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In the recent years, problem-solving become a central topic that discussed by educators or researchers in mathematics education. it's not only as the ability or as a method of teaching. but also, it is a little in reviewing about the components of the support to succeed in problem-solving, such as student's belief and attitude towards mathematics, algebraic thinking skills, resources and teaching materials. In this paper, examines the algebraic thinking skills as a foundation for problem-solving, and learning cycle as a breath of continuous learning. In this paper, learning cycle to be used is a modified type of 5E based on beliefs.

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Abstract

In the recent years, problem-solving become a central topic that discussed by educators or researchers in mathematics education. it's not only as the ability or as a method of teaching. but also, it is a little in reviewing about the components of the support to succeed in problem-solving, such as student's belief and attitude towards mathematics, algebraic thinking skills, resources and teaching materials. In this paper, examines the algebraic thinking skills as a foundation for problem-solving, and learning cycle as a breath of continuous learning. In this paper, learning cycle to be used is a modified type of 5E based on beliefs.

Keywords: Algebraic thinking, Belief and attitudes, Learning Cycle, 5E

Introduction

Patterns and generalizations is an important concept in mathematics, especially algebra and algebraic thinking. An understanding of patterns, functions, how to represent and analyze mathematical situations structure and is an aspect of algebraic thinking. Algebraic thinking is arranged into two main components, the development of tools to think mathematically and study of the basic ideas of algebraic (Kreigler, 2007). Tools to think mathematically defined analytically habits of mind that are structured around three topics: problem-solving skills, representation skills, and quantitative reasoning skills. Fundamental ideas in algebra represent the content domain in which mathematical thinking tools developed. The fundamental idea explored into 3 parts: algebra as generalized arithmetic, algebra as a language, and algebra and functions as a tool for mathematical modeling.

In line with the above description, NCTM (2000) states that there are some fundamental components of algebraic thinking. Fundamental components include: 1) understanding patterns, relationships or relationships, and functions; 2) represent and analyze mathematical situations and structures using mathematical symbols, 3) using mathematical models to represent and understand quantitative linkages; 4) analyze changes in a variety of contexts.

Many mathematicians are agreed, the teaching of mathematics at the Elementary and Secondary Schools would be better to prepare all students in the school curriculum in the face of higher (Steen, 1992; Chambers &

Hankes,1994; Silver 1997, Carpenter, Franke & Levi, 2003). In the meantime, Asquith, Stephens, Grandau, Knuth, & Alibali (2005). That student uses several different aspects of algebraic thinking in particular of generalization and representation. According to the National Mathematics Advisory Panel (2007), students should develop the understanding of concepts, problem-solving abilities, and computational skills associated with the algebra.

Student success in algebra and algebraic thinking will certainly be affected by the practice of learning undertaken by teachers. Meanwhile, according to Pepin, teacher belief about mathematics, learning and teaching mathematics, as well as the influence of belief on the practice of teachers in the classroom, is a relatively new area of studies. A number of studies in mathematics education (eg, Lerman 1983; Gonzalez Thompson, 1984) has suggested that teachers of mathematics and beliefs about teaching and learning are very influential on 'model' of teacher pedagogies characteristics. Ernest (1989) notes that among the major elements that affect the practice of teachers, three of the most influential: (1) teachers' belief systems about mathematics, learning, and teaching, (2) the social context of the teaching situation (constraints, opportunities, etc.). (3) the level of teacher reflection.

Teachers implemented the learning would be more effective when based on a cycle of learning. Learning Cycles rests on the theory of constructivism. "Constructivism is a dynamic and interactive model of how people learn" (Bybee, 1997). One of the constructivist perspectives is to consider the student must be actively involved in their learning and concepts that are not transmitted from teacher to student but constructed by the students.

Students' algebraic thinking skill is essential as a preparation in problem-solving ability, which is currently sedan developed in mathematics education. This paper examines the increasing skills of algebraic thinking, belief, and attitude toward mathematics through a learning cycle based on the belief that the student / prospective student teachers.

Discussion

The results of the study; Dendane, & Math (2009); Schoenfeld (2007); Pimta, Tayraukham & Nuangchalerm (2009) stated there are several factors that affect problem solving ability. These factors, among others, concentration, teacher behavior, attitudes toward mathematics, belief, strategy, basic knowledge of concepts and facts, metacognition, group work. Furthermore, Dendane states that arithmetic skills, algebraic and geometric manipulation, estimation, approximation is needed in mathematical problem solving ability. Similarly in Singapore, mathematical problem solving depends on five aspects, namely concepts, skills, attitude, metakognition, processes (Kaur, 2001).

Aspects or factors that support needs to be developed by teachers that the students had no difficulty in solving problems. In this paper will review three important aspects, namely algebraic thinking skills, beliefs and attitude, and learning cycle. Not only that, teachers in the learning aspects of behavior will also be influential for students, according to Dendane & Math (2009)

teacher behavior directly and indirectly impact on students' problem solving abilities.

Algebraic Thinking Skills

Algebraic thinking is arranged into two main components, the development of tools / media to think mathematically and study of the basic ideas of algebraic (Kriegler, 2008). Herbert & Brown (1997) ; Wagner & Kieran (1989); Dindyal (2003) states there are three components associated with the thought of algebra, namely: 1) the use of symbols and algebraic relations, 2) the use of forms of representation are different, 3) usage patterns and generalizations. Students' algebraic thinking and reasoning are analyzed with respect to their ability to use mathematical symbols and tools to analyze situations with a mathematical problem (1) extracting information, (2) representing information using a variety of forms, and (3) interpret and apply the ideas mathematics into a new situation (Nilklad, 2004). Manly & Ginsburg (2010) states there are three big ideas in algebra, ie, variables, symbolic notation and multiple representations.

Another basic idea is the algebra as a language. According to Usiskin (1995); Kaput, Hegedus & Lesh (2007) that the algebra is the language of symbols to describe and menyelesaiakan real problems, patterns, generalizations, making predictions, making sense of the world, the study of functions, relations, multi-representation, modeling to generalize. As a language course is very comprehensive, one must understand is the concept of variables and variable expressions, and the meaning of a settlement. Including the suitability of using the properties of the number system. So that the teacher also has a strong view that the algebraic thinking involves the use of variables.

The ability to make connections according to a variety of information representsi mathematics give students the quantitative tools of communication. The relationship mathematically can be shown with less variety of forms including visual (such as diagrams, pictures or graphics), numerically (such as tables, lists, calculations), symbolically and verbally. A good mathematical explanation seeringkali termasu in some reresentasi because each contributes to the understanding of the ideas presented. The ability to create, interpretation, and translation according to the various representations provide a powerful media to think mathematically (Kriegler, 2008).

Representation and symbol system is fundamental in mathematics as expressed Kaput (in Panasuk & Beyranevand, 2010) "... representations and symbol systems are fundamental to mathematics as a discipline since mathematics is: inherently representational in its intentions and methods ". Some ideas related to the representation among others, Bruner with three models of representation, enaktif, iconik and symbolic; Pape and Tchoshanov with Cognitive Schema, and Carpenter with representation system, Piere with mathematical language.
Matos & Ponte (2009) stated that there are five phases of algebraic thinking are

interrelated; 1) generalizing and formalizing patterns and constraints, 2) manipulating the formal, 3) examine the structures of abstract, 4) review of functions, relations and joint variations , 5) use different language in a mathematical model and control some of the phenomena.

Beliefs and Attitudes Toward Mathematics

Beswick (2006) defines the belief refers to something by someone considered to be true, which is derived from the experience real or only imagined. Similarly, Schoenfeld (2007) defines belief as understanding and feelings of individuals who shape the way individuals in the conceptualization and engages in mathematical behavior. Pehkonen (1997) explains that the belief is a subjective knowledge of mathematics.

However, Ernest (1989), suggests that knowledge is the result of thinking is the result of cognitive and affective belief, but he also acknowledged that the belief has a significant part but the result of cognitive processes. Grossman, Wilson & Shulman (1989) further argues that knowledge is justified as true through objective evidence or consensus opinion of the information, but it also almost goes for belief. Conversely, belief is often owned or justified for reasons that are marked by a lack of agreement as may be judged or evaluated by them. In contrast to knowledge, belief disputability carries connotations. Characteristics that distinguish knowledge is agreement on procedures to evaluate and assess its validity. Feyeraband and Kuhn (in Lester, 2005) argues that what has been claimed as knowledge at a time can be explained by new theories, and considered as a belief. On the other hand, once a belief is held and accepted as a new theory of knowledge in the explanation of that support.

According to Pepin (1999) belief is a teacher of mathematics, learning and teaching mathematics, and the influence of belief on the practice of teachers in the classroom is a relatively new area of studies. A number of studies in mathematics education (eg, Lerman 1983; Gonzalez Thompson, 1984) had suggested that teachers of mathematics and beliefs about teaching and learning are very influential on 'model' of teacher pedagogies characteristics. Ernest (1988) notes that among the major elements that affect the practice of teachers, three of the most influential: (1) teachers' belief systems about mathematics, learning and teaching, (2) the social context of the teaching situation (constraints, opportunities, etc.), (3) the level of teacher reflection. Research literature about mathematics, teacher belief suggests that the approach to teaching mathematics that teachers do basically depends on their belief systems (especially in their concepts about the nature of mathematics) and their mental models in teaching and learning mathematics.

Therefore, belief is an important aspect for students, either as learners or forward as prospective teachers of mathematics. Beliefs course for students of mathematics-related belief, belief towards learning mathematics. As revealed by Kaiser & Maab (2007) which states, "Professional competencies comprise of effective and value-oriented aspects apart from the cognitive-oriented

dimensions of knowledge via belief measured components. Further said that these aspects are based on belief systems, among others: 1) belief about mathematics as a discipline of science, 2) belief about teaching and learning of mathematics, 3) belief about learning in general, and 4) belief about teacher education and development professionals. As with the Kaiser, Grigutsch, Raatz & Törner (1998) dividing the four categories of the belief that are based on acceptance and felt mathematics. Is basically: 1) aspect formalise, pure mathematics and formal logic are characterized by precise language, with the advanced deductive character; 2) aspects of the schematic, where mathematics is considered as a routine problem solving, a collection of formulas, rules, and procedures; 3) aspects of the application, where mathematics is considered useful in everyday life and emphasizes the application and problem-solving skills; 4) Aspects of process, which considers mathematics as heuristic activity, intensive and creative, where problem-solving can be done by individuals with a variety of ways and practicing math.

Belief is so important in mathematics and mathematics learning. However, the observation and measurement of it are not easy. According to Leder & Forgasz (2002) states that the belief and attitude can not be directly observed and inferred because they overlap each other naturally. Kislenko Breiteig & Grevholm (2005) classify belief as one component of attitude, attitude, or vice versa is a collection of belief. Cooper & McGaugh (1966) record looks very rewarding, where they wrote,"... one has an attitude toward and a belief in or about a stimulus object ... Belief involves the which connotes an attitude or identifies the subject Deeply with the object". According to Allport & Cantril (1935) Attitude is the mental state and readiness derived from experience, who directs and dynamically affect individual responses to all related objects and situations. Rokeach & McLellan (1972), He expressed the attitude is a series of several beliefs focused on a particular object or situation that affects one to respond in certain ways. Wyer (1974), Attitude is the subjective opportunities associated with (a) a member of the stimulus in providing category (b) the relationship between parts of different categories. If a person has a tendency toward a set of objects in the environment (eg self-mathematics, school, teacher, etc.), it is reasonable to expect that such a tendency that it will interact with the perception of objects such that affect the response to each object.

Attitudes according to Dogbey (2010) is a psychological construct associated with the cognitive domain, affective, and behavior of human learning. This attitude involves a condition in which individuals choose the possible actions taken. Yee (2010) defines attitude as an emotional disposition of a positive or negative. Meanwhile, Akinsola & Olowojaiye (2008) stated that the definition of attitude is very dependent on the problem under study, evaluation tools used.

Attitude, in mathematics, can be classified in two components, attitude toward the subject of mathematics and attitudes towards learning mathematics. Attitudes towards mathematics according to APU (in Mcguinness & Nisbet,

1991) has four main components, namely: Enjoyment of Mathematics; Utility of Mathematics; Difficulty of Mathematics; and usefulness of Mathematics in the Future. Meanwhile, Yee (2010) suggest that attitudes toward mathematics can be measured by tests ATMI (Attitude Towards Mathematics Inventory) which includes four factors: Enjoyment, Value, General, Motivation, and self-confidence.

Learning Cycle

Teachers implemented the learning would be more effective when based on a cycle learning. Learning Cycles rests on the theory of constructivism. Constructivism is a dynamic and interactive model of how people learn (Bybee, 1997). There the early 1960s, Robert Karplus and his colleagues propose and use a learning model based on the work of Piaget. This model was eventually called the Cycle of Learning (learning cycle) (Atkin & Karplus, 1962). At first, the learning cycle consists of three stages: exploration, concept introduction, and concept application. Furthermore, Bybee (1997) developed a five-step Engagement, Exploration, Explanation, Elaboration, and Evaluation, hereinafter known with 5E.

Blanton & Kaput (2003) states that "... teachers must find Airways to support algebraic thinking and create a classroom culture values That" students modeling, exploring, arguing, predicting, conjecturing, and testing Their ideas, as well as practicing computational skills .. ". In 2007, the Congress recommends that the MAA in college algebra must stress the experience to use algebra and functions in problem solving and modeling. Burns (2004). writes that teachers in classes of lower routine procedures focus on teaching, rather than conceptual understanding. Students are able to perform tasks but do not understand what they do. Manly & Ginsburg (2010) suggested that ".. That formal algebra instruction for adults emphasizes modeling (analyzing and representing real Situations with mathematical structure), the which is fundamental to applying mathematical concepts to everyday life and workplace Situations."

As McGonagle (2009) states, "Teachers need to teach algebraic thinking to students in elementary and middle school to help prepare Them for the complexities of advanced algebra in high school. Kriegler (2008) stated, 'algebraic thinking' becomes the holder of all the phrases in mathematics teaching and learning experiences that will prepare students for success in algebra and beyond. Many mathematicians are agreed, the teaching of mathematics at the Elementary and Secondary Schools would be better to prepare all students to face charges in school curricula of higher (Steen, 1992; Chambers & Hankes, 1994; Silver, 1997). In the meantime, Asquith, Stephens, Knuth & Alibali (2007) states that students use several different aspects of algebraic thinking in particular of generalization and representation. This difference is possible because of their experiences in learning mathematics, different attitudes toward mathematics.

Conslusion and Suggestions

Problem-solving requires a proprietary mathematical tool to describe what is done when a person not knowing what to do. Students who have a set of strategies for problem-solving (such as guess and check, make a list, work backward, using the model, solve simple problems, and others) may be better to start a problem, solve problems, and interpret them. What is disclosed in accordance

The use of the function, which is part of the algebra, the complete problem solving and reasoning related to the classifier's the function and non-function, representing the function into various shapes, the transformation function from one representation to another representation, the use of functions to real-world problems.

, .. Their problem solving approaches and reasoning while solving the problems related to (1) classifying relations into functions and nonfunctions, (2) representing a function in Several forms, (3) transforming a function from one representation to another, (4) applying a function symbolic understanding to unfamiliar problems and to real-world problems, (5) giving examples of functions given Satisfying some constraints, and (6) identifying a function Satisfying a given constraint ".

Algebra is often inferred as a generalization of arithmetic. It becomes essential that the teaching should provide opportunities for students to make sense to make a general procedure which was formed from the number and quantity, Battista, Van Auken Borrow, Vance (in Krieger, 2007). Furthermore, according to Battista, think about the numerical procedure should begin in elementary school and continued to rise and reflect on the procedure by using algebraic symbols.

Learning cycle with stages Engagement, Exploration, Explanation, Elaboration, and Evaluation will allow the student or prospective student teachers' thinking skills to succeed in algebra. Stages in the learning cycle allow students to interact with colleagues in building the knowledge dynamically and the views of constructivism in the acquisition of knowledge. Learning is student-centered differences also constructed through social interaction.

Teachers' attitudes towards mathematics are often influential on the method used, and how mathematics is presented. Attitudes and behaviors of teachers who indicated a manifestation of belief and belief system which he held. Similarly, students, success in learning mathematics will be influenced by the belief and attitude toward mathematics and mathematics learning. Belief and a positive attitude will have the positive influence on its success in learning some math. Therefore, the fair would if the learning is carried out teachers should see their belief that their students more successful in learning.

In this paper, I suggest that the learning cycle with a grounded belief that students can be used as an alternative learning model for improving math skills of algebraic thinking, belief, and attitude toward mathematics. With this model students will feel enjoy in learning, and its phases allow them to explore,

explanate, elaborate, and evaluate their knowledge with colleagues. Positive attitudes towards mathematics will be embedded within them.

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