A CORRELATIONAL-COMPARATIVE STUDY OF GRADES 6 TO 8 STUDENTS' MATHEMATICS SELF-EFFICACY AND MATHEMATICS ANXIETY ACCORDING TO THEIR GENDER AND GRADE LEVELAT PAN-ASIA INTERNATIONAL SCHOOL, BANGKOK

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Abstract: This study was designed to identify middle school students' mathematics self-efficacy and mathematics anxiety levels at the Pan-Asia International School (PAIS) in Thailand and to determine if there was a significant difference among students' mathematics self-efficacy and mathematics anxiety levels according to their gender and the grade level, and further aimed out to find out if any statistically significant relationship between their mathematics self-efficacy and the mathematics anxiety exists. The study focused on ninety-four Grade 6-8 students at PAIS in the academic year 2017-2018. The researcher used the Mathematics Self-Efficacy and Anxiety Questionnaire (MSEAQ) to identify their levels of mathematics self-efficacy and anxiety and data organized according to gender and grade levels of students. The data collected from the questionnaire were analyzed descriptively as frequency tables, mean and standard deviations and inferentially by independent samples t-test, one-way ANOVA test, and the method of Pearson Product Moment Correlation coefficient. The results of this study showed that the level of students' mathematics self-efficacy and anxiety were moderate and there was no significant difference neither between the genders nor among their grade levels. In terms of the association between mathematics self-efficacy and mathematics anxiety, the current study revealed a significant and a strong negative relationship based on the Pearson Product Moment Correlation coefficient at the .05 level.

Keywords: Mathematics Self-Efficacy, Mathematics Anxiety, Gender, Grade level, Pan-Asia International School.

Introduction

Majority of students in grade school levels have constantly perceived mathematics as the most abstract and the most difficult subject to comprehend. Mathematics has the greatest number of failures of any school subjects, as well

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as the highest volume of non-completion (drop outs) of all curriculum subject areas (Altman, 1997; Bonham & Boylan, 2012). On top of its complex nature, a relatively high student-teacher ratio in classrooms makes it even more difficult for students to grasp this subject due to the limited personalized instruction time per student (Barker, 1986). Low mathematics achievement, failures and low motivation in the math classes among school students has led mathematics educators to get into a quest of finding ways to foster students' mathematics literacy through multi-dimensional research, utilizing variety of methods and variables. Mathematics self-efficacy and mathematics anxiety have received increased attention in this quest (Hannula, 2006).

The students at the Pan-Asia International School are also struggling with their mathematics courses and show varied interests, willingness, or hesitation to select their International Baccalaureate (IB) mathematics courses in their last two grade years of IB diploma programme. Therefore, this researcher wondered on the association between math self-efficacy, math anxiety, gender, and grade level variables at the Pan-Asia International School where he taught mathematics from 2010 until 2017.

Research Objectives

The researcher was guided by the following research objectives.

1. To identify the Grades 6-8 students' mathematics self-efficacy levels at the Pan-Asia International School.
2. To identify the Grades 6-8 students' mathematics anxiety levels at the Pan-Asia International School.
3. To determine if there is a significant difference of Grades 6-8 students' mathematics self-efficacy levels at the Pan-Asia International School according to their gender.
4. To determine if there is a significant difference of Grades 6-8 students' mathematics self-efficacy levels at the Pan-Asia International School according to their grade level.
5. To determine if there is a significant difference of Grades 6-8 students' mathematics anxiety levels at the Pan-Asia International School according to their gender.
6. To determine if there is a significant difference of Grades 6-8 students' mathematics anxiety levels at the Pan-Asia International School according to their grade level.
7. To determine if there is a significant relationship of Grades 6-8 students' mathematics self-efficacy and mathematics anxiety levels at the Pan-Asia International School.

Research Hypotheses

The researcher set the following research hypotheses to be used in this quantitative research.

1. There is a significant difference of Grades 6-8 students' mathematics self-efficacy levels at the Pan-Asia International School according to their gender at the level of .05.
2. There is a significant difference of Grades 6-8 students' mathematics self-efficacy levels at the Pan-Asia International School according to their grade level at the level of .05.
3. There is a significant difference of Grades 6-8 students' mathematics anxiety levels at the Pan-Asia International School according to their gender at the level of .05.
4. There is a significant difference of Grades 6-8 students' mathematics anxiety levels at the Pan-Asia International School according to their grade level at the level of .05.
5. There is a significant relationship of Grades 6-8 students' mathematics self-efficacy and mathematics anxiety levels at the Pan-Asia International School at the level of .05.

Conceptual Framework

The current study was designed to determine if there was a significant difference among students' mathematics self-efficacy and mathematics anxiety according to their gender and the grade level, and aimed out to find if there was a significant relationship between their mathematics self-efficacy and the mathematics anxiety. The researcher has chosen to conduct a survey study to identify the self-efficacy and anxiety levels of grade 6 to 8 students at Pan-Asia International School. In order to address the research questions, independent samples' t-test, and Pearson Product Moment correlation coefficient were used to examine the relationships of the study. In this model, students' gender and grade levels serve as the independent variable which are feeding into the dependent variables mathematics self-efficacy and mathematics anxiety. The following figure shows the conceptual framework of this study.

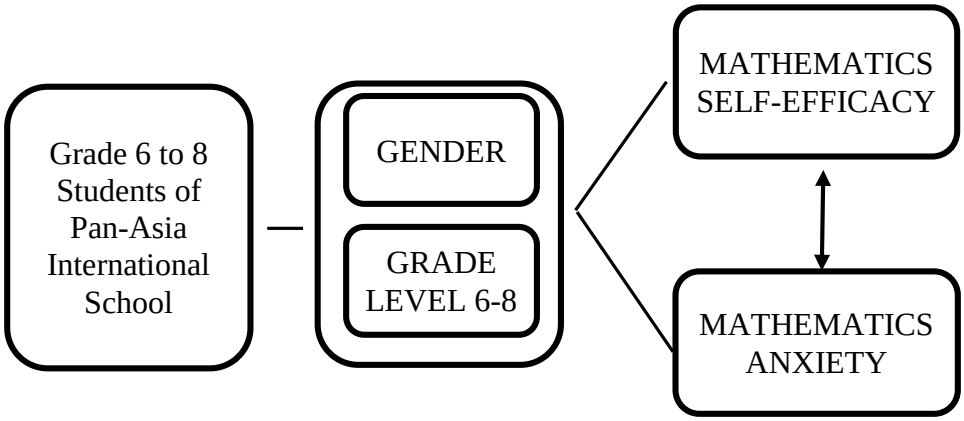

Figure 1. Conceptual Framework of the study

Literature Review

Social Cognitive Theory and Self-Efficacy Theory

Bandura's Social cognitive theory, specifically Self-Efficacy Theory under the Social Cognitive Theory are based on the premises that people are autonomous in organizing, proactive not only reactive, self-reflecting, and self-regulating (Bandura, 1986). In the aim of explaining behavioral change, Bandura developed the construct of self-efficacy as an important element of social learning theory based on the premise that behavioral change is cognitively mediated (Bandura, 1977). He proposed self-efficacy belief as the main determinant of the human behavior as to approach or to avoid the newly observed one. As Bandura (1993) posited in his summary remarks that a strong self-efficacy influences people's achievement in many ways, they see the challenges in life something to be mastered rather than being avoided. They have a strong commitment to those tasks in hand and see the failure as something needs more efforts or skills to be acquired for, and recovered steadfastly from them.

Cognitive psychology gained a great value among the psychologists after the World War II era in terms of studying mind, learning process, information processing, metacognition and self-beliefs. Main assumption in this theory relies on humans' capacity to process and organize information in their mind and it cares more thought-processes than the observed behavior itself. Memory and decision making processes are two focal points of study (McLeod, 2016). Albert Bandura carried out research to understand what is happening in the black box between stimuli and the following response; and so in 1977, he posited two pillars of his Social Cognitive Theory as mediating processes

occur between stimuli and responses; and behavior is learned from the environment through the process of observational learning (Bandura, 1977, 1999; Pajares, 2002).

According to behaviorism, learning is described as a change in the observed behavior and a function of the stimulus-response relationship and their concurrency. With behaviorism, scientists do not consider what is happening in between the two. On the other hand, Bandura's social learning theory defines learning as an implicit function of three variables (Figure 1) specifically, environmental factors, behavior, and personal factors (cognitive, affective, and biological) where their triadic relationship influences people's perceptions and actions. This relationship is called reciprocal determinism, utilizes observations and one's own experiences as the main drive of the theory (Bandura, 1978, 2012; Pajares, 2002b).

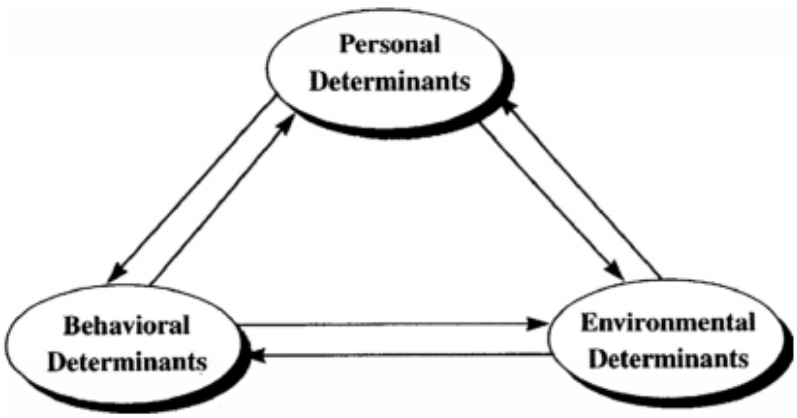

Figure 2. ***Triadic Reciprocal Determination of Social Cognitive Theory (Bandura, 2012, p. 12).***

Social cognitive theory views our human functioning as the result of a bilateral interaction between three entities; person, behavior, and environment and in this it is deviated from the other learning theories which either overvalue the role of the environment or the internal biological factors (Pajares, 2002). This relationship is shown in figure 1. and is known as reciprocal determinism (Bandura, 2012).

Bandura's theory is based on how self-efficacy formed and modified by four principal sources of information namely; mastery performance attainments; vicarious experiences of observing the performances of others; verbal and

social persuasion; and physiological states from which people partly judge their capableness, strength, and vulnerability to dysfunction (Altman, 1997).

Bandura (1994) identified mastery experiences as the first and the most important of the four main sources of self-efficacy. To build a robust belief in one's personal efficacy, mastery experiences provide the best source of the self-efficacy, on the contrary failures undermine it especially if occurs before the sense of efficacy firmly established in young people. If students have had good mastery experiences, they believe mostly they are able students. For instance, students who were successful in previous mathematics courses will most likely believe that they have the ability to succeed in future mathematics courses (May, 2009). Pajares (2002) posited that success and failure directly affect students math self-efficacy and mastery learning must be utilized to raise students' feelings of self-worth and mathematics competence.

Vicarious experiences involve students learning not from their own experiences but from observing success or failure of others i.e., social models, like themselves dealing with particular tasks. Although this does not contribute as strongly to self-efficacy as mastery experiences, students will feel more confident in mathematics if they see students they perceive as like themselves succeeding in mathematics. The observation is coded and used as a guide for future action. Observational learning is controlled by the processes of attention, retention, production, and motivation. Attention is the front door to the observation if a change of behavior is intended. Attention evokes sensory system which help prepares for motivation and perception. After carefully observing the actions of a model, retention, a human capability to symbolize, is ready to take place. The learner codes the observation in their mental, verbal, and physical faculties. Finally, the learner would use motor skills to produce the observed behavior. People's motivation has a determinant role in either imitate the behavior or give up before the reproduction, regenerating the observed behavior (Pajares, 2002). If all engaged well, individual will be motivated to adopt the behavior and repeat it in the future (Wheeler, 2017).

Verbal or Social persuasion is the third source of self-efficacy, which refers to encouragement, both positive and negative, from peers, teachers, and parents. When people are persuaded that they can achieve a given task, they are likely to get positive result out of it (Bandura, 1997). A good example for this is football coaching; to be able to motivate the team, coaches persuade the players that they are better than the rival team. Conversely, when people are told that they do not have the necessary skills for a set of tasks, they will more likely to fail in the task before even start (Bandura, 1994). Teachers and

parents also encouraged to employ verbal persuasion to increase the learning motivation of students but in the limits of students' zone of proximal developments and without losing their credibility (Amory, 2013).

Somatic and emotional or physiological states such as anxiety, stress, arousal, and mood states are important sources of efficacy beliefs (Pajares, 2002b). People partly take them responsible for their capableness, strength, and vulnerability (Altman, 1997). Bandura (1994) stated that "People also rely partly on their somatic and emotional states in judging their capabilities" (p.74). In their physical activities people judge their fatigue or aches/pains as inability to perform a designated action. Their emotional mood also plays role in their efficacy. While positive mood help increase perceived self-efficacy, negative mood destroys it (Bandura, 1994). Another way to raise self-efficacy beliefs is to improve physical and emotional well-being and reduce negative emotional states like people's anxiety and stress which negatively correlates with the self-efficacy construct (May 2009). Due to the people's capability to alter their own thinking and feeling, enhanced self-efficacy beliefs can powerfully influence the somatic and emotional states themselves.

Bandura stated that these sources of information affect one's perceptions that he/she can accomplish a given set of behaviors. It is also important to note that Bandura suggested that performance accomplishments are the most important factor influencing the development of one's self-efficacy expectations (Bandura, 1997). Pajares, in total agreement with Bandura, emphasized the role of skill development in increasing student self-efficacy on the contention that mastery experiences are the most influential source of self-efficacy information (Pajares, 2002b).

Anxiety Theory

Anxiety, in general, means worry, fear, curiosity. It is a feeling and experience one goes through in certain states of life. Spielberger (1983) called the times we are living in as the "Age of Anxiety" (p.5). Although history well knows fear, anxiety was not fully described as a construct until the Spielberger's initial studies in 1970s (Spielberger, 1983).International OCD Foundation (2019) defines anxiety as chronic and/or generalized worry, fear, or nervousness that students exhibit often. The anxiety that the students feel are sometimes driven by specific situations, but sometimes are quite general – they feel anxious most of the time, regardless of what is happening in their life. In these cases, anxiety noticeably impacts a student's behavior in school and at home, their ability to participate in class, their learning, and/or their ability to perform assigned tasks (International OCD Foundation, 2019).

This study was also based on State-Trait Anxiety Theory of Spielberger (Spielberger, 1983). Spielberger posited that anxiety is the most often used term to describe an unpleasant emotional state or condition. Spielberger (1983) developed the concepts of state and trait anxiety to analyze the construct. It can be rooted from internal variables as unconscious arousal (trait anxiety), or can be depending on the immediate situations (state anxiety) (Jahanian & Poornaghi, 2012). Trait anxiety is not directly related to a certain situation, but it derives from one's own personality. Trait anxiety becomes a part of person's character and arises regardless of the situations (Jahanian & Poornaghi, 2012). State anxiety derives from a time when one views or interprets a situation as threatening and dangerous. This situation results in an unsettling, unwanted state. When people view a situation as threatening, they feel anxiety. If someone feels anxious in result of a threatening situation that worry is considered normal and temporary. The reactions to a state anxiety is listed as negative feelings such as; excitement, wakefulness, fear, misgiving, confusion, lack of self-confidence (Spielberger, 1983).

Bandura (1994) stated that anxiety is very much related with humans perceived self-efficacy to exercise control over stressors and disturbing thoughts. He believes that people who can strongly exercise control over threats do not give up easily and manage their high anxiety arousal even in taxing and threatening situations. He also posited that a low sense of self-efficacy ends up becoming depression or anxiety at the end (Bandura, 1993). Stress and depression can be prevented before emerging if perceived self-efficacy to control thought is high. Bandura (1994) believed that perceived inability is the major source of distress and coping self-efficacy and thought control efficacy operate together to reduce anxiety and avoidant behavior.

Spielberger (1983) has postulated following concerning state and trait anxieties.

1. People with high trait anxieties will respond to situations involving ego-threat or fear of failure, with the elevated levels of state anxieties compared to people with low trait anxieties.
2. On the other hand, they will respond to situations in which a threat to physical welfare is the case, with almost no differential levels of state anxieties compared to people with low trait anxieties.
3. In general, high trait anxious people also show high state anxieties, accordingly, low trait anxious people show low state anxieties.

Individuals anxiety levels depends on their subjective appraisal of situations as physically or psychologically threatening to themselves especially to their

self-esteem and personal adequacy. The level of threat can be evaluated as a function of their past experiences and learning (Tiscione, 1974).

Bandura (1993) argued that a strong self-efficacy diminishes the risks of being vulnerable to stress and depression in taxing situations and increases people's persistence to cope with anxiety. Math anxiety is identified as the main reason of the decline in math achievement during early secondary school years for those with high anxieties (Ma, 1999). There is an inverse relationship between anxiety and self-efficacy (Bandura, 2012). Math avoidance is a common character of highly math-anxious individuals, which ultimately adversely affect their career paths (Ashcraft, 2002). They take fewer elective math courses, both in high school and in college than people with low math anxiety. And when they take math, they receive lower grades. Highly math-anxious people also show negative attitudes toward math, and hold negative self-perceptions for learning it, hence end up with lower math achievement or avoiding math courses on their career path (Ashcraft, 2002).

In a study between math anxiety and math achievement on elementary school arithmetic problems, Ashcraft (2002) found that math anxiety does not have a significant relation with math achievement if the problems are easy and simple, on the other hand when the level of difficulty increases, a significant relationship occurs. This phenomenon is in accordance with Spielberger's theory of state and trait anxieties, in the face of a difficult question (threat to the students), state anxiety hinders the successful performance.

Finlayson (2014) has identified teaching style and experiences with mathematics teachers as the main factor causing anxiety with the students, hence posited that the anxieties that teachers have are being passed on to the students as they observe their math anxious teachers. He proposed the constructivist teaching methodologies in the delivery of mathematics classes for students to overcome and cope with the math anxiety.

Previous Research on the Relationship of Mathematics Self-Efficacy, Mathematics Anxiety, Gender and Mathematics Achievement

Hafner (2008) studied the correlation among math self-efficacy, math anxiety and achievement on a convenience sample of 220 grade-8 middle school students in Massachusetts and results revealed that there are significant correlations in between these variables as expected and as in the literature. After running a regression analysis, math anxiety predicted math achievement significantly, and math self-efficacy is proven to be mediating variable between math anxiety and math achievement as postulated by the social cognitive theory.

Collins (1985) demonstrated in her study on 148 elementary grade-5 students in San Jose Unified School District, California the relationship between math word problem self-efficacy and math achievement and concluded that positive attitudes toward mathematics were better predicted by self-efficacy than the actual math ability. As Bandura (1993) agreed that the poor performance in mathematics might be a result of lack of skills or lack of self-efficacy to use those skills.

A common belief in most societies is that women are not as proficient in math as men. However, research does not support this assertion in full. Many show no gender differences in math and science abilities among students although women continue to be less likely than men to pursue a college education in the fields of science and math (Sarfo & Adusei, 2016). Differences surrounding attitudes and confidence in math do exist but have practically disappeared in recent years. In an earlier study of math anxiety in 6th through 12th grade students (Wigfield & Meece, 1988), girls reported stronger negative affective reactions to math than did boys with ninth grade students experiencing the most worry and sixth graders the least. Interestingly, Hembree (1990) studied male students in high school exhibited higher levels in the areas of depressed performance or math avoidance. This paradox was explained by the possibility that females may be more willing than males to admit their anxiety and that females may cope with anxiety better. However, in a later meta-analysis of the relationship between anxiety and achievement in mathematics Ma (1999) found no significant gender differences in the relationship. Ma also criticized the Hembree study, claiming that his meta-analysis did not focus on the relationship between math anxiety and math achievement, and that his conclusion appears to apply more to college students that to precollege students.

Results of research on gender differences in math self-efficacy are similar. Cooper & Robinson (1991) found no significant gender differences among college students on math self-efficacy, math anxiety, or math performance. Loo & Choy (2017) did find higher levels of math self-efficacy among their sample of college men, but the magnitude of these relations was small. In contrast, Lopez & Lent (1992) in a study of math self-efficacy among high school students, concluded that women's self-efficacy was higher than men's, although the difference did not reach significance.

Pajares & Graham (1999) reported similar results and in a study of math self-efficacy of college freshmen, More recently, in a cross-national comparison study on the accuracy of self-efficacy beliefs of middle school math students

(Chen & Zimmerman, 2007) results indicated a lack of gender differences in math performance and math self-efficacy.

Despite the lack of significant gender differences in math anxiety, math self-efficacy, or achievement, participation by women in computer science, physics, and engineering remains low. Feingold (1988) by analyzing the results of meta-studies, has shown that there is a substantial decrease in gender differences in quantitative mathematical tasks and men outperform women only at the further mathematical studies.

Spaniol (2017) posited that student success in mathematics is positively correlated to math self-efficacy and negatively correlated to math anxiety, hence suggested professional development programs to inform the teachers about math self-efficacy and math anxiety and to implement strategies that may increase math self-efficacy and decrease math anxiety over time.

Mathematics Self-Efficacy and Anxiety Questionnaire (MSEAQ)
Mathematics Self-Efficacy and Anxiety Questionnaire (MSEAQ) was designed by May in 2009 and constantly used to investigate students' math self-efficacy and math anxiety in the research processes (Altounji, 2016; Alyamani, 2017; DeThomas, 2017).

Methodology/Procedures
The purpose of this study was to determine the whether there was a significant difference in Grade 6- 8 students' mathematics self-efficacy and mathematics anxiety levels according to their gender and grade levels, and investigate whether there was also a correlation between their mathematics self-efficacy and mathematics anxiety levels.

Students are from a diverse community and English is the main language of school. The researcher's target population was all the students from Grade 6 through Grade 8 at the middle school. These students were selected for the study as for their maturity that they can independently express their views and give feedback and, also they are at the initial stages of adolescence where anxiety and efficacy impacts on their behavior and learning. The students were all fluent in English and advanced enough to understand and complete the questionnaire.

The researcher designed a quantitative, comparative and correlational study which utilized both descriptive and inferential statistics to fulfill the purposes of this study. Data-collected through the questionnaire is analyzed through descriptive and inferential statistics using a statistical package for social

sciences to determine Grade 6-8 students' mathematics self-efficacy and mathematics anxiety levels, to find out whether there was a significant difference between these levels according to the students' gender and grade level, and whether there was a significant correlation between aforementioned dependent variables.

Research Instrument

In this research, Mathematics Self-Efficacy and Anxiety Questionnaire (MSEAQ) was chosen to collect data from the targeted sample students to identify their mathematics self-efficacy and anxiety levels due to its high construct validity (concurrent validity), practicality in terms of combining two variables of this research.

MSEAQ was designed by May (2009) and constantly being used to investigate students' math self-efficacy and math anxiety in the research processes (Altounji, 2016; Alyamani, 2017; DeThomas, 2017; Parsons & Gonzalez, 2018). To be able to convey the research objectives, students were asked to indicate their responses regarding to their feelings or emotions in twenty-eight mathematical situations which aimed at collecting genuine data from the students on their mathematics self-efficacy and mathematics anxiety levels as compared to their gender and grade level studied at the school.

In MSEAQ, mathematics self-efficacy levels (MSEAQ-SE) is measured by thirteen items and mathematics anxiety levels (MSEAQ-A) is measured by fifteen items. Both type of item questions are given on a 5-point Likert-type scale from 1 (never) to 5 (usually) for students to indicate the strength of related behaviors.

Findings

Research Objective 1

Overall PAIS students' self-efficacy level is found to be moderate except the class of Grade8-girls, which revealed the level of slightly low self-efficacy. As per the mean score analysis of each of the thirteen self-efficacy items, ten of them has shown moderate self-efficacy levels among the PAIS students, one item was to be noted (item number 1: I feel confident enough to ask questions in my mathematics class) with a high self-efficacy level which indicated that the students could ask questions in mathematics classes comfortably.

Research Objective 2

Overall PAIS students' anxiety level is found to be moderate for all of the groups comprising the population except the class of Grade8-girls, which

revealed the high anxiety levels. As per the mean score analysis of each of the fifteen anxiety items, thirteen of them revealed a moderate level of math anxiety among the PAIS students, two with a low level of math anxiety which indicated that they were not worried when asked questions in mathematics classes (item number 14: I get nervous when asking questions in class), and can apply math in the real world comfortably (item3: I get nervous when I have to use mathematics outside of school).In an overall look, the mean score of the fifteen items of the MSEAQ-A was interpreted as moderate level of mathematics anxiety among the PAIS students.

Research Objective 3

Research Objective 3 was to determine if there was a significant difference of Grades 6-8 students' mathematics self-efficacy levels at the Pan-Asia International School according to their gender. In order to address this, a two-tailed independent samples t-test was applied to compare the self-efficacy means of male and female students. The result of the inferential statistics was displayed in Table 1.

Table 1. *Result of the Independent Samples t-Test of PAIS Students Mathematics Self-Efficacy According to their Gender*

Gender	***N***	***M***	***SD***	***t***	***df***	***Sig. (2-tailed)***
Female	53	2.96	0.74	0.13	92	0.89
Male	41	2.94	0.93			

Table 1 revealed no significant difference between the male (sample mean=2.94) and the female (sample mean=2.96) students' mathematics self-efficacies as the p-score (p= .89) indicates no significance difference at .05 level (due to the fact .89 > .05).

Therefore, the researcher rejected the research hypothesis one: There is a significant difference of Grades 6-8 students' mathematics self-efficacy levels at the Pan-Asia International School according to their gender at the level of .05.

Research Objective 4

Research Objective 4 was to determine if there was a significant difference of Grades 6-8 students' mathematics self-efficacy levels at the Pan-Asia International School according to their grade level. In order to address the Research Objective 4, one-way analysis of variance (ANOVA) was applied to make comparisons among the students according to their grade level. The result of the inferential statistics was displayed in Table 2.

Table 2. *Comparing the PAIS Students Mathematics Self-Efficacies According to their Grade Level*

Self-Efficacy	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	*1.02*	*2*	*.51*	*.74*	*.48*
Within Groups	*62.50*	*91*	*.69*		
Total	*63.52*	*93*			

Table 2 revealed no significant difference between the sample means of middle school grades as the p-value stood at .48.

Therefore, the researcher rejected the research hypothesis two: There is a significant difference of Grades 6-8 students' mathematics self-efficacy levels at the Pan-Asia International School according to their grade level at the level of .05.

Research Objective 5

Research Objective 5 was to determine if there was a significant difference of Grades 6-8 students' mathematics anxiety levels at the Pan-Asia International School according to their gender. In order to address the Research Objective 5, a two-tailed independent samples t-test was applied to compare the anxiety means of male and female students. The result of the inferential statistics was displayed in Table 3.

Table 3. *Result of the Independent Samples t-Test of PAIS Students Mathematics Anxiety According to their Gender*

Gender	**N**	**M**	**SD**	**t**	**df**	**Sig. (2-tailed)**
Female	53	3.04	0.71	0.39	92	0.70
Male	41	2.98	0.72			

Table 3 revealed no significant difference between the male (sample mean=2.98) and the female (sample mean=3.04) students' mathematics anxieties as the p-score (p= .70) indicated no significance at .05 level (due to the fact .70 > .05). Therefore, the researcher rejected the research hypothesis three: There is a significant difference of Grades 6-8 students' mathematics anxiety levels at the Pan-Asia International School according to their gender at the level of .05.

Research Objective 6

Research Objective 6 was to determine if there was a significant difference of Grades 6-8 students' mathematics anxiety levels at the Pan-Asia International School according to their grade level. In order to address the Research Objective 6, one-way analysis of variance (ANOVA) was applied to make comparisons among the students according to their grade level.

Table 4. *Comparing the PAIS Students Mathematics Anxieties According to their Grade Level*

Self-Efficacy	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	.97	*2*	.49	*.96*	*.39*
Within Groups	46.19	*91*	.51		
Total	47.16	*93*			

Table 4 revealed no significant difference between the sample means of middle school grades since the p-value stood at .39 which is greater than .05 (level of significance).

Therefore, the researcher rejected the research hypothesis four: There is a significant difference of Grades 6-8 students' mathematics anxiety levels at the Pan-Asia International School according to their grade level at the level of .05.

Research Objective 7

Research Objective 7 was to determine if there was a significant relationship of Grades 6-8 students' mathematics self-efficacy and mathematics anxiety levels at the Pan-Asia International School. In order to address the Research Objective 7 Pearson Product Moment Correlation Coefficient is calculated from the data gathered in MSEAQ-SE and MSEAQ-A components of the research instrument. The Pearson Product Moment Correlation Coefficient or r-value can be interpreted according to Table 5.

Table 5. *Relationship Between PAIS Students Mathematics Self-Efficacy and Anxiety*

Mathematics Self-Efficacy Level			***Interpretation***
Mathematics Anxiety Level	*Pearson Correlation*	*-.70***	*There is a significant negative strong correlation*
	Sig. (2-tailed)	*.00*	

Note. **Correlation is significant at the .01 level (2-tailed).

Pearson Product Moment Correlation Coefficient or r-value that the relationship between the mathematics self-efficacy and mathematics anxiety of PAIS students is found significant even at the .01 significance level and the magnitude of the correlation was -.70 which indicated a strong negative correlation.

Hence the researcher accepted the research hypothesis five: There is a significant relationship of Grades 6-8 students' mathematics self-efficacy and mathematics anxiety levels at the Pan-Asia International School at the level of .05.

Discussion

In terms of the association between mathematics self-efficacy and mathematics anxiety, the current study revealed a very significant relationship as it was posited by Pajares (2002) and Spaniol (2017) that student success in mathematics is positively correlated to math self-efficacy and negatively correlated to math anxiety. Professional development ideas to increase the mathematics achievement by increasing their self –efficacies and decrease their anxieties are vital for improving mathematics education in schools. Pajares, in total agreement with Bandura, suggests educators increasing student self-efficacy by skill development rather than only praising them on the contention that mastery experiences are the most influential source of self-efficacy information (Pajares, 2002), and math anxiety is a hindrance for the students' achievement. As Spielberger (1983) cautions out past experiences students had builds the perception of the situations as threatening or psychologically dangerous, which ultimately causes the hindrance on the way of students' math achievement.

As demonstrated in the literature that both self-efficacy and math anxiety are the major predictors of mathematics achievement and increasing the self-efficacy and decreasing the anxiety affect the mathematics achievement directly.

On the other hand, this current study did not reveal any significant difference between the males and females in parallel with Cooper & Robinson's study (1991) where no significant gender differences among college students on math self-efficacy, math anxiety, or math performance found. Based on the grade level also, this study did not reveal any significant differences among the students although there were minor fluctuations in both self-efficacies and anxieties, which could be attributed to many factors related to the students' past experiences with specific teachers and teaching methodologies or can be

attributed to some unpredicted reasons like change of textbooks or exam styles.

Recommendations

The following recommendation for students, teachers, administrators, and future researchers are based on the findings of this research.

Recommendations for Students:

This research revealed that students' mathematics self-efficacy and mathematics anxiety were significantly correlated, and literature has proven their association with mathematics achievement. Hence students should strive to achieve mastery, have positive attitudes towards mathematics to increase mathematics self-efficacy, and decrease mathematics anxiety.

Recommendations for Teachers:

As mathematics self-efficacy can be increased through mastery experiences, vicarious experiences, verbal and social persuasion and somatic-psychological states, teachers shall approach students by giving chances to experience mastery by scaffolding their learning, and being more understanding their psychology and nature. Also, by understanding the devastating effects of anxiety, teachers shall restrain using prompts to threatening their self-esteem and personal adequacy and keep students' way to success anxiety free.

Recommendations for Administrators:

Administrators could arrange professional development opportunities for teachers to understand the constructs of self-efficacy and anxiety and their relationship with the students' achievement.

Recommendations for Future Researchers:

This study was limited in scope to middle school grade levels at only one school, a recommendation to future researcher would be to conduct the study using a larger population by extending the grade levels and by adding to the number of schools, another modification could be studying the constructs of this study with science subject together with mathematics.

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