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Investigation Of Mathematical Concepts In Order To Increase Tacit Knowledge Of Mathematics Novice Teachers

Edy Bambang Irawan

Mathematics Department , State University of Malang
*ib_ide@yahoo.co.id_*

Abstract

This paper presents an alternative investigation of mathematics concept in order to increase tacit knowledge of mathematics novice teachers. The term mathematics novice teacherS refer to teachers who do not have a good ability to organize mathematical concepts that will be represented in the process of learning in the classroom. The research results showed that not all teachers are able to communicate clearly without wandering, speaking beyond the child's ability, and use patterns that damage the clarity of the presentation. The Leinhardt research results (1989) showed that mathematics novice teachers is weak in analytical skills. Structure learning by novice teachers mutilated with a long transition, often confused, and the system of learning objectives are unclear. Howard T.C. and Aleman G.L. (2008) stated that many teachers failed to build a conducive learning environment for the students

The term *tacit knowledge* is widely used in various disciplines. Specifically , the term is widely used in the organization of knowledge . Basically there are two issues concerning tacit knowledge. Both of these issues are connected to the two following questions : (i) whether the person's tacit knowledge tacit individually-owned or collectively owned ?, (ii) whether tacit knowledge can changing into explicit knowledge ? Many authors seem to agree with the notion of tacit knowledge , but the interpretation is often different. Investigation of tacit knowledge dimention in this paper is associated with the ability of novice teachers in organizing the learning process in the classroom. In this regard , the study of knowledge related tacit second issue , with the following question : how alternative investigation for mathematics novice teachers to increase tacit knowledge in an effort to improve the learning process ? Investigation of mathematical concepts are divided into two terms, ie, identifying concepts and formulating questions.

Keyword: *investigation, mathematical concept, tacit knowledge, novice teachers*

INTRODUCTION

In the process of learning mathematics, mathematics teacher have an important role so that learners can learn mathematics optimally. Based on academic ability, the role of the teacher in the classroom can be classified into five levels, namely: prospective teachers, beginning teachers, novice teachers, expert teachers and professional teachers. In ordinary terms, the prospective teachers often referred to student teacher or practice teachers. Beginning teachers associated with the new teacher in a lot of the challenges of teaching, such as motivating students, accommodating differences among students, and evaluating students' work. Novice teachers associated with the problem of knowledge and experience (discipline problems), which is not good in organizing several professional knowledge than experienced teachers. Expert teachers have a good knowledge in organizing knowledge, such as mastery of the material taught, the application of learning strategies, cultural background and learning characteristics. While the professional teacher is an expert teacher who has the ability to develop academic skills such as conducting research, developing ideas through the management of teachers' activities or seminars. This

article focuses on the importance of investigating mathematical concepts in order to improve the ability of tacit knowlwdge of novice mathematics teachers.

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Howard T.C. and Aleman G.L. (2008, h.157) stated that many views about the ability of teachers failed to build conducive learning environment for students. The research results in the USA and the UK stated that the five teacher's question, there are three questions that are memory (recall), one question is the managerial, and one question is to develop the thought processes of children (Brown & Endmonson, 1984, in Borich, 1992, p. 252). In another study stated that approximately 70-80% of the questions just a question of memory of the facts, and about 20-30% is to develop the thinking process (Haynes, 1935; Corey, 1940; in Borich, 1992, p. 252).

Brown & Borko (1992, in Hino & Shigematsu, 2002, p. 240) have compared the ability of novice teachers and experienced teachers (expert teacher). He said that teachers have experienced a more systematic and more capabilities in terms of content and pedagogical knowledge compared with novice teachers. The Leinhardt research result (1989, p. 173) suggests that novice teachers in mathematics is weak in analytical skills. The structure of a lesson by a novice teacher dismembered with a long transition, is often confusion caused by missent signal and the system of learning objectives are unclear. So it is highly recommended for novice teachers to develop appropriate teaching skills desired objectives, namely: open lesson, flexible, responsive, based on the problem and not convoluted.

MATERIALS AND METHOD

The term tacit knowledge as opposed to formal knowledge or explicit knowledge is a kind of knowledge that is difficult to trenferres to other person, both written and verbal. Interpretation tacit knowledge and explicit knowledge is often controvertion. The debate lies in the nature of his dependency. Some theories say that tacit knowledge and explicit knowledge dependent and can be described in terms of a continuum (Crossan, Lane & White, 1999; Inkpen and Dinur, 1998; Nonaka & Takeuchi, 1995, in Evans & Smith (2000). Another theory says that tacit knowledge and explicit knowledge are distinct and separate (Cook & Brown, 1999; Gourlay, 2000; Spender, 1994, 1996, in Evans & Smith, 2000). This paper is not intended to deepen the sharp debate, however, is more focused on implementation tacit knowledge in improving the quality of learning for novice teachers of mathematics.

Issues concerning the development of thinking in learning mathematics includes understanding of learning concept. Battista MT (2007, p. 863) considers that learning concept giving an opportunity in the development of thinking similar with the development of thinking put forward by van-Hiele. Of course, the idea of learning a concept by Battista MT requires to conduct the study on specific mathematical concepts.

In community education, especially mathematics teachers, the term "mathematical concept" has been commonly used. The Use of the term is often understood without questioning its understanding. However, it would need to be presented in this paper the term concept in the view of some psychologists studying mathematics, which explained differently according to their respective views.

Gagne (in Bell, 1978, p. 108) defines the term concept as an abstract idea that allows one to classify objects or events, and specify whether the object or event is an example or not an example of such an abstract idea. Dienes (in Bell, 1978, p. 124) uses the term refers to the mathematical concept of mathematical structures, a meaning broader than the definition of Gagne. According to Dienes, there are three types of mathematical concepts, namely the pure mathematics concept), the notational concept and concept application. Skemp (1982, p. 22) explains the term preceded the concept with an explanation of the term abstraction .

In his explanation, Skemp distinguish the term abstraction and abstracting. Abstractions defined as an mental activity which raised awareness of the similarities of the experiences we face. Abstraction said to be the last mental change, the result of abstracting allows a person familiar with the experience similarity of the new finding that has been formed previously. In this case, the word abstraction can be viewed as an mental activity and as a final result. According to Skemp, abstraction as the end result is called the concept.

In another section, Vinner, Tall & Dreyfus (in Thompson, 1996, p. 271) define the term concept as mental images generated from the name of the concept. By considering the opinion of Gagne, the mental image from Vinner, Tall & Dreyfus seems to have the same sense of' abstract ideas', while the sense "raised from the name of the concept" seems to have the same meaning to "allow a person can give examples and not examples". In implementation, the term mathematical concepts that many tend to choose the term that described by Dienes, which refers to the mathematical structure.

RESULTS AND DISCUSSION

The results of research and observation in mathematics education suggests that learners need to work with concrete representations of mathematical concepts before a comprehensive understanding. Views of Piaget, Bruner, Dienes, and other psychologists to learn mathematics support the proposition that manipulating concrete objects is an important activity in learning mathematics. The ability of teachers to provide useful concrete objects to assist students in learning activities in class. With the concrete objects facility, students can observe, engage in an activity, using the material, discuss and challenged to make inquiries. In terms of child activities and material selection, teachers have a very important role (Kennedy & Tipps, 1994, p. 211).

The term material is intended to provide concrete objects are concrete objects that can be replaced by other objects with different shapes have the same function as representations of concepts studied. The term model refers to concrete objects to represent mathematical concepts with identical shape. The term diagram can be either concrete images of objects or symbols that allows students to learn concepts in class. It is recognized that teachers of mathematics in secondary scholl is not only required to be able to provide concrete object, but also demanded to be able to

communicate to the students. Communication has an important role in constructing the child's understanding, evaluate, and interpret ideas (Bloomer & Carlson, 1993, h.2). In

an effort to be able to communicate math concepts to students, teachers need to have the ability to make verbal statements related to the concepts studied.

An observation conducted on novice teachers who classroom practice, often found some mistake in compiling the verbal statement. The mistake could be predicted as a result of a lack of understanding of problem-solving diagrams. Embodiment diagram problem solving can be seen in the problem solving diagram expressed by Burger & Murser (2011). Lack of understanding of problem solving in the diagram, can be affected verbal statement prepared disrupt the link between
everyday problem and mathematically problems.   .

1. Identify Concepts

The efforts to improve the ability of tacit knowledge of novice mathematics teachers can be done through practice to develop the ability to identify the concept. The ability to identify concepts that are intended is linked to two things, namely to understand the characteristics of the concept and the ability to give examples and not an example. To arrange the characteristics of the concept means to analyze the properties of the concept. Analysis of that   properties   provide   support   in   pattern recognition. (Kellas, Ferraro & Simpson, 1988; in Bruning et al, p. 26). The process known patterns are important elements in learning mathematics (Burger & Murser, 1991, p. 11; Fendel, 1987, p. 104).

The ability of teachers in identifying the concept will support the smooth process of learning, particularly in helping children understand the concept. In the process of learning, students will understand concepts best when presented in a meaningful concept. That is supports the principle of self-reflexivity from Stilerr. The principle of self-reflexivity from Stiler (1995, in Voight, 1996, p. 479) argued that mathematical learning models need to be built by connecting between the mathematical meaning to the context faced by learners.

Ability to give examples and not examples of an concept is important owned by a teacher to help students so that students understand the depth of the concepts being studied. Habits of teachers in preparing examples and not an example to create mathematical activities in the classroom. Booler (Lester, 2007, p. 411) view that exemplification and not an example of an activity in class can inspire the reform of learning. According Booler, studied mathematics in the classroom actively not just only have procedural knowledge, but will be able to develop conceptual understanding, (Lester, p. 411)

2. Creating Questions

Another alternative to increase the ability of tacit knowledge of novice mathematics teachers can be done through practice to develop the ability to make questions. The ability of teachers to make questions in the teaching activities in class will have an influence on increased student creativity. Questions formulated by teachers can both increase participation in the classroom and make students feel themselves to have an important role in the classroom. Participation is an important aspect in developing a teacher's question. Participation of students in the classroom reinforces the principle of *the relational perspective*. Cobb & Hadge (2002, h.408) connects the participation of children with the term relational perspective. In principle relational perspective, the participation of children not only developed in the classroom, but need

International Seminar on Innovation in Mathematics and Mathematics Education
1st ISIM-MED 2014 Department of Mathematics Education,Yogyakarta State University,Yogyakarta, November 26-30, 2014

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the establishment of the relationship between participation in class and practice outside the classroom, where students act as members of society.

CLOSING

The discourse investigating mathematical concepts presented in this paper is based on the theoretical foundation and partial observations of novice teachers who plan classroom practice. The discourse needs to be followed by considering aspects of the broader, so as to obtain the investigating model concepts that can be used in a practical hand for teachers. The facts indicate that many teachers fail in building a conducive learning environment for students. A form of investigation of mathematical concepts for novice teachers to improve their tacit knowledge in an effort to improve the quality of learning in the classroom can be done by providing a concrete object, identifies the concepts and make questions.

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International Seminar on Innovation in Mathematics and Mathematics Education
1st ISIM-MED 2014 Department of Mathematics Education,Yogyakarta State University,Yogyakarta, November 26-30, 2014

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