THE RELATIONSHIP BETWEEN MATHEMATICS
SELF-EFFICACY AND MATHEMATICS ACHIEVEMENT OF
MATHAYOMSUKSA STUDENTS IN THE ENGLISH PROGRAM OF
ST. JOSEPH BANGNA SCHOOL

Emil D. PEREZ

A Thesis Submitted in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF EDUCATION
in Curriculum and Instruction
Graduate School of Education
ASSUMPTION UNIVERSITY OF THAILAND
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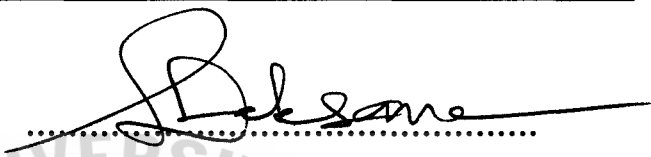**ASSUMPTION UNIVERSITY OF THAILAND**
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Thesis Title: THE RELATIONSHIP BETWEEN MATHEMATICS SELF-EFFICACY AND MATHEMATICS ACHIEVEMENT OF MATHAYOMSUKSA STUDENTS IN THE ENGLISH PROGRAM OF ST. JOSEPH BANGNA SCHOOL

By: EMIL D. PEREZ

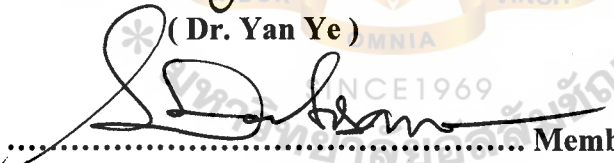**Field of Study:** CURRICULUM AND INSTRUCTION

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ABSTRACT

The purpose of this study was to determine the levels of mathematics self-efficacy and mathematics achievement of mathayomsuksa students in the English program of St. Joseph Bangna School and the relationship between the two.

The study focused on 198 mathayomsuksa 1 to 3 students of the English program enrolled in the academic year 2012-2013. The students sample answered mathematics self-efficacy questionnaires to rate their confidence in being able to solve math problems that they had already learned. The students' test scores in mathematics in the final examination were the basis of mathematics achievement in this study.

The researcher had the hypothesis that there exists a significant relationship between mathematics self-efficacy and mathematics achievement of mathayomsuksa students in the English program. Frequency, mean, standard deviation and Pearson Product Moment Correlation were used to analyze the data.

The study's findings were: 1) The levels of mathematics achievement of mathayomsuksa students based on the mathematics final test results were relatively high (excellent); 2) The levels of mathematics self-efficacy of mathayomsuksa

students were high (complete confidence); and 3) There was a significant and positive relationship between mathematics self-efficacy and mathematics achievement of mathayomsuksa students, meaning students with higher self-efficacy had higher scores in mathematics achievement test. These results are consistent with previous researches showing a significant relationship between students' self-efficacy and achievement.

Field of Study: Curriculum and Instruction   **Student's signature**...........................

Graduate School of Education   **Advisor's signature** ....

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CHAPTER I

INTRODUCTION

This chapter presents important sections such as Background of the Study, Statement of the Problem, Research Questions, Objectives Hypothesis, Theoretical and Conceptual Framework, Scope and Limitation of the Study, Definitions of Terms and Significance of the Study.

Background of the Study

Students' ability to learn mathematics has been the concern of researchers for many years. Research field concerning student success in mathematics has been dominated by previous mathematics achievement. There has been also a great deal of discussions about students and their self-efficacy concerning mathematics.

Self-efficacy is an important concept in social cognitive theory, which has been widely recognized as one of the most prominent theories about human learning (Ormrod, 2008). First developed by Albert Bandura (1977; 1986), self-efficacy refers to learners' beliefs about their ability to accomplish certain tasks. Many researchers, including Bandura, have demonstrated that self-efficacy affects human motivation, persistence, efforts, action, behavior, and achievement (Bandura, 1977; Zimmerman, 2000).

Although numerous studies have been conducted on the relationship between attitude toward mathematics and mathematics achievement, comparatively there was a deficiency of research in examining the relationship between mathematics self-efficacy and mathematics achievement. (Liu & Koirala, 2009). Also, self-efficacy particularly regarding mathematics has been found to be related to mathematics achievement in western settings (Hackett & Betz, 1983; Pajares &

Graham 1999; Pajares & Schunk 2001; Zimmerman, 2000), however, very less is known how self-efficacy operates in non-western population, particularly in Asian samples.

Pajares and Miller (1994) noted that the years in middle school (mathayomsuksa 1 to 3) are particularly significant for girls because during this time self-perceptions of ability emerge and girls in middle school are thought to show less interest in math and report higher levels of anxiety.

However, there are some studies that showed that girls from single-gender schools performed better than girls from co-educational schools. According to Tully and Jacobs (2008), women from single-gender secondary schools displayed the high self- perception of mathematics ability. But they also found out in their same research study that many students failed mathematics due to low self-efficacy.

Mathematics is also a big concern of Thai educators considering that based on Organization for Economic Co-operation and Development - Programme for International Student Assessment (OECD – PISA) 2009 results, Thailand ranked 48th among the 65 countries assessed in the domain of mathematics. The mean score of 419 of Thailand was statistically significant below the OECD average (OECD, 2010).

For above reasons, the researcher suggested to study single-gender schools, particularly all-girl schools, to see if single-gender environments foster math efficacy levels among female students and if these environments affect attitudes about math. So, this study investigated the mathematics self-efficacy and mathematics achievement of female students in a single-gender school in Thailand.

Statement of the Problem

St. Joseph Bangna School, is an all-girls private school which offers two programs: English program and Thai program.

The researcher, being the head of the Mathematics Department in the English Program of St. Joseph Bangna School, is responsible to ensure that the highest possible standards of teaching and learning are achieved by monitoring students' competence and confidence in the subject.

In the course of performing his job, the researcher found out that mathayomsuksa 1 to 3 students in the English program of St. Joseph Bangna School were having difficulties in mathematics in previous semesters. The subject had been one of the areas with the highest rates of failure in previous periodical examinations. This group of students had shown high percentage of failures particularly in the midterm examinations with 23.68%, 26.31% and 25.25% in the last three semesters. The following figures show the midterm and final test results of mathayomsuksa 1 to 6 in the English program of St. Joseph Bangna School in the last three semesters.

Table 1: Test Results of Mathayomsuksa 1- 6 Students in the English Program of SJBS

		Mathayomsuksa 1-3		Mathayomsuksa 4-6	
School Year		**Passed**	**Failed**	**Passed**	**Failed**
2011 -2012		**%**	**%**	**%**	**%**
1st Semester	Midterm	76.32	23.68	94.87	5.13
	Final	88.95	11.05	96.15	3.85
2nd Semester	Midterm	73.69	26.31	93.59	6.41
	Final	89.48	10.52	97.44	2.56
2012-2013					
1st Semester	Midterm	74.75	25.25	92.86	7.14
	Final	92.42	7.58	98.57	1.43

Due to the above reasons, the researcher was inspired to conduct a study to determine the levels of math self efficacy and mathematics achievement of the mathayomsuksa 1 to 3 students in the English program, and the relationship between the mathematics self efficacy and mathematics achievement.

Research Questions

The researcher arrived at the following research questions:

1. What are the levels of the mathematics achievement of mathayomsuksa students in the English program?

2. What are the levels of mathematics self-efficacy of mathayomsuksa students in the English program?

3. Is there a relationship between mathematics self efficacy and mathematics achievement of mathayomsuksa students in the English program?

Research Objectives

With regard to the purposes of this study, the researcher considered the following objectives.

1. To determine the levels of mathematics achievement of mathayomsuksa students in the English program.

2. To determine the levels of mathematics self-efficacy of mathayomsuksa students in the English program.

3. To determine the relationship between mathematics self-efficacy and mathematics achievement of mathayomsuksa students in the English program.

Research Hypothesis

There is a significant relationship between mathematics self efficacy and mathematics achievement of the mathayomsuksa students in the English program.

Theoretical Framework

This study was conducted based upon the following supporting theories:

Social Cognitive Theory considers that human functioning is molded by the reciprocal interaction of behavior; personal factors, including cognition; and environmental events (Bandura, 1997). This model is what Bandura calls the Triadic Reciprocal Determinism.

Self efficacy is a major construct of the social cognitive theory. It is defined as the person's beliefs in his capabilities to organize and execute the courses of action required to produce the desired result. This concept was also introduced by Albert Bandura. He theorized that there are four sources of self-efficacy. These are mastery experiences, vicarious experiences, social persuasions, and physiological and affective factors (Bandura, 1997).

Expectancy Theory is a model of behavioral choice, that is, as an explanation of why a particular person chooses one behavioral option over others. Also, an individual's belief that his effort will result to desired performance goals is generally based on his past experience, self efficacy, and the perceived difficulty of the performance standard or goal (Redmond, 2010).

The Attribution Theory suggests that a person often like to identify probable reasons for the things he or she experiences. Theorists Weisz and Cameron propose one's attribution to factors one can control involves a belief that one can affect and change one's circumstances (Omrod, 2008).

Conceptual Framework

Mathayomsuksa 1-3 students in the English program of St. Joseph Bangna School were considered in this study. Student participants were given a questionnaire to determine their level of mathematics self-efficacy. Their final examination scores in mathematics in the second semester of the school year 2012-2013 were the basis of mathematics achievement in this study.
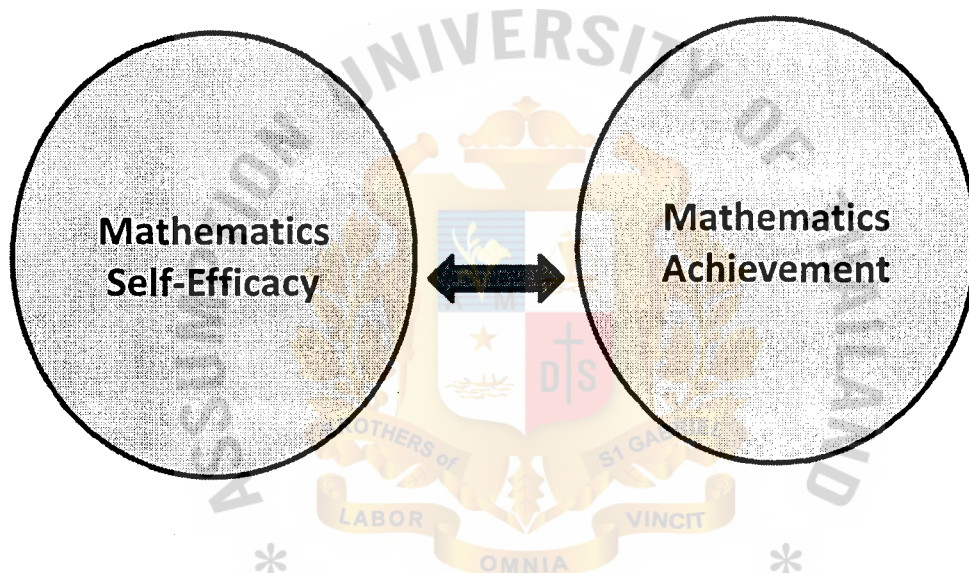
Figure 1: Conceptual Framework of this Study

Scope and Limitation of the Study

This study focused only on mathayomsuksa 1 to 3 students of St. Joseph Bangna School in the English program during the second semester of the academic year 2012-2013.

This study was limited to the respondents from mathayomsuksa 1 to 3 at St. Joseph Bangna School so the consequential findings cannot be generalized to other respondents. Another limitation was that the subjects of this study are only

those of high socio-economic status due to the nature of private schools. This research was also conducted within a specific period of time and therefore its findings might not be generalized for all times.

The students' score in mathematics in the final examination of the second semester of school year 2012-2013 was used as the basis of mathematics achievement so there might be some factors that had affected the score such as physiological factors.

Definitions of Terms

Mathematics Self Efficacy is the individual's judgement of one's capabilities to solve specific mathematics problems in the Mathematics Self-efficacy Questionnaire (MSEQ). On this study, MSEQ is a ten- point Likert type scale which was used to rate students' perception in being able to solve math problems that they have had previous experience with. Students were instructed to look at each item and rate their confidence in solving each problem.

Mathematics Achievement is the measure of proficiency, mastery and understanding of mathematics sequence and skills of the students on items in their mathematics final tests. So, in this study, mathematics achievement was basically based on the students' score in mathematics in the final examination of the second semester of the school year 2012-2013. The total score for all levels was 30 points and the questions were combinations of objective (multiple choice, identification and fill-in the blanks) and subjective types (problem solving). The students were given ninety (90) minutes to do the final test.

Mathayomsuksa 1 to 3 refers to grade seven to nine in high school.

St. Joseph Bangna School (SJBS) is an all-girl private school run by St. Paul de Chartres.

English Program (EP) is one of the school programs offered at St. Joseph Bangna School with all subjects being taught in English and by foreign teachers, except for Thai subject.

Significance of the Study

To the researcher's knowledge, no such research at SJBS yet.

This study may help mathematics teachers to design effective learning activities to improve the math self efficacy of the students, especially in single-gender schools.

This study may help math teachers and academic researchers understand the relationship of mathematics self efficacy and mathematics achievement.

This study may help students to improve their level of math achievement by improving their math self efficacy.

CHAPTER II

REVIEW OF LITERATURE

This chapter presents a review of the theory and research literature which served as the theoretical foundation of this study which aimed to investigate the relationship between self-efficacy and mathematics achievement of mathayomsuksa 1 to 3 students of St. Joseph Bangna School. Thus, this chapter provided background information of **St. Joseph Bangna School, Self-Efficacy, Theories that Incorporate Self-Efficacy, Self-Efficacy in Single-Gender Schools. Factors Affecting Mathematics Achievement** and **Mathematics Self-Efficacy and Mathematics Achievement**

St. Joseph Bangna School

St. Joseph Bangna School is one of the private schools in Thailand owned and run by the sisters of St. Paul de Chartres. It is an all-girl school that exists for the main purpose of serving the nation by providing scientific and humanistic knowledge to prepare the students for the future as professionally skilled individuals and responsible citizens of the world.

The school offers two programs, the English program and the Thai program, from prathomsuksa 1 (grade 1) to mathayomsuksa 6 (grade 12). In the school year 2012-2013, there were 45 classes in prathomsuksa 1 to 6 in which 25 classes were in Thai program and 20 classes were in English program. For mathayomsuksa 1 to 6, there were 41 classes in which 29 classes were in Thai program and 12 classes were in English program. The average number of students per class in the Thai program is 40 and the average number of students per class in the English program is 24. The number of students enrolled in the second semester of

the school year 2012-2013 was 2,139 in Thai program and 799 in English program for the total population of 2,938 students.

Self-efficacy

Self-efficacy is an important concept in social cognitive theory, which has been widely recognized as one of the most prominent theories about human learning according to Omrod (2008). Self-efficacy refers to the person's beliefs in his capabilities to organize and execute the required courses of action to handle prospective situations (Bandura,1997). Bandura asserted that these person's beliefs influence action, effort, perseverance, resilience to adversity, and realization of goals. Therefore, the person's beliefs associated with individual capability often determine outcomes before any action occurs.

In an academic context, self-efficacy reflects how confident students are in performing specific tasks. However, high self-efficacy in one area may not coincide with high self-efficacy in another area. Self-efficacy is specific to the task being undertaken. For example, high self-efficacy in mathematics does not necessarily accompany high self efficacy in English subject. Having high self-efficacy does not also necessary mean that students believe they will be successful. While self-efficacy indicates how students strongly believe they have the skills to do well, they may also believe other factors will keep them from succeeding (Siegle, 2000).

According to Bandura (1997), individual's beliefs about his efficacy can be developed by four main sources of influence. These are mastery experiences (performance accomplishments), vicarious experiences, social persuasions and physiological factors.

Mastery Experiences - Both positive and negative experiences can influence the ability of a person to perform a given task. If one has performed well at a given task previously, he is more likely to feel competent and perform well at a similarly associated task (Bandura, 1977). For example, if a student did well in a previous math test, he is more likely to feel confident and have high self-efficacy in the next math test. But the opposite is also true. If a student experiences a failure, his self-efficacy is likely to be reduced. However, if this failure is later overcome, it can serve to increase self-motivated persistence when the situation is considered as an achievable challenge (Bandura, 1977).

Vicarious Experiences - Bandura (1997) has claimed that social comparisons are fundamental features of vicarious experience and greatly affect the choice and proficiency of models. From these models, strategies are learned that help increase efficacy. A person can watch another perform and then compare their competence with the other's competence. If a person sees someone similar to them succeed, it can increase their self-efficacy. However, the opposite is also true; seeing someone similar fail can lower self-efficacy (Bandura, 1997).

Social Persuasions - According to Redmond (2010), self-efficacy is also influenced by encouragement and discouragement from other persons. Using verbal persuasion in a positive way, such as "You can do it!" leads individual's to exert more effort for a greater chance of success. However, if the verbal persuasion is negative, such remark as "This is unacceptable! You're not good!" can lead to doubts about one self resulting in lower chances of success.

Physiological Factors - Bandura (1977) also stated that individuals also experience physiological feelings and how they perceive these emotional arousals influences their beliefs of efficacy. Some individuals may experience anxiety and

agitation when they make a presentation or taking test, thus making them uncomfortable and have lower beliefs of self-efficacy. Thus, it is important to note that if one is more at ease with the task at hand they will feel more capable and have higher beliefs of self-efficacy.

Although all four sources of self-efficacy information play important roles in the creation of efficacy beliefs, it is the interpretation of this information that is critical. Cognitive processing determines how these sources of self-efficacy will be weighed and how they will influence the analysis of the task and the assessment of personal competence (Bandura, 1997).

Schunk (1996) stated that the choices we make, the effort we put forth, and how long we persist are influenced by self-efficacy. Self-efficacy beliefs also determine how people feel, think, motivate themselves and behave. These beliefs produce diverse effects through four major psychological processes. These are cognitive process, motivational process, affective process and selection process.

Cognitive Process - Most courses of action are initially organized in thought. Individuals' beliefs in their efficacy influence the types of anticipatory scenarios they construct and rehearse. Those who have a high sense of efficacy, visualize success scenarios that provide positive guides for performance. Those who doubt their efficacy visualize failure scenarios and dwell on the many things that can go wrong.

Motivational Process - According to Bandura (1994), self-efficacy beliefs play an important part in the self-regulation of motivation. Most human motivation is cognitively generated. People motivate themselves and form beliefs about what they can do. They set goals for themselves and plan courses of action designed to realize valued futures.

Affective Process - Perceived coping self-efficacy regulates avoidance behavior as well as anxiety arousal. The stronger the sense of self-efficacy, the bolder people are in taking on taxing and threatening activities (Bandura, 1994). For example, individuals who believe they can exercise control over threats do not have any disturbing or negative thoughts. But those who believe they cannot manage threats experience high anxiety arousal and they dwell more on their coping deficiencies.

Selection Process - Bandura (1994) also stated that self-efficacy beliefs can shape the course of life paths of individuals through choice-related processes. People avoid activities and situations they believe beyond their personal capabilities, but they readily undertake challenging activities and select situations they see themselves capable of handling. By the choices they make, people develop different competencies, interests and social connections that determine life courses.

Theories that Incorporate Self-Efficacy

Social Cognitive Theory

The social cognitive theory of Bandura explains how people acquire and maintain certain behavioral patterns while also providing the basis for intervention strategies. The theory considers that human functioning is molded by the reciprocal interaction of behavior; personal factors, including cognition; and environmental events. This model is popularly known as the Triadic Reciprocal Determinism **(Figure 2)**.
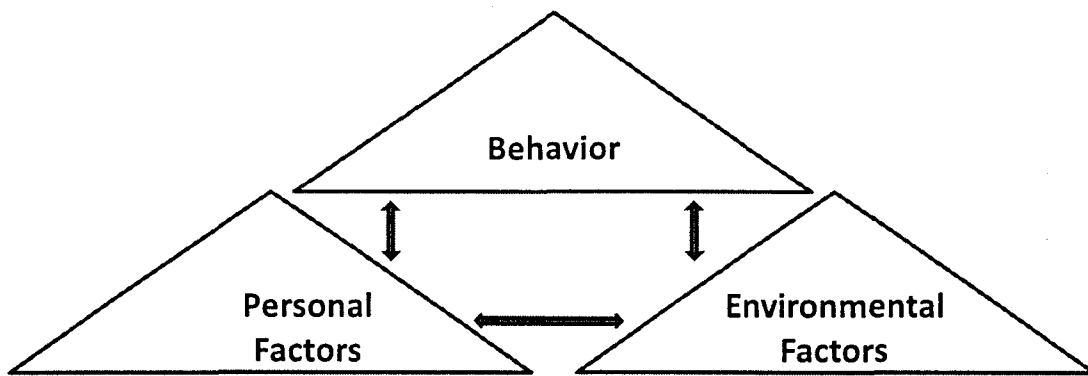
- Figure 2: Triadic Reciprocal Determinism

Source: *Self-Efficacy* (Bandura, 1994).

Bandura, however, does not suggest that the three factors in the Triadic Reciprocal Determinism model make equal contributions to behavior. The relative influence of behavior, environment, and person depends on which factor is strongest at any particular moment (Redmond & Moser, 2011).

The social cognitive theory is composed of four processes of goal realization which are interrelated and each has an effect on motivation and goal attainment (Redmond & Moser, 2011). These are self-observation, self-evaluation, self-reaction and self-efficacy as illustrated below (**Figure 3**).
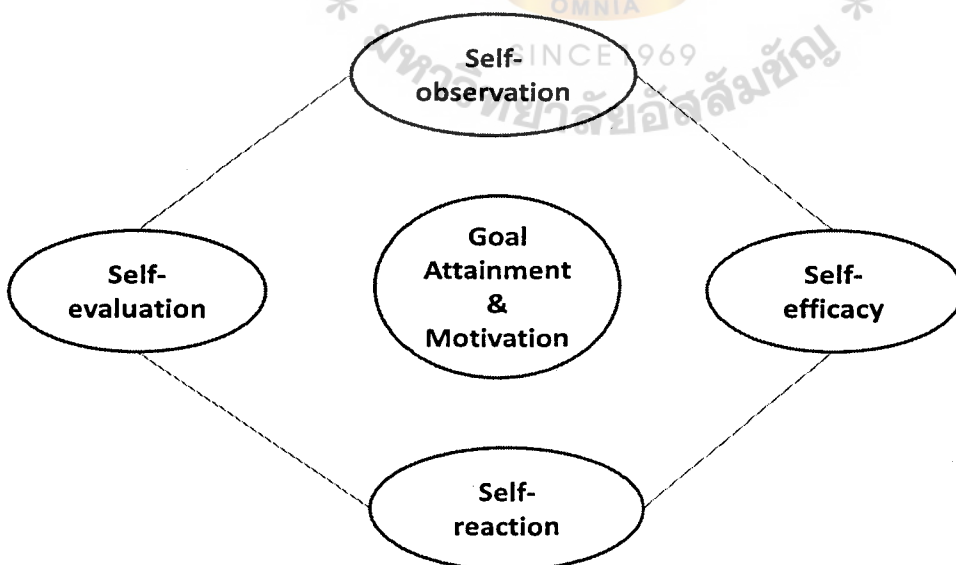
Figure 3: Process of Goal Realization

Source: *Self-Efficay and Social Cognitive Theory*, (Redmond & Moser, 2011)

Self-observation can be used to assess individual's progress toward attainment of goal as well as motivate behavioral changes. Regularity and proximity are the two important factors with regards to self-observation. Regularity means that the behavior should be continually observed and proximity means that the behavior should be observed while it occurs, or shortly after. However, self-observation alone is not sufficient because motivation depends on one's expectations of outcomes and efficacy (Redmond & Moser, 2011).

Self-evaluation compares an individual's current performance with a desired performance or specific goal. Redmond & Moser (2011) stated that specific goals specify the amount of effort required for success and boost self-efficacy because progress or accomplishment can be easily measured. They also suggested that a person with little regard for his goal will not evaluate performance. There are two types of self-evaluation standards: absolute and normative. A grading scale would be an example of a fixed or absolute standard while a social comparison such as evaluating one's behavior or performance against other individuals is an example of a normative standard (Redmond & Moser, 2011).

Self-reaction to individual's own performance can also be motivating. If progress is considered acceptable, then one will have a feeling of self-efficacy to continue the task and will be motivated towards the achievement of their goal. A negative self-evaluation may also be motivating in a way that one may strive harder provided that they consider the goal as valuable. Bandura (1989) stated that self-reaction also allows a person to re-evaluate their goals in conjunction with their attainments.

Self-efficacy beliefs influence the choices people make and the courses of action they pursue. People tend to engage in tasks about which they feel

competent and confident and avoid those in which they do not. Efficacy beliefs also influence the amount of stress and anxiety individuals experience as they engage in an activity (Pajares & Miller, 1994). As a consequence, self-efficacy beliefs exercise a powerful influence on the level of accomplishment that individuals ultimately realize.

Expentancy Theory (VIE Theory)

This theory by Victor Broom, also known as the VIE (expectancy, instrumentality, and valence) theory, is based on the beliefs that an individual's effort will lead to performance, which in turn, will lead to a specific outcome. In this theory, motivation is regulated by the expectation that a given course of behavior will produce certain outcomes and the value of those outcomes. Individuals act on their beliefs about what they can do, as well as on their beliefs about the likely outcomes of performance. The motivating influence of outcome expectancies is thus partly governed by self-beliefs of efficacy. There are many alternatives individuals do not pursue because they perceived they lack the capabilities for them. The predictiveness of expectancy-value theory is enhanced by including the influence of perceived self- efficacy. According to Bandura (1997), individuals take action when they hold efficacy beliefs and outcome expectations that make the effort seem worthwhile. They expect given actions to produce desired outcomes and believe that they can perform those actions.

People with high self-efficacy are more likely to respond with renewed effort (expectancy) when feedback shows that they are not reaching their goals by developing more successful strategies (Redmond & Moser, 2011). However,

individuals with low self-efficacy, given the same circumstances, may perform poorly because their low self-efficacy impairs their motivation and effort.

Attribution Theory

Attribution theory of Bernard Weiner is said to be the most influential contemporary theory with implications for academic motivation. It incorporates behavior modification in the sense that it emphasizes the idea that learners are strongly motivated by the pleasant outcome of being able to feel good about themselves. It incorporates cognitive theory and self-efficacy theory in the sense that it emphasizes that learners' current self-perceptions will strongly influence the ways in which they will interpret the success or failure of their current efforts and hence their future tendency to perform these same behaviors (Learning Theories Knowledgebase, 2011).

Causal attributions affect motivation, performance and affective reactions mainly through beliefs of self-efficacy (Bandura, 1994). Individuals who perceived themselves as highly efficacious attribute their failures to insufficient effort, those who perceived themselves as inefficacious attribute their failures to low ability.

Self-Efficacy in Single-Gender Schools

Some researchers and educational practitioners have suggested several reasons that single-gender schools may provide better environments for female students with regard to both teacher-student and peer-group interactions, which may encourage them to pursue their educational careers in STEM (Science, Technology, Engineering and Math) as well as improve female students' overall educational outcomes (Whitlock, 2006). Single-gender schools may reduce influences of

adolescent subcultures that tend to distract students' attention from academic learning and instead place emphasis on physical characteristics, social status and interpersonal relationships. Previous studies made showed that students in coeducational schools were more concerned about appearance and popularity and that girls do not want to seem "too smart" because they do not want to lose their appeal to boys. Therefore, by reducing the influences of adolescent culture, single-gender schools may help students concentrate on academic learning.

Single-gender school classrooms were rated higher in student involvement in the class, higher in affiliation among students than coed school classrooms, and higher in order and organization and teacher control. Students from single-gender schools are more academically oriented whereas students from coed schools are more socially oriented. Also, achievement levels in single-gender schools typically show that academic achievement is substantially higher than in coed schools (Whitlock, 2006).

Park, Berhman & Choi (2011) stated that all-girl high schools enhance female education because of the absence of social interactions with boys that divert attention from academic activities and because of the absence of competition from boys for teachers' attention. Also, female students in single-gender schools spend significantly more time on homework than those from coed schools.

Another positive finding on single-gender schools, especially for girls, is related to classroom dynamics that affect students' self-concept, self-efficacy and confidence in academic learning (UNESCO, 2007). Rodriguez (2003) found in her study, that girls in a single-gender classroom had the sense of ownership of their class, while girls did not feel the sense of ownership in coeducational classrooms because they perceived the dominance of boys. Also, girls in a single-gender

classroom reported that they were not afraid of asking and answering questions because they were no longer concerned about reactions from boys as in usual coeducational classrooms. Along with the sense of ownership of class, female students reported improved confidence in their academic abilities as a consequence of attending the single-gender classroom (Rodriguez, 2003).

In 1989, Jimenez and Lockheed assessed the performance of eight graders on standardized math tests from both single-gender and co-educational schools in Thailand to find gauge the relative effectiveness of single-gender education versus coeducation on student attitudinal and cognitive outcomes. They found out that girls in girl-only schools scored higher in mathematics as compared to girls from coed school. Based on the same research, the result of the study implied that an average single-gender school eighth-grade Thai girl chosen at random would improve her achievement by attending a single-gender school. These results play a vital role in supporting single-gender education for girls in terms of math achievement (UNESCO, 2007).

Also, Whitlock (2006) suggested that girls do better in certain subject areas such as mathematics and science when boys are not in the class.

Factors Affecting Mathematics Achievement

For the last three decades, mathematics educators and researchers have focused on factors affecting students' mathematics achievement (Savas, et.al., 2010). Different reasons have been given by researchers for the performance of the students in mathematics. Savas,Tas and Duru (2010) found that four factors such as student background, self regulated cognitions in mathematics, learning strategies and school climate have significant effects on the achievement.

However, Saritas and Akdemir (2009) identified three factors or predictors in math achievement: demographic, instructional and individual factors. Demographic factors that are known to be related to mathematics achievement are gender, socio-economic status and parents' educational level. Instructional factors are math curriculum, teachers' instructional strategies, teachers' competency in math education, school context and facilities. Individual factors include self-directed learning, arithmetic ability, motivation or concentration, self-efficacy and attitude towards mathematics.

Mathematics Self-Efficacy and Mathematics Achievement

Many psychologists, over the years, had become aware of the fact that an individual's self-efficacy or his attitude to and perception of himself relates closely to how he learns and behaves. For this same reason that caused Edstrom (1996) to assume that many students have difficulty in school not as a result of low intelligence or physical impairment, but because they have perceived themselves as unable to do academic work.

Students' self-efficacy for mathematics may be defined as their judgements about their potential to learn the subject successfully. Those students with higher levels of self-efficacy generally set higher goals, apply more effort, persevere longer in difficult situations and are more likely to use self-regulated learning strategies (Pajares & Schunk, 2001).

Expectations about doing well in mathematics are closely related to one's beliefs about personal capabilities for successfully performing specific tasks. For this reason, it is said to be important for mathematic educators to know the how their

learners feel, think, and act, about, within, and toward mathematics (Tait-McCutcheon, 2008).

Bandura (1977) believed that the development of life-long learners of mathematics depended on the interaction of three linked psychological domains of functioning: the affective, the cognitive, and the conative. One way to gain insight into how their learners feel, think, and act, about and toward mathematics is to examine these three psychological domains of functioning (Pajares & Schunk, 2001).

The affective domain includes learners' beliefs about themselves and their capacity to learn mathematics; their self esteem and their perceived status as learners; their beliefs about the nature of mathematical understanding; and their potential to succeed in the subject. The cognitive domain includes learners' awareness of their mathematical knowledge: their strengths and weaknesses; and their development of links between aspects of the subject. The conative domain includes learners' intentions and dispositions to learn, and their approach to monitoring their own learning and to self-assessment. It is important to examine each domain as a student may feel efficacious within the affective domain but less confident within the cognitive domain (Pajares & Schunk, 2001).

Many research studies have revealed that there is a positive and significant relationship between students' self-efficacy beliefs and their mathematics achievement. Students with low self-efficacy toward a task are more likely to avoid it, while those with high self-efficacy are not only more likely to attempt the task, but they also will exert more effort and persist longer in the face of difficulties. Self-efficacy beliefs of the students influence what activities they select, how much effort they exert, how persistent they are in the face of difficulties, and the difficulty of the goals they set. Students with low self-efficacy do not expect to do well, and they

often do not achieve at a level that is commensurate with their abilities. They do not believe they have the skills to do well so they don't try (Pajares & Schunk, 2001).

It was further found that mathematics self-efficacy is a good predictor of mathematics performance irrespective of the indicators of performance and regardless of any other variables. Pajares & Miller (1994) stated in their report that mathematics self-efficacy is a better predictor of mathematics performance than mathematics anxiety, previous involvement in mathematics, mathematics self-concept and prior mathematics performance. They even noted that self-efficacy beliefs were even found to be a stronger predictor of performance than general mental ability. Research findings also support the observation that students with high mathematics achievement have higher and more accurate efficacy beliefs (Pajares & Miller, 1994).

Pajares and Schunk (2001) asserted that the connection between self-efficacy and achievement gets stronger as students advance through school. By the time students are in college, their self-efficacy beliefs are more strongly related to their achievement than any measure of their ability. For the teachers to develop high educational achievement among their students, it is essential that they begin building stronger self-efficacy as early as possible.

Summary

Students' ability to learn mathematics has been noted in the literature to be of great concern of many researchers for many years. Most of these researchers have determined that previous mathematics performance and perceived self-efficacy are both key elements for success in mathematics.

Research findings in the literature review generally support those female students in single-sex schools are more academically oriented and perform better in the class as compared to those in coeducational schools.

An insight into the self-efficacy of the learners is a valuable tool for mathematics educators. It is important for educators to know how their learners feel, think, and act, about, within, and toward mathematics. It is also important to note that the acquisition of cognitive skills, modeling effects, attributional feedback, and goal setting influence the development of self-efficacy beliefs and that these beliefs will influence academic performances.

CHAPTER III

RESEARCH METHODOLOGY

This chapter presents the structure on how the researcher carried out the research study in terms of design, population and sample, instruments to be used, data collection and data analysis.

Research Design

The research was a quantitative statistics that include both descriptive and correlation studies.

Descriptive study was used in determining the levels of mathematics self-efficacy and mathematics achievement of mathayomsuksa 1 to 3 students. Correlation study was used in determining the relationship between the mathematics achievement and mathematics self-efficacy of mathayomsuksa 1 to 3 students.

Population and Sample

This was a study of mathayomsuksa students in the English program of St. Joseph Bangna School. The population was one hundred and ninety-eight (198) students from mathayomsuksa 1 to 3 in the second semester of the school year 2012-2013.

The researcher chose this group of students because he found out that most of these students are having difficulties in mathematics particularly in the last three semesters. The sample students have the record of having the highest rates of failure particularly in mathematics midterm examination in the previous semesters.

All students in mathayomsuksa 1-3 in the English program were used as the subjects of this study, in other words, the population and sample were the same, as the following table shows.

Table 2: Population and Sample of Mathayomsuksa 1- 3 Students in the English Program of St. Joseph Bangna School

Level	Number of Classes	Number of Students
Mathayomsuksa 1	3	77
Mathayomsuksa 2	2	57
Mathayomsuksa 3	3	64
Total	8	198

Research Instruments

The sample students responded to the Mathematics Self-efficacy Questionnaire (**Appendix A**). This questionnaire was patterned after the Mathematics Self-efficacy Scale which was used by Ana Rodriguez in 2003 to middle school students. This was a 20-item questionnaire wherein the students were asked to rate their confidence in being able to solve math problems that they have already learned, such as decimals, square roots, algebraic equations, angles, percentage and fractions. Students looked at each math problem and rated their confidence in solving each item. They did not have to solve the problem nor give an answer. A ten- point Likert type scale was used with zero being no confidence at all to nine being complete confidence. A high total score indicated strong math self-efficacy (Rodriguez, 2003).

In determining the level of mathematics self-efficacy of the mathayomsuksa students, the following standard was used (**Table 3**).

Table 3: Standard for the Levels of Mathematics Self-efficacy of Mathayomsuksa Students in the English Program of SJBS

MSE Scores	Description	Level of MSE
0 to 60	Little or No Confidence	Low
61 to 120	Some Confidence	Moderate
121 to 180	Complete Confidence	High

The test scores in mathematics of the sample students in the final examination in the second semester of the school year 2012-2013 were the basis of the mathematics achievement in this study. Final examination questions include the topics of measurement, number operations, statistics and probability for mathayomsuksa 1, measurement, algebra and statistics for mathayomsuksa 2, and measurement, geometry, trigonometry, statistics and probability for mathayomsuksa 3. Questions for all three levels were objective (multiple choice, identifications and fill-in the blanks) and subjective types (problem solving). The total score for each level was 30 points and the students were given ninety (90) minutes to do the test.

In determining the level of mathematics achievement of the mathayomsuksa students, the following standard was used (**Table 4**).

Table 4: Standard for the Levels of Mathematics Achievement of Mathayomsuksa Students in the English Program of SJBS

Math Test Scores (X)	Description	Level of Mathematics Achievement
$X \le 7.5$	Very Poor (Failed)	Very Low
$7.5 < X \le 15$	Poor (Failed)	Low
$15 < X \le 22.5$	Good (Passed)	Moderate
$22.5 < X \le 30$	Excellent(Passed)	High

Validity and Reliability of the Instrument

The researcher requested the help of three experts to review the questionnaire for its content validity and reliability.

1. Head of the English Program of St. Joseph Bangna School with a Ph.D. in Educational Administration.

2. Head of Mathematics Department of the Thai Program of St. Joseph Bangna School with a Master's Degree in Education (Mathematics).

3. Mathayomsuksa Teacher at St. Joseph Bangna School with a Master's Degree in Education (Mathematics).

The three experts confirmed that the questionnaire in this study was appropriate to mathayomsuksa 1 to 3 students (**Appendix B**).

The reliability of the instrument was calculated by using Cronbach's Alpha. The data gathered from the 198 students were used in determining the realibility of the 20-item instrument which resulted to Cronbach's Alpha value of 0.863.

Collection of Data

The researcher asked the permission of the school administrator of St. Joseph Bangna School for this research study to be done in their school (**Appendix C**).

On the 22th of February 2013, Mathematics Self Efficacy Questionnaire was administered to sample students through the assistance of the homeroom class teachers.

On the 6th of March 2013, the final examination scores in mathematics of the sample students were collected from the mathematics teachers.

Data Analysis

The following statistical methods were used to realize the research objectives:

Objective 1: *To determine the levels of mathematics achievement of mathayomsuksa students in the English program.*

Frequency, mean and standard deviation were used to determine the level of mathematics achievement of the students.

Objective 2: *To determine the levels of mathematics self-efficacy of mathayomsuksa students in the English program.*

Frequency, mean and standard deviation were used to determine the levels of mathematics self-efficacy of the students.

4. Objective 3: *To determine the relationship between mathematics self-efficacy and mathematics achievement of mathayomsuksa students in the English program.*

Pearson Product Moment Correlation was used to determine the relationship between the mathematics self-efficacy and mathematics achievement.

Table 5: Summary of the Research Process

Research Objective (R.O.)	Source of Data or Sample	Data Collection Method or Research Instrument	Data Analysis
1.1. To determine the levels of mathematics achievement of mathayomsuksa students in the English program.		Scores in mathematics Final Exam of the second semester of 2012-2013	Frequency, Mean and Standard Deviation
2. To determine the levels of mathematics self-efficacy of mathayomsuksa students in the English program.	Mathayomsuksa 1 to 3 students in the English program of SJBS (198/198)	Mathematics Self Efficacy Questionnaire (MSEQ)	Frequency, Mean and Standard Deviation
3. To determine the relationship of mathematics self efficacy and mathematics achievement of mathayomsuksa students in the English program.			Pearson Product Moment Correlation-r

CHAPTER IV

RESEARCH FINDINGS

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter presents the significant findings in this research study based on the data gathered from the responses of 198 mathayomsuksa students of St. Joseph Bangna School.

The researcher used the validated questionnaire to determine the levels of mathematics self-efficacy of the respondents. Data were collected from 198 returned questionnaires and were coded using the student numbers provided by the school. For this self-efficacy questionnaire, all the responses for the 20 items were added for each student. As the scale ranged from 0 to 9, the highest possible score was 180 and the lowest possible score was 0. The higher the score, the more confident the student is in solving the math problems, indicating high mathematics self-efficacy.

The students' final examination score in the second semester of 2012-2013 was used as the basis of their mathematics achievement. Final examination questions include the topics of measurement, number operations, statistics and probability for mathayomsuksa 1, measurement, algebra and statistics for mathayomsuksa 2, and measurement, geometry, trigonometry, statistics and probability for mathayomsuksa 3. Test questions were combinations of objective and subjective types. The students were given ninety (90) minutes to do the final test. The total score in the final was 30, and the test scores were coded using the student numbers.

The data that was collected from the respondents through the questionnaire and the test scores are presented in the following sections in the sequence of the objectives contained in Chapter 1.

Research Objective One

Research Objective One was to determine the levels of mathematics achievement of mathayomsuksa students in the English program. To analyze the data for Objective One, frequency, means and standard deviations were calculated to determine the levels of mathematics achievement of the students using the test scores of the students.

Table 6: Frequency Table of Mathematics Achievement of Mathayomsuksa Students

Math Test Scores (X)	Mathayomsuksa 1 Frequency	Mathayomsuksa 2 Frequency	Mathayomsuksa 3 Frequency	Total
$X \leq 7.5$	0	0	0	0
$7.5 < X \leq 15$	8	0	12	20
$15 < X \leq 22.5$	25	17	21	63
$22.5 < X \leq 30$	44	40	31	115
Total	**77**	**57**	**64**	**198**

Table 6 contains the frequency of mathematics achievement of mathayomsuksa students per level. Based on the school's policy on passing marks of more than fifty percent (50%) of the total score, there were 178 out of 198 students

(89%) who passed the examination. These students got scores of more than 15 out of 30. Out of 178 students who passed in the examination, only 115 students got an equivalent grade of "Excellent". Those who failed in the examination were 8 matahyomsuksa 1 students and 12 mathayomsuksa 3 students. All mathayomsuksa 2 students passed the examination.

Overall, the highest frequency considering the whole population is in the scores of more than 22.5 to 30 which is 115 students, that is about 58% of the whole sample population, as shown in the following graph (**Figure 4**).

Figure 4: Mathematics Achievement of Mathayomsuksa Students

Table 7: Mean and Standard Deviation of Mathematics Achievement of Mathayomsuksa Students.

Grade Level	Number of Students	Mean of the Scores	Standard Deviation
Mathayomsuksa 1	77	22.78	4.675
Mathayomsuksa 2	57	24.56	3.469
Mathayomsuksa 3	64	21.44	6.042
Total	198	22.91	5.003

Table 7 contains the mean and standard deviation of the test scores (mathematics achievement) of the students. The highest mean was in mathayomsuksa 2 students with a mean score of 24.56. This was followed by mathayomsuksa 1 with a mean score of 22.78 and mathayomsuksa 3 with a mean score of 21.59. Calculating the scores of the whole sample population resulted to a mean score of 22.91 and standard deviation of 5.003. The mean score of the total sample population was 22.91, which was 76.37% of the maximum score of 30. About 65% of the students got a score higher than the mean score.

Research Objective Two

Research Objective Two was to determine the levels of mathematics self-efficacy of mathayomsuksa students in the English program. To analyze the data for Objective Two, frequency, means and standard deviations were calculated to determine the levels of mathematics self-efficacy of the students.

Table 8: Frequency Table of Mathematics Self-efficacy of Mathayomsuksa Students

Levels of MSE	Mathayomsuka 1 Frequency	Mathayomsuksa 2 Frequency	Mathayomsuksa 3 Frequency	Total
0 to 20	0	0	0	0
21 to 40	2	1	0	3
41 to 60	0	2	2	4
61 to 80	3	4	0	7
81 to 100	11	11	9	31
101 to 120	21	16	13	50
121 to 140	18	13	12	43
141 to 160	11	5	20	36
161 to 180	11	5	8	24
Total	77	57	64	198

Table 8 contains the frequency of the levels of mathematics self-efficacy of mathayomsuksa students per level. The highest possible score was 180 and the lowest possible score was 0. The higher the score, the more confident the student is in solving the math problems, indicating high mathematics self-efficacy.

There were 40 mathayomsuksa 3 students out of 64 (62.5%) who scored 121 and above which indicate 'complete confidence'. For mathayomsuksa 1 and mathayomsuksa 2, there were only 40 students out of 77 (51.95%) and 23 students out of 57 (40.35%), respectively, who scored 121 and above (complete confidence).

Out of 198 students, there were 103 students (52.02%) who scored 121 and above (complete confidence), 88 students (44.44%) who scored more than 60 but less than 121 (some confidence) and 7 students (3.54%) who scored less than 61 (little or no confidence). The highest frequency considering the whole population is in the scores of 101 to 120 which is 50 students, which is about 25% of the whole sample population, as shown in the following graph (**Figure 5**).
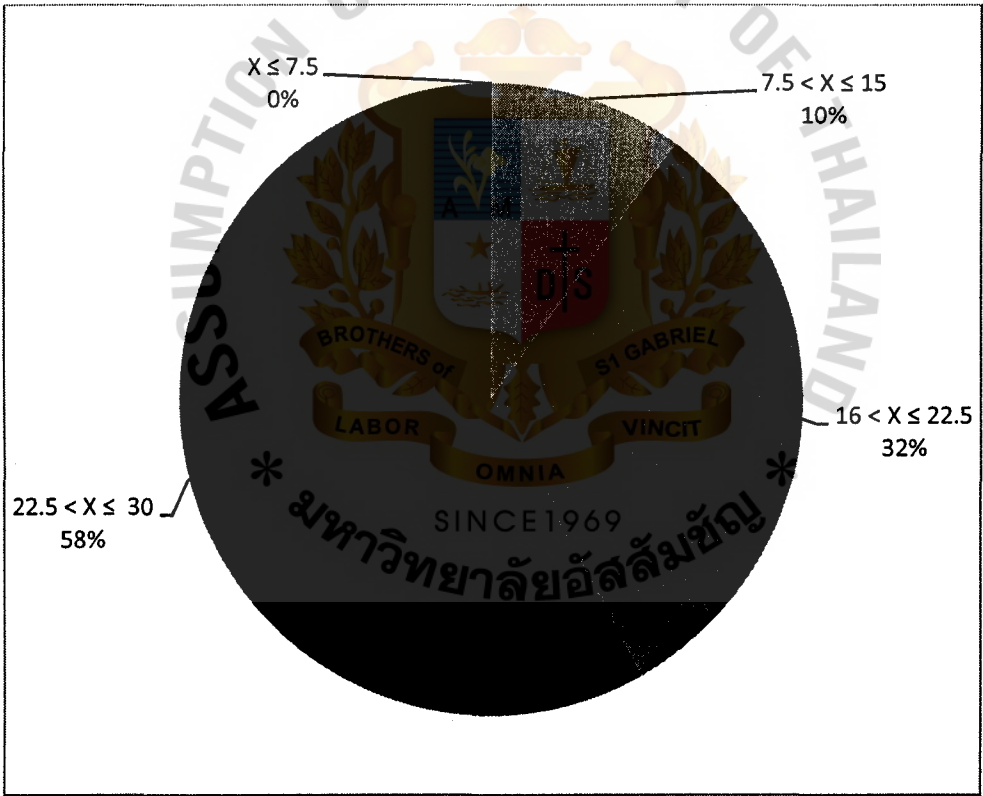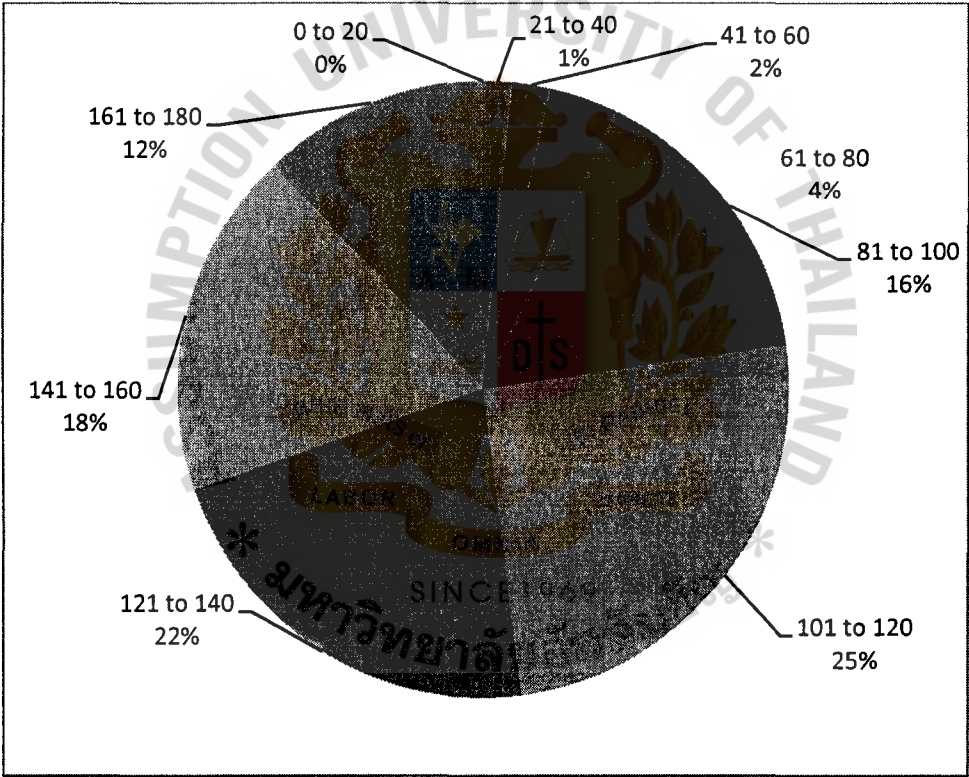

Figure 5: Mathematics Self-efficacy of Mathayomsuksa Students

Table 9: Mean and Standard Deviation of Mathematics Self-efficacy Scores of Mathayomsuksa Students.

Grade Level	Number of Students	Mean of the Scores	Standard Deviation
Mathayomsuksa 1	77	123.61	29.516
Mathayomsuksa 2	57	112.54	30.375
Mathayomsuksa 3	64	128.36	28.127
Total	198	121.96	29.856

Table 9 contains the mean and standard deviation of the self-efficacy scores of the students. The highest mean was in mathayomsuksa 3 students with a mean score of 128.36. This was followed by mathayomsuksa 1 with a mean score of 123.61 and mathayomsuksa 2 with a mean score of 112.54. Calculating the scores of the whole sample population resulted to a mean score of 121.96 which was 67.76% of the maximum possible score. More than 50% of the students showed a self-efficacy score higher than the mean score.

Research Objective Three

Research Objective Three was to determine the relationship of mathematics self-efficacy and mathematics achievement of mathayomsuksa students in the English Program. To analyze the data for Objective Three, a Pearson's Product-Moment Correlation Coefficient was computed to assess the relationship between mathematics self-efficacy and mathematics achievement.
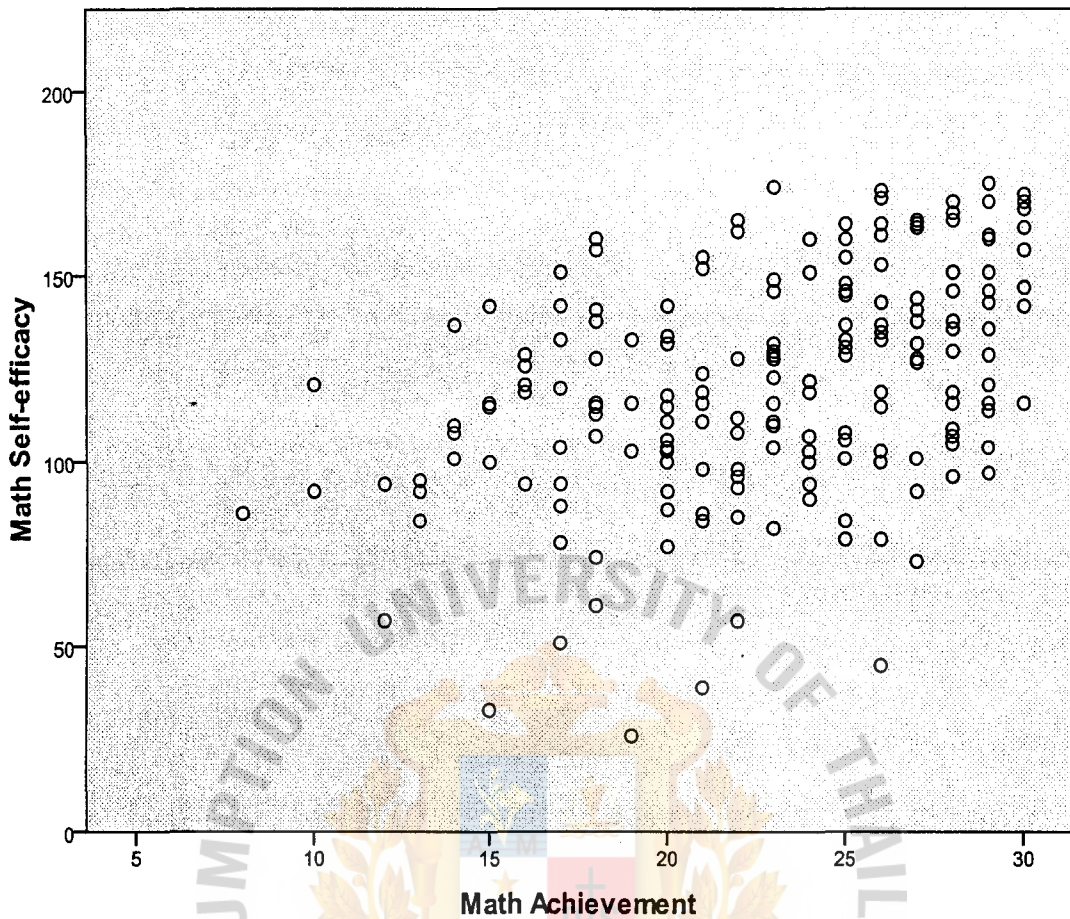
Figure 6: Scatter Plot of the Correlation between Mathematics Self-efficacy and Mathematics Achievement of Mathayomsuksa Students.

Figure 6 presents the scatterplot of the 198 mathayomsuksa students which shows a moderate positive correlation between mathematics self-efficacy and mathematics achievement.

Table 10: Relationship Between Mathematics Self-efficacy and Mathematics Achievement.

Grade Level	Pearson Product Moment Coefficient (r)	Level of Significance (p)	Sig. (2-tailed) @ level	N
Mathayomsuksa 1	.533	.000	.01	77
Mathayomsuksa 2	.307	.020	.05	57
Mathayomsuksa 3	.585	.000	.01	64
Mathayomsuksa 1 to 3	.423	.000	.01	198

Table 10 shows the Pearson's Product Moment Correlation between mathematics self-efficacy and mathematics achievement of mathayonsuksa students. Based on this table, mathayomsuksa 3 had shown the highest level of significance among the three grade levels (r = 0.585, p = 0.000, n = 64), followed by mathayomsuksa 1 (r = 0.533, p = 0.000, n = 77) and mathayomsuksa 2 (r = 0.307, p = 0.020, n = 57). Overall, there was a positive and significant correlation between the two variables, r = 0.423, n = 198, p = 0.000. Increases in mathematics self-efficacy were correlated with increases in mathematics achievement.

The study's research hypothesis was "there is a significant relationship between mathematics self-efficacy and mathematics achievement of mathayomsuksa students in the English program of St. Joseph Bangna School". And hence, **Table 10** clearly shows that the hypothesis has been proved to be correct.

CHAPTER V

FINDINGS, CONCLUSION, DISCUSSION AND RECOMMENDATIONS

This chapter presents a brief review of how this study was conducted, what instruments were used to gather the data, as well as the study's findings, conclusions, discussion, and recommendations for practice and for future study.

The study was to determine the levels of mathematics achievement and mathematics self-efficacy of mathayomsuksa students in the English Program of St. Joseph Bangna School, and then determine the relationship between the two.

The student samples that were selected were 198 mathayomsuksa 1 to 3 students in the English Program of St. Joseph Bangna School. A self-efficacy questionnaire was given to each student to determine the level of self-efficacy and the math final test scores were used as basis of the mathematics achievement.

Three objectives were formulated in the study. The first objective was to determine the levels of mathematics achievement of mathayomsuksa students. The second objective was to determine the levels of mathematics self-efficacy of the mathayomsuksa students. Finally, the third objective was to determine the relationship between mathematics self-efficacy and mathematic achievement.

There was one hypothesis developed regarding whether there was a significant relationship between mathematics self-efficacy and mathematics achievement of mathayomsuksa students in the English Program.

Findings

1.   St. Joseph Bangna School's policy on passing mark is above fifty percent (50%) of the possible maximum scores. Based on this policy, there were 178 out of 198 students (89%) who got passing marks. These students got scores of more than

15 out of possible 30. However, out of 178 students who passed in the examination, only 115 students got an equivalent grade of "Excellent". The mean score of the total sample population was 22.91, which was 76.37% of the maximum score of 30. Also, it is important to note that about 65% of the students got a score of more than the mean score.

2.   For mathematics self-efficacy, the highest possible score was 180 and the lowest possible score was 0. The higher the score, the more confident the student is in solving the math problems, indicating high mathematics self-efficacy. Out of 198 students, there were 103 students (52.02%) who scored 121 and above (complete confidence), 88 students (44.44%) who scored more than 60 but less than 121 (some confidence) and 7 students (3.54%) who scored less than 61 (little or no confidence). The mean score of the total sample population was 121.96 which was 67.76% of the maximum possible score. About 52% of the total sample students got a score more than the mean score.

3.   Findings in this study had shown that there was a moderate, positive and significant correlation between mathematics self-efficacy and mathematics achievement. Increases in mathematics self-efficacy were correlated with increases in mathematics achievement.

Conclusions

From the findings, the following conclusions are drawn.

1.   The levels of mathematics achievement of mathayomsuksa students based on the mathematics final test results were relatively high (excellent).

2.   The levels of mathematics self-efficacy of mathayomsuksa students were high (complete confidence).

3.   There was a positive and significant relationship between mathematics self-efficacy and mathematics achievement of mathayomsuksa students, meaning students with higher self-efficacy had higher scores in mathematics achievement test.

Discussion

1.   Levels of Mathematics Achievement and Mathematics Self-efficacy

For the levels of mathematics achievement, frequency and mean indicated that the sampled students had a relatively high mathematics achievement, in general, based on their math test results in the final examination. However, it is important to note that mathematics achievement in this study was only based on one particular test, which was the final examination in mathematics in the second semester of the school year 2012-2013. Based on the test performances of the students in the last three semesters, the result of this examination has proven that students were doing better in the final examinations than in the midterm examinations. The students seemed to study harder for final examinations than for midterm examinations.

It is also important to note that the mathematics achievement of the sampled students can be attributed to different factors mentioned in the literature, such as demographic, instructional and individual (Saritas & Akdemir, 2009).

For mathematics self-efficacy, frequency and mean also indicated a relatively high level for the sampled students. Generally, the sample students had shown high confidence in solving specific math problems appropriate to their levels. However, it is fairly to note Bandura's (1986) notion that young students are generally overconfident about their abilities. He says that some overestimation of capability is useful, since it increases effort and persistence. He also further contends

(Bandura, 1997) that accurate evaluation of capability while it enables the student to assess their problem-solving strategies more accurately, it does, however, limit students' sense of optimism. Also, attention is needed for the protection of the over confident students from danger of disappointment especially in cases of continual failures. Experts say that students' self-efficacy beliefs become more stable and accurate over time, and it is very difficult to change (Bandura, 1997).

Nevertheless, the high level of self-efficacy result in this study is in agreement with UNESCO's (2007) positive findings on single gender schools, especially for girls, which is related to classroom dynamics that affect students' self-efficacy in academic learning.

Also, the finding of this study supports Rodriguez's (2009) report that female students had shown improved confidence in their academic abilities as a consequence of attending the single-gender classroom.

2. The Relationship between Mathematics Self-efficacy and Mathematics Achievement

Results of the correlation analysis showed that there was a positive and significant relationship between mathematics self-efficacy and mathematics achievement. This finding supported the research hypothesis that mathematics self-efficacy and mathematics achievement were significantly related. Students with high mathematics self-efficacy were associated with high mathematics achievement. This finding is in agreement with the work of researchers who reported significant relationships between self-efficacy and academic performances (Bandura,1996; Fast, et.al., 2010; Hackett & Betz, 1983; Liu & Koirala, 2009; Pajares & Miller, 1994; Pajares & Graham, 1999; Pajares & Schunk, 2001; Zimmerman, 2000).

This finding is also generally consistent with the basic assumption of Bandura's self-efficacy. Self-efficacy has been shown to influence students' mathematical achievement (Bandura,1996; Pajares & Graham, 1999). Bandura (1997) even contends that self-efficacy can influence many parts of one's life such as motivation and perseverance in times of difficulties and failures, resilience to adversity and quality of analytical thinking.

Mathematics is not an easy subject, thus difficulties and setbacks occur often, making it important to have the motivation, perseverance, and resilience to continue to put forth effort in a mathematics classroom. Mathematics does not always come naturally to students, but they can succeed if they keep working hard and do not give up. Zimmerman (2000) found "evidence that self-efficacious students participate more readily, work harder, persist longer, and have fewer adverse emotional reactions when they encounter difficulties than do those who doubt their capabilities" (p. 86). Moreover, within the domain of mathematics, Fast, et.al (2010) found that students with less self-efficacy will give up easier on difficult math problems and are less accurate in math computation.

It is also important to acknowledge limitations of this study. Previous researchers had typically observed a stronger relationship between math self-efficacy and math achievement than that observed in this study (e.g. Pajares & Graham, 1999). Pajares and Miller (1994) suggest that the magnitude of association between self-efficacy and achievement depends mainly on the match between the self-efficacy index and the criterion performance task. For example, asking students to rate their confidence in their ability to solve a specific math problem (e.g. 25% of 120) should correlate highly with their success in solving that exact or much similar math problem, whereas asking students to rate their overall confidence in their ability

to do math should be relatively less related to their performance on a multidimensional math test (Fast, et.al., 2010). In this research study, sampled students rated their self-efficacy to do well in solving specific problems which were not similar to the math questions in their final test. But the questions in the questionnaire were all about math concepts appropriate to their levels and, then, these ratings were correlated with their performances in their final math tests. Nevertheless, it seems that the distal match between this study's self-efficacy and performance indices had positively proved a significant relationship between math self-efficacy and math performance.

The positive finding in this study also supports the previous researches that asserted that self-efficacy had been shown to be an accurate predictor of success in academic performance, (Fast, et.al., 2010; Hackett & Betz, 1983). As Pajares and Miller (1994) stated in their report, mathematics self-efficacy is a better predictor of mathematics performance than mathematics anxiety, previous involvement in mathematics and mathematics self-concepts. Also, Liu and Koirala (2009) reported that mathematics self-efficacy was a significantly positive predictor of mathematics achievement. Their findings suggest that students who were confident of their performance in mathematics tended to have better mathematics achievement. Students who have high mathematics self-efficacy could understand well the most difficult material presented. They could do well on math assignments and tests, and, more importantly, they could master the skills being taught in their math classes, hence, they were more likely to have better mathematics achievement. Therefore, there is a need to improve students' self-efficacy which may improve students' mathematics achievement.

Recommendations

1. Recommendations for Practice

The clear implication of the findings of this research is that since mathematics self-efficacy was significantly and positively associated with students' mathematics achievement, teachers, educational policy-makers and practitioners as well as parents are encouraged to make endeavors to promote and develop self-efficacy of students to enhance their mathematics achievement.

Self-efficacy beliefs are developed through the interpretation of performance outcomes. These beliefs, as discussed in the literature, are based on four primary sources of influence: mastery experience, vicarious experience, social persuasion, and physiological factors (Bandura, 1997). Thus, it is highly recommended to educational practitioners, policy makers and parents to provide the students opportunities to develop self-efficacy through these four sources of influence.

Mastery experiences refer to previous experiences and performances with a particular task. Mastery experiences in mathematics usually dictate student opinions concerning their perception of their ability in mathematics. Successful outcomes build up self-efficacy whereas failures lower it. Also, research shows that mastery experiences are significant predictors of self-efficacy (Bandura, 1997).

For above reasons, it is recommended to educational practitioners to integrate "mastery experience" opportunities into mathematics classes by doing the following.

- Include in the course curriculum hands-on activities and projects that require self-regulation.

- Provide lessons and activities which are tailored-fit to students' ability-level so that they are challenging but not impossible.

- Design lessons specifically for students' needs.

- Support the student throughout their struggles and always think about what will help the student to learn best.

- Set attainable goals for students and let them see how they will reach those goals.

Vicarious experiences refer to learning through observation of others performance of a given task. Vicarious experience, which may have great influence on student's performance, occurs when these students believe in their ability to achieve certain results after observing other people, like their teachers or peers, who have engaged in the same activity and have acquired success (Bandura, 1986, 1997). For this reason, it is recommended to educational practitioners to create vicarious learning experiences that incorporate opportunities for students to observe the practices and performances of their peers and math professionals in classes and in other activities by having the following activities.

- Provide group-works in which the groups have one group member has slightly higher math skills and serves as a model to the other members of the group.

- Invite more advanced students (undergraduate or graduate) or professionals of Science, Technology, Engineering and Mathematics (STEM) into classrooms or seminars to share their experiences and success.

- Provide influential role models wherein students perceive similarities between the models and themselves. For example a girl's mathematics self-efficacy is more positively affected by interacting with a young female engineer than an older male engineer.

Social persuasions refer to others' judgments, feedback, and support. Positive feedback and encouragement, especially from influential people (e.g., parents and teachers) enhances self-efficacy. Social persuasion is particularly instrumental in the development and maintenance of students' self- efficacy (Pajares & Miller, 1994). To increase mathematics self-efficacy, educational practitioners are recommended to do the following endeavors.

- Provide positive, genuine, appropriate, and realistic feedback and support to students.

- Encourage students to persist and study harder despite difficulties and failures.

- Praise students' effort and persistence rather than their ability.

- Enlighten parents and guardians of the importance of supporting their students' interest in school subjects and activities, especially related to mathematics.

- Encourage the students to participate in extra-curricular mathematics activities, such as after-school math clubs, math camps, local lectures and math exhibits.

Physiological factors refer to the individual's emotional and physical states during task preparation and performance. Most prevalent but controllable physiological factors are anxiety and apprehensions. Feeling calm and composed, rather than nervous and worried, when preparing for and performing a task leads to higher self-efficacy (Liu & Koirala, 2009). To reduce anxiety and apprehension related to mathematics, practitioners are recommended to have the following activities.

- Create a classroom environment where students gain confidence in their math abilities, lower their math anxiety, and participate in a healthy learning community.

- Teach students effective anxiety-management strategies such as breathing and visualization exercises.

- Discuss with the students the experience of math related anxiety and tell them that they can possibly control their physiological reactions.

- Encourage students to concentrate fully to the task at hand, which should reduce their attention to apprehensions and fears thereby reducing task-related anxiety.

2. Recommendations for Future Research

Recommendations for future research regarding mathematics self-efficacy and mathematics achievement are:

a. Future research may include investigation of the sources of mathematics self- efficacy of the students. It will be interesting to find out the most influential source among the four sources of influence (mastery experience, vicarious experience, social persuasion and physiological factors).

b. This study only had subjects of high socio-economic status due to the nature of private schools. It would be good to do a research across all socio-economic status levels in Thailand or in any other countries, and find out what the results would look like.

c. Other future researches of this kind are recommended to follow Pajares and Miller's (1994) suggestion on matching self-efficacy index and the criterion performance task. For example, asking students to rate their confidence in

their ability to solve a specific math problem (e.g. 25% of 120) should be correlated with their success in solving similar math problem (e.g. 20 is what percent of 150).

d. This study only had subjects of one program of a single-gender school. A suggestion for a future study would be to compare mathematics self-efficacy and mathematics achievement of students from single-gender school and co-educational schools.

REFERENCES

Bandura, A. (1977). *Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review.* Retrieved from http://des.emory.edu/mfp/Pajares Schunk2001.html

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory.* Retrieved November 2012

Bandura, A. (1989). *The Social Cognitive Theory.* Retrieved October 2012, from Stanford University: http://www.des.emory.edu/mfp/Bandura1989ACD.pdf

Bandura, A. (1994). *Self-Efficacy.* Retrieved October 2012, from http://des.emory. edu/mfp/BanEncy.html

Bandura, A. (1997). *Self-efficacy: The exercise of self-control. New York: W.H.* Retrieved from http://des.emory.edu/mfp/PajaresSchunk2001.html

Edstrom, T. (1996). *Self-concept and its Implications for Counsellors. Nigerian Journal of Clinical and Counseling Psychology 2,.* Retrieved October 2012, fromfile:///J:/AN%20ASSESSMENT%20OF%20MATHEMATICS%20SEL F%20-%20EFFICACY.htm#ixzz1XegPMKdi

Fast, L., Lewis, J., Bryant, M., Bocian, K., Cardullo, R., Rettig, M., et al. (2010). *Does Mathematics Self-efficacy Mediate the Effect of the Perceived Classroom Environment on the Standardized Math Test Performace?* Retrieved January 2013, from HTTP://RAP.UCR.EDU/EFFICACY.PDF

Hackett, G., & Betz, N. (1983). *The relationship of mathematics self-efficacy expectations to the selection of science-based college majors.* Retrieved January 2013, from http://www.sciencedirect.com/science/article/pii

Learning Theories, K. (2011). *Attribution Theory (Weiner) at Learning Theories. com.* Retrieved November 2012, from http://www.learning-theories.com/

weiners-attribution-theory.html

Liu, X., & Koirala, H. (2009). *The Effects of Mathematics Self-efficacy on Mathematics Achievement of High School Students.* Retrieved February 2013, from http://digitalcommons.uconn.edu/cgi/viewcontent.cgi?article=1029& context=nera_2009

Organisation for Economic Co-operation and Development - Programme for International Student Assessment, O. (2010). *PISA 2009 Results: What Students Know and Can Do – Student Performance in Reading, Mathematics and Science.* Retrieved October 2012, from http://dx.doi.org/10.1787 / 9789264091450-en

Ormrod, J. (2008). *Human learning (3rd ed.). Upper Saddle River, NJ: Prentice-Hall.* Retrieved November 2012, from http://teachnet.edb.utexas.edu/~ Lynda_abbot/Social.html

Pajares, F., & Graham, L. (1999). *Self- efficacy, motivation constructs, and mathematics performance of entering middle school students. Contemporary Educational Psychology 24.*

Pajares, F., & Miller, M. (1994). *MATHEMATICS SELF-EFFICACY AND MATHEMATICS PERFORMANCES:THE NEED FOR SPECIFICITY OF ASSESSMENT.* Retrieved November 2012, from http://www.des.emory. edu/mfp/PM1995JCP.html

Pajares, F., & Schunk, D. (2001). *SELF-BELIEFS AND SCHOOL SUCCESS:SELF-EFFICACY, SELF-CONCEPT, AND SCHOOL ACHIEVEMENT.* Retrieved October 2012, from http://des.emory.edu/mfp/PajaresSchunk2001.html

Park, H., Berhman, J., & Choi, J. (2011). *Causal Effects of Single-Sex Schools on Students' STEM.* Retrieved November 2012, from http://paa2011.princeton.

edu/download.aspx?submissionId=111625

Redmond, B. F. (2010). *Self-Efficacy Theory: Do I think that I can succeed in my work? Work Attitudes and Motivation.* Retrieved November 2012, from The Pennsylvania State University; World Campus.

Redmond, B., & Moser, C. (2011). *Self-Efficay and Social Cognitive Theory.* Retrieved November2012,fromTheory and cases in school-based consultation :https://wikispaces.psu.edu/display/PSYCH484/7.+SelfEfficacy+and+Social+ Cognitive+Theories

Rodriguez, A. (2003). *COMPARING MATH SELF-EFFICACY IN MIDDLE SCHOOL GIRLS.* Retrieved October 2012, from http://wvuscholar. wvu.edu:8881//exlibris/dtl/d3_1/apache_media/L2V4bGlicmlzL2R0bC9kM1 8xL2FwYWNoZV9tZWRpYS82ODg1.pdf

Saritas, T., & Akdemir, O. (2009). *Identifying Factors Affecting the Mathematics Achievement of Students for Better Instructional Design.* Retrieved February 2013, from http://www.itdl.org/Journal/Dec_09/article03.htm

Savas, E., Tas, S., & Duru, A. (2010). *Factors Affecting Students' Achievement in Mathematics.* Retrieved February 2013, fromhttp://web.inonu.edu.tr/~efdergi/ 111/11107.pdf

Schunk, D. H. (1996). *Self-efficacy for learning and performance. Paper presented at the annual conference of theAmerican Educational Research Association, New York.* Retrieved November 2012, from http://www.merga.net.au/ documents/RP612008.pdf

Siegle, D. (2000). *Self-efficacy.* Retrieved October 2012,from The NationalResearch Center on the Gifted and Talented Neag School of Education - University of Connecticut: http://www.gifted.uconn.edu/siegle/SelfEfficacy/section1.html

Tait-McCutcheon, S. (2008). *Self-Efficacy in Mathematics: Affective, Cognitive, and Conative Domains of Functioning.* Retrieved October 2012, from http://www.merga.net.au/documents/RP612008.pdf

Tully, D., & Jacobs, B. (2008). *Effects of Single-Gender Mathematics Classrooms on Self Perception of Mthematical Ability and Post Secondary.* Retrieved October 2012, from http://www.sefi.be/wp-content/abstracts2009/Tully.pdf

UNESCO (2007). *Single-Sex Schools for Girls and Gender Equality in Education - Advocacy Brief. Bangkok: UNESCO Bangkok, 2007.* Retrieved November 2012, from http://www2.unescobkk.org/elib/publications/127_128/Advocacy Brief_Single_Sex_Schools.pdf

Whitlock, S. (2006). *The Effects of Single-Sex and Coeducational Environments on the Self-Efficacy of Middle Schools.* Retrieved October 2012, from http://scholar.lib.vt.edu/theses/available/etd-06142006-164417/unrestricted/Dissertation3.pdf

Zimmerman, B. (2000). *Self-efficacy: Motivation to Learn.* Retrieved January 2013, from HTTP://WWW.ITL.USYD.EDU.AU/NEWS/PDFS/ZIMMERMAN%202000.PDF

APPENDICES

Appendix A

MATHEMATICS SELF-EFFICACY QUESTIONNAIRE

Student No. _____

Directions: Using the rating scale below, <u>circle</u> the number on the scale next to each problem that shows **your confidence in your ability to solve** the following problems <u>without using a calculator</u>. You **do not** have to solve the problems.

Scale:

0	1	2	3	4	5	6	7	8	9

No confidence at all   Some confidence   Complete confidence
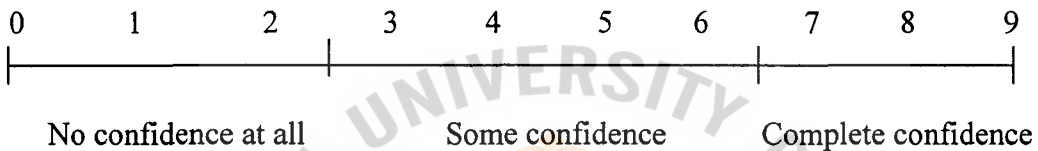
1. What is 25% of 120?

    0   1   2   3   4   5   6   7   8   9

2. 20 is what percent of 37?

    0   1   2   3   4   5   6   7   8   9

3. Convert $\frac{3}{8}$ into a decimal number.

    0   1   2   3   4   5   6   7   8   9

4. Convert 30% into a decimal number.

    0   1   2   3   4   5   6   7   8   9

5. $2\frac{1}{3} + \frac{5}{9} = \boxed{}$
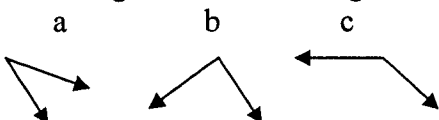
    0   1   2   3   4   5   6   7   8   9

6. Solve for x if x+3 = 6

    0   1   2   3   4   5   6   7   8   9

7. Which angle is an obtuse angle?

   a   b   c

    0   1   2   3   4   5   6   7   8   9
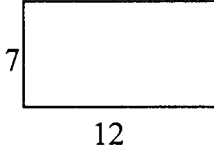
8. Solve $\sqrt{169}$

    0   1   2   3   4   5   6   7   8   9

9. What is the area of the rectangle?

    0   1   2   3   4   5   6   7   8   9

10. Solve $\frac{x}{3} = \frac{15}{2}$

    0   1   2   3   4   5   6   7   8   9

11. You have a rope 20 inches long. Cut it so that you have 3 pieces where 2 of the pieces are 2 times as long as the smaller piece.

    0   1   2   3   4   5   6   7   8   9

12. How will Yin divide 3 dozen cookies between 9 friends?

    0   1   2   3   4   5   6   7   8   9

13. Add: 13,574 + 839 + 5,011

    0   1   2   3   4   5   6   7   8   9

14. Divide $4.907 \div 0.07$

    0   1   2   3   4   5   6   7   8   9

15. Multiply .05 x 13.9

    0   1   2   3   4   5   6   7   8   9

16. Solve $\frac{3}{4} \div \frac{17}{212}$

    0   1   2   3   4   5   6   7   8   9

17. If Dora makes a 6% commission on all her sales and her total sales were ThaiBth 50,780. What was her commission?

    0   1   2   3   4   5   6   7   8   9

18. Which is the better rate? 2 kilos for ThBth 198 or 20 pounds for ThBth150?

    0   1   2   3   4   5   6   7   8   9

19. Solve $\frac{x}{3} + 7 = 41$

    0   1   2   3   4   5   6   7   8   9

20. Multiply 29 by 36 in your head.

    0   1   2   3   4   5   6   7   8   9

Appendix B

QUESTIONNAIRE FEEDBACK FORM

QUESTIONNAIRE FEEDBACK FORM

Thank you for taking the time to review the questionnaire for the Master's Degree Thesis of Emil Perez at Assumption University in Thailand. The questionnaire is entitled " Mathematics Self-efficacy Questionnaire".

The objective of the questionnaire is to determine the level of mathematics self-efficacy of Mathayom 1-3 students. The students will be instructed to look at each item in the questionnaire and rate their confidence in solving each problem.

----

1. What do you think about the questionnaire? Is the questionnaire clear and easy to understand? Are the questions appropriate for Mathayom 1 to 3 students?

    The questionnaire is very clear and easy to understand. It is very appropriate to Mathayom 1 - 3 students.

2. What mistakes, if any, does this questionnaire have? How could this questionnaire be improved?

    The questionnaire has no mistake at all.

3. Please write any other comments that you may have for the questionnaire.

    Can there be 5 items more that will measure the higher level thinking skills of students?

Your Name : *Sr. Erlinda Kerilva, SPC* (Signature: *Kerilva*

QUESTIONNAIRE FEEDBACK FORM

Thank you for taking the time to review the questionnaire for the Master's Degree Thesis of Emil Perez at Assumption University in Thailand. The questionnaire is titled " Mathematics Self-efficacy Questionnaire".

The objective of the questionnaire is to determine the level of mathematics self-efficacy of mathayom 1-3 students. The students will be instructed to look at each item in the questionnaire and rate their confidence in solving each problem.

----

1. What do you think about the questionnaire? Is the questionnaire clear and easy to understand? Are the questions appropriate for mathayom 1 to 3 students?

   The questionnaire is clear and covers all the content of mathayom 1-3 students.

2. What mistakes, if any, does this questionnaire have? How could this questionnaire be improved?

   - For typing a decimal number, the question n° 15, .05 must be 0.05.

   - The question 1-7, there is a space between lines.

3. Please write any other comments that you may have for the questionnaire.

   The questionnaire is suitable for the students of mathayom 1-3.

Your Name : *Suvadee Yeamkasorn* Signature: *Suvadee Yeamkasorn*.

QUESTIONNAIRE FEEDBACK FORM

Thank you for taking the time to review the questionnaire for the Master's Degree Thesis of Emil Perez at Assumption University in Thailand. The questionnaire is titled " Mathematics Self-efficacy Questionnaire".

The objective of the questionnaire is to determine the level of mathematics self-efficacy of mathayom 1-3 students. The students will be instructed to look at each item in the questionnaire and rate their confidence in solving each problem.

----

1. What do you think about the questionnaire? Is the questionnaire clear and easy to understand? Are the questions appropriate for mathayom 1 to 3 students?

   This questionnaire is good for the students in Mathayom 1-3. It is suitable for their level. It is clear and easy to understand. So the questions are appropriate for Mathayom 1-3 students.

2. What mistakes, if any, does this questionnaire have? How could this questionnaire be improved?

   This questionnaire doesn't have any mistakes.

3. Please write any other comments that you may have for the questionnaire.

   I think the questionnaire Number 13 is too easy and the questionnaire Number 20 is too difficult for the students to think in their heads.

Your Name : _Warerat Pimpha_   Signature: _Warerat Pimpha_

Appendix C

LETTER FOR PERMISSION TO CONDUCT RESEARCH STUDY

15 February 2013

Sr. Dominic Kitcharoen, SPC
Principal
St. Joseph Bangna School

Thru : Sr. Erlinda Gesilva, SPC

RE: Permission to Conduct Research Study

Dear Sister,

Greetings!

I am writing to request permission to conduct a research study at our school. I am currently enrolled in the Master's Degree in Curriculum and Instruction at Assumption University and am in the process of writing my Master's Thesis. The study is entitled "A Study of the Relationship between Mathematics Self-efficacy and Mathematics Achievement of Mathayom Students of St. Joseph Bangna School".

I hope that the school administration will allow me to have the Mathayom 1-3 students in the English Program as my sample for the collection of data.
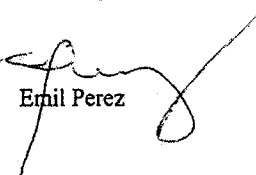
If approval is granted, student participants will complete the questionnaire and the process should take no longer than 30 minutes. The survey results will be pooled for the thesis project and individual results of this study will remain absolutely confidential and anonymous.

Your approval to conduct this study will be greatly appreciated.

If you approve my request, kindly sign below.

Thank you very much.

Sincerely,   Approved by:

Emil Perez   Sr. Dominic Kitcharoen, SPC

                                                   _____
                                                            Date

Biography

Emil Dimasaka Perez was born and raised in a small town of Angono, Rizal in the Philippines, the product of catholic parents, Norberto and Natalia. He has one older brother, Roberto, and a younger sister, Perla.

In his early years, he was a timid and shy child. But he was able to change into an active and friendly type of person when he entered school. He was quite smart in school with mathematics as his most favorite subject. He graduated as the class valedictorian when he finished his elementary studies.

He believed that he grew more, emotionally, socially, and intellectually, during his four years of high school than during any other period of time thus far. When he finished high school, he was the class valedictorian of his graduating class.

He entered Adamson University in Manila taking up Bachelor of Science in Civil Engineering. He graduated after five years and passed the licensure examination for civil engineers. He, then, practiced and worked as civil engineer in many different projects in various companies.

At the age of 27, he got married to Ana Liza Leanda and they were blessed with three wonderful children, Amiel Marie, Emil Augusto and Elyssa Marie.

He worked as civil engineer for almost sixteen years. At the same time, he was able to work in the corporate world (banking and insurance investments). He tried to balance his two jobs which he was able to do with motivation and inspiration he got from his wife and children. During also these years, he was also able to work as mathematics teacher in one the private high schools for two years.

Year 2004, his wife decided to go to Bangkok to work as nursery teacher. Two years later, he decided to join her in Bangkok and he was very fortunate to be

hired by St. Joseph Bangna School as mathematics teacher. To improve his teaching skills, he pursued further studies in Education taking up Graduate Diploma in Teaching which he finished in one year. At present, he is still part of St. Joseph Bangna School as the Head of Mathematics Department in the English Program.

He considered his wife and children as the most important part of his life. It is the influence that he has on his children as well as his personal goals that have driven him to excel in all he does and tries to be a good role model to them, to his students and to others he comes into contact with. His life is comprised of wonderful family, great friends, good teaching job and a sincere dedication to his family and work.