The profile of conceptual comprehension of pre-service teacher in the mathematical problem solving with low emotional intelligence

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Abstract. Conceptual comprehension in this research is the ability to use the procedures that are owned by pre-service teachers to solve problems by finding the relation of the concept to another, or can be done by identifying the type of problem and associating it with some troubleshooting procedures, or connect the mathematical symbols with mathematical ideas and incorporate them into a series of logical reasoning, or by using prior knowledge that occurred directly, through its conceptual knowledge. The goal of this research is to describe the profile of conceptual comprehension of pre-service teachers with low emotional intelligence in mathematical problems solving. Through observation and in-depth interview with the research subject the conclusion was that: pre-service teachers with low emotional intelligence pertained to the level of formal understanding in understanding the issues, relatively to the level of intuitive understanding in planning problem solving, to the level of relational understanding in implementing the relational problem solving plan, and pertained to the level of formal understanding in looking back to solve the problem.

1. Introduction
Pre-service of mathematics teachers as managers of mathematics learning, not only they involve students’ emotional intelligence in problem solving, but also master abstract ideas of concepts, operations, principles, and generalization processes in mathematics as the basic capital of understanding of mathematics. Furthermore, understanding is an ability to build cognitive connections. People feel to understand something when they can relate a new experience to the experience gained before.

Research conducted by Buxton in Mc.Cleod stated that students' emotional reaction when solving math problems was panic, where students find it very difficult to control themselves in concentration. Beside that the students also feel fear, anxiety and embarrassment [1]. It shows that when the student's emotional intelligence is low, he will find it difficult to control himself, feel depressed, anxious, and eventually gives up. Therefore, he cannot solve mathematical problems well. Based on the result of the try out on the math pre-service teacher in solving mathematical problems (geometry), the researcher concludes that math teacher candidates have different conceptual of understanding. This is considered as one of the influences of the emotional intelligences.

Since the conceptual comprehension and emotional intelligence are important for teachers to be able to manage the learning process well for the success of students’ learning mathematics, the goal to be achieved in this study is "Describing the Profile of Conceptual Comprehension of Pre-Service Teachers in Mathematical Problems Solving with Low Emotional Intelligence".
2. Theoretical Framework

A concept is a unit of meaning that represents a number of objects which share the same characteristics. The unit of meaning in question is an abstract notion which shows on one particular aspect found in an object [2]. Concepts are closely related to definitions. Definition is a phrase that discusses a concept [3]. Operations are counting, algebra and other mathematical work [3]. Principle is a complex mathematical object. The principle may consist of several facts, some concepts are connected by a relation or operation [3].

Generalization is a statement that links one concept to another in common patterns [4]. There are four levels of understanding related to rules in mathematics. First, the mechanical understanding (mechanical), i.e. the memorization that can be applied directly; second, the inductive understanding of the acceptance of the exploration process beginning with specific cases then extended to complex ones; third, rational understanding (rational) with regard to the acceptance of the proof of rules indicated by others; and fourth, the intuitive understanding of personal belief as an incontrovertible truth [5].

Of understanding is grouped into three categories; (1) **Instrumental understanding** is the ability to apply an appropriate remembered rule to the solution of a problem without knowing why the rule works. (2) **Relational understanding** is the ability to deduce specific rules or procedures from more general mathematical relationships. (3) **Formal understanding** is the ability to connect mathematical symbolism and notation with relevant mathematical ideas and to combine these ideas into chains of logical reasoning [6]. Intuition as the act or process of coming to direct knowledge or certainly with little reasoning or inferring. In other words that intuition is an act or process of acquiring knowledge directly or believed to be true with a conjecture or a little reasoning [7]. Intuition is a cognitive or mental process when understanding of information in the form of capturing, uncovering or exposing ideas or knowledge based on feeling. The cognitive process of understanding information in the form of expressing an abstract idea through the activity of explaining, scribbing, drawing, sketching, manipulating symbols which are done directly in the problem-solving work series as a series of intuitive thinking activities. The understanding of information abstract idea is called intuitive understanding.

| Understanding | Conceptual Knowledge | Conceptual Understanding |
|--------------|----------------------|-------------------------|
| Instrumental | Concept              | Instrumental Concepts   |
|              |                      | Instrumental Operations |
|              |                      | Instrumental Principle  |
|              |                      | Instrumental Generalization |
| Relational   | Operation            | Relational Concepts     |
|              |                      | Relational Operations   |
|              |                      | Relational Principle    |
|              |                      | Relational Generalization |
| Formal       | Principle            | Formal Concepts         |
|              |                      | Formal Operations       |
|              |                      | Formal Principle        |
|              |                      | Formal Generalization   |
| Intuitive    | Generalisasi         | Intuitive Concepts      |
|              |                      | Intuitive Operations    |
|              |                      | Intuitive Principle     |
|              |                      | Intuitive Generalization |

Based on Table 1, the understanding in this study includes the level of instrumental understanding, relational, formal, and intuitive. Conceptual knowledge includes the knowledge of facts, generalizations, and principles. This knowledge is usually not tied to specific types of problems. This type of knowledge is sometimes also called conceptual understanding or knowledge of principle [8]. In general, all the knowledge discussed in mathematics can be grouped into four groups. The four groups are known by the terms of concept, facts, principles, and procedures or skills (operations) [9].
Based on the above definitions, the conceptual knowledge in this research is the knowledge of mathematician candidate to a concept, operation principle and generalization in mathematics and the relation. Thus, the ability of prospective teachers in understanding concepts, operations and relationships in geometry can also be regarded as conceptual comprehension.

Based on the above notions, the researchers formulate that conceptual comprehension is the ability of pre-service teachers in using a rule / procedure owned to solve problems by identifying the type of problem and associate it with a problem-solving procedure, or linking a new concept with a concept that has been previously possessed, or associate mathematical notations / symbols with mathematical ideas and incorporate them into logical reasoning sequences, or by using prior knowledge that occurs directly / automatically, through their conceptual knowledge. By this definition, the researchers construct the following types of conceptual comprehension shown in Table 1.

A problem is a situation or question faced by an individual or group when they have no rules, algorithms/ procedures or laws that can be used immediately to determine the answer. This means a problem is a question that requires non-routine rules/ procedures to determine the answer [10]. There are two types of problems: (1) Problems finding. The goal is to find a clear object, which is asked in the problem. The most important part is what is asked, what data is known, and what the condition is. (2) Problems prove. The purpose of showing a statement is true or false. The most important part is the hypothesis and conclusion of the theorem to be verified [11]. The type of problems in this study is the problems to find.

Problem solving can be interpreted as a process by which the previous obtained data / information is used to solve a new situation that has not yet been determined the solution [12]. The troubleshooting steps consist of (1) understanding the problem, (2) planning the completion, (3) implementing the settlement plan, and (4) checking again [11].

Based on the description above, it can be formulated that the problem solving in this research is the effort done by the students in solving a geometry problem of building the space which the steps consist of understanding problem, planning problem solving, implementing problem solving plan, and checking back the solution that have been obtained.

Emotional Intelligence is The ability to recognize our own feelings and the feelings of others, the ability to motivate themselves and the ability to manage emotions well on oneself and in relationships with others [13]. Gardner's personal intelligence in the basic definition of emotional intelligence, he spawned, extending this capability into five major areas, namely; Recognizing self-emotion, Managing emotions, Motivating oneself, Recognizing the emotions of others (Empathy), Establishing relationships [14].

3. Research Methods
3.1. Subject
The subject of this research is mathematics students at the end of mathematics education program of PGRI University Adi Buana Surabaya. The selection of last semester students with consideration of psychology development of students in terms of emotional intelligence is quite stable and academic ability as a control variable is considered sufficient.

3.2. Instrument
The main instrument in this study is the researchers themselves, while the supporting instruments are audiovisual recording devices, interview guides and test pieces. The main instrument of the researcher himself is because the researcher will plan, implement and collect data.

3.3. Technique
Data collection techniques in this study were (1) Pre-survey, conducted to get the subject of research teachers candidates who were identified to have low emotional intelligence. Pre-surveys were conducted by conducting emotional intelligence tests of prospective teachers in mathematics studies. (2) Observation, conducted to find out the conceptual profiling profile of teachers candidates in solving math problems. (3) Interviews, used to find out the reasons students perform an action.
4. Result and Discussion

Results of solving mathematical problems of pre-service teachers with low emotional intelligence shown in Figure 1.

Figure 1. Results of solving mathematical problems of pre-service teachers with low emotional intelligence

Results of interviews of researchers with pre-service teachers with low emotional intelligence can be formulated as follows:

4.1. Phase of Understanding Problems
The conceptual comprehension of subjects who have low emotional intelligence falls within the level of formal understanding in understanding the problem. This is consistent with the theory of Skemp, that in understanding the problem the subject begins by identifying it, then relates it to previously owned concepts, and links mathematical symbols with mathematical ideas and incorporates them into logical reasoning sequences.

4.2. Phase of Plan for Problem Solving
The conceptual comprehension of subjects who have low emotional intelligence falls into the level of intuitive understanding in making problem-solving plans. This is in accordance with the theories of Skemp and Polya, that in planning problem solving the subject begins by identifying the problem, relating to previously owned concepts, associating mathematical symbols with mathematical ideas and incorporating them into logical reasoning sequences, and using knowledge previously experienced automatically.

4.3. Phase of Implementing Problem Solving Plan
The conceptual comprehension of subjects who have low emotional intelligence falls within the level of relational understanding in implementing problem-solving plans. This is in line with the theory of Skemp, that in carrying out the problem-solving plan the subject begins by identifying the problem and associating it with a problem-solving procedure, then linking it with previous concepts until completion.

4.4. Phase of Looking Back
The conceptual comprehension of subjects who have low emotional intelligence belongs to the level of formal understanding in looking at problem solving. This is in line with the theory of Skemp, that in looking back at the problem solving the subject begins by identifying the problem, then relating it
to previously owned concepts, and connecting mathematical symbols with mathematical ideas and incorporating them into logical reasoning sequences.

5. Conclusion
Through observations and in-depth interviews on the subject, it can be concluded that the pre-service teacher with low emotional intelligence is classified as belonging to the level of formal understanding in understanding the problem. In planning problem solving, the subject is classified as belonging to the level of intuitive understanding. In implementing problem solving plan, the subject is classified as belonging to the level of relational understanding, and in looking back problem solving, the subject is classified as belonging to formal understanding level.

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