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An Overview of Mathematics Teachers' Perspectives on the Implementation of Values in the Teaching and Learning of Mathematics

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Abstract: **Values are certain beliefs as a role of principles in life, especially the attitude and the character of a man. There are three categories of value that can be applied in mathematics education as general education value, mathematical value and mathematics education value. This study aims to review the perspectives and insights (knowledge) of mathematics teachers on the implementation of the three categories of value in the teaching and learning of mathematics. The study design used descriptive qualitative approach through interviews. The study involved four mathematics teachers in primary schools and four mathematics teachers in secondary schools in the area of Selangor as respondents. Interviews were conducted in accordance with the form of structured interviews with three main constructs of the three categories of values in mathematics education and the findings were analyzed using ATLAS.ti software. The findings showed that most teachers agreed with the implementation of value in mathematics teaching and no difference was found in terms of the perspective of middle school teachers and elementary school teachers in the implementation of value in teaching. Nevertheless, the mathematics teacher has not mastered the understanding of three categories in the education of mathematics and its application in the classroom even though teachers were aware of the importance of values in mathematics education. The findings suggest that the stakeholders should further improve the education system, especially in the teaching and learning of mathematics are often evaluated and compared to international levels such as TIMSS and PISA. The results of this study may also improve the quality of mathematics teachers.**

Keywords: **Values, general educational values, mathematical values, mathematics education values, primary and secondary school mathematics teachers, teacher perspectives.**

I. INTRODUCTION

Values are beliefs that play an important role in life especially in developing one's morals and character (Nik Azis, 2014). There are various types of values that can be applied in learning and teaching mathematics in the classroom, such as general educational values, mathematical values and mathematics education values (Bishop, 2008; Dede, 2006; Nik Azis, Sharifah Norul Akmar, Nor Afizah & Naliny, 2011; Seah & Wong, 2012). Recent studies on values in mathematics education emphasize that mathematical knowledge has a wide connection with life and there are many types of values that can be applied through teaching and learning mathematics (Shaharir, 2002). For example, a teacher can apply some other general educational values to students in learning mathematics such as responsibility, fairness, and so on. Shaharir (2002) also discusses one of Malaysian-based mathematical features of the mathematics approach, which takes into account the broad concept of mathematical knowledge that suits the root words of mathema + technique. Mathema means "learning, understanding, explaining, reviewing, solving and managing the nature, social and political environment" (Shaharir, 2002, p. 18).

Due to the nature of teaching and learning in classroom and mathematics textbooks itself which only emphasize on the technique of mathematics and seems to ignore the essence of life, people will hard to connect the purpose of mathematics in real life. Mathematics is also seen as a knowledge that is free from values, culture, ideology, religion, and that it is neutral and objective because it is regarded as mechanical, logical and structuralist (Shaharir, 2002).

Mathematics education nowadays only focuses on the concept and not implementing the values where the implementation of values will lead to improve the students' behavior. All teachers need to be smart in dealing with various problems especially the ones that come from students and mathematics teachers. In addition to teaching, teachers need to be smart in controlling emotions in the classroom in order to create a conducive teaching and learning environment.

Teachers can control students' emotion in several ways and one of them is by applying values (Wan Zah et al., 2005). It can be done during the teaching and learning of mathematics by emphasizing the importance of having personal and social relationships among students. General education values refers to the application of quality or values related to the society norms like ethics and morals that are considered vital in maintaining and developing social relations within the students (Nik Azis, 2014).

According to Mohd Uzi (2012) affective domain is related to attitudes and values. It covers one's behavioral characters such as feelings, interests, attitudes, emotions, and values. Some experts state that one's attitude change can be predicted when one has a high level of cognition. We can see the affective characteristics in students' various behaviours (Mohd Uzi, 2012). Mathematical values are the expanding values in the mathematical knowledge with six mathematical values compiled in three complementary pairs namely, rationalism value versus empirism, control value versus progress and the value of openness versus mystery. While the mathematics education values refers to the norms and mathematical practices which include accuracy in calculations, making conjectures, systematically solving mathematical problems, and checking answers (Nik Azis, 2014).

Many previous studies were conducted with the aim of denying the allegations and the opinion that mathematics teaching is difficult and 'dry' (Bishop & Clarkson, 1998; Dede, 2015; Jeyasingam & Nik Azis, 2014; Lim & Ernest, 1997; Nik Azis, 2014; Syed Ismail & Ahmad Subki, 2013). The word 'dry' refers to the education or teaching that is not related to values and life. Moreover, many people even think that values teaching is always more associated with islamic and moral studies (Jeyasingam & Nik Azis, 2014). However, previous studies has shown that mathematics mathematics is not as dry as it is claimed, since it is full of values. But, the issue ofthe application of values still remains unsolved and teachers especially mathematics teachers still do not understand the values contained in mathematics education and not unaware of the application of values in the classroom. Yet, there is a dearth of research on mathematics teachers' perspectives on the three values mentioned before Although Govindaraj and Nik Azis (2014) conducted a study on on these three values, they only focused on the construction of the instrument on mathematical values on fractions topic for primary school teachers (Nik Azis, 2011). Therefore, this study examined whether mathematics teachers understand the three values and how they applied them in the classroom.

Even though the ministry of education has put a lot of efforts on emphasizing the values that can be applied in teaching and learning through modules and textbooks, previous studies indicate that many teachers still do not fully understand the application of values in mathematics education (e.g., Nik Azis et al., 2011).

This study aims to focus on the extent of mathematics teachers' understanding of application of values in the teaching and learning of mathematics. Besides, mathematics teachers' application of values in teaching mathematics including the general educational values, mathematical values, and mathematics education values in the classroom were explored. In particular, the objectives of this study are toidentify mathematics teachers' knowledge and understanding regarding the values in mathematics education, identify the application of values by the mathematics teachers in teaching and learning, and identify mathematics teachers' awareness on the importance of values in teaching and learning mathematics.

This study is important in increasing mathematics teachers' awareness and in helping policy makers give more weight to the teaching of values in mathematics education.

II. METHODOLOGY

This study examined teachers' perspectives about values in mathematics education by qualitative approach through interviews based on the semi-structure protocol questionnaire. A total of eight teachers were interviewed Background information about participant teachers are presented in Table 1.

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A. Background information about participant teachers:

TABLE: I

Participants	Gender	Professional Qualifications	School Level	Years of Teaching Experience
T1	Male	Diploma of Education KPLI/DPLI	Primary School	5
T2	Female	Diploma of Education KPLI/DPLI	Primary School	10
T3	Female	Diploma of Education KPLI/DPLI	Secondary School	13
T4	Male	Bachelor of Education	Secondary School	5
T5	Female	Bachelor of Education	Secondary School	7
T6	Male	Bachelor of Education	Secondary School	6
T7	Female	Bachelor of Education	Primary School	5
T8	Male	Bachelor of Education	Primary School	5

The participants consist of four primary school teachers and four secondary school teachers that have different professional qualifications. Five teachers have degree in education while the remaining three teachers have diploma of education KPLI/DPLI. Both primary and secondary teachers were chosen to compare their implementation of values in teaching mathematic. There are two male and two female primary mathematics teachers. Similarly, there are two male and two female secondary mathematics teachers Overall, all of the teachers have five or more years of teaching experience. The participants were chosen by purposive sampling. The teachers were all working in Selangor since Selangor is the state where teachers from different races and culture from other states are gathered. All participants were interviewed using the questions that were adapted based on Wan Zah et al. (2005) and Norziah et al. (2014) and a few questions were added such as teachers' understanding of general educational values, mathematical values and mathematics education values. Data gathered have been transcribed verbatim and were analyzed using Atlas.ti software.

III. RESULTS AND DISCUSSION

Teacher's Understanding of Three Categories of Values in Mathematics Education:

The aim of this study was to identify mathematics teachers' understanding and knowledge of the three values in mathematics education. Findings related to the analysis of interview data have been summarized into a table form to compare teachers' answers as shown in Table 2.

B. Teachers' Understanding of Three Categories of Values in Mathematics Education:

TABLE: II

Participants	Teacher's understanding		
	General education values	Mathematical Values	Mathematics Education Values
T1	*Character building*	*Unitary*	*Consistent*
T2	*Not sure*	*Not sure*	*None*
T3	*Able to solve problem*	*Able to apply in everyday life*	*Diligent*
T4	*Helps to achieve the goal of creating students that can think outside the box*	*Making individuals able to solve everyday problems*	*Values related to problem solving using number logic*
T5	*Application of moral values during teaching and learning*	*Values that can be applied during teaching and learning*	*Values that can be applied during teaching and learning*
T6	*Application of moral values that suits the topic*	*Values in mathematical concept*	*Moral values related to mathematics*
T7	*Moral teaching*	*Not sure*	*Not sure*
T8	*Education that can be used in everyday life*	*Values that can be applied in everyday life*	*Values in mathematics education*

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Teachers' understanding of general education values:

When teachers were asked about their understanding of the general educational values, it was seen that only Teacher1 (T1)), T5, T6, and T7 could understand the concept of general education values. On the other hand, T3 assumed that general educational values are "to solve problems". However, problem solving is associated more with the application of mathematics education values. T4 understood the concept of mathematical values as general education values. He stated that "mathematical values help to achieve the goal of creating students that can think outside the box".

Besides, T2 was unsure about general education values. Meanwhile, T8 had a very general perspective about general education values and described them as "an education that can be used in everyday life".

Teachers' understanding of mathematical values:

The analysis of interview data showed that only T4 and T6 had an accurate understanding about the concept of mathematical values. For instance, T4 stated as follows: "mathematical values involve making individuals confident enough to solve problems using mathematical logic".

Teachers' understanding of mathematics education values:

The analysis of interview data showed that only T4 had an accurate understanding about the concept of mathematics education values. He viewed mathematics education values as "values related to problem solving using number logic". Meanwhile, other teachers did not really understand the concept of mathematics education values and only understood it as a whole.

To conclude, the participating teachers have not yet fully grabbed all the three concept of values in mathematics education. When they were asked to state what they know about values in mathematics education, most of them mentioned about moral values and values in education as whole. Generally, they did not know about the three values that can be applied in the teaching and learning of mathematics as specified in this study.

Application of Values in Mathematics Education:

The second aim of this study was to identify the application of values by the teachers during the teaching and learning of mathematics. The results have been summarized in Table 3 to make it easy to compare participants' answers.

C. Application of three category of values in mathematics education

TABLE: III

Participants	Application of values by teacher in teaching and learning		
	General education values	Mathematical Values	Mathematics Education Values
T1	*Creativity, rationality*	*Money*	*Entrepreneurship*
T2	*Diligent and cautious*	*Cautious in calculating*	*Diligent*
T3	*Dare to stand*	*Strive*	*Responsible*
T4	*Thankful to God*	*Analyzing data*	*Logical and independent*
T5	*Cooperate, appreciate time, think creatively*	*Cooperative, think creatively*	*Cooperative*
T6	*Produce individuals with good character*	*Think creatively and critically*	*Hardworking*
T7	*Cooperate, listen to instruction*	*Cooperate, listen to instructions, compromise*	*Not sure*
T8	*Honest, trust, compromise*	*Responsible*	*Trust, honest*

Based on the table above, it can be concluded that the teachers who understood the application values were more likely to apply general educational values. There are teachers who did not understand the concept of mathematical values applied and assumed that the values applied are general values. For example, T1 assumed that rationality is one of the general educational values, but according to Nik Azis (Year), Bishop (Year), and Mohd Uzi (Year) rationality is an element that is contained in the mathematical values. In the context of Malaysian education, it is important to apply religious values in

our society (Nik Azis, 2011; Norziah, Effandi & Zanaton, 2014). T4 applied the value of thankfulness (the basic value of faith and piety). It is actually contained in the general education values by Nik Azis (2014) andNorziah et al. (2014). Based on the explanation of the teachers, it seems that they do not understand the meaning of mathematical values and are only able to list the general educational values in the application. For the implementation of mathematical values, only T4 were capable to meet the context of mathematical values. From data analyzed, T4 responses all the value asked as a value that contained in the three complementary pair of mathematical values by Bishop (2008), Dede (2006), Nik Azis (2014) and Seah & Wong (2012).

Importance of Application of Values in Mathematics Education:

All of the teachers who participated in this study agreed that the application of values in the teaching and learning of L&T mathematics is vital. According to T1, "the application will make students tend to be more positive". Besides, T7 stated that "the application of values is essential for student outcomes in addition to the knowledge that has been taught".

Interviews with the teachers showed that they were all in agreement about the importance of application of values in mathematics education. However, they have not yet understood the three values clearly. Most of them could grab the concept of moral values application but could not fully understand the concept of mathematical values and the application of mathematics education values.

IV. CONCLUSION

The findings of this study indicated that the primary and secondary mathematics teachers could not yet understand the three values clearly. Although there has been an application of the values during teaching and learning in the classroom, they did not know how to differentiate the three values studied. In the study of Nik Azis et al. (2011) the presentation of values in the mathematics textbooks showed that the government's efforts in applying values in mathematics education have long been practiced Teachers should know how to apply in their classrooms the three elements of values contained in the textbooks. It seems that even after the provision of the three values through teaching modules for the potential teachers and their inclusion in textbooks, the teachers still cannot understand the importance of application of values in the teaching and learning of mathematics. Some previous studies also found that teachers were not aware of the application of values that they did in classroom and they did not understand the the three values of mathematics education described in this study (Nyimas Aisyah, Mohd Uzi & Noor Shah, 2013; Sivagami, Mohd Uzi, Noor Shah & Qismullah , 2014). Furthermore, the teachers did not realize that applying values in the classroom has been done even implicitly and not explicitly. The policy makers should make sure that teachers are fully prepared on implementing values in teaching and learning especially in mathematics classroom. They also need to provide the most suitable approaches that emphasize the three values of mathematics education explicitly in the modules for potential teachers.

However, the findings is not generalizable to all mathematics teachers, since the participants of the study do not represent the entire population. Therefore, it is recommended that further studies should be conducted to explore mathematics teachers' understanding of values in mathematics education by using quantitative approaches It is important to raise children that are knowledgeable and in good manner and behavior. This study suggests policy makers and other stakeholders to increase the quality of mathematics education and through developing mathematics teachers with a solid understanding of three values in mathematics education.

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