Faculty of Cognitive Sciences and Human Development

RELATIONSHIP BETWEEN MATHEMATICS SELF-EFFICACY (MSE) AND MATHEMATICS SELF-REGULATED LEARNING STRATEGIES (MSRLS) AMONG SECONDARY SCHOOL STUDENTS

Chung San San

Master of Science
(Learning Sciences)
2015
RELATIONSHIP BETWEEN MATHEMATICS SELF-EFFICACY (MSE) AND MATHEMATICS SELF-REGULATED LEARNING STRATEGIES (MSRLS) AMONG SECONDARY SCHOOL STUDENTS

CHUNG SAN SAN

A thesis submitted
In partial fulfillment of the requirements for the degree of Master of Science (Learning Sciences)

Faculty of Cognitive Sciences and Human Development
UNIVERSITI MALAYSIA SARAWAK
2015
The research paper entitled ‘Relationship between Mathematics Self-Efficacy (MSE) and Mathematics Self-Regulated Learning Strategies (MSRLS) Among Secondary School Students’ was prepared by Chung San San and submitted to the Faculty of Cognitive Sciences and Human Development in partial fulfilment of the requirements for Master of Science (Learning Sciences).

Received for examination by:

-----------------------------------
(Prof. Dr. Hong Kian Sam)
Date:

-----------------------------------

Gred
Statement of Originality

The work described in this Research Paper, entitled “Relationship between Mathematics Self-Efficacy (MSE) and Mathematics Self-Regulated Learning Strategies (MSRLS) Among Secondary School Students” is to the best of the author’s knowledge that of the author except where due reference is made.

No part of this work has been submitted in support of an application for a degree or qualification of this or any other university or educational establishment. However, some parts of this work have been published in co-authorship with Prof. Dr. Hong Kian Sam in the following paper:


__________________________

(Date Submitted) Chung San San
(13030224)
ACKNOWLEDGEMENTS

First and foremost, I would like to express my deepest gratitude to my supervisor, Prof. Dr. Hong Kian Sam, who has supported me throughout these two semesters with his excellent guidance, encouragement, immense knowledge, understanding and prompt feedback whilst allowing me the room to work in my own way towards the accomplishment of the research paper. I attribute the level of my Master degree to his patience and effort and without him, this paper would not have been completed within the established time frame.

Besides my supervisor, I would like to thank all the lecturers who have taught me within these two years of my Master degree. Special thanks dedicated to Mdm. Lily Law, for her warmest encouragement and insightful comments in the class of Seminar of Learning Sciences during last semester.

Also, I would like to convey my heartiest thanks to En. Hafiz Hashim, our course coordinator, for his invaluable help and guidance throughout the whole course that aids towards the success of my research paper.

Finally, I would like to thank my family members for their unceasing support and also, my course mates, who directly or indirectly, have lent their helping hands throughout these two years at UNIMAS.

Once again, I would like to thank my supervisor, Prof. Hong Kian Sam, for his expert and dedication towards the completion for my research paper. I am truly grateful and blessed to have him as my supervisor and mentor. Thank you very much!
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement of Originality</td>
<td>iii</td>
</tr>
<tr>
<td>Acknowledgement</td>
<td>iv</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>v</td>
</tr>
<tr>
<td>List of Tables</td>
<td>vi</td>
</tr>
<tr>
<td>List of Figures</td>
<td>viii</td>
</tr>
<tr>
<td>List of Abbreviations</td>
<td>ix</td>
</tr>
<tr>
<td>Abstract</td>
<td>x</td>
</tr>
<tr>
<td>Abstrak</td>
<td>xi</td>
</tr>
</tbody>
</table>

## CHAPTER 1: INTRODUCTION

1.0 Introduction
1.1 Background of the Study
1.2 Statement of the Problem
1.3 Research Objectives
1.4 Research Questions
1.5 Research Hypotheses
1.6 Research Framework
1.7 Definitions of Terms
1.8 Significance of the Study
1.9 Limitations of the Study
1.10 Summary

## CHAPTER 2: LITERATURE REVIEW

2.0 Introduction
2.1 Mathematics Self-Efficacy (MSE)
2.2 Mathematics Self-Regulated Learning Strategies (MSRLS)
2.3 Gender, MSE and MSRLS
2.4 Academic stream, MSE and MSRLS
2.5 MSE and MSRLS
2.6 Summary

## CHAPTER 3: RESEARCH METHODOLOGY

3.0 Introduction
3.1 Research Design
3.2 Research Samples
3.3 Research Instrument
3.4 Pilot Study
3.5 Data Collection Procedures
3.6 Data Analysis
3.7 Ethical Issues
3.8 Threats to Validity
3.9 Summary
CHAPTER 4: FINDINGS

4.0 Introduction 35
4.1 Demographics of the Respondents 36
4.2 Reliability Analysis of the Research Instruments 38
4.3 Descriptive Results of Students’ MSE and MSRLS 39
4.4 Differences in MSE and MSRLS based on Demographic Variables 53
4.5 Relationships between MSE and MSRLS 56
4.6 Summary 57

CHAPTER 5: DISCUSSIONS AND CONCLUSIONS

5.0 Introduction 58
5.1 Summary of the Study 59
5.2 Summary of the Findings 60
5.3 Discussions of the Findings 63
5.4 Implications for Practice 68
5.5 Implications for Future Research 71
5.6 Conclusions 72

REFERENCES 73

APPENDICES 78

Appendix A Questionnaire 78
Appendix B Scales and Item Analysis 83
Appendix C Letter of Permissions 85
Appendix C1 Copy of the permission letter to the State Education Department 85
Appendix C2 Copy of the permission letter from the Ministry of Education 87
Appendix C3 Copy of the permission letter from the State Education Department 89
Appendix C4 Copy of the permission letter from the Faculty of Cognitive Science and Human Development, UNIMAS 91
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 3.1</td>
<td>28</td>
</tr>
<tr>
<td>Reliability of the questionnaire in the pilot study</td>
<td></td>
</tr>
<tr>
<td>Table 3.2</td>
<td>29</td>
</tr>
<tr>
<td>Data analysis of the study</td>
<td></td>
</tr>
<tr>
<td>Table 3.3</td>
<td>30</td>
</tr>
<tr>
<td>Interpretation of the ‘r’ value</td>
<td></td>
</tr>
<tr>
<td>Table 4.1</td>
<td>36</td>
</tr>
<tr>
<td>Demographic of the respondents</td>
<td></td>
</tr>
<tr>
<td>Table 4.2</td>
<td>38</td>
</tr>
<tr>
<td>Reliability of the questionnaire in the actual study</td>
<td></td>
</tr>
<tr>
<td>Table 4.3</td>
<td>42</td>
</tr>
<tr>
<td>Descriptive Statistics for Students’ MSE</td>
<td></td>
</tr>
<tr>
<td>Table 4.4</td>
<td>46</td>
</tr>
<tr>
<td>Descriptive Statistics for Students’ MSRLS: Value</td>
<td></td>
</tr>
<tr>
<td>Table 4.5</td>
<td>49</td>
</tr>
<tr>
<td>Descriptive Statistics for Students’ MSRLS: Cognitive Strategies</td>
<td></td>
</tr>
<tr>
<td>Table 4.6</td>
<td>52</td>
</tr>
<tr>
<td>Descriptive Statistics for Students’ MSRLS: Metacognitive Strategies</td>
<td></td>
</tr>
<tr>
<td>Table 4.7</td>
<td>53</td>
</tr>
<tr>
<td>Differences in MSE based on gender</td>
<td></td>
</tr>
<tr>
<td>Table 4.8</td>
<td>54</td>
</tr>
<tr>
<td>Differences in MSE based on academic stream</td>
<td></td>
</tr>
<tr>
<td>Table 4.9</td>
<td>55</td>
</tr>
<tr>
<td>Differences in MSRLS based on gender</td>
<td></td>
</tr>
<tr>
<td>Table 4.10</td>
<td>55</td>
</tr>
<tr>
<td>Differences in MSRLS based on academic stream</td>
<td></td>
</tr>
<tr>
<td>Table 4.11</td>
<td>56</td>
</tr>
<tr>
<td>Relationship between Students’ MSE and MSRLS</td>
<td></td>
</tr>
<tr>
<td>Table 4.12</td>
<td>57</td>
</tr>
<tr>
<td>Relationships between Students’ MSE and various aspects of MSRLS</td>
<td></td>
</tr>
</tbody>
</table>
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1.1</td>
<td>8</td>
</tr>
<tr>
<td>Research framework guiding the study</td>
<td>8</td>
</tr>
</tbody>
</table>
## LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSE</td>
<td>Mathematics Self-Efficacy</td>
</tr>
<tr>
<td>MSRLS</td>
<td>Mathematics Self-Regulated Learning Strategies</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
</tr>
<tr>
<td>PISA</td>
<td>Programme for International Student Assessment</td>
</tr>
<tr>
<td>SISC</td>
<td>School Improvement Specialist Coaches</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Packages for the Social Science</td>
</tr>
</tbody>
</table>
ABSTRACT

RELATIONSHIP BETWEEN MATHEMATICS SELF-EFFICACY (MSE) AND MATHEMATICS SELF-REGULATED LEARNING STRATEGIES (MSRLS) AMONG SECONDARY SCHOOL STUDENTS

Chung San San

Mathematics Self-Efficacy (MSE) is an individual’s confidence towards accomplishments of a variety of tasks, ranging from understanding of concepts to problem solving in mathematics. Mathematics Self-Regulated Learning Strategies (MSRLS) is an academically effective form of learning, through which the learner sets the goals; monitors and regulates his or her cognition, motivation and behaviour during the learning process. This research highlights the importance of MSE, MSRLS and the relationship between MSE and MSRLS in teaching and learning of mathematics in school. In addition, the differences in MSE and MSRLS between gender and academic stream are also discussed. The samples in this study consisted of 211 students from Form Four Science and Arts Classes at two secondary schools, Lundu Secondary School and Sematan Secondary School in Lundu, Sarawak. Two research instruments were used to collect data in this study namely Students’ Mathematics Self-Efficacy (MSE) and Students’ Mathematics Self-Regulated Learning Strategies (MSRLS). This study was conducted using a Cross-Sectional Survey research design. Independent samples t-tests were used to determine the differences in MSE and MSRLS based on gender and academic stream. Pearson’s Moment Correlation Coefficients (r) were used to measure the relationships between MSE and MSRLS. The finding from the present study reported no significant difference in MSE and MSRLS based on gender. In addition, finding indicated students’ MSE did not differ significantly between science and arts stream. Nevertheless, there was significant difference in MSRLS based on academic stream. Furthermore, positive and strong relationships were found between MSE and MSRLS.

Keywords: Mathematics Self-Efficacy (MSE) and Mathematics Self-Regulated Learning Strategies (MSRLS)
ABSTRAK

HUBUNGAN ANTARA EFIKASI-KENDIRI MATEMATIK (MSE) DAN STRATEGI PEMBELAJARAN REGULASI-KENDIRI MATEMATIK (MSRLS) DI KALANGAN PELAJAR SEKOLAH MENENGAH

Chung San San


Katakunci: Efikasi-Kendiri Matematik (MSE) and Strategi Pembelajaran Regulasi-Kendiri Matematik (MSRLS)
CHAPTER ONE
INTRODUCTION

1.0 Introduction

This chapter is divided into nine main sections. Section 1.1 discusses the background of the study. Section 1.2 provides the problem statement of this study. Section 1.3 lists the research objectives of the study. Section 1.4 provides the research questions of the study. This is followed by Section 1.5 which discusses the research hypotheses of the study. The next section, Section 1.6 gives an overall view of the research through the research framework of the study. Section 1.7 provides the meanings and definitions of the relevant terms used in this study. Section 1.8 discusses the significance and the importance of the study. This is then followed by Section 1.9, which lists the limitations of this study. Lastly, Section 1.10 summarizes the chapter.
1.1 Background of the Study

Mathematics is important to prepare the learners to cope with the demands of a progressive nation towards various developments in science and technology. As a field of study, mathematics trains our minds to think systematically and logically in making decisions and solving problems. This discipline promotes meaningful learning and challenges the mind of the learner, and therefore contributes towards an individual’s holistic development. Additionally, mathematics is essential to solve problems in everyday life (Mohamed & Waheed, 2011).

Aligned with the National Education Philosophy, the mathematics curriculum provides opportunities for learners from different backgrounds and levels of abilities to acquire mathematical knowledge and skills. Learners are then able to seek relevant information, and be creative in formulating solutions and alternatives when facing challenges (Curriculum Development Centre, 2013).

In Malaysia, mathematics is a mandatory subject in the curriculum. It is compulsory for primary and secondary schools and it is compulsory for external examinations such as Ujian Pencapaian Sekolah Rendah (UPSR), Penilaian Menengah Rendah (PMR) and Sijil Pelajaran Malaysia (SPM). The recent 2013 SPM examination results showed improvement for all subjects except mathematics. Thus, the education ministry intended to conduct a detailed study to identify the reasons behind the weak performances in mathematics in the 2013 SPM examinations by taking into account of the role of the teachers as well as the subject content (Mustafa & Wong, 2014). This is important as mathematics serves as a foundation for the
learners who intend to pursue their studies in science, computer science, engineering, architecture, medicine and other related fields.

In addition to that, global tests revealed that our secondary schools students did not perform to the expected level. Malaysian students scored below the global average of the Programme for International Student Assessment (PISA) 2012. According to the results released by the Organisation for Economic Cooperation and Development (OECD), Malaysia scored 421 in Mathematics which is below the global average score of 494. Malaysia is still placed in the bottom third, ranking 52 out of 65 countries based on the mean score for 2012. PISA 2012 reported that Mathematics Self-Efficacy (MSE) functions as an important element that reflects students’ performance in mathematics (OECD, 2013).

Thus, MSE can be defined as an individual’s beliefs on his or her abilities in mathematics (May, 2009). MSE has been found to be a better predictor of mathematics performance than mathematics self-concept, mathematics anxiety or prior experience and it has a powerful direct effect on mathematics performance (Nuruddin, Tong, Moo, & Yap, 2008). Liu, Hsieh, Cho and Schallert (2006) found Self-Efficacy (SE) to be a statistically significant predictor of achievement in a study investigating the relationships among students’ SE, attitude towards science and achievement. Likewise, students with higher MSE persist longer on difficult mathematical problems and are more accurate in computations than those having lower MSE (Hoffman & Schraw, 2009). According to Fast, Lewis, Bryant, Bocian, Cardullo, Rettig, and Hammond (2010), one way to increase scores on standardised mathematics tests is to increase students’ SE, and teachers can positively influence MSE by creating a challenging, caring and mastery-oriented classroom environment.
In addition, self-regulated learning strategies (SRLS) are important in solving mathematical problems (Marchis & Balogh, 2010). Some of the important SRLS include SE, self-reaction, self-monitoring, self-control, self-judgment, and perception of task difficulty. Furthermore, self-regulated learners tend to take on challenging tasks, develop a deep understanding of subject matter and exert effort will promote success in school (Perry, Phillips & Hutchinson, 2006).

Moreover, many researchers have investigated the relationship between gender and MSE. It is in the area of mathematics where even more emphasis is placed on gender in SE studies, possibly because of the valued role that mathematics plays in academia, high-stakes examinations for scholarships and admissions, and the filtering of students in highly specialized and technical jobs (Pajares, 2005). Many studies have shown that perceived academic efficacy plays an influential role in students’ academic choices and their school success (Schunk & Pajares, 2005).

According to Goodwin, Ostrom, and Scott (2009), high SE could make a substantial difference for students in undergraduate mathematics. Better understanding of the relationship between gender and MSE would help teachers to be more effective in their classroom management as well as assessment. Additionally, Zimmerman and Schunk (2003, cited in Goodwin et al., 2009) suggested that teachers who consider their students’ SE beliefs, strategy use, goal setting, and other forms of SRLS in their instructional plans not only improve students’ academic knowledge, but they also enhance students’ capability for self-directed learning throughout their life span (p. 452). Thus, it is important for teachers to know the level at which a student performs in order to better understand his or her perceptions of own performances.
1.2 Statement of the Problem

There is a need to explore the relationship between MSE and MSRLS among secondary school students. This is required as the past decade; there are accumulating evidences that MSE and MSRLS are correlated (Abdullah, Abu Bakar, Roslan, Wong & Abd Rahman, 2006; Al-Harthy & Was, 2010; Bouffard-Bouchard, Parent & Larivee, 1991; Kitsantas & Zimmerman, 2009). Additionally, Spence and Usher (2007) suggested MSE to be among the most significant predictors of mathematics achievement. Similarly, MSRLS has been found to be positively correlated to achievement (Pintrich & De Groot, 1990). Therefore, this study aimed to look at the relationship between MSE and MSRLS among secondary school students and investigated the relationships in MSE and MSRLS based on gender and academic stream.

1.3 Research Objectives

The main objective of this study was to determine whether there was a relationship between MSE and MSRLS among secondary school students. Based on the statement of the problem, the following were the research objectives of the study:

- **RO1** - To determine the significant differences in MSE based on demographic variables.
  - To determine the significant differences in MSE based on gender.
  - To determine the significant differences in MSE based on academic stream.
RO2 - To determine the significant difference in MSRLS based on demographic variables.
  - To determine the significant differences in MSRLS based on gender.
  - To determine the significant differences in MSRLS based on academic stream.

RO3 - To determine the significant relationship between MSE and MSRLS.

1.4 Research Questions

The following research questions were investigated in this study based on the research objectives stated previously:

RQ1 - Were there any significant differences in MSE based on demographic variables?
  - Was there a significant difference in MSE based on gender?
  - Was there a significant difference in MSE based on academic stream?

RQ2 - Were there any significant differences in MSRLS based on demographic variables?
  - Was there a significant difference in MSRLS based on gender?
  - Was there a significant difference in MSRLS based on academic stream?

RQ3 - Was there a significant relationship between MSE and MSRLS?
1.5 Research Hypotheses

Based on the research questions, the following were the research hypotheses of the study:

\( H_{01} \) - There were no significant differences in MSE based on demographic variables.
  - There was no significant difference in MSE based on gender.
  - There was no significant difference in MSE based on academic stream.

\( H_{02} \) - There were no significant differences in MSRLS based on demographic variables.
  - There was no significant difference in MSRLS based on gender.
  - There was no significant difference in MSRLS based on academic stream.

\( H_{03} \) - There was no significant relationship between MSE and MSRLS.
1.6 Research Framework

The research framework of the research is shown in Figure 1.1.

**Independent Variables**

- Gender
  - Male
  - Female

- Students’ Academic Stream
  - Science stream
  - Art stream

**Dependent Variables**

- Mathematics Self-Efficacy (MSE)
- Mathematics Self-Regulated Learning Strategies (MSRLS)

*Figure 1.1.* Research framework guiding the study
1.7 Definitions of Terms

For the purpose of this study, the following definitions of terms were used.

1.7.1 Mathematics Self-Efficacy (MSE)

According to Clutts (2010, p. 13), MSE is defined as “a situational assessment of an individual’s confidence in her or his ability to successfully accomplish a specific mathematical task”.

For the purpose of the present study, MSE was defined as Form Four secondary school students’ judgments of their capabilities towards completing variety of tasks, ranging from concepts understanding to problem solving. Therefore, MSE in this study focused on how students believed in their abilities to meet the mathematics learning objectives.

1.7.2 Mathematics Self-Regulated Learning Strategies (MSRLS)

According to Cheng (2011), MSRLS refers to a process in which learners think, feel and act on their own initiative in order to achieve specific learning goals.

Significantly for this study, Form Four secondary school students implemented strategies by which they chose, used, monitored and adjusted learning strategies and employed the strategies in order to achieve learning goals during a mathematics lesson. The process involved: (a) learning motivation, (b) action control, (c) goal setting and; (d) learning strategies.
1.7.3 Academic Stream

According to Zittleman and Sadker (2006), academic stream is defined as separation of students based on their abilities into classes within a school. Thus, students are assigned to classes based on their overall achievement.

In this study, academic stream consisted of Form Four secondary school students from both Science stream and Art stream, in which students who scored above a certain cut-off points in PMR exams were assigned into the Science stream and those who scored below the cut-off points were assigned into the Art stream.

1.8 Significance of the Study

Research investigating MSE and MSRLS of secondary school students is still lacking in Malaysia. Therefore, the findings of this study would provide an insight on the relationship between MSE and MSRLS of secondary school students. In addition, this study determined whether gender and academic stream influenced MSE and MSRLS.

Besides, this study also suggested guidelines to improve students’ mathematics performance by looking at students’ MSE and MSRLS. The data collected from this research could be used by the Ministry of Education in preparing guidelines to promote and create policies that can improve mathematics achievement among learners.
Moreover, this study would also help to create awareness among mathematics teachers by tailoring their teaching to enhance MSE and MSRLS among the students. They could make use of the findings of this study to determine students’ level of MSE and MSRLS. This would ensure that the Malaysia education system would keep pace with Shanghai, Singapore and Hong Kong which were ranked in the top three highest for mathematics in the global test, PISA 2012.

The findings of the study could also be used as references for future researchers who would like to conduct further investigations on the relationship between MSE and MSRLS among secondary school students. It would provide a basis for understanding of how MSE is related with MSRLS.

1.9 Limitations of the Study

The respondents in this study were Form Four secondary schools students and considering the fact that these students were from only four selected classes (two science classes and two art classes), the result of the study might not be representative of the entire population of Form Four secondary schools students in the country.

Besides that, the research was conducted in only two schools involving Lundu Secondary School and Sematan Secondary School at Lundu district. As the two schools were from the same division, Lundu, they could have similar learning culture and environment. Thus, the result of the study might not accurately reflect the existing conditions of all schools in Malaysia.
Furthermore, the demographic variables of this study were also limited to gender and academic stream which could influence MSE and MSRLS. Other factors such as past learning experiences, academic background and ethnic groups which might bring impact on secondary school students’ MSE and MSRLS were not considered in this study. Also, there were limitations in the ratio of male respondents to female respondents in this study. There were more female respondents (128) compared to male respondents (83) for this study. The bias in genders might have influenced on the findings.

In addition, this study only used questionnaires to collect the required data. Other sources of data such as observations, interviews and documents analyses which were excluded in this study might be able to provide additional data that could give better understanding of the problems investigated in the study.

1.10 Summary

This chapter discussed the background of the study, problem statement of the study, research objectives, research questions, research hypotheses and research framework of the study. It concluded with the significance and limitations of the study and defined the conceptual and operational definitions of important terms used in the study. The next chapter discusses the literature review and past research relevant to the study.