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THE INFLUENCES OF MATH ANXIETY AND MATH ATTITUDES TOWARDS MATH ACHIEVEMENT AMONG COGNITIVE SCIENCE STUDENT OF UNIVERSITY MALAYSIA SARAWAK

SITI NOORMAIZHATUL HASNIDAH BINTI OSMAN

This project is submitted
In partial fulfillment of the requirements for a
Bachelor of Science with Honours
(Cognitive Science)

Faculty of Cognitive Sciences and Human Development
UNIVERSITI MALAYSIA SARAWAK
2015

The project entitled 'The Influences of Math Anxiety and Math Attitudes Towards Math Achievement among Cognitive Science Student of Universiti Malaysia Sarawak' was prepared by Siti Noormaizhatul Hasnidah Binti Osman and submitted to the Faculty of Cognitive Sciences and Human Development in partial fulfillment of the requirements for a Bachelor of Science with Honours (Cognitive Science)

Received for examination by:

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(Nur Fatihah Bt Mat Yusoff)

Date:

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# ACKNOWLEDGMENTS

Firstly, I would like to express my gratitude and Alhamdulillah to God for blessing me throughout the completion of this Final Year Project. I am sincerely grateful for the plentiful love received.

From the bottom of my heart, I wish my profound appreciation to my supervisor, Mdm. Nur Fatihah Bt Mat Yusoff for her continuous guidance, wonderful suggestions, constructive advices, wise opinions, endless support, understanding, and encouragement that were provided to me in accomplishing this research. I learned a great deal from her throughout this course.

To my parents, Mr. Osman and my sister Nabilah, thank you for your unfailing love and always support me. To my friends especially Hafizah, Atiqah and Fariha, I appreciate your support and timely words of encouragement. The completion of the entire bachelor's degree is possible because of your love for me. I am so blessed to have you in my life that always at my side.

Last but not least, I wish to express my thanks to the students of UNIMAS that had participated in this research willingly. Thank you for the time and cooperation. Not to forget to thank UNIMAS, for giving me the chance to conduct my Final Year Project in the university. Once again, thank you all very much.

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**ABSTRACT**

The aim of this research is to examine the mathematic anxiety and mathematic attitudes towards mathematic achievement. About 150 students of Cognitive Science in Universiti Malaysia Sarawak were chosen to contribute in this research. The instrument used in this research the questionnaire proposed by Martha Tapia (1996) for mathematic attitudes and the mathematics anxiety by Wigfield and Meece (1998). The distribution of this instrument was done by using simple random sampling technique. The questionnaire consisted of several items, which are demographic, math anxiety component and math attitudes component. This research also used several statistical analysis methods, which were, t-test, ANOVA test, Pearson Correlation and Multiple Regression test. The main finding of this research showed there is a significant relationship of math anxiety and math achievement and also there is a significant relationship between math attitudes and math achievement and the math attitudes is the biggest factor that contributes to student math achievement.

*Keywords:* mathematic anxiety, mathematic attitudes, student mathematic achievement.

# ABSTRAK

Tujuan kajian ini adalah untuk mengenalpasti mengenai kebimbangan matematik dan sikap dalam matematik terhadap pencapaian matematik pelajar. Kajian ini akan dapat membantu tenaga pengajar untuk mengambil berat terhadap pelajar terutama bagi yang mengalami kebimbangan matematik. Selain itu, membantu dalam menentukan bentuk sikap yang pelajar ingin bentuk dalam diri mereka. Seramai 150 pelajar telah dipilih dari pengajian Sains Kognitif di Universiti Malaysia Sarawak. Instrumen yang telah digunakan di dalam kajian ini adalah borang soal selidik bagi kebimbangan matematik telah dibuat oleh Wigfield & Meece (1998). Sementara itu, soal selidik sikap terhadap matematik dibangunkan oleh Martha Tapia (1996). Borang soal selidik ini diedarkan dengan menggunakan cara *simple random sampling* (SRS). Bagi menganalisis data, *t-test*, *ANOVA*, *pearson correlation* dan juga *multiple regression* telah digunakan. Keputusan utama bagi kajian ini menunjukkan bahawa, terdapat hubungan yang signifikan antara kebimbangan matematik dengan pencapaian matematik. Selain itu, sikap dalam matematik juga mempunyai hubungan yang signifikan dengan pencapaian matematik.

*Kata kunci*: kebimbangan matematik, sikap dalam matematik, pencapaian matematik pelajar.

## Background of study

This research was conduct to know more about the mathematic anxiety among Cognitive Science student in Universiti Malaysia Sarawak. Mathematics is an important topic especially in technology world. All the things need mathematic, either in continue study or to be hired. All need mathematics. But there is some problem that appeared since a long time ago even until nowadays. Mathematic anxiety is an illness that creates uncomfortable feelings when they need to solve mathematic problem.

Mathematic anxiety can be divided into two types such as somatic math anxiety and also cognitive math anxiety. For the somatic math anxiety, it produces physical effects to the sufferer. The symptom that people show is sweating, stomach pains and nervous tics. These entire symptoms make the somatic math anxiety comparable to the other phobias. This is also show the physical symptom in an individual. The second types of math anxiety are cognitive math anxiety. The cognitive math anxiety affects the mental processes. This is when someone has the math anxiety, they will feel uncomfortable. They tend to make mistake and they will not full concentrate in learning. They cannot do work without constant feeling because they afraid with the expected failure in their outcome (Ashcraft, 2002).

Mathematic attitude is the one aspect that will be tested to measure the effects of a performance or achievement. Attitude is the based on believe and value also as an unstable degree based on fact of understanding (Mullis, Martin, Gonzalez, Conner, Chrostowski, Gregory, Garden & Smith, 2001). Girls are often discouraged from mathematical work in their primary years. Student that have strong and positive attitudes toward mathematic can easily handle their

stress, emotion or anxiety in order to achieve a great achievement in examination or while do math task in class.

Math achievement is the thing that can measure the student understanding done by giving examination or task in class. Student's achievements are based on the grades that they have. Basically, in class, either in school or in university level, student always competes with their friend or it is must have boys student that they need to competes. This is because they will study group with their friend and want to show their good performance. The achievement basically look based on gender. Based on previous research available, male student if as a group will perform better than female student on mathematic achievement (Benbow & Stanley, 1982; Clark & Grandy, 1984; Fennema & Carpenter, 1981). The previous research also shows, there is significance gender difference in mathematic achievement (Abubakar and Eze, 2010; Grassi, 2004 & Witt-Rose, 2003).

It is difficult to endure math anxiety because it involves the cognitive part. When someone has set in their mind it is need time to heal the math anxiety. Attitudes also play an important part to increase the math achievement result.

**Problem Statement**

Research or studies would not exist if there is no problem, and the study was conducted is to resolve the problem. However, to solve the problem, the problem must be identified in advance.

Mostly people fear when faced with mathematical further questions. They would be easily mistaken and lost focus (Hembree, 1990). It influences their performance in mathematics at the same time, the achievement also disturbing. Between men and women usually there are

different stages of their problems to the mathematical (Hembree, 1990).  Besides, in Malaysia, the state of the various occupied countries and nations make no difference in mathematics ravine. The successes of the student in mathematics it is depend on the attitudes toward mathematics and it is can influences the degree of understanding and rate of learner (Shah, 2008).

Other than that, attitudes are formed by student when learning mathematic tends to remain for a long time and these attitudes may help student to learn mathematic better. However, this is can be successful if the attitude form were positive (Mutai, 2007). These researches is to investigate whether attitudes is part of mathematic achievement among Cognitive Science student.

In addition, the need of mathematics education is important to develop Malaysia as a nation. So, all important need is to focus the achievement of student. There are several factor that can consumes in math achievement, it is include gender, race and attitudes. So, the problem is how this thing effects the student math achievement.

**Research objective**

**General objective**

In overall, this research will be conducted to identify the mathematics anxiety towards Cognitive Science student in University Malaysia Sarawak.

**Specific Objective**

In specific, this research is conducted to identify:

i. To identify is there any difference on mathematic anxiety based on demographic (gender and race).

ii. To identify is there any difference on mathematic achievement on based demographic (gender and race).

iii. To identify is there any difference on mathematic attitudes based on demographic (gender and race)

iv. To investigate the relationship between mathematic anxiety and student math achievement.

v. To investigate the relationship between students achievement in math and mathematic attitudes.

vi. To investigate the relationship between math attitudes and math anxiety.

vii. To indentify which factor that has the biggest contribution toward math achievement.

**Research Hypothesis and Research Question**

Based on the previous study, there is several hypotheses that has been identify in this research:

**Ho1**   There is no significant difference of mathematic anxieties based on gender

**Ho2**    There is no significant difference of mathematic anxieties based on race

**Ho3**   There is no significant difference of mathematic achievement based on gender

**Ho4**   There is no significant difference of mathematic achievement based on race

**Ho5**   There is no significant difference of mathematic attitudes based on gender

**Ho6**   There is no significant difference of mathematic attitudes based on race

**Ho7**   There is no significant relationship between mathematic anxieties and student achievement.

**Ho8**   There is no significant relationship between student achievements and mathematic attitudes.

**Ho9**   There is no significant relationship between math attitudes and math anxiety

**Research question:** which factor that have biggest contribution toward math achievement?

**Conceptual Framework**



**Independent variable**

- Math attitudes
- Math anxiety
- Demographic (gender and race)

**Dependent variable**
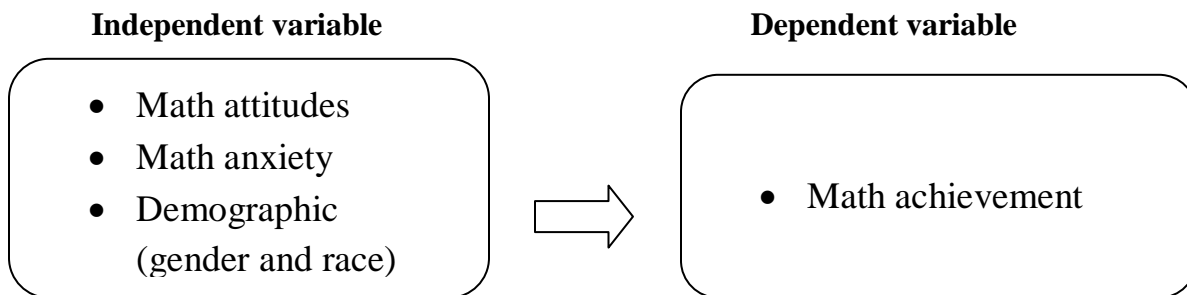
- Math achievement

Figure 1: *Conceptual Framework*

Based on the figure 1, the independent variables are the math attitudes, demographic and math anxiety. For the dependent variable is a math achievement.

**Definition**

For each variable related, it is can be defined as conceptually or operationally. The definition of the variable gets by searching in dictionary, reference books and internet articles. Here I define some terms related to the study being undertaken. The purpose of this definition is to avoid the enactment made the wrong interpretation and impression ambiguous indirectly to this study.

Math attitudes

**Conceptual.** Based on the conceptual meaning, math attitude is an attitude believe or value that people have in certain thing. In this concept, it is believe towards mathematics. The meaning of the believe is an either positive or negative believe in doing the math test or facing problem in mathematics (Barton, 2000; Furinghetti & Pekhonen, 2002).

**Operational**. Based on operational, math attitudes is a like a feel that student have to know whether they are excited or not interested at all toward mathematic. Attitude also is a predisposition to respond to a particular object (mathematics as a subject) in a generally favorable or unfavorable way.

Math anxiety

**Conceptual**. Based on conceptual meaning, the anxieties toward mathematics bring meaning depressed or worried about the manipulation of numbers and solving mathematical problems. According to Toblas in year 1998, math anxiety makes someone becomes forgotten and lost confidence.

**Operational.** Based on operational, math anxiety is a something that make student feel uncomfortable and afraid when they facing problem in mathematics. Student make mistake when they are afraid or nervous. It also make student cannot do math properly.

Math achievement

**Conceptual**. Based on the conceptual meaning, that taken from oxford dictionary, mathematic is the abstract science of number, quantity and space either as abstract concept or as applied to other discipline, for example in physic or engineering. The math word comes from a plural of obsolete mathematics in late $16^{th}$ century. The meaning of achievement is a thing that done successfully with an effort, skills or courage in order to achieve and reach great achievement.

**Operational.** Based on operational, the mathematic achievement can be measured based on the grade that student get after they sit for their examination. The grade that student can have is A (4.00), A- (3.67), B+ (3.33), B (3.00), B- (2.67), C+ (2.33), C (2.00), C- (1.50), D (1.00), F (0.00).

**Significant of study**

This study will benefit parties involved in this study, especially those who have problems with math anxiety. In addition, this study also contributes to the mathematical description of the anxiety students that focuses on students' cognitive science, University Malaysia Sarawak. This study also provides resources for researchers of math anxiety by race in Malaysia. Another interest is that this study can be used as a reference for conducting the study in the future. Besides that, this study will help out in determining attitudes formed by Cognitive Science student towards achievement in mathematics. Moreover, this research can clearly explain about the mathematic anxiety among undergraduate student that more specific towards Cognitive

Science student. Other than that, this research also shows whether anxiety and attitudes have a relationship between this two variable. It is also to show whether this two variable, which is anxiety or attitudes have the biggest contribution towards mathematic achievement.

**Conclusion**

In conclusion, this chapter has discussed the introduction, research background, the background behind the study, problem statement, and objectives of the study, conceptual framework, and definition of terms used the importance of research as well as limitations of the study. The main objective of this study was to investigate mathematic anxiety.

## CHAPTER TWO

## LITERATURE REVIEW

**Introduction**

This chapter will describe in more detail about the review of the literature that has been studied by previous researchers in the field of reward and desire to quit. The first part of this chapter will explain the theories of this research topic. The next section will explain the past research related to this study. In addition, the concept of math anxiety, math achievement and attitudes in mathematics that will be examined in this study also discussed in this chapter.

**Theory of anxiety**

**Cognitive theory.** In the Cognitive theory, there are two theories that proposed by Michael Eysenck (1990) and Ohman (1993). Based on the Michael Eysenck, the cognitive system acts as a gateway to the psychological system, in order to understand about the anxiety it is important to understand about both system. As background of this theory, M Eysenck state that there are differences between people that have high anxiety or low anxiety in the information that they have stored in the long-term memory. Besides that, people who have high or low anxiety also show an inconsistency in their mood state. If take an example of math anxiety, student that have it, will show same thing, it is inconsistency in their mood state. This is make content of their memory also become vary. M. Eysenck also said that, people who have high or low trait anxiety may also be different in the process side and the structure of their cognitive systems. People that have different level of anxiety bring to the different in broad schemata and in specific items. For example, type or amount of specific worries that they may have.  Based on this theory, M. Eysenck proposed two reasons why people that have high anxiety more worries than people that have low anxiety. The first reason is they have frequently

organized sets of worries in the long-term memory. Secondly, because of the negative mood states support the mood-state-dependent retrieval. As the conclusion based on this theory is a, the importance of cognitive system as a physiological and behavioral (Strongman, 1995).

Based on Cognitive theory, Ohman (1993) has proposed his own theory in term of model that consist five major aspects (as cited in Strongman, 1995). The first major aspect is a feature detector, second is a significance evaluator, third is arousal system, fourth is an expectancy system and the last is a conscious perception or threat. In addition, based on the figure below, the researcher found link between the unconscious aspects of anxiety based on the Freud theory, state that two types of unconscious. Based on two type of unconscious it is related to the Ohman mode of feature detector and significance evaluator. Ohman stated that fear it is emotion that have relationship with the conscious avoidance and escape. Student that fears of math will try to avoid or escape it. If these response are blocked then it is will go to the anxiety. The basic anxiety usually comes from unconscious input then goes to conscious perception system from significance evaluator and arousal system. From this result, it is an undirected anxiety and the causes of this anxiety being not accessible to the person. Based on this context, phobias and panic disorder are seen as arising from physiological root, while the generalized of anxiety comes from a cognitive basis. Ohman also argues that, some anxiety effects occurs straight away, but the cognitions from unconscious biases also have own responsibility in interpretation of threat. As conclusion, Ohman theory model has some reasonable things that explain about anxiety (Strongman, 1995)

Fig 1: Öhman's Information Processing Model of Anxiety
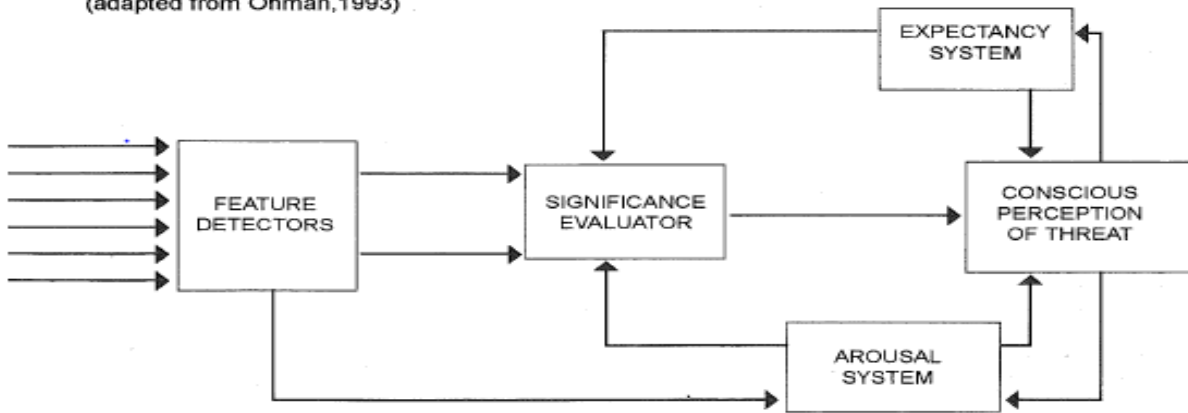(adapted from Öhman, 1993)

Figure 2: *Ohman Information Processing Model of Anxiety*

**Theory of attitudes**

**Functionalist theory.** The functionalist theory has been proposed by Daniel Katz. He said that attitudes are determined by the function they serve for us. He also said that, people tend to held on attitudes because it is help them to achieve their basic goal. According to Katz, there are four components that psychological function attitudes meet. The first is the instrumental. People develop positive attitudes toward something because of reward that will give to us. People also want to maximize the reward and want to minimize the penalties. The second is knowledge. Based on knowledge, attitudes give us a meaningful of structured environment. Attitudes help us by supply the standard of evaluation. That mean, students have knowledge they will have a positive attitudes toward something. If the students have a good knowledge of mathematics, it is can give positive attitudes towards math. The third is a value-expressive. For example, when there is student really like towards mathematic, they will show interest by looking their expression and behavior. Last but not least is an ego-defensive, bring meaning that, attitudes provide us protection from acknowledging basic truth about ourselves or harsh of

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reality life. For example, when one student does not like to learn math, they will show negative attitudes such as not focus when learning process or play while learning process (Strongman, 1995).

**Past Research**

**Mathematic Attitudes.** Attitude can determines whether a person is successful or not. Positive or negative attitude is decisive. This attitude can be measured by student achievement, gender and also in terms of race in Malaysia. Attitudes also act as the main role in teaching and learnig process and it is can affect student performance or achievement. Many studies have been conducted to examine whether attitudes in mathematics there is a relationship between gender, race or student achievement in mathematics. Attitudes also play as a main role in order to success. If there is a failure, a lot of people will say that it is must come from attitudes. Attitudes are build from the experience and the perception toward something or fenomena (Robbins, 1986).

**Mathematic Attitudes and Gender.** The attitudes based on gender are based on the individual perception of their own abilities and also their sex role (Schiefele & Csikszentmihalyli, 1995). Based on previous study stated that girl tend to have negative attitudes toward math than male student (Frost, Hyde & Fennema, 1994; Leder, 1995). Previous research also stated that boys have good achievement or performance in mathematic than girl (Mutai, 2007). The reason why female show poor performance than male in mathematic it is because they less confidence (Farooq & Shah, 2008). Less in confidence usually can make student difficult to cope with problem in doing math, student tend to like to hide their self rather than expose. If student itself does not want to exposed, it is difficult to know whether they understand

or not. For the males, they have their own attitudes toward mathematics. They feel comfortable with their own attitudes and can easily accomodate with the math if they comfortable with their own attitude. Besides that, poor attitudes in mathematics can influence the student achievement in math or poor performance in mathematic  towards girls (Wilis, 1995; Fullarton, 1993).

**Mathematic Attitudes and Math Achievement.** As mention above, attitudes play an important role in achievement of something. So if the attitudes of student more to negative attitudes, it is can directly or indirectly influence the student achievement. Bandura (1994) found that, positive attitudes toward subject can give a strong effect toward student motivation. Positive attitudes can give a positive perception toward math (Ruffell, Mason & Allen, 1998). So student that can have or save in their  mind the positive attituteds indirectly, they will feel or expose the positive perception also. Perception can influence someone before they face that situation. Futhermore, Schreiber (2002) in his research also found there is a positive relationship between student attitudes with the student achivement. In his research also, he also found that, if student have bad or low attitudes, the math achievement also not in a good result. Student tend to ignore all the importants thing while learning and it is make student loss many thing and then difficult to recall what have they learn, also difficult to do better in examination. In addtition, there other research also stated that, student attitudes in mathematic, there is positive relationship toward math achievement (Arsaythamby, 2006).

**Mathematic Attitudes and Math Anxiety.** Math attitudes is investigate in terms of the relationship with the math anxiety. Sometimes student feel anxious when they need to perform or do task in mathematic and it is usually influence by the attitudes. For example, when student always have a negative attitudes toward math, when they face math problem, they will feel afraid and feel uncomfortable. In this kind of situation, this can bring to the anxiety. In addition, other research also found that high level of math anxiety will affect the mathematical thinking and attitudes (Ashcraft & Faust, 1994). If they feel anxious they cannot focus towards learning and they easily feel afraid if lecturer or teacher going to ask question to them. Besides that, the affect the mathematical thinking, it is will show the less knowledgeable about mathematic and does not interested in discovered special strategies on how to solve math problem. A lot of student that have math anxiety have less confidence in their ability to do math (Gresham, 2005).

## Mathematic Anxiety

**Mathematic anxiety and gender**. Anxiety in mathematics is the study often made by researchers worldwide. Anxiety in mathematics give a huge impact in the learning of mathematics. This is irrespective of status, race or gender of a person. There is two type of sex in the world, and it is male and female. Both in practically show many differences either in term of thinking or physically. So math anxiety also can be measure by see gender differences. It is needed because, need to prove that whether there is a differences or not in term of gender. No doubt, the sex is very important to measure the level of anxiety in mathematics (Aiken, 1970). Based on prevoius result done by Anglin, Pirson, & Langer, Hall, Davis, Bolen, & Chia, Meelissen & Luyten, Penner & Paret,it shows that mathematics anxiety and gender showed different results, which mean female and male have different anxiety level (as cited in Iraz Firoozfar, 2013). In addition, a study conducted by (Baloglu & Kocak, 2006) suggests that

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