

# MATHEMATICS BELIEFS: THE PERCEPTION OF MATHEMATICS ANXIETY, TEACHING EFFICACY AND MATHEMATICS AVOIDANCE AMONG NON-OPTIONIST MATHEMATICS TEACHERS IN CENTRAL ZONE OF MALAYSIA

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## Abstract

*This research was conducted to determine the perception of mathematics anxiety, the efficacy of teaching and mathematics avoidance among non-optionist mathematics teachers. This research consisted of 91 primary teachers who teach mathematics as a minor subject in national-type Chinese schools (SJKC) in the central zone. Teachers are disproportionately highly significant in this study in which female teachers predominate in education compared with male teachers. This study had adapted questionnaires of mathematics belief instruments (MBI) from previous studies. Data were analysed using descriptive statistics and statistical inference using Statistical Package for the Social Sciences (SPSS) version 21. The findings indicate the moderate perception of mathematics anxiety, the efficacy of the teaching of mathematics and mathematical avoidance among teachers. Meanwhile, Pearson correlation analysis showed that there is a strong and positive relationship between mathematics anxiety and mathematics avoidance and also a moderate positive relationship between mathematics anxiety and mathematics efficacy.*

**Keywords:** *Mathematics Anxiety, Teaching Efficacy, Mathematics Avoidance*

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## Introduction

Mathematics is a main subject that is very interesting and enjoyed in daily life that involved various formulas, principles and procedures to be remembered or memorized (Boaler 2002; Gina Gresham 2010 ; Hannula et al. 2005; Seaman et al. 2005). It requires learning environment (Uusimaki & Nason, 2004), teacher instructional practices, content knowledge and beliefs in mathematics (Iossi, 2007; Vinson, 2001) to ensure that students gain the knowledge and positive attitudes towards mathematics (Cornelius-White 2007).

Teachers should need to use good teaching skills and sufficient to carry out teaching in the classroom (Cropley & Cropley 2011 ; Koster et al. 2005; Zampetakis, Bouranta & Moustakis 2010) as an effort to encourage students' interest in learning mathematics (Ball et al. 2001; Handal 2003 ; Pajares 1992) and also help them to obtain good performance in academic and extra-curricular (Hussain Alkharusi et al.2012). Effectiveness in delivering a lesson depends on the beliefs and pedagogical content knowledge of the teacher (Tickle, 2000). Teachers with good educational backgrounds in the subject taught can increase student interest and achievement in these subjects (Darling-Hammond 2000; Wilson, Flodent & Ferrini Mundy 2001). However, there are studies from abroad and also in Malaysia which focused on the issue of non-optionist teacher without a background in education and training in the subject taught at school especially teaching in secondary schools (Ingersoll 2001).

Generally, a significant problem exists among optionist and non-optionist teachers regarding teaching mathematics in the classrooms. Mathematics anxiety is one of the factors that shape attitudes towards mathematics and it exist in any individual who faced with a problems in all levels of education (Curtain-Phillips 2001; Geist 2010; Gina Gresham 2010; Uusimaki 2004). It can happen to anyone regardless of any level of age whether among teachers or students. The relevance of mathematics anxiety can be seen when the practice of teaching in the classroom also provide a strong influence on mathematics anxiety among students (Curtain-Phillips 2001 ; Geist 2010). Previous studies found that an individual's success depends on many factors and among those that have contributed to the situation is mathematics anxiety . In many situations, review of previous studies indicates that mathematics anxiety gives an impact on the practice of teaching in the classroom (Bursal & Paznokas 2006) and students learning (Wischkaemper, 2005).

Therefore, it was found that teachers with high levels of mathematics anxiety have a tendency to adopt the teaching of mathematics lectures or traditional method

(Swars et al.2006) and also focuses on teaching skills than mastery of a concept (Gresham 2010).

### **Problem statement**

The study of mathematics discipline that consists various constructs such as mathematics anxiety, mathematics efficacy or mathematics avoidance is often made to the teachers who have the dominant option of mathematics. Existing studies focused less on the non-optionist mathematics teachers with a mandate to teach mathematics as a minor subject teaching. According to Curriculum Development Centre (2000), mathematics is one of the main factors that indicate the success of students (Kamisah 2003 ; Rauch & Frese 2007) in a school system. Teaching and learning mathematics should be implemented effectively as mathematics is an abstract subject (Ben 2009; Gresham 2010; Mrinal Sarma & Majidul Ahmed 2013) and almost all of the students not only in Malaysia but also in foreign countries believe that mathematics is a daunting (Mrinal Sarma a& Majidul Ahmed 2013) and difficult subject. In conjunction with this, mathematics teaching methods in the classroom should be diversified by teachers and ensure active learning experiences that can be achieved by students in order to promote interaction between teachers and students, thus increasing the efficacy of teaching mathematics among teachers.

### **Objectives Research :**

This study intends to :

- i. Identify the perception of mathematics anxiety, the efficacy and avoidance of mathematics teaching among non-optionist mathematics teachers.
- ii. Identify whether there is a significant relationship between mathematics anxiety, the mathematics efficacy and mathematics avoidance among non-optionist mathematics teachers.
- iii. Identify whether there is a significant difference between mathematics anxiety, mathematics avoidance and teaching efficacy based on age groups of teachers.

### **Research Questions**

This study was conducted to answer the following questions:

- i. What is the perception of mathematics anxiety, mathematics avoidance and teaching efficacy among non-optionist mathematics teachers?

- ii. Is there a significant relationship between mathematics anxiety, mathematics avoidance and teaching efficacy among non-optionist mathematics teachers?
- iii. Is there a significant difference between mathematics anxiety, mathematics avoidance and teaching efficacy based on age groups of teachers?

## **Research Methodology**

The quantitative study was conducted using a questionnaire to be filled by primary school teachers of Chinese language option who teach mathematics as a minor subject. All of these primary teachers are non optionist mathematics and teaching in Chinese primary schools (SJKC) in the central zone of Malaysia. They have been teaching mathematics in elementary school between 5 to 27 years. The number of male teachers and female teachers was disproportionately due to the limitations in the Chinese language options and non optionist teachers who teach mathematics as a minor subject.

## **Sampling and populations**

This simple random sampling research was conducted to 91 primary school teachers in the central zone whose ages varied from 30 to 50 years. The teachers selected as a respondent to participate in this study were experienced teachers who are non-optionist mathematics but are responsible for teaching mathematics from year one to year six at national-type Chinese schools (SJKC).

## **Research Instruments**

The instruments used for collecting data in this study consisted of 33 items adapted from the Revised Mathematics Anxiety Scale (RMAS), Mathematics Avoidance Scale (MAS) and Personal Mathematics Teaching Efficacy Beliefs (PMTEB). Revised Mathematics Anxiety Scale (RMAS) and Mathematics Avoidance Scale (MAS) obtained from Mathematics Experiences Questionnaire (MEQ) whereas Personal Mathematics Teaching Efficacy Beliefs (PMTEB) obtained from Mathematics Teaching Efficacy Beliefs Inventory (MTEBI).

## **Data Analysis and Reliability**

All the data obtained were analysed using Statistical Package for the Social Sciences (SPSS) version 21. Descriptive data such as mean, percentage and standard deviation are some of the statistics used to describe the research questions. Descriptive statistical procedures such as the mean value had been

categorized into three levels, namely low, medium and high. As for inferential statistics, data also includes statistical analysis using Pearson correlation and one way ANOVA. The reliability of the instruments used in this study was determined using internal consistency, Cronbach alpha. Cronbach alpha values were obtained between 0.671 to 0.798 and it shows that the instrument that includes three mathematical constructs may serve and meet the desired characteristics. According to W. Wiersma (2000), the validity of measurement is the extent to which the instrument measures what it is designed to measure. All values of reliability obtained were considered as good as the Borg et al. (1993) mentioned that the value of 0.6 or more is acceptable.

### Descriptive finding

Findings from the survey indicated that teachers who are in the category of 30-39 years are among the most selected as respondents, followed by 23 teachers aged between 40-49 and 3 teachers aged between 50-59 years. Of the 91 respondents, women teachers were found to dominate the overall number of respondents in the study with 86 respondents (94.5%) and the remaining of 5 males (5.5%). Most of the teachers selected to participate in this study were involved in the teaching of mathematics in year 6 (34.1%). According to the descriptive analysis as seen in Table 1, the distribution of mean and standard deviation for all three constructs showed that the mean level of anxiety towards mathematics teacher, mathematics avoidance and mathematics efficacy among non optionist teacher was at a moderate level.

Table 1: Descriptive analysis based on research construct

Construct	N	Mean	Standard Deviation
Interpretation			
Mathematics Anxiety	91	2.4945	0.42593
Moderate Mathematics Avoidance	91	2.711	
0.40701	Moderate		
Mathematics Efficacy	91	2.8309	0.38156
Moderate			

Meanwhile, for the second research questions, Pearson correlation analysis showed that the constructs of mathematics anxiety have a very high and positive

relationship with mathematical avoidance as shown in Table 3. The value of correlation Pearson (0.704) indicates that there is a strong relationship and significant ( $p < .05$ ) between mathematics anxiety and mathematics avoidance,  $r = 0.704$ ,  $n = 91$ ,  $p < .05$ . While relations between mathematics anxiety and efficacy of teaching mathematics showed that there is a moderate positive correlation (0.460). In addition, there is a strong positive relationship (substantial relationship) for the avoidance of mathematics and efficacy of teaching (0.670). It shows that if more teachers avoid from teaching mathematics, the more teachers increase their efficacy in teaching mathematics. According to Tschannen-Moran and Hoy (2002), high efficacy beliefs encourage teachers to make greater efforts to diversify the task of teaching the lesson and not easily deterred. The more teachers refrain from anything related to math, the more teacher tries in their teaching for something better. The obtained correlation value is also referred to interpretation expressed by Davies (1971) as shown in table 2 below.

Table 2 : Adjectives for describing the magnitude

Correlation coefficient value (r)	Adjectives
0.01-0.09	negligible
0.10-0.29	low
0.30-0.49	moderate
0.50-0.69	substantial
0.70-0.99	very high
1.00	perfect

Table 3: Pearson correlations between mathematics anxiety, mathematics avoidance and mathematics efficacy among non-optionist mathematics teachers

Construct	Mathematics anxiety	mathematics avoidance
mathematics efficacy		
Mathematics anxiety	1.00	0.704
0.460		

Mathematics Avoidance	-	1.00
0.670		
Mathematics Efficacy	-	1.00

Meanwhile, one-way ANOVA analysis is used for the third research questions and the finding shows that Levene test,  $p > .05$  indicates that all three groups have uniform variance. Table 4 shows that there is no statistically significant differences in mathematics anxiety for the group aged between 30-39, 40-49 and 50-59 with the  $F(2,88) = 0.983$ ,  $p > .05$ . As a conclusion, each age groups of teachers have a similar level of mathematics anxiety.

Table 4: ANOVA test for mathematics anxiety level among teachers by age group.

Category	sum of squares	degree of freedom	mean of squares	F value
Between Group	0.357	2		0.178
0.983	0.378			
Within Group	15.971	88	0.181	

Meanwhile , Table 5 presents the findings of the SS (sum of squares) between groups with  $F = 0.88$

( $p > .05$ ), indicating that the mean evasion of mathematics among the three age categories did not differ significantly. Accordingly, it can be stated that the table indicates no statistically significant difference between age groups with the  $F(2,88) = .88$ ,  $p > .05$ . This means that there is no statistically significant differences in the level of evasion of mathematics equivalent to each other for the age group of teachers involved.

Table 5 : ANOVA test for mathematics avoidance among teachers by age group .

Category Significant	sum of squares	Degree of Freedom	mean of squares	F value
Between Group 0.88	0.275 0.440	2		0.138
Within Group	14.634	88	0.166	

Table 6 shows that there are no significant differences between the age groups of teachers with the  $F(2,88) = 1,958$ ,  $p > .05$ . This means there is no significant differences in the mean degree of efficacy of teaching between the age group of teachers. Each age group has a similar level of teaching efficacy between each other.

Table 6 : ANOVA test for mathematics efficacy perception among teachers by age group.

Category Significant	sum of squares	degree of freedom	mean of squares	F value
Between Group 1.958	0.558 0.147	2	0.279	
Within Groups	12.545	88	0.143	

## Discussion and Summary

Based on these findings, it shows that teachers belief based on mathematics anxiety, the efficacy of teaching mathematics and mathematics avoidance exists among non-optionist mathematics teacher. Understanding gained when it was found that these teachers have a moderate level of all the construct consists of mathematics anxiety, the efficacy of mathematics and mathematics avoidance. This situation clearly shows that teachers are not too anxious to teach mathematics but try to avoid if given the choice of teaching mathematics as the second option

compared to teach Chinese language subject as the dominant option. This high perception has given an impact on teachers to implement teaching and learning mathematics in the classroom and ensure that students can excel in mathematics. Student's achievement from Chinese School is known as one of the best and brightest compared students' achievement in other public schools. According to the teachers who teach mathematics, those teachers who are in the age range of 50-59 have a high perception of mathematics anxiety, mathematics teaching efficacy and avoidance of mathematics. Teachers from the age group between 50-59 were among the teachers who have been long-serving and experienced in the few years of teaching mathematics. Most of them have lots of experienced in teaching the Chinese language as a major subject in school.

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