

Exploring Beliefs of Pre-Service Mathematics Teachers: A Malaysian Perspective

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Abstract

The purpose of this study was to determine the beliefs of pre-service mathematics teachers. This study involved 83 respondents from the pre-service teachers from a public higher education institution (IPTA) in Malaysia. The instruments used in this study consist 42 items of mathematics beliefs. There are three dimensions in these instruments, namely beliefs about mathematics as nature, beliefs about learning mathematics and beliefs about the teaching of mathematics. The findings showed that pre-service teacher's beliefs mathematics can be used in everyday life. For the beliefs about learning mathematics, the respondents agreed that students should be able to give reasons to support each solve mathematical problems. Finally, about the beliefs on mathematics teaching, the respondents agreed that the teaching of mathematics to students should be encouraged by explaining the mathematical ideas.

Keywords: Mathematical beliefs, Pre-service teachers

1. Introduction

In the 21st century, the challenge of globalisation demands that the people of Malaysia to become more knowledgeable, skilled, disciplined and emphasise quality. To realise these challenges, the key individuals who should bear the responsibility are the teachers. This is because the teacher is a person who is in the best front line in an effort to educate current and future generations to realise the challenge. So it can be said of responsibility and demands of the teachers are called far greater.

Therefore, the responsibility to be as a teacher today is far more challenging compared to teachers in the previous decade. This is a result of globalisation, liberalisation and development of ICT that requires all people who feel that the teacher is responsible for the greater efforts needed to produce students who have self-esteem, moral character and can compete regardless of national or international stage. In fact, this task could be realised with the availability of quality teachers through effective teaching, providing exemplary leadership and personality that can be a good example to all children. Therefore, this task can be undertaken with care if every prospective teacher has quality academic ability and personality so that the future generation will be excellence, and glorious in education.

2. Mathematics Beliefs

Research on teachers' beliefs and goals are common among many researchers in educational research as well as research on teachers' practices. But in recent years, a trend of research on the relationship between teachers' beliefs in practice has been regarded as an important issue in mathematics education (Vacc et al., 1999; Borko et al., 1992; Raymond, 1997; Francis, 1992; Simon et al., 2000). Knowledge and beliefs held by a teacher influenced their practices and behaviour in the classroom (Simon, et al. 2000; Vacc et al., 1999; Calderhead, 1996; Richardson et al., 1991).

There are many studies shows that teachers' beliefs influence student beliefs (Lester & Garofalo, 1987; Chapman, 2001). It is generally accepted, and widely known about what the teacher was (teacher knowledge) will influence

what will be taught by the teacher to student, and will eventually also affect students (Dougherty, 1990; Ball & McDiarmid, 1990; Fennema & Franke, 1992). In addition, pre-service teachers' beliefs about mathematics teaching and pedagogical content knowledge can influence the decisions or the selection method of teaching (Pajares, 1992; Prawat, 1992; Thompson, 1992). New teachers as they taught mostly in teaching (Lortie, 1975; Noyes, 2004). Thus, it is important to investigate the beliefs of mathematics among pre-service teachers as there are studies that showed that teachers' beliefs is one of the factors that are to guide the selection of an action learning process (Thompson, 1992). The study also found that teachers' beliefs were used in determining how teachers will teach either he realised it or not (Lester & Garofalo, 1987). For example, if a teacher believes that mathematics is learned through memorisation and teaching is spacious with lots of rules so the teacher will also emphasise memorization more than a conceptual understanding of mathematics itself. In addition, there are also teachers believe the goal of solving a mathematical problem that just to get the correct answer (Ball & Feiman-Nemser, 1988).

Understanding the beliefs of pre-service teachers is very important in mathematics education to help them develop and implement an effective teacher education programmes (Barlow & Reddish, 2006). This is because beliefs of mathematics as a mathematics as nature, mathematics teaching and learning can affect their teaching in school (Beswick, 2005). This will also influence their attitudes (McLeod, 1992). Teachers who take mathematics education carry with them a variety of experiences based on their beliefs. Individually they interpret their own experience and it brought to the mathematics classroom with prejudice and bias that exists. The findings showed that trust in the service of teachers play a vital role in securing and interpretation of knowledge and experience. It is also responsible for a less effective teaching practice (Thompson, 1992).

Mathematical beliefs can influence their beliefs and their conception. Negative beliefs teachers pre-service students will affect their future, and this cycle will be prolonged. Studies show that prospective teachers do not like math, believe they will fail, and also believe that mathematics can only be understood by some students only (Evan, 2003). The study also found that perception of pre-service teachers that mathematics consists of facts, procedures and regulations to be memorised (Thompson, 1992). This understanding, is not prevented from the outset to be carried to the classes that they teach mathematics. This will encourage teachers to teach only to the understanding of the procedure only and not on conceptual understanding. Understanding the beliefs of student teachers are very important for mathematics educators to help them design and implement an effective teacher education programmes (Barlow & Reddish, 2006).

Teachers' beliefs about mathematics have an enormous impact on teaching practices (Hart, 2002; Buchman, 1987; Hall, 2005; Beswick, 2006; Golafshani, 2002, 2005; Charalambos, Philippou & Kyriakides, 2002; Ernest, 1988, 1989, 2000; Putnam, Prawat & Remillard, 1992 ; Perrin-Glorian, Deblois & Robert, 2008). The study by Samuelsson (2008) found that nearly 80% of respondents in the study of pre-service teachers who were interviewed had negative feelings toward mathematics. Studies show that prospective teachers do not like math, believe they will fail, and also believe that mathematics can only be understood by some students (Evan, 2003). The study also found that pre-service teachers have the perception that mathematics consists of facts, procedures and regulations that need to be memorised (Dossy, 1992; Thompson, 1992). This understanding, if not prevented from the outset to be carried to the classes they teach mathematics will have a negative effect on students performance. This will encourage teachers to teach only to the understanding of the procedure only and not on conceptual understanding. Therefore, the pre-service teachers' beliefs are an important element to be studied in each teacher education programme (Llinares, 2002). Thus, there is a need to assess whether the beliefs held pre-service teachers of mathematics, mathematics teaching and learning.

3. Research Objectives

The objective of this study was to determine the beliefs of pre-service mathematics teachers. Based on the objective, the following research questions are drawn for this study:

1. What are the beliefs about mathematics as nature held by pre-service teachers?
2. What are the beliefs about learning mathematics held by pre-service teachers?
3. What are the beliefs about mathematics teaching held by pre service teachers?

4. Methodology

The research design is a survey study. This study used a questionnaire on beliefs in mathematics. Mathematics Beliefs Questionnaire (MBQ) which was adapted from Hart (2002) has 42 items with three dimensions that include beliefs about mathematics as nature, beliefs about learning mathematics and beliefs about mathematics teaching. This questionnaire divided into three sub construct of beliefs about mathematics as nature (10 items),

beliefs about learning mathematics (13 items) and beliefs about teaching mathematics (19 items). The Cronbach alpha's value for MBQ was 0.76. The reliability value for all items was 0.87 which can be considered good (Hair et al., 1988). Each respondent should answer all the items submitted and the time allocated to complete this questionnaire is 30 minutes.

They were 83 pre-service teachers who participated in this study. There are from a public institution of higher learning (IPTA) in Malaysia. The respondents are a third year pre service teachers of mathematics education who are taking mathematics as a major.

5. Results and Discussion

5.1 Profile of Respondents

The study involved 83 pre-service teachers from one institution. They are majoring in mathematics and they are in their sixth semester. Overall, the profiles of the respondents are shown in Table 1.

The respondents mainly comprised of women, (75.9%) were female and the remaining 20 (24.1) were the male. There were 66 Malay respondents (79.5%). This was followed by the 13 Chinese (15.7%) and 3 natives from Sabah / Sarawak (3.6%). There was 1 Indian respondent (1.2%). Linear Algebra for the subject was used, the number of respondents who received the excellence were 34 (41.0%) of the total. Respondents with good were 24 (28.9%), moderate 21 (25.2%) and weak 4 (4.8%). To subject the beginning of calculus, the largest number of respondents for both were 39 men (47.0%). The medium has excellence and the same respondents 20 (24.1%) and weak 4 (4.8%).

5.2 Beliefs about mathematics as a nature held by pre-service teacher

According to Table 2, the item "Mathematics is essentially an abstract subject," the highest percentage is on a scale of "Agree" that a total of 55.4%. For the item "Mathematical reasoning involved in solving problems", the highest percentage is also on the scale of "Agree" with this item is of 69.9%. For the third item of "Mathematics can be used in everyday life", the percentage is the highest and second highest on the scale of "Strongly Agree", and "Agree". Percent of the scale "Strongly Agree" with this item is of 77.1%.

There are 10 items used to measure beliefs about mathematics among pre-service teachers. Of these items, item number 6 of "mathematics can be used in everyday life" shows how often "Strongly Agree" the highest compared to other items of a total of 77.1%. This shows that pre-service teachers alike believe that mathematics can be used in our daily lives. The result is consistent with the findings of Lazim and Abu Osman (2009). It is also among the most important element of knowledge required in each individual to be applied in everyday life.

5.3 Beliefs about learning mathematics held by pre-service teachers

According to Table 3, the item "In mathematics, students need to understand all the concepts, principles and strategies of solving in mathematics, the percentage is the highest and second highest on the scale of "Agree" and "Strongly Agree". The percentage of scale "Agree" with this item is of 60.2%. For the item "In mathematics, students should be trained in the procedures before the calculation is given in the form of mathematical problem solving", the highest percentage is on a scale of "Agree". The percentage of scale "Agree" with this item is of 61.4%. For the third item of "In learning mathematics, students should be able to give reasons to support each solve mathematical problems, the highest percentage is on a scale of "Agree". The percentage of scale "Agree" with this item is of 78.3%. For the item "In mathematics, students need frequent practice", the highest percentage is on a scale of "Strongly Agree" that is 57.8%.

There are 13 items to measure beliefs about mathematics learning among pre-service teachers, item number 31 of "In learning mathematics, students should be able to give reasons to support each solve mathematical problems" shows the frequency of "Agree" the highest compared to other items of a 78.3%. This shows that pre-service teachers alike agree that the learning of mathematics, they believe students should be able to give reasons to support each solve mathematical problems. Give reasons to support every mathematical problem is one of the most important element of knowledge required in each individual that called for teachers to be applied in teaching and learning of mathematics. The result is an advantage to students in the pre-service teachers had beliefs and the realization that the understanding of mathematical concepts is very important to apply to the disciples.

5.4 Beliefs about mathematics teaching held by pre-service teachers

According to Table 4, the item "Teaching mathematics should involve the investigation and findings by the students themselves", the highest percentage is on a scale of "Agree". The percentage of scale "Agree" with this item is of 59.0%. For the item "Mathematics should be taught as a set of concepts, skills, and the calculations,

the highest percentage is on a scale of "agree". The percentage of scale "Agree" with this item is of 66.3%. For the third item is "In the teaching of mathematics, students should be encouraged to explain their mathematical ideas", the highest percentage is on a scale of "Agree". The percentage of scale "Agree" with this item is of 69.9%. For the item "Teachers should guide students who have difficulties in solving mathematical word problems", the highest percentage is on a scale of "Strongly Agree" that is 50.6%.

There are 19 items to measure beliefs about the teaching of mathematics in pre-service teachers, item number 10 that "the teaching of mathematics, students should be encouraged to explain their mathematical ideas" showed that the frequency of "Agree" was the highest compared with other items of a total of 69.9%. This shows that pre-service teachers alike believe that the teaching of mathematics, students should be encouraged to explain their mathematical ideas.

6. Conclusion

This study aimed to investigate the beliefs of mathematics among pre-service teachers of mathematics in Malaysia. Mathematical beliefs held by pre-service teachers were an important aspect that needs to be studied. Therefore, a detailed study, the views from various parties and also the effect of short-term and long term that might occur should be noted accordingly. The effect here means that either positive or negative effects that may arise as a result of the beliefs held by the pre-service teachers. We do not want future generations to hold on to produce some of the beliefs that may lead to a more progressive party and one of the more declining.

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Table 1. Profile of Respondents

Profile		Frequency (f)	Percentage
Gender	Male	20	24.1
	Female	63	75.9
Race	Malay	66	79.5
	Chinese	13	15.7
	Indian	1	1.2
	Natives of Sabah/Sarawak	3	3.6
Linear Algebra	Excellent	34	41.0
	Good	24	28.9
	Moderate	21	25.2

	Weak	4	4.8
Beginning Calculus	Excellent	20	24.1
	Good	39	47.0
	Moderate	20	24.1
	Weak	4	4.8

Table 2. Beliefs about Mathematics

Item	SD		D		MD		A		SA	
	f	%	f	%	f	%	f	%	f	%
Mathematics is primarily an abstract subject	4	4.8	8	9.6	14	16.9	46	55.4	11	13.3
Mathematics is about reasoning in solving problem	0	0.0	1	1.2	4	4.8	58	69.9	20	24.1
Mathematics is applicable	0	0.0	0	0.0	1	1.2	18	21.7	64	77.1

Table 3. Beliefs about Mathematics Learning

Item	SD		D		MD		A		SA	
	f	%	f	%	f	%	f	%	f	%
In learning mathematics, student should understand mathematical concepts, principles, and strategies	0	0.0	0	0.0	3	3.6	50	60.2	30	36.1
Time should be spent practicing computational procedures before student spend much time solving problem	0	0.0	3	3.6	12	14.5	51	61.4	17	20.5
In learning mathematics, student should be able to provide reasons to support their solutions	1	1.2	2	2.4	6	7.2	65	78.3	9	10.8

Table 4. Beliefs about Mathematics Teaching

Item	SD		D		MD		A		SA	
	f	%	f	%	f	%	f	%	f	%
Mathematics instruction should involve the investigation and findings by the students themselves	0	0.0	6	7.2	18	21.7	49	59.0	10	12.0
Mathematics SHOULD be taught as a COLLECTION of concepts, skills and algorithms	0	0.0	1	1.2	14	16.9	55	66.3	13	15.7
In mathematics lesson, students should be encourage to explain their math ideas	0	0.0	3	3.6	7	8.4	58	69.9	15	18.1