Analysis of Concept Understanding Student in Class X Inequalities Material

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Abstract. Math is a subject that requires students to think using logic. Not a few students only receive raw mathematic learning without a concept understanding of the intent and purpose of learning. The purpose of writing is this scientific paper to know the description of students' understanding of the concept on inequality material. Indicators of understanding of the concept among other things: the student can understand of problems resolving and explaining verbally; presentation of mathematical models and classifying objects based on mathematical concepts requirements; use of appropriate mathematical procedures and their application in the relationship between concepts and procedures; and the ability to apply and develop concepts by algorithm. This research is a descriptive qualitative analysis of understanding of the concept. The data in this study were collected by tests and interviews. The results showed that the student has poor understanding of the concept of material inequality. Students can be encouraged by internal order to overcome the lack of understanding of mathematical concepts.

1. Introduction
Mathematics is an abstract subject that uses symbols and formulas that enter through the learning context and take the example of its application in everyday life [1]. Mathematics learning encourages students to think logically and systematically. This is mandated by the Indonesian curriculum. One of the reasons for teaching mathematics lessons in schools is to equip students with the ability to think logically, analytically, systematically, critically, and creatively as well as the ability to cooperate. This competence is needed so that students have the ability to obtain, manage, and utilize information to survive in ever-changing, uncertain and competitive situations [2].

Therefore, problem-solving in mathematics, especially in everyday life is one of the important aspects to be studied and mastered by students [3]. Students not only learn theories or mathematical formulas, but they are also trained and accustomed to learning problem solving so that their understanding of a concept becomes more meaningful [4]. In the application of mathematics learning, concept understanding is very important to be used in developing mathematical knowledge. Mathematics learning takes place well when directed to the understanding of mathematical concepts in a systematic and interesting way. This is obtained through the planning of good learning by requiring the ability to regulate the order of learning, selection of certain methods and media in learning activities [5].

Students' incomplete understanding of a mathematical concept will potentially lead them to do errors in solving problems related to the application of the concept [6]. Problems with a misunderstanding of mathematical concepts, of course at various levels of education. Primary and secondary schools even at the tertiary level are levels of education that already have a provision of concept understanding from an early stage of high school [7]. Because the mathematical concepts have actually been taught since the levels of primary, junior and high school education. However, if the understanding of the concept cannot be accepted and absorbed by students, it is not surprising that the level of mathematics understanding is also low.
According to [8], "conceptual understanding as an explicit or implicit understanding of the principles that govern domains and relations between pieces of knowledge in a domain". Based on Johnson and [9] opinion, conceptual understanding is an explicit or implicit understanding of the principles that govern a realm and the relationship between some knowledge in a realm. As according to Geoff [9], "conceptual knowledge is a knowledge that is rich in relationships, where the connections between facts are as important as the facts themselves". This means conceptual knowledge is about relationships where the interrelated relationships of other facts are as important as the facts themselves.

Understanding the concept of prerequisite material is very important because when students master the concept of prerequisite material, they will be able to understand the concept of the next material easily [10]. This is supported by the data revealed by Mullis, "conceptual understanding of Indonesian students is low. TIMSS result, the year 2011 shows that there are only 20% of Indonesian students who had the right answer for a question which demands conceptual understanding ability. These facts indicate that the majority of Indonesian students' conceptual understanding needs to be increased" [11]. This means, understanding the concept of students, according to the results of TIMSS in 2011, shows that only 20% of Indonesian students can answer questions correctly regarding the demands of concept comprehension skills.

The low ability of high school students in understanding and interpreting mathematics is one of the problems that occur in teaching mathematics in schools. This problem arose long enough and was neglected because most teachers in learning activities focused more on completing the subject matter compared to the understanding of the material by their students. The one material that is difficult to understand by students is the Inequality material.

Mathematics learning in secondary education, especially inequality material aims to make students have an understanding of the concept. That is, students can explain the relationship between elements that build the concept of inequality through the process of learning mathematics. In addition, students can determine the set of inequalities. However, that goal has not been achieved because based on the results of the students' average daily test scores on this material at SMAN 1 Pabelan 2018/2019 school year is 62.8 where this figure shows that the minimum completeness criteria (KKM) are set, which is 65 has not been reached.

Research which shows that students have not linked the elements that build the concept of equality so that the students have not yet fully understood the concept of the equation, one of which is the equation of absolute value [12].

Understanding can be interpreted as mastery of something with the mind [13]. A concept is a mathematical object in the form of abstract ideas that can be used to classify objects [14]. The concept according to Nakhleh [15] is as a set of propositions mathematics in various ways and knowing differences are (1) able to classify objects based on whether or not the requirements form the concept; (2) able to apply the relationship between concepts and procedures; (3) able to provide examples and counterexamples of the concepts learned; (6) able to apply the concept algorithmically; and (4) able to develop concepts that have been learned. As in this article, indicators of concept understanding include: 1) being able to understand problems and explain verbally about what has been understood; 2) able to present mathematical models in various ways and classify objects based on whether or not the requirements of mathematical concepts are met; 3) able to use appropriate mathematical procedures and apply them in the relationship between concepts and procedures; and 4) able to apply the concept in an algorithm and be able to develop concepts that have been studied.

Referring to the criteria set out in the understanding of concepts, Compile a criterias to classify concept understanding as shown in table 1 below [16].
Table 1. A Classification of Concepts Understanding degrees

| No | Criteria | Degrees of Understanding | Category |
|----|----------|--------------------------|----------|
| 1  | Do not answer/ empty, answer “I do not know” | no response | Do not understand |
| 2  | Repeat the question, answer but out of context or non-relevant answer | Do not understand | |
| 3  | Answer with non-logical answer | Misconception | Misconception |
| 4  | The answer shows that there is a concept that is mastered but there is a question in the answer that implies misconception | Partially understand with misconception | |
| 5  | The answer shows that some parts of the concept are mastered without conception | Partially understand | Understand |
| 6  | The answer shows that the concept is well understood with good explanation | Understand the concept | |

Conceptual understanding based on the categorization conducted by [16] shown above is a level that is widely used by researchers to determine the level of students' understanding of the concept. The things that can be done to apply the level of understanding of the concept is to do concept analysis to students in the form of a definition of a concept, attributes of concepts, examples non-examples of concepts and relationships between concepts.

This article aims to describe students' conceptual understanding of Inequality material. Understanding of students' concepts is traced from understanding, drawing, and measuring Inequality material. This research is limited to students' understanding in defining the concept of inequality, identifying elements of inequality, and applying it to mathematical procedures, as well as its interrelationships in finding solutions to the concept of inequality.

2. Research method

This research is an explorative study with a qualitative approach and the research subject consisted of 1 class X student of the MIPA high school program at SMA N 1 Pabelan who had studied Inequality material in school. In addition, the subject chosen is also based on consideration of his ability to communicate mathematical ideas both orally and in writing. The main instrument in this study is the researcher himself. Data in this study were collected using interviews. In this study, researchers used the Miles & Huberman model qualitative data analysis techniques, namely data reduction, data presentation and conclusions [17]. One that guarantees the validity of research is determined through triangulation techniques. Triangulation is a data validity checking technique that utilizes something other than the data for checking purposes or as a comparison of the data [18]. Triangulation in this study is the triangulation method. There are 2 questions about concept understanding given to understanding students' understanding of concepts in terms of: (1) knowing students' understanding of the problems presented, and being able to explain verbally about what they have understood, (2) knowing the ability of students to present mathematical models in various ways and able to classify objects based on whether or not the requirements of mathematical concepts are met, (3) Knowing students' understanding in using appropriate mathematical procedures and being able to apply the relationship between concepts and procedures, and (4) knowing the ability of students to apply concepts in an algorithm and able to develop concepts that have been learned. Interviews were conducted after obtaining students' written answers. They were conducted to find out more information about students understanding of concepts, both to confirm written works and to explore the understanding of concepts that had not yet appeared in students' written answers.

3. Result and discussion

The researcher provides 2 questions as a guide to the questions posed by the researcher to the subject / student related to fractional inequalities. The following is an excerpt from the researcher interview (P) with student (S) class X which is related to fractional inequality material.
Q: do you know what a fractional inequality is?
S: mmm what is it, a form of mathematics that has a sign less than "<" or more than ">".
Q: do you have any other information related to fractional inequality?
S: eh, it means a form of mathematics that uses marks less than "<" or more than ">" on fractions.
Q: if I give you a problem, will you be able to solve it?
S: mmm maybe I can, I'll try.

Q: why do you divide into a numerator equal to “=” 0 and a denominator not equal to “≠” 0?
S: because the terms of the fractional inequality are written like that.
Q: why should the numerator be = 0 and if the denominator is not equal to “≠” 0?
S: if the numerator contains a variable that is replaced by 0 it can still be divided which results in 0, while if the denominator produces zero (0) then the value is undefined.
P: then, what is the set of solutions for?
S: we make the first number line, x = 3 and x = 1/4, this uses an open circle because there is no sign with it. Because it is less than being arsized in the middle.
Q: why can you mention it like that?
S: If I'm not mistaken, Sis, it's not less than to the left, uh, but x = 1/4 is also to the left.
P: so the conclusion is?
S: that means my answer is wrong Sis, hehe it should be set completion (HP) = {x | x < 1/4}
Q: what is the solution for the second problem?
S: almost the same as the first problem Sis.
P: then, why does it make less than equal to "≤" zero (0)?
S: same as the terms of the numerator and denominator are sis, if the numerator is 0 and the denominator is ≠ 0, so I move the segment to the left for 2.
P: then?
S: I equate the denominator, uh ... why did I make it two times? I wrongly equate the denominator sis, (seems confused to see the answer).
P: actually which part is wrong?
S: This is the second I have to adjust to the other denominator by 2.
P: so what do you think is a fractional inequality when viewed from the conditions?
S: fractional inequality is a mathematical statement that states the fraction value where the numerator may be zero while the denominator cannot be zero.

They were conducted to find out more information about students' understanding of concepts, both to confirm written works and to explore the understanding of concepts that had not yet appeared in students' written answers. Furthermore, the data is checked on the validity of whether Pabelan 1 Public High School has received learning related to Inequality material to related subject teachers through interviews so that data accuracy can be found. It should also be done by researcher checking the validity of other research sub focuses to match the data acquisition. The steps taken by the researcher are as follows are 1) Comparing observational data with the results of interview data, 2) Comparing the results of interviews with related documentation, and 3) Comparing one's perspective with the opinions and views of others.

Based on excerpts from the interview results, the following can be stated: (1) students can explain the definition of fractional inequality, but there is still a misconception that is using moving segments. (2) students are able to explain the notion of geometric inequality by describing the number line and lining with the sentence itself even though there are still errors, (3) students can describe the definition of algebraic inequality by writing down the conditions, and (4) students experience difficulty in solving fractional inequalities, namely students have not been able to associate the concept of inequality in the form of mathematical operations.

Students have had an incomplete understanding in explaining the concept of inequality. However, there are several things that need to be improved in students' understanding of the solution to inequality, namely, the fractional inequality. Students must be trained and taught in the use of concepts that are correct and in accordance with theories in mathematics. If this is ignored and continued as such, then students will have difficulty in solving different problems with known examples.

Students are able to explain the notion of geometric inequality by describing the number line and lining with the sentence itself. However, this definition is not based on definitions. In geometric explanations, students still do not really understand.

Based on the level of understanding of concepts according to [16], students who were used as research subjects in this article belong to the category of misconceptions. Students in the criteria show answers to concepts that are mastered but there are statements in answers that indicate misconceptions.

The formation of students' conceptual understanding actually comes from the acceptance of mathematics learning in the classroom. Mathematics learning is certainly focused on students so the teacher needs to reinforce and deepen the concept. Therefore, when the teacher increases the variety of questions for students' training. But in reality students misconceptions do not even understand the concept so it is fatal to students, namely students have not fully understood the concept of fractional inequality.

Teachers must play an important role in anticipating students' misconceptions. If the teacher does not participate in shaping the concept of understanding students will lead to errors in solving mathematical problems until carried over to the next level. In addition to the teacher's role, of course,
students themselves can form concepts through learning in school and outside of school, for example in the place of tutoring even students can learn their own concepts from book and internet sources [6].

4. Conclusion and suggestions
Based on the descriptions of the results and discussion above, the subjects in this study had incomplete concept understanding of the material inequality. Determination of procedures and selection of computed operations is less precise in equating the denominator.

Students' concepts understanding in the material of Fractional inequality is low and needs to be responded by holding a learning process that can encourage them to better internalize. Contextual learning and the application of learning that activates students cognitively and the skills that support them can be done to minimize the lack of understanding of concepts in the Inequality material. This research was conducted on a very limited number of subjects, the results might be different if done elsewhere. Therefore, it is recommended for future researchers to conduct similar research in other places and use even different material.

Acknowledgments
Our sincere gratitude goes to the Head of the mathematics education department of Universitas Sebelas Maret and the Principal of Negeri 1 Pabelan junior high school in Semarang regency who gave his permission and support in this study. We also thank the research subjects who have spent the time to communicate their opinions about concept understanding of fractional inequality.

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