Faculty of Cognitive Sciences and Human Development

ADOLESCENTS’, PARENTS’ AND PEERS’ MATHEMATICS ANXIETY, ATTITUDES TOWARD MATHEMATICS AND MATHEMATICS ACHIEVEMENT

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ADOLESCENTS’, PARENTS’ AND PEERS’ MATHEMATICS ANXIETY, ATTITUDES TOWARD MATHEMATICS AND MATHEMATICS ACHIEVEMENT

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Statement of Originality

The work described in this project, entitled “Adolescents’, parents’ and peers’ mathematics anxiety, attitudes toward mathematics and mathematics achievement” is to the best of the author’s knowledge that of the author except where due reference is made.

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ABSTRACT

ADOLESCENTS', PARENTS' AND PEERS’ MATHEMATICS ANXIETY, ATTITUDES TOWARD MATHEMATICS AND MATHEMATICS ACHIEVEMENTS

Chong Yung Yung

The significance of attitudes toward mathematics in mathematics teaching and learning has been highlighted in the literature, but with less emphasis as compared to mathematics anxiety. Attitudes toward mathematics and mathematics anxiety are two essential variables in determining students’ mathematics performances and achievements in mathematics. Moreover, there were less research that studied the correlation between students’ own mathematics anxiety and attitudes toward mathematics. Therefore, the main focus of this research is to investigate the correlation between mathematics anxiety, attitudes toward mathematics, and mathematics achievements, their relationships to adolescents’ perceptions of parents’ and peers’ mathematics anxiety and attitudes toward mathematics, and gender differences in adolescents’ mathematics anxiety, attitudes toward mathematics, and mathematics achievement. This correlational and comparative research design study involved 480 adolescents Form Four students from six rural secondary schools. The focus on middle adolescents of Form Four Students, as the samples of this study was due to the reason that middle adolescents represent students who are starting to face more difficulties as the level of complexity and mathematics abstraction increased as compared to lower secondary. Adolescents’ perception of parents’ and peers’ were investigated as possible influence variables of adolescents’ mathematics anxiety level, positive or negative attitudes toward mathematics and level of mathematics achievements. The main instrument of this study was a questionnaire which composed of the Mathematics Anxiety Rating Scale-Revised (MARS-R) and revised model of Attitude toward Mathematics Inventory (ATMI). Results indicated positive relationships between adolescents’ mathematics anxiety with their perceptions of their parents’ mathematics anxiety ($r = 0.534, p < 0.005$), and their peers’ mathematics anxiety ($r = 0.625, p < 0.005$); between adolescents’ attitudes toward mathematics and their perceptions of their parents’ attitudes toward mathematics ($r = 0.799, p < 0.005$) and their peers’ attitudes toward mathematics ($r = 0.814, p < 0.005$); and relationships between adolescents’ perceptions of their own mathematics achievement with their own attitudes toward mathematics ($r = 0.524, p < 0.005$), perceptions of their parents’ attitudes toward mathematics ($r = 0.382, p < 0.005$), and perceptions of their peers’ attitudes toward mathematics ($r = 0.415, p < 0.005$). The findings of present study also found negative relationships between adolescents’ perceptions of own mathematics achievements with their own mathematics anxiety level ($r = 0.303, p < 0.005$), with perceptions of their parents’ mathematics anxiety ($r = -0.252, p < 0.005$), and perceptions of peers’ mathematics anxiety ($r = -0.201, p < 0.005$); and also negative relationships between adolescents’ mathematics anxiety and attitudes toward mathematics ($r = -
0.118, \( p = 0.010 \). The findings of study also indicated that there were no significant differences in adolescents’ mathematics anxiety, attitudes toward mathematics, and perceptions of their own mathematics achievements based on gender. Overall, this study found that adolescents from these six secondary schools faced moderate level of mathematics anxiety, have positive attitudes toward mathematics and perceived themselves to have moderate level of achievement in mathematics.
ABSTRAK

KEGELISAHAN MATEMATIK, SIKAP TERHADAP MATEMATIK DAN PENCAPAIAN MATEMATIK REMAJA, IBU BAPA DAN RAKAN

Chong Yung Yung

Kepentingan sikap pelajar terhadap matematik dalam pengajaran dan pembelajaran matematik sering dinyatakan dalam literatur, tetapi kurang diberi perhatian berbanding dengan kegelisahan matematik. Sikap terhadap matematik dan kegelisahan matematik merupakan dua pembolehubah yang penting dalam menentukan prestasi and pencapaian pelajar dalam matematik. Lebih-lebih lagi, kurang penelitian dijalankan bagi mengkaji korelasi antara kegelisahan matematik dan sikap terhadap matematik. Oleh itu, fokus utama penelitian ini adalah untuk mengkaji hubungan antara kegelisahan matematik, sikap terhadap matematik, dan pencapaian matematik remaja, dan juga dengan persepsi remaja terhadap perasaan kegelisahan matematik ibu bapa dan rakan dan sikap ibu bapa dan rakan terhadap matematik. Kajian ini juga mengkaji korelasi berbanding dengan menengah rendah. Persepsi remaja terhadap ibu bapa dan rakan dikaji sebagai penyebab yang berkemungkinan mempengaruhi tahap kegelisahan matematik, sikap positif atau negatif terhadap matematik, dan tahap pencapaian matematik. Instrumen utama kajian ini ialah soal selidik yang merangkumi: Mathematics Anxiety Rating Scale-Revised (MARS-R) and Attitude toward Mathematics Inventory (ATMI) diubahsuai. Keputusan kajian menunjukkan korelasi positif dalam hubungan antara kegelisahan remaja dalam matematik dengan persepsi mereka terhadap perasaan kegelisahan mateatik ibu bapa (r = 0.534, p < 0.005), dan dengan persepsi mereka terhadap perasaan kegelisahan rakan terhadap matematik (r = 0.625, p < 0.005); hubungan antara sikap remaja terhadap matematik dan persepsi terhadap sikap ibu bapa terhadap matematik (r = 0.799, p < 0.005), dan persepsi terhadap sikap rakan terhadap matematik (r = 0.814, p < 0.005); dan hubungan antara persepsi remaja terhadap pencapaian mereka dalam matematik dengan sikap mereka terhadap matematik (r = 0.524, p < 0.005), dengan persepsi mereka terhadap sikap ibu bapa terhadap matematik (r = 0.382, p < 0.005), dan persepsi remaja terhadap sikap rakan terhadap matematik (r = 0.415, p < 0.005). Hasil kajian ini juga menunjukkan korelasi negatif dalam hubungan antara persepsi remaja terhadap pencapaian mereka dalam matematik dengan tahap kegelisahan mereka (r = -0.303, p < 0.005), dengan persepsi mereka terhadap tahap kegelisahan matematik ibu bapa (r = -0.252, p < 0.005), dan persepsi mereka terhadap tahap kegelisahan matematik rakan (r = -0.201, p < 0.005); juga hubungan negatif antara tahap kegelisahan remaja terhadap matematik dan
sikap remaja terhadap matematik \( (r = -0.118, p = 0.010) \). Kajian ini juga medapati tiada pembezaan dalam tahap kegelisahan matematik, sikap terhadap matematik, dan persepsi terhadap pencapaian matematik berdasarkan jantina. Secara keseluruhan, kajian ini mendapati remaja mencapai sederhana kegelisahan remaja terhadap matematik, bersikap positif terhadap matematik dan mengikut persepsi mereka kebanyakan mencapai pencapaian sederhana dalam matematik.
CHAPTER ONE

INTRODUCTION

1.0 Introduction

The aim of this research is to investigate the relationship between adolescents’ perceptions of parents’ and peers’ mathematics anxiety and attitudes toward mathematics and adolescents’ own mathematics anxiety, attitudes toward mathematics and mathematics achievement. This chapter presents a general introduction to the study and it includes the background of study, problem statement, purpose and objective of the study, research questions, research hypotheses,
research framework, significance of the study, and definition of terms used in this study. This chapter ends with a brief summary of the chapter.

1.1 Background of the Study

Mathematics is one of the major subjects that have been studied for over hundreds of years. It is a unique body of knowledge which requires mental abstraction and this makes it hard for students to master it well (Ashcraft & Ridley, 2005; Nunez, 2008). Compared to other learning fields, mathematics is ranked as one of the most difficult subjects to be learned (Dawkins, 2006). The abstract nature of mathematical concept is one of the major reasons why students faced difficulties in learning mathematics (Nunez, 2008). Ashcraft and Krause (2007) further elaborate that the highly abstract nature of mathematical concepts and its requirement of manipulation of symbols cause it to be a cognitively challenging subject to learn.

According to the results of the Programme for International Student Assessment (PISA) in the year 2012, Malaysian students were reported to have average improvement in mathematics compared to the previous year’s result, but among the participating counties, the results were still in the lower rank (Guardian News, 2014). Various issues related to mathematics teaching and learning has been studied by researchers all over the world, and one of the recurring issues is mathematics anxiety. Mathematics anxiety is one of the critical issues which many students have problems dealing with in their learning of mathematics. As reported in several research done in the Malaysian context, majority of Malaysian
students were found to have moderate level of mathematics anxiety (Usop, Sabri, Hong, & Tan, 2009; Zakaria, Zain, Ahmad & Erlina; 2012).

Mathematics anxiety refers to the feeling of over-anxiousness towards mathematics, and includes learning and carrying out tasks or activities that require mathematics. Whyte and Anthony (2012) stated that the state of anxiety is an actual situational stress experienced that is specific to personally stressful circumstances, and for mathematics anxiety, it means that the stress is attributed to the subject of mathematics. According to Luo, Wang and Luo (2009, p. 12), “Mathematics anxiety is a kind of disease. It is cognitively passive mood produced by mathematics.” Students’ negative perceptions and fears toward mathematics will become a barrier for them to achieve their full potential in mathematics (Mashego, 1993) and subsequently will affect their learning performance in the subject (Meece, Wigfield, & Eccles, 1990). In addition, many past researches indicate that mathematics anxiety is negatively correlated with learners performance, behavior, self-beliefs, learning efficacy, and mathematics achievement (Devine, Fawcett, Szucs, & Dowker, 2012; Scarpello, 2005; Zakaria et al., 2012).

Attitude toward mathematics is one of the major elements in both teaching and learning process of mathematics, which significantly affect students’ mathematics performance (Farooq & Shah, 2008). Attitude can be explained as one’s evaluative response to a particular object or subject matter, positively or negatively (Aiken, 1970; Mohamed & Waheed, 2011), and in this case it would be focusing on respond towards mathematics. One’s attitude will influences his or her personal construction in making sense of something based on the information
or experience that one faced with, learnt or experienced (He, 2007). When one has negative attitudes towards mathematics, the things he or she will perceive and act in mathematics learning are likely to be responded negatively rather than positively. In mathematics teaching and learning field, attitudes towards mathematics said to be strongly related to mathematics achievement; theoretically or practically (He, 2007). It has been consistently studied and reported that students’ attitudes toward mathematics is one of the important factor influencing students’ mathematics achievement (Mohamed & Waheed, 2011).

Students’ attitudes toward mathematics is also found to be correlated with students’ mathematics anxiety. Akin and Kurbanogle (2011) stated that attitudes toward mathematics is closely related to mathematics anxiety, as it is one of the essential predictor of the level of mathematics anxiety. Several studies have shown that students’ attitudes toward mathematics negatively correlated with mathematics anxiety. In Hembree (1990) meta-analysis paper, results from 151 studies showed that students who experienced higher level of mathematics anxiety were those who had negative attitudes toward mathematics. Also, for students with high mathematics anxiety, their attitudes would become more negative and they also form negative perception of mathematics such as viewing mathematics as an unachievable and unrealistic subject matter to be learned (Bekdemir, 2010; Heydari, Abdi, & Rostani, 2013), tend to believe that mathematics is useless, and avoid mathematics related activities (Neale, 1969; cited in He, 2007). These negative attitudes will affect students’ performance in mathematics learning.

Another major aspect in the study of adolescents’ mathematics learning is parents’ and peers’ influence on adolescents’ mathematics anxiety and attitudes
toward mathematics. Students’ attitude is significantly associated with perceptions of people who are important for them (Philip, Hong, Liau, Usop, & Ting, 2010). The important persons closely related to students would most likely be their parents and peers. Parental influence includes parental encouragement, expectation, and attitudes towards mathematics (Kleanthous & Williams, 2010) and these influences will affect students’ perception of their academic abilities. Phillipson’s (2010) research stated that parental affective factors was one of the main predictor of students’ achievement. In addition, Philip et al. (2010) also stated that students will tend to adopt belief, behavior, or attitude from their perception of parents’ belief, behavior, or attitude toward mathematics (Philip et al., 2010). In addition, Rossnan (2006) claims that parents’ personal view of mathematics often negatively affect students’ mathematics anxiety’s level. Peer is another group of people who is recognized as an important factor which influences adolescents’ socialization, motivation and achievement, especially during adolescent (Philip et al., 2010). Their influence is strong especially when adolescents try to gain a sense of belonging in the peers group; where one of the ways is to adopt the attitude of peer (Philip et al., 2010). Therefore, when their peer hold positive attitude toward mathematics, students would likely to adopt the same attitude and be motivated to perform well in mathematics learning.

Due to the importance of mathematics in students learning and the importance of achieving global mathematics standard, educators and researchers emphasize on the need to further investigate the relationships between mathematics anxiety and various contributing factors such as students’ learning experiences, environmental factors and so forth, and for ways to mitigate this
issue. In order to investigate suitable ways to mitigate mathematics anxiety among the students, researchers or educators need to investigate possible predictor or causes of mathematics anxiety of a particular group of students as there are many different causal factors in different culture, different situation. This study would mainly look into adolescents’ perception of parents’ and peers’ mathematics anxiety and attitude toward mathematics, whether it related to or able to predict adolescents’ own mathematics anxiety, attitudes toward mathematics, and mathematics achievement, in the Malaysian context and culture.

1.2 Problem Statement

Mathematics anxiety is one of the most popular issues in learning mathematics related subject. Mathematics anxiety is the feeling of fear and anxiety towards mathematics, which may due to cultural belief and negative experience with mathematics. According to Devine et al. (2012), it is important to identify the existence of mathematics anxiety in students as it will affect ones’ career choices and prospects. Negative feeling towards mathematics and poor health condition will affect students’ performance in mathematics work. Chan (2012) stated that there is increased activity in the brain region linked with fear for students faced with mathematics anxiety, and this affect on the brain region linked to problem-solving.

There are many different type of causes for mathematics anxiety, which could be classified into family influences, societal influences, school influences, internal influences and neurological consideration (Clark, 2013), or environmental variables (e.g. negative experiences), intellectual variables (e.g. abstraction
aspect), and personality variables (e.g. self-concept or attitude) (Eden, Heine, & Jacobs, 2013). Different people may caused by different factor, especially when it involves different environment condition and cultural belief. Therefore, the study of the potential causes of mathematics anxiety is essential as it influences consideration of suitable ways to mitigate students’ mathematics anxiety.

Attitude toward mathematics is another significant factor which plays as significant role in students’ mathematics learning process. However, generally the research concern has been more towards mathematics anxiety rather than students’ mathematics attitude (Tapia & Marsh, 2004). A number of past findings has shown that students’ attitudes toward mathematics was significantly related to students’ mathematics performance (Aiken, 1970; Cheung, 1988; Chua, Hong, Law, Ting & Othman, 2010; Mohamed & Waheed, 2011; Farooq & Shah, 2008) and negatively correlated with mathematics anxiety level (Akin & Kurbanoglu, 2011; Gierl & Bisanz, 1995; Hembree, 1990; Heydari et al., 2013). Most of the findings indicated that, students’ with positive attitudes toward mathematics would be more likely to achieve better achievement in mathematics (Canh, & Sabo, 2012; Mohamed & Waheed, 2011), it is significant in students success and motivation to learn (Akin & Kurbanoglu, 2011). Similar to mathematics anxiety, attitudes toward mathematics also encounter similar situation in terms of the factor influencing the positive and negative attitudes toward mathematics. It had been long time that mathematics anxiety and attitudes toward mathematics found to be correlated with each other reciprocally, but the correlation of these two variables with the involvement of parents and peers still lacking. Therefore, this study focuses on potential factor such as parental and peers influence and its
relationship with adolescents’ mathematics anxiety and attitudes toward mathematics.

Another issue in this research field is, the often contradictors findings especially gender differences in mathematics anxiety level. Society always has the belief that males are able to perform well compared to females in solving mathematics problems. These negative beliefs cause female students to have negative assumption on their capability in performing mathematics activities and negatively influence their mathematics achievement (Zakaria et al., 2012). Compared to the male students, they tend to have more positive interpretation on their capability in performing mathematics activities; as they felt that they are able to perform better than the female students (Zakaria et al., 2012). Therefore, researchers or educators are questioning these issues and carrying out the investigation, but until now the finding is still inconsistent in terms of the differences of mathematics anxiety, attitudes toward mathematics, and mathematics achievement based on gender.

1.3 Purposes of the Study

The purpose of the current study is to study the influence of adolescents’ perception of parents’ and peers’ mathematics anxiety and attitudes toward mathematics on adolescents’ mathematics anxiety, attitudes toward mathematics, and mathematics achievement. This study also intends to study the relationship between adolescents’ mathematics anxiety, attitudes toward mathematics, and mathematics achievement. This research also intends to look at differences in
adolescents’ mathematics anxiety, attitudes toward mathematics and mathematics achievement based on gender.

1.4 Research Objective

1.4.1 General objective

The general objective of the study is to investigate adolescents’ perception of parents and peers’ mathematics anxiety and attitudes toward mathematics and its relation towards adolescents’ mathematics anxiety level, adolescents’ attitudes toward mathematics, and mathematics achievement.

1.4.2 Specific objectives

Specifically, this study aimed to look for:

1. The relationships between adolescents’ mathematics anxiety and their perception of their parents’ and peers’ mathematics anxiety.
2. The relationships between adolescents’ attitudes toward mathematics and their perception of their parents’ and peers’ attitudes toward mathematics.
3. The relationships between adolescents’ mathematics anxiety, attitudes toward mathematics, and mathematics achievements.
4. The relationships between adolescents’ mathematics achievement and their perception of their parents’ mathematics anxiety and attitudes toward mathematics.
5. The relationships between adolescents’ mathematics achievement and their perception of their peers’ mathematics anxiety and attitudes toward mathematics.
6. The differences in adolescents’ mathematics anxiety, attitudes toward mathematics and mathematics achievement based on gender.

1.5 Research Questions

1. Were there any significant relationships between adolescents’ mathematics anxiety and their perception of their parents’ and peers’ mathematics anxiety?
2. Were there any significant relationships between adolescents’ attitudes toward mathematics and their perception of their parents’ and peers’ attitudes toward mathematics?
3. Were there any significant relationships between adolescents’ mathematics anxiety, attitudes toward mathematics, and mathematics achievement?
4. Were there any significant relationships between adolescents’ mathematics achievement and their perception of their parents’ mathematics anxiety and attitudes toward mathematics?
5. Were there any significant relationships between adolescents’ mathematics achievement and their perception of their peers’ mathematics anxiety and attitudes toward mathematics?
6. Were there any significant differences in adolescents’ mathematics anxiety, attitudes toward mathematics and mathematics achievement based on gender?

1.6 Research Hypotheses

$H_0$ 1 There were no significant relationships between adolescents’ mathematics anxiety with parents’ and peers’ mathematics anxiety.