Student's cognitive conflict form problem solving on mathematics

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Abstract. This study aims to describe the cognitive conflicts of male and female students in mathematical problems solving. This research is a qualitative research with a descriptive approach. Data collection methods include tests, interviews, and documentation. The subjects of this study were 1 male and 1 female student selected from 6 samples consisting of 3 male students and 3 female students using purposive sampling technique. Data analysis techniques used are data reduction, data presentation, and conclusion. The results of the study showed that students experienced cognitive conflict when solving the problem of constructing a flat circle. This is indicated by the attitude of doubt and anxiety experienced by students in answering questions. In addition, the occurrence of errors and misconceptions in students when solving problems where students can not distinguish the concept of circumference and broad concepts in the flat circle. Therefore, it is better that in the learning process students not only memorize formulas, but students must understand the concepts in depth. In addition, teachers also need to pay more attention to male students in the learning process because male students experience cognitive conflict more often than female students.

1. Introduction
Students' incomprehension of definitions and concepts shows that meaningful learning cannot yet occur. Because mathematical learning that only uses formulas cannot make students understand about the meaning and application of the formula correctly. Learning theory says that if someone wants to learn something without linking one knowledge to another, then the process and learning outcomes are expressed as rote and meaningless [1].

This is where students' mistakes in learning mathematics, students do not associate the concepts they have learned with the concepts to be learned. By linking the concept, students not only memorize formulas but students understood a concept that is intact in depth. In addition students must be able to explain the interrelationships between concepts so that students will be able to apply the concepts appropriately and accurately in solving problems in everyday life [2].

The concepts learned are not infrequently changed. Conceptual changes over the past decade have become one of the important domains in educational science research. Conceptual changes that occur have become a theoretical framework in various studies. There are two conditions (dissatisfaction and confidence) conceptual change in learning. Conceptual changes that occur in mathematical concepts
are inseparable from cognitive conflict. Cognitive conflict is a situation where students hold two conflicting views. In mathematics learning, cognitive conflict occurs when students experience doubts with a new concept that he receives because it contradicts the old concept that he believed to be true. The process of pre-existing conception / belief and accepting an anomalous situation as something original is the first stage before cognitive conflict [3].

According to Sutopo, psychologically there are four conditions for students when experiencing cognitive conflict, including recognition, anomalies, interests, anxiety, and revaluation [4], [5]. Checking for signs of cognitive conflict is an important thing for a teacher to do. The teacher can use anomalous phenomena to encourage conceptual change so that help the teacher in terms of not allowing students to experience conflict.

The cognitive conflict be analyzed in this study is composed of three indicators, namely, the students experience uncertainty, doubt, and confusion over the given problem, the students have a contradiction (the difference in understanding) to the given problems, and the students feel the conceptual imbalances and feel the irrelevant problems given.

Cognitive conflict that occurs between male and female students experiences differences. Mathematical and visuospatial abilities of male students are better than female students. But the visual abilities of female students are better than male students [6]. Learning difficulties and academic problems are greater for male students than female students. This shows the difference in cognitive conflict experienced by female students with male students [7]. Research on cognitive conflict by comparing male and female students conducted by Noor & Hidayat found that mathematical understanding of female students in the types of classification, compensation, probability and correlation was insufficient while the types of propositions, seriations and logical multiplications of male students men understand enough [8].

The purpose of this study was to determine the gender perspective on cognitive conflict experienced by students in solving mathematical problems. By analyzing cognitive conflict of students, the teacher can reduce cognitive conflict experienced by students in mathematics learning. And the teacher can find out the causes of cognitive conflict of male and female students so that it minimize students' misconceptions in understanding mathematical concepts. In addition, the conflict that occurs can be used as an aid to motivate students to respond to these conditions and direct students to be better [9].

2. Research Method

This type of research uses qualitative research methods with a descriptive approach. The subjects of this study were 6 junior high school students, namely 3 female students and 3 male students selected by purposive sampling technique. The instruments used in this study were test questions, and in-depth interview guidelines. To test the validity of the data using the triangulation method by finding the suitability of the test results data and interview data. The test instrument used was a description question. The interview guidelines used were taken from indicators regarding cognitive conflict. The next step is data analysis. Data analysis in this study was carried out when data began to be collected, and after data was collected. At the interview, the researcher also conducted an analysis of the answers to the subjects interviewed.

3. Results and Discussion

3.1 Male Subject (SL)

When working on question number 1, SL felt confused, anxious and had doubts because SL forgot the formula around the circle, as the expression "I am not sure of the answers that have been written, because I forgot the formula around the circle, but I did not find it difficult the calculation ". In addition, the SL also does not understand in depth about the definition of mobile so that the SL is not sure of the answer as shown in Figure 1 below.
Figure 1. Shows that the SL does not understand the definition of circumference and experiences contradictions or is unable to solve the problems given and experiences misconceptions. SL thinks that the circumference concept is the same as the concept of circle area, so SL subtracts from the circumference of the rectangle (but answered SL writes K tube) with the circumference of the circle, as stated "I do not understand the circumference of the circle, I think the concept of circumference and area is the same."

Based on the above phrase, information is obtained that SL does not understand the definition of perimeter, so that when students calculate the circumference of a circular flat and rectangular building, students calculate the perimeter separately then subtract the part of the building that is not intact.

Based on the results of the tests and in-depth interviews showed that SL experienced cognitive conflict in mathematical problems solving in the material of flat circle building. Symptoms of cognitive conflict are indicated by anxiety, anxiety, hesitation and even students turn right and left in solving problems, besides errors in answering questions and misconceptions in understanding the concept of circumference and the area of flat circle construction. This is in accordance with Moody's opinion, that the emotional reactions that students raise in cognitive conflict situations such as confusion, doubt, uncertainty, anxiety, giddiness and always looking back [7].

When working on question number 2, SL did not felt so confused and doubts. SL feels familiar with the purpose of the question, as the phrase "I understand the purpose of the question and I'm sure I can do it". In fact SL already understood the purpose of the problem, but SL forgot about the formula around the circle as shown in Figure 2 below.

Figure 2 shows that the circumference of the circle used by SL is less precise. In addition, the mistake made by SL is that SL only calculates the circumference of 1/4 circle without adding the length of the two radius of the circle. That's because the SL doesn't understand the concept of the tour itself. In addition, SL has a contradiction with the concept that has been understood, as the phrase "I never thought that the circumference of the circle is only a curved line, so far I have thought that the traveling concept is the same as a broad concept".

3.2 Female Subject (SP)

When working on question number 1, SP experiences confusion and doubt. SP experiences an error in determining the formula used as shown in Figure 6 below.
Figure 3. SP answer for Question No 1

Figure 3. Shows that SP experiences confusion and hesitation in understanding questions. Mistakes experienced by SP are errors in determining the formula used.

In working on question number 2, the SP repeats the misconception and mistakes made in the first question as shown in Figure 4 below.

Figure 4. SP answer for Question No 2

Figure 4 shows that SP experiences ongoing confusion and experiences misconceptions in determining formulas to work on. The formula that was re-chosen is wrong, namely SP uses a broad concept, even though what is needed is a mobile concept.

From the results of the diagnostic test answers given to students, it can be clearly seen the profile of cognitive conflict experienced by students. From the results of the analysis of the results of diagnostic tests and interviews of subjects experiencing cognitive conflict, it was obtained that the profile of cognitive conflict experienced by students, namely: students experience doubts and confusion in working on mathematical problems in flat circle building material, students lack understanding of the circumference so that students told to count around a field formed by a circle and limited by two circle radius, students only calculate the circumference of the circle without adding a length of twice the radius of the circle, besides that, students are also still having difficulty changing the story problems related to the area circle into mathematical sentences.

Based on the description above, it can be seen that SL experiences doubts and anxieties according to the characteristics of mental imbalance, namely realizing the existence of contradictions, feeling curious / interested, and experiencing anxiety [6]. Cognitive conflict experienced by male subjects occurs when students are faced with ideas that conflict or differ from the ideas they have [10].

Whereas for female subjects it can be seen that SP experiences doubts and feels anxious according to the characteristics of mental imbalance which is aware of the existence of contradiction, feeling curious / interested, experiencing anxiety [11]. Cognitive conflict experienced by female subjects occurs when students are faced with ideas that conflict or differ from the ideas they have [10].
However, even though they also experience cognitive conflicts such as SL 1, SP 1 still understands a little from the question in question, namely in question number 3. The difference in these two subjects, when associated with intervention, is that male students are more likely to experience learning difficulties than female students, and male students receive more instruction and assistance when they have difficulty answering questions than female students [12].

4. Conclusion
Based on the results of research that has been carried out, it can be concluded: Male subjects experienced cognitive conflict characterized by doubts and anxieties in the sub-study. Female subjects experience cognitive conflict which is characterized by doubt and feeling anxious according to the characteristics of mental imbalance. However, even though they also experience cognitive conflict like the male subject, the female subject still understands a little about the question in question

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