THE INFLUENCE OF LEARNING ENVIRONMENT, ATTITUDE AND ACADEMIC SELF-EFFICACY TOWARDS MATHEMATICS ACHIEVEMENT IN MASTERSKILL GLOBAL COLLEGE

GLADYS DE ROZARIO

DISSERTATION SUBMITTED IN FULFILLMENT FOR THE DEGREE OF MASTER OF EDUCATION IN EDUCATIONAL MANAGEMENT

SCHOOL OF EDUCATION AND SOCIAL DEVELOPMENT

UNIVERSITI MALAYSIA SABAH
2012

UNIVERSITI MALAYSIA SABAH

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(GLADYS DE ROZARIO)
Alamat Tetap: 295, LRG 11,
TAMAN DESA WIRA, 93250,
KUCHING, SARAWAK

Tarikh : 20 FEBRUARI 2013

(DR. MUHAMAD SUHAIMI TAAT)

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I hearby declare that this proposal entitled "*The Influence of Learning Environment, Attitude, and Academic Self-efficacy towards Mathematics Achievement In Masterskill Global College*" is the result of my own work and effort, and that all the sources that I have used or quoted have been acknowledged by means of complete references.

20 February 2012

Gladys De Rozario
PT20107499C

CERTIFICATION

NAME : **GLADYS DE ROZARIO**

MATRIC NO. : **PT20107499C**

TITLE : **THE INFLUENCE OF LEARNING ENVIRONMENT, ATTITUDE AND ACADEMIC SELF-EFFICACY TOWARDS MATHEMATICS ACHIEVEMENT IN MASTERSKILL GLOBAL COLLEGE**

DEGREE : **MASTER OF EDUCATION (EDUCATIONAL MANAGEMENT)**

DECLARED BY

1. SUPERVISOR

.....

DR MUHAMAD SUHAIMI TAAT)
Penyarah Kanan
Sekolah Pendidikan dan Pembangunan Sosial
Universiti Malaysia Sabah

DEDICATION

This research paper is lovingly dedicated to both of my parents, Richard Rozario and Irene Pui, who have been the constant source of inspiration.

To my elder sister (and husband) and younger brother who indirectly paid for all this and encouraged me to pursue my dreams the best I can.

Without their love and support, this paper would not have been made possible.

ACKNOWLEDGEMENT

I wish to express my deepest gratitude to my supervisor, Dr. Muhamad Suhaimi Taat for his continuous support and commitment in assisting me with my research problems, and also for his motivation, enthusiasm and immense knowledge, which guided me throughout the development of this paper. I could not have imagined having a better supervisor for my Masters study.

I would also like to thank my fellow course mates in MEM, for the stimulating discussions, for the sleepless nights we worked together before deadlines, for sharing useful information in regards to our study and projects, and for all the fun we had throughout our studies together. I have learned a lot from each one of you.

During the completion of this proposal, I have collaborated with many colleagues for whom I have great regard, and I wish to extend my warmest thanks to all those who have helped me with my work especially to the Department of Medical Laboratory and Department of Environmental Health for both campuses, Kuching (Sarawak) and Kota Kinabalu (Sabah).

For my best friend and colleagues, thank you for being good entertainers when I feel stressed out and for being the most sporting friends during the good and bad times. I will treasure all the reminiscence that we shared together.

Finally, I would like to thank my family for always being there and even willing to help administer questionnaires for me; and for providing both financial and spiritual support when I needed them the most. I owe everything to them.

ABSTRACT

THE INFLUENCE OF LEARNING ENVIRONMENT, ATTITUDE AND ACADEMIC SELF-EFFICACY TOWARDS MATHEMATICS ACHIEVEMENT IN MASTERSKILL GLOBAL COLLEGE

This study aimed to examine the influence of three constructs – mathematics classroom learning environment, students' attitude towards mathematics and academic self-efficacy in mathematics – and their influence towards students' mathematics achievement. For this purpose, a sample of 235 allied health college students was randomly selected from two campuses of Masterskill Global College (formerly known as Masterskill College of Nursing and Health). The questionnaire was a combination of three sets of inventories that had been modified to suit the purpose of study. They were the College and University Classroom Environment Inventory (CUCEI), Attitude towards Mathematics Inventory (ATMI), and College Academic Self-Efficacy Scale (CASES). Two statistical procedures were utilized to examine the demographic and data analyses, which were descriptives and inferential statistics. The analyses reported respondents had high and positive perception on all constructs, and there were also significant difference in respondents' perception based on campuses and mathematics achievement grades. However, all three constructs did not significantly influence achievement in mathematics. Thus, for future research purposes, it is hoped that other contributing factors will be studied on, so as to fill this knowledge gap. Additional research could also be conducted in other allied health colleges.

ABSTRAK

Kajian ini bertujuan untuk mengkaji pengaruh tiga konstruk – persekitaran pembelajaran matematik, sikap terhadap matematik dan efikasi akademik dalam matematik – ke atas pencapaian pelajar dalam matematik. Bagi tujuan ini, sejumlah 235 pelajar kolej kesihatan telah dipilih secara rawak daripada dua kampus Masterskill Global College (dahulunya dikenali sebagai Masterskill College of Nursing and Health). Soal selidik yang diguna adalah terdiri daripada gabungan tiga set instrumen, yang telah diubah suai untuk memenuhi tujuan kajian. Instrument tersebut adalah 'College and University Classroom Environment Inventory' (CUCEI), 'Attitude towards Mathematics Inventory' (ATMI), dan 'College Academic Self-Efficacy Scale' (CASES). Dua prosedur statistik telah digunakan untuk memeriksa analisis demografi dan data, yang dikenali sebagai statistik perihalan dan takbiran. Hasil analisis melaporkan bahawa responden mempunyai persepsi yang tinggi dan positif terhadap semua konstruk, dan terdapat juga perbezaan yang signifikan dalam persepsi responden berdasarkan kampus dan gred pencapaian matematik. Walau bagaimanapun, ketiga-tiga konstruk tidak mempengaruhi pencapaian dalam matematik. Oleh itu, untuk tujuan penyelidikan masa depan, adalah diharapkan bahawa faktor penyumbang yang lain akan dikaji, untuk mengisi jurang pengetahuan ini. Penyelidikan tambahan juga boleh dijalankan di kolej kesihatan yang lain.

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LIST OF ABBREVIATIONS

CUCEI	College and University Classroom Environment Inventory
ATMI	Attitude towards Mathematics Inventory
CASES	College Academic Self-Efficacy Scale
EFA	Exploratory Factor Analysis

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CHAPTER 1

INTRODUCTION

1.1 Importance of Mathematics in the 21st Century

In this 21st century, mathematics could help in creating a global nation because with mathematics there is science, with science there is modern technology and with modern technology there is modern society. By having a modern society, this would not only increase the level of productivity in the country but it would help develop a creative yet innovative nation, who are capable in accepting and facing the challenges inflicted by globalization. Since our country is aiming to be a developed country by the year 2020, the importance of mastering this subject has become evident because it contributes a lot in other disciplines, making it an interdisciplinary subject.

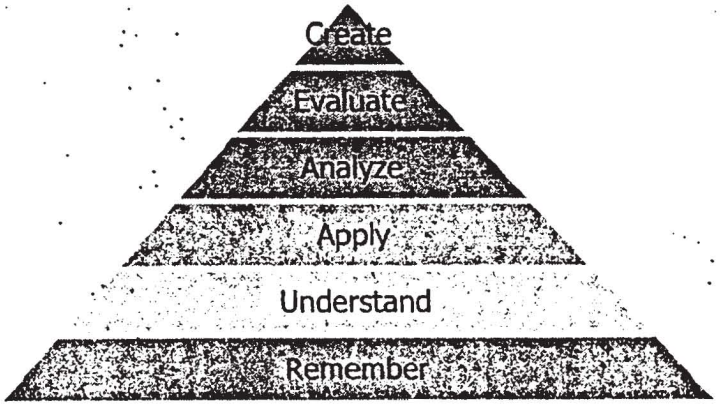
"Mathematics as a discipline offers its own unique set of knowledge, skills and processes."

(Partnership for 21st Skills, 2000)

The mathematics subject is indeed unique for it has been an important aspect to the development of civilisation. Most of us might not have noticed it but from ancient to modern times mathematics has been fundamental to advances in science, engineering and philosophy (Masanja, 2002). Till today, mathematics is widely use among scientists, engineers, businessmen as well as politicians. For instance, the developments of algorithms, mathematical modelling and scientific computing have led to new discoveries in physics and economics. Statistical techniques, on the other hand, enabled politicians and manufacturers to predict or forecast profits and upcoming phenomenon. Their interdisciplinary characteristic proves even more on how unique this subject is. Thus, it is important to ensure that the subject is mastered by students since primary level.

Furthermore, to complement the concept of a modern society, students need to be highly skilled and knowledgeable in mathematics. They need to acquire knowledge to develop skills in mathematics when they venture in their respective area of expertise after completing their study in secondary level. Here, the concept of Bloom's Taxanomy is worth to mention for the six level of cognitive domain is highly emphasised in Malaysian school's curriculum. Figure 1 illustrates the revised Bloom's Taxanomy for 21st Century.

Diagram 1.1: Revised Bloom's Taxanomy



Source: David R. Karthwohl (2002)

Based on the figure above, the six levels are divided into two categories. The bottom three levels are Lower Order Thinking Skills (LOTS), whereas the top three levels are Higher Order Thinking Skills (HOTS). In the Malaysian school curriculum, the order of thinking skills is incorporated based on students' development in a particular subject. The idea of it is like building a skyscraper. Students need to first have a strong foundation (i.e. LOTS) before acquiring and developing deeper understanding in the subject matter (i.e. HOTS). For example, students who know the concept of arithmetic (i.e. addition, subtraction, multiplication and division) would have no problem in using algebra when answering problem solving questions.

In Malaysia, there are basically three mathematics education programs, namely Mathematics for primary schools, Mathematics and Additional Mathematics for secondary schools (Ministry of Education, 2004, 2006). Each level covers

different areas, whose difficulty increases gradually. Table 1 shows the areas of study covered in each education program.

Table 1.1: Areas of Study in Primary and Secondary Schools

Primary Schools (Mathematics)	Secondary Schools	
	Mathematics	Additional Mathematics
1. Numbers and operation	1. Number	1. Geometry
2. Measurement and geometry	2. Shape and space	2. Algebra
3. Statistics and probability	3. Relationship	3. Calculus
		4. Trigonometry
		5. Statistics

Source: Ministry of Education Malaysia (2004, 2006)

As mentioned, once students leave secondary schools, they are expected to further their study in higher learning institutions (college or university) and focus on their own field of interest, by which they too would overcome a subject, or two, that consists a little bit or a lot of mathematical concepts in it. A good example for this is the field of allied health. Most people would think that students undergoing such program would not come across the dreadful subject called mathematics. They are wrong. Students still need to learn and expand their knowledge in mathematics so as to be able to understand science related problems and solve them confidently.

As a result educators in higher learning institutions also bear the same burden as teachers in primary and secondary schools. Whereby besides making sure students get good grades, they too need to ensure that their students are able to activate their prior knowledge in mathematics and apply it throughout their studies in college or university, no matter what their field of study is.

1.2 Research Background

Today mathematics in its various forms has found applications in economics, science, chemical and energy development, engineering and technology (Aguele

and Usman, 2007). This made it as one of the important subject to master during primary and secondary level. As stated by Halimah and Noor Azina (2003), the importance of having a strong foundation of mathematics as a prerequisite for admission into institutions of higher learning in most disciplines is well recognized.

In life sciences discipline, the subject has contributed tremendous discoveries, achievements and breakthroughs.

> "... areas where mathematics is poised to make important progress include the growth process in general and embryology in particular, cell signalling, immunology, emerging and re-emerging infectious diseases, and ecological issues such as global phenomena in vegetation, modelling animal grouping and the human brain."
>
> (Masanja, 2002)

Therefore, students who take life sciences program in college or university would definitely need to have good mathematical skills or develop such skill so that they would be able to connect and understand the concept of mathematics in science related subjects and not be left out from class discussions.

Masterskill Global College, in particular, offers quite a number of life sciences programs to school leavers. It is known as Allied Health program and is categorised into five programs. They are Diploma in Medical Lab Technology, Diploma in Environmental Health, Diploma in Pharmacy, Diploma in Physiotherapy and Diploma in Healthcare. Here, mathematics is a compulsory subject for the first three programs so as to prepare them with the basic mathematical skills before applying it in other subject, which they will face in the following semesters.

In accordance, it is important for mathematics educators in this college to ensure that their students have mastered sufficient knowledge and skills in mathematics before continuing to the next semester that requires the integration of mathematical context and concept. This can be done by monitoring their participation in the classroom; inspecting their behaviour; and analysing their work progress in mathematics. In other words, students need to achieve good grades for

their final examination to prove that they understood and mastered the context and concepts of mathematics.

1.3 Problem Statement

Teaching and learning mathematics are complex tasks (Grouws and Cebulla, 2000). Teachers need to ensure that their teaching techniques are effective so that their students are able to grasp what was being imparted to them during teaching and learning process. Students, on the other hand, need to have the interest to learn and have strong foundation in mathematics to prevent them from having difficulties when learning mathematics at a higher level. As stated by Graham and Provost (2012), without strong foundation in early mathematics, students are not prepared to enrol in more advance mathematics at high school and college level.

There are actually quite a wide range of factors that could lead to difficulty in learning mathematics. These factors can be in an intrinsic or extrinsic form. Among the extrinsic influences are entry mastery; opportunities to learn; external motivation; financial resources and language barriers (Saxe (1988); Capraro (2009)). Meanwhile, the intrinsic influences could be from the learner's will to learn; attitude; self-efficacy; cognitive ability and anxiety level towards mathematics.

Despite the different types of factors, some students do find it difficult to cope with the mathematics syllabus offered in the Masterskill Global College, although the syllabus covers similar topics during secondary school. Some of these students even managed to achieve good grades during their Malaysian Certificate of Education (*Sijil Pelajaran Malaysia*) examination and yet could not handle the challenges portrayed in the syllabus. As stated by Pandit (2004), there are students who have average or above average intelligence but continuously fail to maintain normal progress in school subjects, even though these students are not handicapped.

The mathematics syllabus in Masterskill Global College is quite similar to those in the Malaysian secondary school mathematics curriculum. Students still need to focus on Geometry, Algebra, Calculus, Trigonometry and Statistics, but the

problem solving situations are more likely to be linked to their own area of study. For instance, students in Environmental Health would use logarithm in identifying the pH value of a river, whereas Medical Lab Technology students would use logarithm in investigating cell duplication. Although the area of study is different, students still need to know the rules of logarithm when solving their respective problem, which is the very basic thing to index and logarithm.

Since the importance of higher education has increased several folds in the world, the awareness on the importance of mathematics in higher learning institution such as Masterskill Global College need to be established (Rizwan and Rafaqaat, 2010). Educators need to know how to generate students' optimal potential in this subject by identifying what factor affects students' performance the most. This indirectly requires educators to change their teaching approaches, strategies and practices in the classroom.

Thus, the purpose of this paper is to examine the influence of three contributing factors (both intrinsic and extrinsic) towards students' mathematics achievement. These factors are classroom learning environment, students' attitude towards mathematics and students' academic self-efficacy in mathematics. Although quite a number of researchers had studied on these three constructs, related studies in mathematics for tertiary level involving all three constructs are relatively few in comparison to those carried out at the primary and secondary level.

1.4 Purpose of Study

This research aims to determine the influence of mathematics learning environment, students' attitude towards mathematics and academic self-efficacy in mathematics towards mathematics achievement at Diploma level in Masterskill Global College.

1.5 Objectives of Study

Based on the purpose of the study mentioned in 1.4, this research would consist of the following objectives:

i. To identify students' perception on mathematics learning environment, attitude towards mathematics and perception on academic self-efficacy in mathematics.

ii. To determine the differences in students' perception of mathematics learning environment based on campus.

iii. To determine the differences in students' attitude towards mathematics based on campus.

iv. To determine the differences in students' perception of academic self-efficacy in Mathematics based on campus.

v. To determine the differences in students' perception of mathematics learning environment based on mathematics achievement.

vi. To determine the differences in students' attitude towards mathematics based on mathematics achievement.

vii. To determine the differences in students' perception of academic self-efficacy in Mathematics based on mathematics achievement.

viii. To determine the relationship among mathematics learning environment, students' attitude towards mathematics and academic self-efficacy in mathematics.

ix. To identify the influence of mathematics learning environment, students' attitude and academic self-efficacy towards mathematics achievement.

1.6 Research Questions

Referring to the objectives, the following research questions were developed.

i. What are students' perception on mathematics learning environment, attitude towards mathematics and perception on academic self-efficacy in mathematics?

ii. Is there a significant difference in students' perception of mathematics learning environment based on campus?

iii. Is there a significant difference in students' attitude towards mathematics based on campus?

iv. Is there a significant difference in students' perception of academic self-efficacy in Mathematics based on campus?

v. Is there a significant difference in students' perception of mathematics learning environment based on Mathematics achievement?

vi. Is there a significant difference in students' attitude towards mathematics based on mathematics achievement?

vii. Is there a significant difference in students' perception of academic self-efficacy in Mathematics based on mathematics achievement?

viii. Is there a significant relationship among mathematics learning environment, students' attitude towards mathematics and academic self-efficacy in mathematics?

ix. Is there a significant influence of mathematics learning environment, students' attitude and academic self-efficacy towards mathematics achievement?

1.7 Research Hypotheses

Similarly, the following research hypothesis has been developed to test each research question stated in 1.6.

i. There is a significant difference in students' perception of mathematics learning environment based on campus.

ii. There is a significant difference in students' attitude towards Mathematics based on campus.

iii. There is a significant difference in students' perception of academic self-efficacy in Mathematics based on campus.

iv. There is a significant difference in students' perception of mathematics learning environment based on mathematics achievement.

v. There is a significant difference in students' attitude towards Mathematics based on mathematics achievement.

vi. There is a significant difference in students' perception of academic self-efficacy in Mathematics based on mathematics achievement.

vii. There is a significant relationship between mathematics learning environment, students' attitude towards Mathematics and academic self-efficacy in Mathematics.

viii. There is a significant influence of mathematics learning environment, students' attitude and academic self-efficacy towards mathematics achievement.

1.8 Significance of Study

College Policy

This study is aimed to assist the college's board of management to have a better strategy in tackling the problem of low mathematics achievement. By identifying which of the three factors influence more on achievement, various strategies or programs could be generated for both students and lecturers to improve the teaching and learning process in the classroom.

Lecturers

The significance of this study will also assist lecturers to be aware of the important aspects in a classroom that could affect students' learning outcome. This too will indirectly assist lecturers to identify students' weaknesses in a mathematics learning environment. Moreover, this study could also be applicable to other subjects in the college.

Methodology

This study wish to provide a more reliable and valid data for future research besides to support past research. The data analyses could help determine which factor influences mathematics achievement the most. These analyses would also generate a model that shows the relationship between these three factors (classroom learning environment, students' attitude and academic self-efficacy) and students' achievement in Mathematics.

1.9 Limitation of Study

This research is conducted in Masterskill Global College. There are a total of six branch campuses, however only two branches were involved. These campuses are located in Kota Kinabalu (Sabah) and Kuching (Sarawak). Both campuses were taken as sampling group because the location is closer to the researcher.

Moreover, the research's sample group will be chosen from only two diploma programmes, instead of all six programmes. This is because only these programmes offer mathematics subject as their core subject. The programmes involved are Diploma in Medical Lab Technology and Diploma in Environmental Health.

Apart from that, the researcher focuses mainly on Year 1 students because the subject mathematics is offered in their first semester. Although Year 2 and Year 3 students had taken the same subject, they were not taken as samples because these students would have forgotten how their classroom environment was in the first semester. Hence, to have a valid response from samples, the limitation of this research is that only Year 1 students would be taken as samples.

In addition, students will response to a self-report questionnaire, whereby they would assess themselves based on a set of items. Hence, students' responses on learning environment, attitude towards mathematics and academic self-efficacy might not be true reflection of their actual behaviour.

1.10 Operational Definition

Learning environment

There are various definitions for learning environment in schools. Sink (2005), mentioned that it concerns the dynamics of classrooms or smaller learning environment, including how children feel and experience the characteristics of this milieu. Apart from that, Thangiah (2012) associated learning environment with the physical aspects, psychological or emotional conditions and social and cultural influences present in the classroom.

From all these definitions and opinions, this research's definition of learning environment is the physical, psychological, interpersonal environment and teacher's attitude and behaviour that exist in a classroom. A 5-point Likert Scale instrument called College and University Classroom Environment Inventory (CUCEI) will be used to measure students' perception on this dimension. There are a total of 31 items, which had been revised to better suit the respondents.

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