INTERRELATIONSHIPS BETWEEN STUDENTS’ ATTITUDES TOWARD MATHEMATICS, BELIEFS ABOUT MATHEMATICS LEARNING, CONFIDENCE IN SOLVING MATHEMATICAL PROBLEMS AND MATHEMATICS PERFORMANCE

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This project is submitted in partial fulfilment of the requirements for a Bachelor of Education with Honours (Mathematics)

Faculty of Cognitive Sciences and Human Development
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ABSTRACT

INTERRELATIONSHIPS BETWEEN STUDENTS’ ATTITUDES TOWARD MATHEMATICS, BELIEFS ABOUT MATHEMATICS LEARNING, CONFIDENCE IN SOLVING MATHEMATICAL PROBLEMS AND MATHEMATICS PERFORMANCE

Chua Yi Jüan

This research examined students’ attitudes toward mathematics, beliefs about mathematics learning, confidence in solving mathematical problems, and mathematics performance. The interrelationships between the variables and the differences in the variables based on gender, race, PMR mathematics grades, attendance at tuition, and assistance from parents in completing mathematics homework were also investigated. One hundred and sixty Form Four students who enrolled in the 2008/2009 academic session from four schools in Kuching were selected as the sample for this study. The Attitudes toward Mathematics Scale and Beliefs about Mathematics Learning Scale were used as the measure of attitudes toward mathematics and beliefs about mathematics learning. The Mathematics Performance Test and Confidence Rating Scale were used to measure students’ mathematics performance and their confidence in solving mathematical problems. Descriptive statistics was used to examine students’ attitudes toward mathematics, beliefs about mathematics learning, confidence in solving mathematical problems, and mathematics performance. Pearson-product moment correlations were used to measure the interrelationships between attitudes toward mathematics, beliefs about mathematics learning, confidence in solving mathematical problems, and mathematics performance while independent t-test and One-Way ANOVA were used to determine the differences in those variables based on gender, race, PMR mathematics grades, attendance at tuition, and assistance from parents in completing mathematics homework. The results indicated that students’ performances in mathematics were average, had positive attitudes toward mathematics, positive beliefs about mathematics learning, and high confidence in solving mathematical problems. The results also showed positive relationship between confidence in solving mathematical problems and mathematics performance. The affective aspects including attitudes toward mathematics, beliefs about mathematics learning, and confidence in solving mathematical problems were interrelated. In relation to the differences in those variables, significant differences were found in confidence in solving mathematical problems and mathematics performance based on race and PMR mathematics grades and not in attitudes toward mathematics and beliefs about mathematics learning. However, no significant differences were found in attitudes toward mathematics, beliefs about mathematics learning, confidence in solving mathematical problems, and mathematics performance based on gender, attendance at tuition, and assistance from parents in completing mathematics homework.
ABSTRAK

PERHUBUNGAN DI ANTARA SIKAP TERHADAP MATEMATIK, KEPERCAYAAN TERHADAP PEMBELAJARAN MATEMATIK, KEYAKINAN DALAM MENYELESAIKAN MASALAH MATEMATIK, DAN PENCAPAIAN MATEMATIK PELAJAR

Chua Yi Jiuan

berdasarkan bangsa dan keputusan matematik PMR dan tidak wujud dalam sikap terhadap matematik dan kepercayaan terhadap pembelajaran matematik. Walau bagaimanapun, perbezaan yang signifikan tidak wujud dalam sikap terhadap matematik, kepercayaan terhadap pembelajaran matematik, keyakinan dalam menyelesaikan masalah matematik, dan pencapaian matematik pelajar berdasarkan jantina, bangsa, keputusan matematik PMR, tuisyen, dan penglibatan ibu bapa dalam membuat kerja rumah matematik.
CHAPTER ONE
INTRODUCTION

1.0 Introduction

The present study examined students’ attitudes toward mathematics, beliefs about mathematics learning, confidence in solving mathematical problems, and mathematics performance. Specifically, the interrelationships between the variables were investigated and the differences in the variables were explored based on gender, race, PMR mathematics grades, attendance at tuition, and assistance from parents in completing mathematics homework. This chapter discusses the background of the study, statement of the problem, research objectives, research questions, research hypotheses and research framework of the study. The chapter also presents the significance of the study, limitation of the study and definition of important terms used in the study.
1.1 Background of the study

Mathematics has always been emphasized in the national development plans of Malaysia as one of the steps to achieve Malaysia’s vision to be a fully developed country by the year 2020 (Noraini Idris, 2006). A firm mathematics education is important in helping students to develop scientific and mathematical proficiency and it is necessary for students to keep abreast with the rapid advances in science and technology (Lim & Hwa, 2007). Moreover, good mathematics knowledge was claimed as one of the requirements for future employment (Lim & Hwa, 2007).

In Malaysia, the mathematics curriculum aimed to develop students with mathematical knowledge and skills such as problem solving and decision making skills for everyday use (Ministry of Education, 2006). The secondary level mathematics curriculum emphasized on problem solving, decision making, communication, extension of mathematical abstraction, and positive attitudes toward mathematics (Ministry of Education, 2006). According to Lim and Hwa (2007), communication skills and logical reasoning which focused on the ability to explain the logical thinking and the results of mathematical activities are essential to stimulate mathematics learning.

Previous researchers had placed considerable concern on mathematics achievement in their studies relating to mathematics learning (Ma & Kishor, 1997; Noraini Idris, 2002; Grootenboer & Hemmings, 2007). Among others, the Trends in International Mathematics and Science Study (TIMSS) has been reporting national level results of middle primary and lower secondary level students’ performance in the TIMSS international mathematics assessment. Eighth grade students in Malaysia had participated in the four-year cycle assessment of TIMSS. Using data from TIMSS 2003, Halimah Awang and Noor Azina Ismail (2005) reported that the overall average mathematics score of 508 ranked Malaysia at the 10th place in TIMSS 2003.
and in TIMSS 1999, Malaysia was ranked at the 16th place with an overall average mathematics achievement of and 519. In TIMSS 2007 and the latest cycle, Malaysia was ranked at the 20th place with an overall average mathematics score of 474 (Mullis, Martin, Foy, Olson, Preuschoff, Erberber, Arora, & Galia, 2008). By examining the overall average mathematics scores of Malaysian eighth graders in TIMSS, there has been a declining trend in the students’ mathematics performance.

Furthermore, De Corte (1995) pointed out that mathematics teaching and learning requires the exploration of affective as well as cognitive factors. The influence of affective variables, specifically attitudes on mathematics performance, has long been recognized as one of the main concerns by educators. In mathematics education, attitudes, beliefs, and emotions are under the affective domain (McLeod, 1992) and are related to mathematics achievement. De Corte (1995) asserted that these terms have differing level of stability and intensity of affect involved. Beliefs are claimed to have a higher degree of cognitive loading compared to attitudes and emotions. Although, the terms attitudes, beliefs, and emotions are interrelated, most mathematics researchers chose to explore the relationship between attitudes toward mathematics and achievement in mathematics (Abu-Hilal, 2000) rather than examining all the components in the affective domain.

Noraini Idris (2006) considered students’ attitudes toward mathematics as one of the concerns in mathematics classroom. Students’ poor attitudes toward mathematics were claimed to cause poor appreciation of mathematics learning, which in turn result in poor mathematics performance. Research evidences by Ma and Kishor (1997) in a meta-analysis to investigate the relationship between attitudes toward mathematics and mathematics performance at the elementary and secondary school levels found positive significant correlation between the two variables. This finding indicated that students who held more positive attitudes toward mathematics performed better in mathematics. Likewise, House (2006) concluded that students
who reported that mathematics was boring tended to achieve low mathematics test scores.

On the other hand, studies have also investigated the possible influence of beliefs on students’ mathematics learning (House, 2006; Anderson, Rogers, Klinger, Ungerleider, Glickman, & Anderson, 2006). In the studies conducted by House (2006) and Anderson et al. (2006), research findings revealed positive significant relationship between students’ beliefs about mathematics learning and mathematics performance. Students’ negative beliefs about mathematics impede their mathematics learning (Ignacio, Nieto, & Barona, 2006). McLeod (1992) proposed four components of students’ beliefs which included beliefs about mathematics, beliefs about self, beliefs about teaching, and beliefs about social context. McLeod (1992) noted that the component of beliefs that influence mathematics learning the most was beliefs about mathematics.

In addition, previous studies suggested that there was a significant relationship between students’ confidence in mathematics and mathematics performance (Hannula & Malmivuori, 1997). Self-confidence was claimed as an important predictor of mathematical achievement (Hannula & Malmivuori, 1997; Hannula, Maijala, & Pehkonen, 2004). The term self-confidence is related to self-efficacy and the term mathematics self-efficacy is defined as an individual’s assessment of his or her capability to perform successfully or to solve a particular mathematical problem based on a specific task or situation (Pajares & Kranzler, 1995). Thus, self-confidence is a belief variable and could be used in determining its effect on mathematics performance.

Furthermore, findings from TIMSS have been providing information to researchers regarding gender differences in mathematics performance. Ma (2007) who examined the data from all three cycles of TIMSS observed the disappearance of
male advantage and the emergence of the female advantage as the overall trend of gender differences in mathematics performance among eighth graders. Generally, continuing absence of gender differences was observed in 1999 and 2003 TIMSS, with most of the developed countries reported no gender differences in mathematics performance (Ma, 2007). Moreover, TIMSS data also revealed differences in students’ attitudes toward mathematics with female eighth graders in Malaysia reported more positive attitudes toward mathematics than their male counterparts in TIMSS 2003 (Halimah Awang & Noor Azina Ismail, 2005). Additionally, the Self-Confidence in Mathematics (SCM) Index was developed in 2002 to examine students’ perceptions of their abilities in learning mathematics in TIMSS 2003. A secondary analysis of TIMSS 2003 data found the existence of gender difference in Malaysian eighth graders’ confidence in mathematics. On the other hand, research on beliefs about mathematics revealed no difference in male and female students’ beliefs about mathematics learning (Hoang, 2008).

Besides gender differences in mathematics performance, previous research findings also revealed differences in the variable based on ethnicity, previous mathematics achievement, attendance at tuition, and assistance from parents in children’s mathematics learning. In terms of ethnicity, Grootenboer and Hemmings (2007) found that the dominant ethnic group in New Zealand performed better in mathematics than the minority group while in Malaysia, non-Malay natives performed significantly better in mathematics than Malay natives (Liew & Pong, 2004). Other researchers also noted the influence of previous mathematics achievement on students’ attitudes toward mathematics (Utsumi & Mendes, 2000) and beliefs about mathematics (Pajares & Graham, 1999). In addition, the increasing number of students who attended private tuition in mathematics has led researcher to investigate the influence of private tuition on students’ mathematics learning (Dindyal & Besoondyal, 2007; Dang & Rogers, 2008). Generally, researchers found that students were reported to achieve better score in mathematics by attending
mathematics tuition (Dindyal & Besoondyal, 2007). On the other hand, issues of parental involvement in children’s mathematics learning have suggested positive influence of parental assistance on mathematics performance (Cotton & Wikelund, 2001). Those research findings suggested the existence of differences in students’ mathematics performance and affective aspects based on gender, race, previous mathematics achievement, attendance at tuition, and assistance from parents in students’ mathematics learning.

1.2 Problem statement

According to Noraini Idris (2006), Malaysian students’ performance in mathematics has been generally found to be not good. Likewise, the secondary analyses of TIMSS data have shown a declining trend in eighth grade students’ mathematics performance in Malaysia. For instance, the eighth grade students’ overall average scores in the international TIMSS mathematics assessment has dropped from 519 in TIMSS 1999 to 508 in TIMSS 2003 (Halimah Awang & Noor Azina Ismail, 2005). Furthermore, in the latest TIMSS 2007, the overall average scores of Malaysian eighth graders decreased again to 474 (Mullis et al., 2008). This declining trend in students’ mathematics performance internationally suggested the need to identify the possible factors that influence mathematics performance as Noraini Idris (2006) asserted that students’ poor mathematics performance at secondary level would lead to a decrease in the number of students entering university.

Affective factors which include attitudes, beliefs, and emotions have long been recognized as the important predictors of mathematics performance in mathematics learning (De Corte, 1995). According to Ignacio et al. (2006), studies of these factors were initially limited to examining attitudes. The researchers, in their studies on the
affective domain in mathematics learning found that many students showed negative attitudes toward mathematics and some of them viewed mathematics as a tiresome chore (Ignacio et al., 2006). Moreover, in Malaysia, Mohd Lazim Abdullah, Abu Osman Md Tap and Wan Salihin Wong Abdullah (2004) reported that there has been a decline in Malaysian students’ interest in mathematics. Ignacio et al. (2006) confirmed that negative attitudes toward mathematics and inaccurate beliefs about mathematics held by students would jeopardize their mathematics learning.

Other researchers also noted the possible influence of attitudes toward mathematics (Gallagher & De Lisi, 1994; Ma & Kishor, 1997; Zeleke, 2001) and beliefs about mathematics (Anderson et al., 2006; House, 2006) on mathematics performance. On the other hand, confidence in mathematics was also found to be related with mathematics performance (Hannula & Malmivuori, 1997; Maree, 1999; Deal, 2003; Hannula, Maijala, & Pehkonen, 2004). Deal (2003) asserted that students with low self-confidence were more likely to have low self-motivation and tended to perform poorly in mathematics. All those research findings had shown the possible influences of affective factors on mathematics performance. However, most of the studies pertaining to this issue were from Western context and not much of such studies had been done in Malaysia.

In addition, problems arises when Malaysian educators are not aware of the possible differences in students’ mathematics performance, confidence in solving mathematical problems, attitudes toward mathematics, and beliefs about mathematics learning based on demographic variables such as gender, race, previous mathematics achievement, attendance at tuition, and assistance from parents in completing mathematics homework. Halimah Awang and Noor Azina Ismail (2005) had reported that mathematics achievement differs across nations, regions, and various socio-economic and demographic characteristics.