the concept. Therefore, this research aims to see whether that phenomenon still happens or not.

2. Methods
This research was conducted to 10 primary school active teachers in some schools in Bandung. The main instrument of this research was the researcher, as for additional instrument we used a simple test and interview about the answer of the test. The procedure in this research was (1) preparing some simple research instruments, (2) giving the instruments as a test to primary school teachers, (3) interviewing primary school teacher, and (4) analyzing the result of test and interview.

We wish primary school teacher will answer the test not only using their knowledge about the formula they got when still be a student in primary school. We wish they know about the whole concept of the questions. We also interviewed them to make sure that we can make a better conclusion through the analysis, whether the primary school teacher understands the whole concept of the questions or not. The list of question is as follow:
1. State the formula to calculate the area of a triangle. Can you construct the area of the triangle from an area of a square or a rectangle?

2. What is the value of $\frac{1}{7} + \frac{1}{8}$? Explain how you get the answer.

3. What is the value of $\frac{2}{3} + \frac{1}{3}$? Explain how you get the answer.

3. Result and Discussion

We can see the logical thinking skill of primary school teachers by giving them a test about simple mathematics questions. In this research, we want to see the logical thinking skills of primary school teachers that teach mathematics. Whether they understand the whole concept or they just remember it and use the concept only to answer a question. After we gave them a simple test, we also interviewed them to make sure the reason for their answers. An interview is given to collect more data for deeper analyzing about logical thinking skills of primary school teachers. So, we can make a better conclusion with this data. We present some analysis of the teachers’ answers that most of them have the same answer below.

3.1. analyzing question number 1

First, we try to analyze question number one about the area of a triangle. Based on teachers’ answer, most of them have the same answer (the triangle formula is derived from the rectangular formula, which is multiplication of the length (which forms the base of the triangle) and the width (which forms the height of the triangle)). It shows that teachers not understand a whole concept of triangle area yet. They just change the variable rectangle length to triangle base and rectangle width to triangle height. There is no construction process from area of a rectangle formula.

Then we try to interview the teacher about their answer, but the result from the interview is also not showing that they understand the concept. A few teachers donot understand the whole concept yet, they just remember the formula to solve the question. A few teachers already understand the whole concept of the triangle area where the formula for the triangle area isamultiplication of base and height divided by two. Why is it divided by two, because the triangle comes from a square and a rectangle that cut diagonally. As we can see that they know how to get the area of triangle formula from the area of rectangle or square. They make a good reason for the answer.

To make sure of their answer, we also interviewed them. After we interviewed them, we can conclude that they have understood the whole concept of the question. They understand how to construct an area of triangle formula from the area of rectangle formula. So, we can conclude for question number one that there are still some teachers that not understand the whole concept of the triangle area formula. They still cannot construct that formula from the rectangle area formula.

3.2. analyzing question number 2

Question number 2 is about the division of two fractions. As we can see that some teachers have the same reason why they answer like that. We can see they just using a formula that they remember. They don’t write a logic reason for answering the question (the first term is reversed by the dividing term, then it becomes multiplication operation). The answer not represented that teachers have understood about dividing the fraction concepts. Then we try to interview them about their answers. After we interviewed them, the result is they really don’t understand about dividing the fraction concept. They just know and use a formula that they know when they’re in primary school.

Based on teachers’ answer it is also found that teachers didnot understand yet. The reason is not clear (1. the fractional is not divided by other fractional, and 2. the meaning of ‘Per’ is divided, so if a fractional is divided by other fractional), we can’t understand clearly what they want to say. They still not understand the meaning of fractions that divided by another fraction.
We can conclude that most teachers do not understand yet about dividing the fraction concepts. They don’t know what the meaning of one fraction divided by another fraction is. They just know how to solve the question about that concept without understanding the whole concept.

3.3. analyzing question number 3
Regarding to question number 3, teachers donot write a reason why they can make an answer like that. Then we interviewed them about the reason how they can get the answer. Based on the interview, they understand the whole concept of addition of fraction. They know what the meaning of one fraction added by another fraction.

So, we can conclude that most teachers understand well about the whole concept of the addition of fractions. They know what the meaning by explaining it with paper media how $\frac{3}{2}$ added by $\frac{2}{5}$ is.

4. Conclusion
Based on result and discussion, primary school teachers’ answers represented that not all teachers understand the concept used in the given test. We can say that not all teachers have good logical thinking skills because a few of them not understand the whole concept of the question. They just remember how to solve the question using a formula. So, we can conclude that the phenomenon of teacher that not understand a whole concept still exist. It represented too that they don’t have good logical thinking skills yet.

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