

Running head: DIFFERENCES IN MATHEMATICS SELF-EFFICACY

**THE DIFFERENCES IN MATHEMATICS SELF-EFFICACY SCORES BETWEEN  
MILITARY DEPENDENT STUDENTS AND GENERAL POPULATION STUDENTS**

by

Jeffrey Thomas Harris

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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## ABSTRACT

The United States has now been engaged in war for fourteen years, the longest war in American history. A war like this has created an atmosphere of extended deployments for members of the military resulting in separation from their family. Deployments can affect many areas of family life, and the child's academics is one such area. A student's success often depends on his/her confidence, or "self-efficacy", in academics. This can be affected by the inconsistencies of military life, such as constantly moving and transferring schools, which can shake that confidence causing him or her to struggle academically. The purpose of this study was to examine the mathematics self-efficacy of military dependent students and compare the results to the general student population. The Mathematics Self-Efficacy Scale (MSES) was used to quantify the results and a multivariate analysis of variance (MANOVA) was run to determine the areas of significance of the subscales and overall mathematics self-efficacy. The study was a quantitative, causal-comparative design comparing 200 students - 100 military dependent and 100 general population - comparing each population's total mathematics self-efficacy, mathematical task self-efficacy, and math-related school subjects self-efficacy. The results are intended to determine whether, in this population, the military dependent students show a greater amount of self-efficacy than the general population. According to the results of the One-Way MANOVA, military dependent students did show a greater mathematics self-efficacy than general population students. Since the One-Way MANOVA showed a significant difference, one-way ANOVAS were run and the only significance found was that military dependent students were higher than the general population in math task self-efficacy.

*Keywords:* military dependent, self-efficacy, mathematics, stress, military life

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**List of Abbreviations**

Global War on Terrorism (GWOT)

Mathematics Self-Efficacy Scale (MSES)

Operation Enduring Freedom (OEF)

Operation Iraqi Freedom (OIF)

Operation New Dawn (OND)

Self-Efficacy (SE)

## CHAPTER ONE: INTRODUCTION

### Background

The United States is currently involved in the longest period of war in its history, including more than a decade of military involvement in the wars in Afghanistan and Iraq (Operation Enduring Freedom [OEF], Operation Iraqi Freedom [OIF], and Operation New Dawn [OND]) (Lester & Flake, 2013). As such, there are approximately 2.4 million service members that have been deployed since October of 2001 (Hawkins et al., 2017; Ross & DeVoe, 2014; Tautman, Alhusen, & Gross, 2015). The deployment of that many military members means that there are numerous family members left behind that must find a way to carry on. When military members leave, they not only leave a spouse but children as well; there are approximately two million children and youths that have been affected by wartime deployment (Easterbrooks, Ginsburg, & Lerner, 2013). These children and youths are students in schools throughout the nation and overseas that face special and unique challenges that other students do not. Amid the turmoil of parental deployments, multiple moves, school transitions, and parental reintegration these students are still expected to perform and achieve academic success.

A measure of a student's mathematics self-efficacy has been identified as a strong predictor of academic achievement (Schweinle & Mims, 2009). There have been several studies performed regarding a student's mathematics self-efficacy; Schweinle and Mims (2009) studied mathematics self-efficacy in regard to race as it pertains to resiliency, while Louis and Mistele (2011) studied mathematics self-efficacy evaluating the differences in gender in mathematics and science. However, the population of students identified as military dependents have been severely overlooked in academic studies. There have been numerous studies involving stress (Knobloch, Ebata, McGlaughlin, & Theiss, 2013), school transitioning (Bradshaw, Sudhinaraset,

Mmari, & Blum, 2010), and behavior (Lester et al., 2012), but far fewer involving academic success. Aronson and Perkins (2013) conducted a study examining decreased social functioning and poor academic achievement amongst military students, but they did not explore the area of mathematics self-efficacy as an indicator of academic achievement.

The issue of self-efficacy was realized during examination of the social learning theory, pioneered in the early 1900's by men such as Henri Bergson and John Watson (Miller, 2011). Watson claimed that he could take any infant, chosen at random, place the child in his environment, and train the child to become anything he desired (Miller, 2011). In this scenario, it is evident that the focus was on creating an environment that would influence learning. Bandura carried the concept of social learning a little further and developed the concept of self-efficacy. He believed this was the component of the learning process that would

help determine the choices people make, the effort they put forth, the persistence and perseverance they display in the face of difficulties, and the degree of anxiety or serenity they experience as they engage the myriad tasks that comprise their life (Pajares & Usher, 2008, p. 1).

According to Zimmerman (2000), self-efficacy measures a student's performance capabilities and not his qualities or characteristics toward learning. The concept of self-efficacy is all about a student's confidence in his/her own abilities and not the abilities themselves.

Understanding that self-efficacy is synonymous with confidence, it is easy to see that the unstable environment of a military lifestyle could have a negative effect on a student's confidence level. Due to the war in which the United States is engaged, military dependent students have more stresses with which to contend than did their predecessors (Bradshaw et al., 2010). This change in stresses has raised new concerns for this population of students and,

therefore, warrants the full attention of the academic world. There needs to be more research accomplished concerning military dependent students and academic achievement.

### **Problem Statement**

Military families face a variety of challenges that a normal, functioning family may never face, such as long separations from loved ones, multiple moves, continuous school transitioning, and the stress of having a loved one in dangerous combat situations (Easterbrooks et al., 2013; Aronson & Perkins, 2013). There have been numerous studies conducted evaluating the effect of military life on families, but there is a lack of studies on the effects of military life on student achievement. There exists a need to gain deeper understanding into how military dependent students are affected academically by such a tumultuous lifestyle. Mathematics self-efficacy, which is considered a key indicator of academic success (Schweinle & Mims, 2009), has been studied and analyzed by race and gender; as of yet, there has not been a study conducted examining the mathematics self-efficacy of military dependent students compared to the general student population. The problem is the lack of studies concerning the mathematics self-efficacy of the formidable subgroup of military dependents.

### **Purpose Statement**

The purpose of this study was to determine the difference in mathematics self-efficacy between military dependent students and general population students. The independent variables in this study were the populations of students defined as military dependent students and general population students. The dependent variables were overall mathematics self-efficacy, mathematics task self-efficacy, and math related school subjects' self-efficacy. The research method for this study was a quantitative, causal comparative design to add to existing literature on the topic of self-efficacy in mathematics. Students who are enrolled in a mathematics course

from a high school in eastern North Carolina that was determined to have a military dependent to general population ratio of 1:2 were targeted to participate in this study.

### **Significance of the Study**

Today there are military men and women deployed all over the world, in both combat and peace keeping roles. The need for America to care for their families is great, and the education of their children is an important factor in the future success of the country. Hosek and Woodsworth (2013) revealed the true financial condition of today's military and provided evidence that there are many families on government assistance. In studies performed by McConney and Perry (2010) and Siegler et al. (2012), they showed that a low socioeconomic status has a negative effect on student achievement. The financial status of the family can play a large role in the confidence of a student.

The confidence, or self-efficacy, of students has been examined as it pertains to gender and shows that there is not a significant difference between boys and girls in this area of self-efficacy beliefs (Erdogan, Baloglu, & Kesici, 2011); however, studies showed a significant difference between minority students and non-minority students (Siegler et al., 2012). The existence of this significant difference presents the need to explore mathematics self-efficacy more deeply and involve different unique populations. Including military students in a study of mathematics self-efficacy as an indicator of academic success is not only a necessity but an obligation, as mathematics self-efficacy is a strong indicator of mathematics achievement (Schweinle & Mims, 2009) and warrants investigation. Cozza and Lerner (2013) remind the nation that there is a promise that must be kept to our military men and women; watch over their families while they serve our country.

### Research Questions

The researcher in this study focused on the following research question:

**RQ1:** Is there a difference in overall mathematics self-efficacy scores, mathematics task self-efficacy scores, and math-related school subject self-efficacy scores between military dependent students and general population students?

### Definitions

1. *Deployment* - Extended separation from one's family due to military operations because of wartime maneuvers (Lester et al., 2012).
2. *General population students* – Students not associated with the military.
3. *Mathematical self-efficacy* – Personal judgements of one's capabilities to organize and execute courses of action to attain designated mathematical goals (Schweinle & Mims, 2009).
4. *Military dependent* – The family of a military member, usually a spouse and/or children (Hosek & Wadsworth, 2013).
5. *Reintegration* – The reuniting of a service member with the family after a deployment and the attempt to restore the family unit to a pre-deployment state (Knobloch et al., 2013).
6. *Self-efficacy* – One's judgement of confidence to perform academic tasks or succeed in academic activities (Pajares & Graham, 1999).

## **CHAPTER TWO: LITERATURE REVIEW**

### **Introduction**

The mathematics self-efficacy of students has been a widely studied and discussed component of academic success. Previous studies have concentrated on various sub-groups of students, such as race and gender, but there is a sub-group of students that has been neglected – military dependent students. Due to the recent war that has now become the longest war in United States history, the sub-group of military dependent students has become a very large contingent. This chapter will provide a conceptual framework and a review of literature relevant to the topics of mathematics self-efficacy and the need to consider military dependent students as a formidable sub-group to be studied. The literature review will consist of two major parts: 1) academic success and 2) military life, both through the filter of mathematics self-efficacy. The review of literature will remain consistent with the purpose of the research which was to determine the difference in mathematics self-efficacy between military dependent students and general population students. With mathematics self-efficacy being a strong indicator of academic success, it is imperative that all sub-groups be evaluated to determine what, if anything, needs to be done to increase mathematics self-efficacy. The purpose of this chapter is to provide a conceptual framework upon which all findings will be evaluated, present a background of knowledge upon which the study will be conducted, and identify the gap in literature the present study will fill.

### **Conceptual Framework**

The concept of self-efficacy can be attributed to Albert Bandura and his theory of social learning (Bandura, 1971). Bandura (1971) believed that people behave the way they do because of internalized beliefs and learning resulting from social interaction; people can learn through

observation and not experience alone. In 2006, Bandura tied his social learning theory to self-efficacy in his book *Self-Efficacy Beliefs of Adolescents*, where he discussed the development of a scale to measure perceived self-efficacy. Pajares and Graham (1999) took Bandura's social cognitive theory and apply it to determining a student's self-efficacy as it pertains to mathematics, defining Bandura's self-efficacy beliefs as, "their judgements of confidence to perform academic tasks or succeed in academic activities" (p. 124). The way in which a person looks at or evaluates his/her own abilities is referred to as self-perception. There have been two schools of thought as it pertains to academic self-perception: 1) self-concept and 2) self-efficacy (Skaalvik & Skaalvik, 2009). The difference in the two perceptions is grounded in the way each is realized. The perception of self-concept is based on external factors, such as comments of others and other such social factors, while self-efficacy is based on one's own perception or judgement of the abilities possessed to accomplish assigned tasks (Skaalvik & Skaalvik, 2009).

Self-concept is based on academic success or failure and other such external motivations. A negative self-concept can be associated with academic failure, frustration, and negative comments from others while a positive self-concept can be linked to academic success, excitement, encouragement, and positive comments from others (Pajares & Usher, 2008). A person's self-concept is a driving factor toward success but has not proven to be as strongly related to academic success as self-efficacy (Pajares & Usher, 2008). Self-concept, according to Schunk (1991), is comprised of four components: self-esteem, self-confidence, stability, and self-crystallization. Self-esteem is the way in which a person perceives their own sense of worth to their environment. Self-confidence describes the way in which an individual perceives their ability to complete assigned tasks. Stability refers to the ease or difficulty in which a person completes or perceives assigned tasks. Finally, self-crystallization describes the extent to which

all the above listed components are ingrained into a person's life, creating the foundation of learning (Schunk, 1991). Each of the aforementioned components are external, or social, factors that influence the way in which a person assesses the level at which he or she can complete assigned tasks, thereby affecting the individual's confidence level. A person's self-confidence has ties to self-efficacy, but it is not interchangeable with self-efficacy.

Self-efficacy refers to the way in which an individual perceives their ability to perform an assigned task. Self-efficacy is an answer to the question, "Do you believe you can perform a certain task?" Usher and Pajares (2009) break down Bandura's definition of self-efficacy and provide four primary sources from which self-efficacy is derived: 1) Mastery experience, 2) Vicarious experience, 3) Social persuasions, and 4) Emotional and psychological states (Usher & Pajares, 2009). The first source, mastery experience, refers to the practice of building on previous experiences. The more an individual experiences success, the more self-confidence the individual gains which in turn leads to a greater perception of belief in one's own abilities. The second, vicarious experience, refers to learning through others successful or unsuccessful experiences. Vicariously observing others perform tasks successfully leads to the idea, "I can do that", which can be a powerful tool for developing one's own self-efficacy. Observing others experience success provides motivation to take chances and attempt new and innovative ideas, building a sound foundation of self-efficacy. The unsuccessful experiences of others also shape the self-efficacy of a person as he or she gains confidence by knowing what to avoid in their future endeavors. The third, social persuasions, is accomplished by receiving information or training from others that encourages an individual. This increases that individual's perception of being equipped to complete a certain task, thereby increasing that individual's self-efficacy. Lastly is the emotional and psychological state of the individual. Arousal, anxiety, mood, and

fatigue are all factors that can contribute to a person's perception of ability or self-efficacy (Usher & Pajares, 2009).

### **Math Self-Efficacy**

As stated previously, there are four primary sources from which self-efficacy is derived: 1) Mastery experience, 2) Vicarious experience, 3) Social persuasions, and 4) Emotional and psychological states (Usher & Pajares, 2009). Each one of these sources provide an important piece in the building of a solid foundation for an individual's positive self-efficacy. The classroom is where students are most likely to have the opportunity to experience all four of these sources. The teacher is there to guide the students on the journey of discovery.

Mastery experience is achieved through a student's academic, and in this case mathematical, journey. Throndsen (2011) refers to the computation of basic facts as being a fundamental functional skill of mathematics. The concepts of addition and subtraction on the most basic level are key aspects of mathematical education in a student's early education. The building of a solid foundation of mathematical facts and computations is the key to creating a base on which to build all future mathematical knowledge. Lindsey Shorser (2010) produced a document that shows Bloom's taxonomy interpreted for mathematics. According to Shorser (2010), knowledge is defined as understanding the concepts of mathematics, structures and methodologies. The methods used to teach these basic concepts vary, but whatever method is used, the goal should be creating a solid mathematical foundation for students. The taxonomies of learning, although different, all have the base in common – the need to teach basic skills. Likewise, they have different names and different numbers of levels, but no level is more important than any other. "The highest level on the taxonomy – evaluation – has no more inherent 'goodness' or desirability than the lowest level – knowledge" (Holmes, 2012, p. 56).

The taxonomies are in synchronization with Piaget's Cognitive Stage Theory (Miller, 2011). The foundational level of each of these taxonomies are based on Piaget's Cognitive Stage Theory.

States have long adhered to sets of standards by which instruction has been guided. Recently, there has been a shift toward a Common Core approach. Powell, Fuchs, and Fuchs (2013) state, "Foundational skills, such as knowledge of numbers, counting, number combinations, operations, and algorithms, are necessary to complete many mathematical problems" (p. 42). Understanding this need for basic mathematical knowledge is key to creating effective standards, whether traditional or common core (Powell et al., 2013). The concept of taking students back to the basics is applicable throughout education. In special education, the emphasis in mathematics is to help students build a solid foundation built on concrete skills (Ketterlin-Geller, Chard, & Fien, 2008). This same idea needs to encompass the whole educational system, not solely special education. Students at all levels and learning abilities need to have a solid foundation upon which to build future learning, as this creates opportunities for future success in mathematics. Success in mathematics then helps foster a positive mathematics self-efficacy, which in turn encourages learning; thus, a positive feedback loop can be created.

Gonzalez-Castro, Cueli, Cabeza, Alvarez-Garcia and Rodriguez (2014) referred to the importance of intervention in mathematical development of students at an early age; the task of repairing the foundations of middle and high school students entails creating a successful intervention model (Balfanz, McPartland, & Shaw, 2002). Students entering the ninth grade who perform at a seventh-grade level are in the 23<sup>rd</sup> percentile in mathematics. This means roughly one fourth of students entering the ninth grade are lagging behind their peers and need extra help in mathematics (Balfanz et al., 2002). Balfanz et al. (2002) referred to a study performed by

Betts (1998) that showed 31% of ninth grade students performed below the median score for seventh grade students. The results do not change very much over the years. Kloosterman (2010) reports minimal gains in performance by 17-year-olds in mathematics between 1986 and 2008 on overall scale scores, raising questions about gains made in some areas and deteriorations in other areas. The need for intervention is inevitable.

Although U.S. students may not fare badly when asked to perform straightforward computational procedures, they tend to have limited understanding of basic mathematical concepts. They are also notably deficient in their ability to apply mathematical skills to solve even simple problems (Kloosterman, 2010, p. 49).

The inability of students to perform basic or foundational mathematics tasks – such as adding, subtracting, multiplying, dividing, fractional computations and decimals – is severely impacting their ability to progress into higher level thinking skills. Wade (2006) takes a rather whimsical look at a real problem. The article documents a conversation between the calculator and algebraic procedures with the end result being how the calculator can produce inaccurate results due to rounding. A student's lack of mathematical knowledge and inability to understand rounding can lead to their accepting the calculator's answer without further investigation. Students need to understand basic mathematical principles before they move on to using the tools that make mathematics easier and more streamlined. The idea of using technology and students' dependence on said technology can be seen in the classroom when they pick up a calculator or use a computer to perform the simplest of calculations.

The nature of mathematics is such that it must be built as a house: a solid foundation followed by a strong framework, laying one brick upon the other. Layered instruction, upon which response to intervention (RTI) is based, is an integral part of meeting the needs of

struggling students by leading them through a step-by-step process of learning (Hoover & Love, 2011). Just as with the house, the entire structure is only as sturdy as the sum of its parts; it is essential that one quality layer be built at a time. However, students are progressing through their elementary, middle school, and high school years without developing a sturdy mathematical structure on which to build future learning. The implications of this lack of foundational knowledge far outreach the world of academia, as these same students are the future of the world. A lack of mathematical skills limits a person's ability to achieve or at least makes achievement more difficult. Basic skills assessments are given to students entering college to "provide faculty, institutional researchers, and administrators with a baseline measurement to gauge a student's progress and gains in higher education" (Yin & Volkwein, 2010).

Unfortunately, the concerns over mathematical skills in the United States today are growing. This growing concern, though centered on basic mathematical skills, radiates into the student's ability to think. The ability to perform mathematics is directly linked with a person's ability to reason; a person's ability to reason aids his or her problem-solving skills (Schilling-Traina & Stylianides, 2013). Every day in math classes across the United States, students struggle with basic arithmetic calculations. The inability of students to understand positive and negative numbers, the relationship between fractions and decimals, and how to add, subtract, multiply and divide all lead to frustration, aggravation, and eventual shut down (Moeller, Pixner, L., & Nuerk, 2011). The educational process has let these students down by not helping them to create a solid mathematical foundation.

Wade (2006) documents a hypothetical dialogue between a calculator and algebra and it is a very eye-opening article. The idea that a calculator provides us with the answers is built on two very distinct assumptions: 1) Information is input correctly and 2) the operator understands

the limitations of the calculator. These two assumptions, input validity and output understanding, require foundational mathematics understanding. A student must be grounded in the basic skills of mathematics to understand the efficient use of the calculator (Wade, 2006). An error in input due to lack of understanding by the operator will produce faulty and erroneous output. Likewise, a lack of student understanding as it pertains to the relationship between fractions and decimals makes the transfer of calculator output into useful information difficult. Yes, there are tools that aid students with both basic and advanced mathematical functions, but basic, fundamental knowledge must be possessed by the operator in order to successfully and efficiently use the information provided.

Witnessed everyday by educators, the mathematical struggles of students are well-documented. A return to the basics is necessary for the restoration of a sound mathematical system and an increase in student mathematical self-efficacy. Teachers must once again learn to reach students where they are to help these students build a solid foundation. This foundation needs to start at the early ages and be reinforced throughout a student's educational journey as they build toward higher mathematics. The professional literature suggests that a strong correlation exists between students learning basic foundational math skills at an early age and future success in advanced mathematics courses (Moeller et al., 2011). Learning the computation of basic mathematical facts constitutes a fundamental functional skill of mathematics, and the ability of students to perform addition and subtraction is a key to the success of students in their early years of schooling: It is also essential to future success in advanced mathematical courses (Thronsen, 2011). In a study conducted by Moeller et al. (2011), they found there was direct empirical evidence that complex calculation performance relies upon basic numerical skills, such as magnitude understanding (p. 1838). Therefore, it is

evident that there is a need to emphasize the instruction of basic numeration and mathematical calculations at an early age to increase students' chances of success in future mathematics courses. Placing an emphasis on basic mathematical computation and numeration is vital to all students, especially those with identified learning difficulties. Gonzalez-Castro et al. (2014) state, "It is therefore necessary to first know which mathematical competencies require a more specific approach to promote intervention programs adapted to the initial learning difficulties" (p. 378). Testing students and identifying individual weaknesses is an important component when helping students obtain future mathematical success. Building a firm mathematical foundation upon which students may build will strengthen their mathematical future, which in turn increases a positive feeling of self-efficacy.

Learning through vicarious experiences is achieved by a student being closely related to or watching the journey of another student's mathematical success or failure. Students often compare their mathematical performance to the performance of other students, using other students' performances as a gauge by which to measure their own success or failure (Pajares & Usher, 2008). Through close observation of another student – of perceived like abilities – experiencing success with a mathematical task or problem, it is possible that a student may change their initial assessment of their abilities to complete the same or similar task or problem (Pajares & Usher, 2008). Vicarious learning does, however, possess a weaker effect on self-efficacy than mastery learning because of the possibility for a student to have an unsuccessful experience even though the classmate had a successful experience (Schunk, 1989). Vicarious learning coupled with mastery learning provides a solid source for growing a student's self-efficacy. When a student observes another student's academic success, it gives the student the confidence to try; then, the student's personal success leads to an increase in self-efficacy.

Verbal and social persuasions are also an effective source of student self-efficacy. The communication of confidence in a student's ability to complete assigned tasks or problems by someone of authority or someone the student respects can have a positive effect on the student's self-efficacy; doubt by that same person can have a negative effect (van Dinther, Dochy, & Segers, 2010). Positive feedback is an effective source of self-efficacy, but, once again, it is only lasting when the newfound confidence is coupled with mastery experience.

Each of the already mentioned sources – mastery learning, vicarious learning, and verbal and social persuasions – are all tied to the last source: the emotional and psychological state of the student. For a student to be successful, he or she must have a feeling of worth or value. Self-efficacy has strong ties to the emotional state of the student. A student that has a positive outlook or emotional state can strengthen his or her self-efficacy while those who exist in a negative state can experience low self-efficacy (van Dinther et al., 2010).

There have been studies that relate to a fifth component of self-efficacy: classroom management and discipline (Cheema & Kitsantas, 2014). Prior studies by Hadre et al., (2007) and Ma & Williams (2004) have indicated that student perceptions of the disciplinary climate during math lessons are a significant predictor of math achievement. There appears to be a direct correlation between the perceived control a teacher has in the classroom and mathematics achievement. Clearly establishing the line of authority and letting the students know who is in charge of the classroom is imperative to student success in a mathematics lesson (Cheema & Kitsantas, 2014). “A student's perception of classroom discipline may very well be associated with that student's confidence in and respect for the teacher, both of which can be adversely affected in the presence of a loose discipline policy” (Cheema & Kitsantas, 2014, p. 1274). The negative effects on math self-efficacy of a loose disciplinary climate in a mathematics classroom

is compounded by racial inequities (Klinger, 2000; Ma & Williams, 2004). Therefore, it is possible that an increase in a student's perception of a disciplinary climate may lead to a corresponding increase in math achievement for all ethnic groups. This corresponds with the findings of Shin, Lee, and Kim (2009) that regardless of ethnicity, classroom climate is an important predictor of academic achievement.

Skaalvik and Skaalvik (2009) concluded in their study of the self-concept and self-efficacy of middle school students that self-concept and self-efficacy, under the umbrella of self-perception, are directly related to academic success in mathematics. A student's ability to perform assigned tasks successfully will increase their confidence, consequently increasing their self-perception which in turn affects their self-efficacy.

### **Academic Achievement and Math Self-Efficacy**

The goal of education is to create an atmosphere where all students are provided the opportunity to be successful academically. The challenge for educators is to identify a way to motivate individual students to strive for success in their own way. Identifying the key to motivating a student is, often, tied to the student's interests and abilities. While students progress through their academic journeys, their interests begin to narrow as they realize where they want to concentrate their educational goals. There has been extensive evidence produced that links the academic success of a student to his or her own self-efficacy (Bandura 1997; Chemens, Hu, & Garcia, 2001; Eastin & LaRose, 2000; Khorrami-Arani, 2001; Tamara & Koufteros 2002). According to Yusuf (2011), "Self-efficacy refers to the personal beliefs or to an individual's confidence in his own ability to perform effectively specified tasks" (p. 1). Along with many other factors, self-efficacy beliefs have proved to be important predictors of academic achievement (Komarraju & Karau, 2005; Marsh, Trautwein, Ludtke, & Koller, 2008;

Martin, Montgomery, & Saphian, 2006; Pajares, 2002; Pajares & Schunk, 2001; Robbins et al., 2004). Cheema and Kitsantas (2014) performed a study and concluded that a student's self-efficacy is an important predictor of academic achievement. The findings of Cheema and Kitsantas (2014) are in line with previous findings of Bandura (1986) and Kitsantas, Cheema, and Ware (2011). However, the educational research into the causal effect of self-efficacy of students on their academic success raises the important question: Does self-efficacy affect academic success or academic success affect self-efficacy (Yusuf, 2011)?

The acceptance of a student into a college program is a significant event and accomplishment, but it is only the beginning. Once the college journey has begun, the challenge then becomes focusing on success and completion of the academic process. Self-efficacy plays a major role in a student's achievement and confidence, enabling the student to persevere in college and not leave before the student's academic goal is met (Choi, 2005; Pajares & Schunk, 2001; Vuong, Brown-Welty, & Tracz, 2010). The success of a student academically is a key component in that student's decision whether to continue his or her educational pursuits; there has been research that links academic success to self-efficacy (Pajares & Miller, 1994; Usher & Pajares, 2009). The educational pursuits of a student determines the choice of tasks, the level of performance at which the task is accomplished, the amount of effort put into performing chosen tasks, and the perseverance in the task performance; all of which are influenced by an individual's perceived self-efficacy (Bandura, 1997; Choi, 2005). Choi & Chang (2011) addressed the connection between self-efficacy and academic success as such:

To cite a few empirical studies, Wood and Locke (1987) reported that self-efficacy contributed a significant increment in  $R^2$  (about 8%) for academic performance of undergraduate students. In their study, 29 items were employed to measure academic

self-efficacy in seven academic tasks such as exam concentration and note-taking. Academic performance in the study was measured by composite points earned in a course. Pajares and Miller (1994) also reported a significant direct path coefficient ( $\beta = .545$ ) leading from math self-efficacy to math performance of college students. Overall, self-efficacy is reported to be a strong predictor of college student academic performance, with the magnitude of correlation coefficients between the two variables ranging from .49 to .70 (Pajares, 1996) (Choi & Chang, 2011, p. 197).

Keep in mind, a key component of self-efficacy is that it is task specific (Choi & Chang, 2011; Finney & Schraw, 2003). Measuring self-efficacy on basic criterial tasks with a task-specific scale based on the academic area to be evaluated ensures a high predictive validity (Choi & Chang, 2011; Huang, 2011). It is important to note that a lack of correspondence between the level of self-efficacy and criterial research can result in researchers not observing a significant effect of the self-efficacy construct on the dependent variable measure (Choi & Chang, 2011). Although there is an emphasis placed on the measurement of task-specific self-efficacy, it is suggested by some researchers that this situation and context-specific self-efficacy may be transformed to a more global efficacy, such as academic self-efficacy (Choi, 2005; Sherer et al., 1982).

The key is to link not just self-efficacy to academic achievement, but to link specifically mathematics self-efficacy to academic achievement. In the study conducted by Özgen and Bindak (2011), it was concluded that there is a positive relation between mathematics self-efficacy and academic achievement. These results echo the results of previous studies (O'Brian, Martinez-Pons, & Kopala, 1999; OECD, 2004; Pajares & Miller, 1994).

### **Self-Efficacy, Self-Concept, and Academic Success**

Previous research on the effect of self-beliefs on achievement has focused primarily on the connection between self-efficacy and self-concept (Bong & Skaalvik, 2003; Parker, Marsh, Ciarrochi, Marshall, & Abduljabbar, 2013). Worldwide, the Programme of International Student Assessment (PISA) was established to explore the relationship between academic achievement, self-efficacy and self-concept (Parker et al., 2013). There has been a consistently strong relationship shown between achievement and self-beliefs across nations verified by the PISA research (Lee, 2009; Marsh & Hau, 2003; Parker et al., 2013). There exists a correlation between a student's grades, in the school environment, and the beliefs the student has about his or her ability to perform successfully the tasks presented to him or her (Jungert & Andersson, 2013; Skaalvik & Skaalvik, 2008). A child's perception of his or her self-efficacy and how he or she perceives his or her ability to learn or master skills determines the level of motivation and school accomplishment he or she will attain (Bandura, 1993; Jungert & Andersson, 2013).

The relationship between self-efficacy and self-concept has been well established, as documented by Skaalvik & Rankin (1996) in a paper presented at the meeting of the American Educational Research Association. Bandura (1986), defined self-efficacy as "the belief in one's capabilities to organize and execute courses of action required to produce desired attainments" (p. 391). Although there is a relationship between self-efficacy and self-concept it is also essential to understand the differences and how those differences pertain to a student's academic achievement. Self-concept is comprised of four components: self-esteem, self-confidence, stability, and self-crystallization (Schunk, 1991). The first component of self-concept is self-esteem which is a judgment of self-worth, while self-efficacy is based primarily on a child's perceived capability (Jungert & Andersson, 2013). Self-efficacy is evaluated and determined by

a child based on contextual factors and concerns a specific goal (Bandura, 1997; Jungert & Andersson, 2013). While, according to Bandura (1986), “the conceptual discrimination between self-efficacy and self-concept seems to be marginal, but the two constructs express different phenomena” (van Dinther et al., 2010). Self-concept is based on a person’s own judgment of themselves, and self-efficacy is a task-oriented perception of one’s ability to complete the task at hand.

Understanding the differences, no matter how subtle, between self-efficacy and self-concept is crucial to understanding how self-efficacy can act as a predictor of academic success. There is a growing desire in educational research to study the effect of self-efficacy on student achievement (van Dinther et al., 2010). In a study conducted by Multon, Brown, and Lent (2011), they found a connection between self-efficacy and academic behaviors supporting Bandura’s (1977, 1982, 1986) theory and its extension to educational-vocational behavior (Betz & Hackett, 1993).

Self-efficacy and self-concept are similar, yet there is a basic difference; self-efficacy is based on a person’s perception of their ability to complete a task, while self-concept is based on how a person feels they are perceived by others. Though self-efficacy is based on a person’s perception, there are many outside factors that contribute to the formation of that perception. Feedback that a student receives in a classroom – such as formal and informal assessments from the teacher and reactions from other students – are all crucial forms of information used by the student to appraise self-efficacy (Bandura, 1997; Özdemir & Pape, 2013). According to Bandura’s (1997) social cognitive theory, there are four sources of information that students use to develop their sense of self-efficacy:

Students gain information about their competencies through their performances or enactive mastery experiences. In general, successes raise efficacy, and failures lower it. Students also gain information about their abilities through observing similar peers achieving a goal. These vicarious learning experiences support students' beliefs that they too are capable of accomplishing the task. Students also derive efficacy information through social persuasion as others encourage them and support their ability to perform a task. The last source of efficacy includes physiological and affective states such as heart rate and sweating. For example, bodily symptoms signaling anxiety may be interpreted by students as an indication of lacking necessary skills (Özdemir & Pape, 2013) (Bandura, 1997, p. 248).

Understanding the sources of self-efficacy is crucial to educators as they try to help students achieve academic success.

### **Military Life**

The global war on terrorism (GWOT) has created an atmosphere in the military community unlike any that has been experienced in recent history (Aronson & Perkins, 2013). The reality that the GWOT has now become the longest war in the history of the United States (US) has placed extraordinary demands on families of military members, including their children, as they continue their education despite multiple moves and family instability (Lester & Flake, 2013). There are three main areas of military life the family needs to be able to contend with as the GWOT continues: deployments, frequent moves, and emotional stress. Deployment is the first area of concern within the family. Deployments translate into long periods of separation of one or more of the members of a household – usually the mother or father – from the family unit, creating a situation in which other members of the family need to fill the void,

often requiring adjustments to the family lifestyle. The addition of danger to the separation in wartime versus peacetime deployments has been linked to increased stress and mental health problems among family members (Rodriguez & Margolin, 2015). The longer a family member remains deployed, the more susceptible the at-home family is to psychological health challenges (Lester et al., 2012). Aronson and Perkins (2013) reiterate this issue with the psychological health of the at-home family members, extending the definition of psychological health to include their equilibrium, health, and well-being (Chandra, Burns, Tanielien, & Jaycox, 2011; Esposito-Smythers et al., 2011; Wadsworth 2010). The military child has an increased risk of emotional and behavioral disruptions as the time of deployment increases, making them vulnerable to heightened anxiety and academic difficulties (Lester et al., 2012). Deployments during the developmental years of students thus cause added stress in school-aged children during the already tumultuous time of adolescence (Guzman, 2014; Milburn & Lightfoot, 2013). Thus, deployments act as a catalyst for other problems encountered by the family unit.

The second area of concern is the frequent moving involved with military life. Moving can be caused by a member of the family receiving change of duty orders or the need for the family to move “home” closer to family for support during a deployment. Whatever the reason, moving translates to children having to change schools multiple times, causing academic instability. Moving is a turbulent time for children as they must cope with the loss of friends and familiar surroundings and routines (Jagger & Lederer, 2014; Burrell, Adams, Durand, & Castro, 2006; Perry, 2012). Emotional stress due to the instability and constant change is a real concern as it pertains to the psychological health of children.

Emotional stress is a third area of concern that can affect a person’s performance and emotional stability. Along with the emotional stress experienced due to military life, adolescents

contend with the physical, emotional, and psychological changes they experience due to the natural growing-up process, adding stress to the lives of them and their families (Perry, 2012; Williams, 2013). According to Erickson's psychosocial development theory, young people are seeking to establish their social identities during this time in their lives (Shaffer & Kipp, 2010; Williams, 2013); the stress of growing-up coupled with the military lifestyle can produce negative outcomes in a student's social development. Extended deployments do not only affect the adolescents in the family, but the spouse who is left behind and other children as well (Lester et al., 2012). Emotional stress is not just limited to deployment separation, as it exists during the reintegration process as well (Knobloch et al., 2013). The examination of these three areas of concern – deployments, moving, and emotional stress – helps give a clearer picture of the military dependent student.

### **Deployments**

There are approximately four million military-connected children who are currently living in the US: two million who have a parent on active duty, in the guard, or reserve and another two million whose parents are veterans (Lester & Flake, 2013). Also, according to Lester & Flake (2013) approximately 2.3 percent of the current force is made up of dual-service families while 30 percent of women serving in the military are mothers. All these figures mean one thing: Today's military dependent children are facing challenges never before faced by military dependent children of the past. Wartime deployments average 12–18 months and members find themselves serving on multiple deployments during an enlistment (Aronson & Perkins, 2013; Easterbrooks et al., 2013). Families that are separated due to multiple deployments face struggles that are unique to military families, affecting their health and well-being, due to the added stress of the deployed member being placed in dangerous situations

(Chandra et al., 2011; Esposito-Smythers et al., 2011; Wadsworth, 2010). The effect deployment can have on civilian spouses can be equal to or greater than that of the active duty members due to a lack of a support group or cohesive unit to which they can belong (Lester et al., 2012). The toll that multiple deployments and reintegration stressors take on families and relationships is becoming more evident as indicated by current research (Thomas et al., 2010).

The stress of deployments can often manifest itself in physical sickness and psychological instability (Cozza et al., 2013). Military dependents are often absent from school due to unexplained illnesses; these illnesses can often be attributed to bad news or no news from a deployed parent or loved one. The student's inability to handle the stress can cause them to internalize the feelings or emotions, causing their bodies to react with a physical feeling of sickness (Easterbrooks et al., 2013). The sickness often goes away once the student deals with the stress or the situation that caused the stress disappears. The psychological instability is easier to explain and understand; the more a student tries to subdue the feelings of abandonment or worry, the more susceptible they are to an unstable psyche. Military dependents often feel abandoned, especially if the parent leaves during a crucial time in the life of the student. Although the student may know and understand the parent has no choice in their deployment, the student cannot overcome the real feeling that the parent left in his or her greatest time of need. Worry is another catalyst to psychological instability. The student may worry about the well-being of the deployed service member along with the spouse and other family members that are left behind. These physical and psychological illnesses can have a serious negative effect on the student's ability to perform successfully in school.

Deployments also affect the emotional stability of dependent children. As it has been noted, children tend to internalize and externalize behaviors and possibly develop psychological

characteristics such as anxiety, depression, prolonged grief and emotion dysregulation (Aronson & Perkins, 2013; Lester et al., 2010). According to numerous studies, students tend to struggle in school and with social interaction during parental deployments (Huebner, Mancini, Wilcox, Granss, & Grass, 2007; Aronson & Perkins, 2013; Mmari, Bradshaw, Sudhinaraset, & Bloom, 2010). Brenda Williams (2013) in her article, *Supporting Middle School Students Whose Parents Are Deployed: Challenges and Strategies for Schools*, references several studies that attest to the negative impact deployments have on a student's academic performance:

Nebraska study (Isernhagen and Bulkin 2011) revealed that high mobility rates have a negative correlation with student achievement, especially in math, science, and writing. Other research (Atuel, Esqueda, & Jacobson, 2011) also indicates that parents' deployment intensifies negative effects on academic achievement. For example, Engel, Gallagher, and Lyle (2010) found that children's test scores were lower when parents had been deployed within the last year and that this effect increased in math with the length of parents' deployment. These effects were significant across five core subjects, but were most prominent in math and science. Not only are there immediate academic challenges, but there is also a concern regarding the cumulative effects of learning gaps for students whose parents are deployed. Students may find it difficult to catch up once they have fallen behind academically (Engel, Gallagher, & Lyle, 2010). Such deficiencies can result in embarrassment for students, particularly if these setbacks lead to retention or delayed graduation (Bradshaw et al., 2010). (Williams, 2013, p. 129)

Although there are stressors the military families face during deployment, it is important to note that the majority of school-aged youth and their families are able to adjust to the deployment and

continue to function with no apparent disruption in their daily lives (Aronson & Perkins, 2013; Cozza, Chun, & Polo, 2005; Institute of Medicine, 2010).

The deployment itself is not the only problem that military families face; re-integration is also a significant, reoccurring problem. Aronson and Perkins (2013) reported that nearly 75% of all the military members they interviewed had experienced some type of disconnection with the family, confusion about their role in the family, or a sense their children were experiencing feelings of fear toward them. These findings are supported by a study conducted by Frey, Collins, Pastoor, and Linde (2014) which found that – according to the social workers interviewed – the post-deployment timeframe can be difficult for families as they re-adjust to one another and re-establish roles in the family, all while knowing another deployment is highly likely sometime in the near future. Thus, the re-integration period is a critical time following a military deployment. There is an increasing amount of evidence to suggest that the stress of deployment and re-integration can wear on a military family, especially after multiple deployments (Murphy & Fairbank, 2013; Thomas et al., 2010). The relationship between husband and wife, both romantically and socially, can affect the entire family; therefore, it is important to re-establish the lines of communication in a careful and methodical way. During the deployment the lines of communication may have been limited due to time differences, resources, or availability, so decisions of what and when to share post-deployment must be weighed and considered very carefully (Greene, Buckman, Dandeker, & Greenberg, 2010; Knobloch et al., 2013; Sahlstein, Maguire, & Timmerman, 2009). The disconnect created by strained lines of communication can cause a sense of alienation and lack of belonging for both the deployed member and the family. During the re-integration process, the family members face the task of determining how much information about their experiences should be shared

with one another (Sahlstein et al., 2009; Knobloch et al., 2013). There are many reasons that communication can be hampered during deployment including expense, intermittent access, unreliable technology, and confidentiality regulations (Greene et al., 2010; Knobloch et al., 2013). The more sensitive reasons for not sharing information revolves around the military member's or partner's willingness to hold back information in an effort to protect or reduce the worry for the other (Joseph & Afifi, 2010; Knobloch et al., 2013; Lara-Cinisomo et al., 2012; McNulty, 2005).

### **Moving**

The constant moving involved with being a military family has both negative and positive impacts on families. A military family may find themselves moving every three years – a normal duty station rotation – or even every year due to the needs of the military. According to 2001 estimates, military students experience an average of nine military-related moves in their lives (Williams, 2013; Bradshaw et al., 2010). Also, according to Bradshaw et al. (2010), military dependent students can experience both positive and negative effects from multiple moves. On the positive side, the necessity of students to make new friends helps them become more outgoing and sociable; likewise, they have a chance to start over at a new school after any potentially bad experiences. On the negative side, students may become introverted to avoid the pain associated with eventually leaving friends behind and may exhibit hostility toward their families for the constant upheaval; likewise, the aforementioned academic instability is a problem in the classroom. Moving in the military is a necessity, and as such the impact that it has on the family needs to be closely examined as it pertains to all aspects of the military children's lives (Cozza & Lerner, 2013).

The positive aspects of a military family making multiple moves during a student's school years helps shape his or her life. The increased ability to make new friends easily is directly related to an outgoing personality. This social aspect of a student's lifestyle can help to mold them into high achieving, successful adults. Bradshaw et al. (2010) referred to a student's opportunity to start over after having a bad experience; this can be a positive aspect of constantly moving. There are many opportunities for students to find their niche at new schools offering different classes, sports, and other extra-curricular activities than those offered at a previous school (Bradshaw et al., 2010). Students who respond in a positive manner to military life also tend to develop a resiliency that other students may not have. These students often see the best in every situation and face new challenges with a positive attitude, knowing that new challenges bring new opportunities to succeed. Parents often view moving or relocating as a positive experience for adolescents. According to parents, the students experienced less trouble in school, resulting in less "nonroutine" school conferences. The more moves a family had, the less trouble the adolescent student appeared to have in school. The trouble with this reasoning is that it is based on the parents' perceptions and gives no insight into the students' feelings (Milburn & Lightfoot, 2013; Crow & Seybold, 2013).

The flip side of these opportunities to succeed are the opportunities to fail. The negative effects constantly moving has on a student can be devastating. Some of the hardships encountered by students are due to the timing of the move (e.g. during the middle of a school year or during a senior year of high school); adjusting to a new environment or culture; meeting the expectations of new teachers and parents; learning gaps created by moving to a place where different courses are taught; not meeting a new state's graduation requirements thereby delaying an impending graduation; lack of services for special needs students; and difficulty entering into

extracurricular activities (Milburn & Lightfoot, 2013). According to Easterbrooks et al. (2013), there is a concern among scholars that although a child may appear to be coping with moving and parental deployments adequately, they may still be at risk developmentally. The student can develop an introverted personality causing him or her to become withdrawn, shy, and unable to form new friendships easily. The awkwardness of not being able to form new relationships can cause a student to find alternative ways to “fit in,” often leading to discipline issues (Schultz, 2013; Rush & Akos, 2007; Collins & Chandler, 2008). The transition of students through the aging process is hard enough without the added stressors of having to make new friends, finding ways to fit in, and coping with the changing environment. Once a student finds a way to receive attention – negative or positive – the pattern becomes hard to break. The lack of attention from a parent who has been deployed can often lead to this destructive behavior. When a student that has fallen into a negative pattern of behavior is the dependent of a deployed service member, it is crucial that administrators and counselors are aware. There are certain approaches that can be taken and services available to help in these situations. When military dependents have moved away from the military installation to an area where schools are not aware of the challenges faced by military dependent students, it becomes increasingly difficult to provide these students with the services they need to help cope with their emotions (Schultz, 2013). Therefore, it is imperative that the administration and counselors stay abreast of military students and their ever-changing home situation.

### **Emotional stress**

The stress of deployments, moving, and all aspects of military life can be hard on all members of the family. In children, stress can often manifest in poor academic performance, depression, and behavior disorders (Cozza & Lerner, 2013). Stress affects children in various

ways. Short-lived stress appears during a period of time and disappear as quickly as it came; chronic stress is a cycle of stress triggered by some event which the child finds hard to overcome even when the original situation has been resolved (Easterbrooks et al., 2013). There are numerous causes of stress in a military family, not all of which are associated with the service member leaving for deployment. The return of a service member home can also cause stress as he or she tries to reintegrate into the family, returns home with mental and/or emotional problems the family has to learn about, or returns with physical changes due to combat related injuries (Ross & DeVoe, 2014). The death of a service member can also be a trigger for emotional stress within the family. The reality that children in military families will experience stress is a harsh one, but it is a reality that must be recognized and identified so that proper steps can be taken to help children cope with these atypical stressors. Stress in military children's lives is such a concern that the National Child Traumatic Stress Network (NCTSN) took steps in 2007 to create an interdisciplinary task force and a military family knowledge bank to develop toolkits for educators to test, identify, and provide resources for military students experiencing stress (Frey et al., 2014). Stress in the lives of military children is real; educators need to be prepared to identify it and have the tools available to help the child personally and academically.

Stress can manifest itself in many forms in dependent children. It is imperative that the education system, administrators, counselors, and teachers be prepared to identify students that may be going through stressful situations due to the unusual aspects of military life. Once the problem is identified, there must be procedures and programs in place to help the student before the stress progresses to the point of affecting the student's health, social behavior, and grades (Bradshaw et al., 2010). The earlier stress is diagnosed, the greater the chance of mitigating its effect on the student (Bradshaw et al., 2010). The challenge is for those schools who are not

located near military installations – and therefore do not have ready access to the resources that are in place to help military families – to recognize these potential issues and act early. When a service member is deployed families often move home, near family, to be closer to their support system. This, unfortunately, takes them away from organizations that are prepared to help with military specific stresses (Murphy & Fairbank, 2013).

### **Military life and academics**

The United States is currently involved in the longest war of its history (Lester & Flake, 2013), and there are approximately 2.4 million service members that have been deployed since October of 2001 (Ross & DeVoe, 2014). The deployment of that many military members means that there are numerous family members left behind, all who need to find a way to carry on. When military members leave, they may leave a spouse and children as well; thus, there are approximately two million children and youths that have been affected by wartime deployment (Easterbrooks et al., 2013). These children and youths are students in schools throughout the nation and overseas who face special and unique challenges versus the general student population. Amid the turmoil of parental deployments, multiple moves, school transitions, and parental reintegration, these students are still expected to perform and achieve academic success.

Success in academics has been shown to correlate with students' understanding of and ability to perform mathematics. Mathematics education is an area of concern throughout the United States, and the progression of students from one grade to the next without possessing a solid foundation in arithmetic has created an atmosphere of concern. Employing the theory of Bloom's Taxonomy, Shorser (2010) – who interprets Bloom's Taxonomy for use in mathematics – defines knowledge as “Knowledge - retention of terminology, facts, conventions, methodologies, structures, principles, etc.” (p. 1). This description of the taxonomic knowledge

level emphasizes the need to teach students basic fundamentals without theory. It is imperative that efforts be taken to correct the mathematics education instruction during the early grades to lay a solid foundation of mathematical knowledge on which students can build future learning. Also, efforts must be taken to repair the foundations of students that have moved through the system without a solid foundation, and therefore, possess shaky mathematical skills. The foundational mathematics skills of students who are entering high school need to be strengthened and enhanced so the students can experience success and reduce frustration. Many students say they hate math, but the real problem is a weak foundation that manifests itself in frustration.

The frustration that students experience, when coupled with other life factors, can have a crippling effect on a student's academic success. The reality is that the United States is now currently engaged in the longest war in the history of the country (Cozza & Lerner, 2013). The constant deployment of military personnel is proven to have a detrimental effect on the families that are left behind to navigate the trials of daily life (Tunac De Pedro et al., 2011). According to Tunac De Pedro et al. (2011), there has been a significant increase in the amount of behavioral health visits, reports of behavioral disorder, and reports of stress disorders among military families since 2001. Tunac De Pedro et al. (2011) also reported on a study performed by Angrist and Johnson (2000) that found a negative association between student achievement and parental deployment. Rodriguez and Margolin (2015) discovered a small but significant increase in youths internalizing and externalizing symptoms, along with school problems, associated with parental deployment. The presence of this negative correlation is significant based on the report by the U.S. Department of Defense (2018) that there are approximately 1.7 million total dependent children (Figure 1), 1.0 million currently living in active duty (Figure 2), and approximately 0.7 million living in reserve and National Guard families (Figure 3).

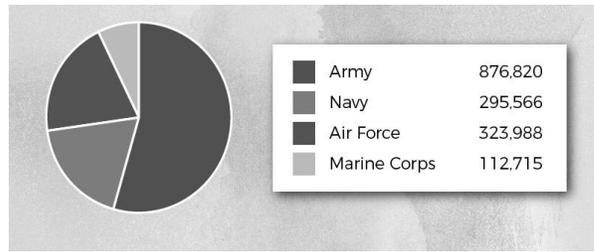


Figure 1. There are 1.7 million dependent children worldwide. Reprinted from *U.S. Department of Defense*, by LEGACY HOMEPAGENEWSPECIAL REPORTS, MONTH OF THE MILITARY CHILD 2018, ND, retrieved from [https://dod.defense.gov/News/Special-Reports/0418\\_militarychild/](https://dod.defense.gov/News/Special-Reports/0418_militarychild/) .

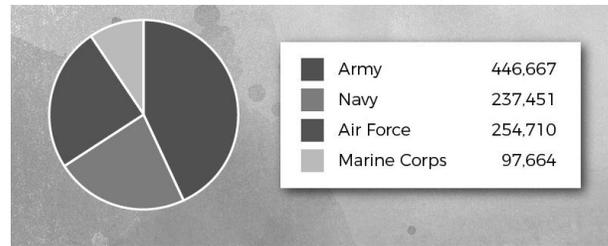


Figure 2. There are 1.0 million active-duty dependent children worldwide. Reprinted from *U.S. Department of Defense*, by LEGACY HOMEPAGENEWSPECIAL REPORTS, MONTH OF THE MILITARY CHILD 2018, ND, retrieved from [https://dod.defense.gov/News/Special-Reports/0418\\_militarychild/](https://dod.defense.gov/News/Special-Reports/0418_militarychild/) .

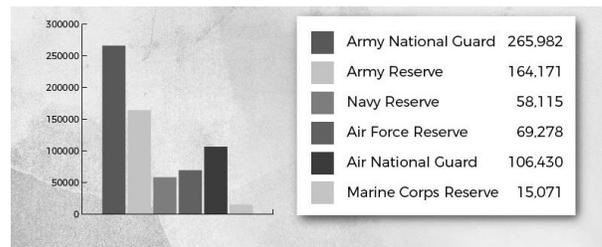


Figure 3. There are 685,344 guard/reserve dependent children worldwide. Reprinted from *U.S. Department of Defense*, by LEGACY HOMEPAGENEWSPECIAL REPORTS, MONTH OF THE MILITARY CHILD 2018, ND, retrieved from [https://dod.defense.gov/News/Special-Reports/0418\\_militarychild/](https://dod.defense.gov/News/Special-Reports/0418_militarychild/) .

These numbers highlight the necessity that military dependent children be identified as a viable demographic within the educational system to be studied and researched. The lack of information available concerning military children and how their growth and development is affected by the deployment of their military parents has led to some very significant knowledge gaps, hindering the ability for researchers to compare military dependent children as a subgroup to students of other subgroups within the educational system (Chandra & London, 2013).

Determining the effect of military deployments of parents on student academic achievement was the subject of a study conducted by Phelps, Dunham, and Lyons reported in 2010. In this study of 4<sup>th</sup> and 5<sup>th</sup> grade students, there was a significant difference noted on student achievement between students whose parents had been on multiple deployments, single deployments, no deployments, and not connected with the military in any way. The presence of a significant difference in student achievement based on their connection with the military shows the need to conduct further studies and delve deeper into the effects of military deployments on student achievement (Chandra & London, 2013). Schools are the one place in which military dependent students and general population students can find common ground; therefore, the school provides an effective place to comparatively evaluate a student's adaptability and coping skills daily. Military dependent students attend schools in both military communities and the civilian sector, so it is important that professionals in both arenas be trained and prepared to identify and act upon potential trouble areas in a student's academic and social interactions (Guzman, 2014).

The concept of taking students back to the basics is applicable throughout education. Building a solid foundation of mathematics is the key to strengthening a student's self-efficacy, and the foundation is only as strong as the materials used to build it. The ability of students to

perform basic calculations and mathematical functions is imperative to their future success. Moeller et al. (2011) stated, “complex calculation performance relies upon basic numeration skill” (p. 1838). As the student’s progress through the levels of mathematical learning are monitored, the ability to not only perform, but also grasp the concept of, basic mathematical skills will be the key to unlocking the mathematical treasures that await them.

The frustration with mathematics that most students experience is based on the lack of a solid mathematical foundation; therefore, it is essential that every effort is made to build this solid mathematical foundation for every student. Unfortunately, due to the nature of the military student’s transitional life, educators do not always know the extent of the student’s previous training. There are students at all levels of education that struggle everyday with gaps in their mathematics learning. The educational system has failed, and while efforts are being made to correct the process, there are still those students who are struggling today. The advancement of mathematical learning into higher level thinking is a noble and necessary goal, but the students who started in an older system cannot be forgotten. The lack of information about what to do with the older students is astounding; further investigation needs to be undertaken on how to help these students repair a broken foundation.

The next step in the process is finding an efficient way to help students fill the gaps in their mathematical foundation. There is a great need for teachers to teach basic mathematical skills; but, due to the pace of today’s instruction and standardized testing, new ways must be found outside classroom. The challenge is discovering the gaps in each student’s foundational structure, finding a way to engage said student, developing an effective process for reaching the student, and funding the extra instruction. Students do not like mathematics because they do not understand it: The goal is to help them understand.

## CHAPTER THREE: METHODS

### Design

A causal-comparative research method was used to conduct this quantitative study, employing the Mathematical Self-Efficacy Scale (MSES) to compare the difference between two unique populations of students and their mathematical self-efficacy. The application of a causal-comparative design was chosen because the study sought to identify the cause-and-effect relationships between the two unique populations – military dependent students and general population students – and the dependent variable of mathematical self-efficacy (Gall, Gall, & Borg, 2007). The independent variables in this study are military dependent students, defined as children of members of the U.S. military (Hosek & Wadsworth, 2013), and general population students, defined as all other students not associated with the U.S. military. The dependent variables in this study are overall mathematics self-efficacy, mathematical task self-efficacy, and math-related school subjects' self-efficacy as measured by the MSES (see Appendix A). Overall mathematics self-efficacy is the combined scale scores of the two subscale scores, *mathematical tasks and math-related school subjects*. Mathematical tasks self-efficacy is the score based on the confidence level of students to perform basic mathematical task computations. The math-related school subjects subscale is the score related to the confidence level of a student as to whether he or she will maintain a “B” average on identified mathematics courses.

### Research Question

The researcher in this study will focus on the following research question:

**RQ1:** Is there a difference in total mathematics self-efficacy scores, mathematics task self-efficacy scores, and math-related school subject self-efficacy scores between military dependent students and general population students?

### **Null Hypothesis**

**H<sub>0</sub>1:** There is no statistically significant difference in total mathematics self-efficacy scores, mathematics task self-efficacy scores, and math-related school subject self-efficacy scores between military dependent students and general population students.

### **Participants and Setting**

#### **Population**

The participants for the study were drawn from a convenience sample of high school students located in eastern North Carolina during the fall semester of the 2018–2019 school year. The school district was a rural county in eastern North Carolina with a large, active military base. The high school in which the study took place was located near the military base and, therefore, had a ratio of 1:2 military dependent to general population students. The student rosters were examined to ensure there would be enough military dependent students and general population students available in the current mathematics classes to satisfy the sample size required by Gall et al. (2007). The determination was made in such a way that the student population in the classes chosen are representative of the school ratio of military dependent to general population students and demographically.

#### **Sample**

The number of participants sampled in this study was 411, exceeding the required minimum for a medium effect size. According to Gall et al. (2007), 126 students is the required minimum for a medium effect size with statistical power of .7 at the .05 alpha level. The participants for the study were drawn from the students currently enrolled in 9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup> and 12<sup>th</sup> grade mathematics classes in a local high school. The students with parental consent took the MSES (Appendix A), and then students from each population were chosen at random from

the available MSES scores.

### **Group Military Students**

The group's demographic information was discussed as consisting of high school students, 9<sup>th</sup> through 12<sup>th</sup> grade, who are officially designated dependents of a military member as determined by the United States Department of Defense. This group consisted of 145 students whose father was in the military, 14 students whose mother was in the military, and 26 students who had both parents in the military. There were 96 males, 84 females, and 4 other; the average age of the population was 15.3 years. The ethnicity of the sample was 49.5% White, 16.3% African American, 2.7% American Indian, 1.1% Asian, 13% Hispanic, 14.1% multi-racial and 3.3% other.

### **Group General Students**

The groups' demographic information was discussed as consisting of high school students, 9<sup>th</sup> through 12<sup>th</sup> grade, who did not qualify as dependents of a military member as determined by the United States Department of Defense. There were 114 males, 104 females, and 9 other; the average age of the population was 15.7 years. The ethnicity of the sample was 41.4% White, 25.1% African American, 1.3% American Indian, 2.7% Asian, 5.3% Hispanic, 16.7% multi-racial and 7.5% other (Table 1, see Appendix M)

## **Instrumentation**

The instrument used in this study was the Mathematics Self-Efficacy Scale (MSES) (Betz & Hackett, 1993) (see Appendix A), which measures the total mathematics self-efficacy of students based on the students' confidence levels on the subscales of mathematics task self-efficacy and math-related school subjects self-efficacy. The MSES has recently been used by several researchers to study different aspects of mathematics self-efficacy within different

sample populations. Peters (2013) used the MSES to conduct a study examining the relationships among classroom climate, self-efficacy, and achievement. Jameson and Fusco (2014) used the MSES to conduct a study on math anxiety, math self-concept, and math self-efficacy in adult learners compared to traditional undergraduate students. Another study was conducted by Bates, Latham, and Kim (2011) linking the preservice teachers' mathematics self-efficacy and mathematics teaching efficacy to their mathematical performance.

The original scale was 52 questions in length and contained three subscales – mathematical tasks, math problems, and math-related subjects – along with a total score that was comprised of all three subscales. The scale that was developed was based on Dowling's *Mathematics Confidence Scale* (MCS) and the *Mathematics Anxiety Rating Scale* (MARS) developed by Richardson and Suinn (1972) (Betz & Hackett, 1993). Dowling's MCS was adapted to assess math problems self-efficacy and the MARS was used to develop the everyday math tasks scale along with examples submitted by students of math that they used in daily life.

The MSES, as revised in 1993, consists of two subscales – mathematical task self-efficacy and math-related school subjects self-efficacy – which consist of 18 and 16 questions respectively, rendering 34 total mathematics self-efficacy questions. Each question was scored on a 10-point efficacy scale of 0 = no confidence, 1–3 = very little confidence, 4–5 = some confidence, 6–7 = much confidence, and 8–9 = complete confidence. The MSES was scored by subscale and then by total score. To score the task subscale, each of the 18 responses was added together and the total divided by 18 (the number of items). This same procedure was used for the subjects subscale with the exception of using 16 as the divisor as there are only 16 items on this subscale. The total score was calculated by adding the sums of the two subscales together and dividing by 34, the total number of items on the instrument. For both subscales and the total,

a score of 0 was the lowest possible score while a score of 9 was the highest possible score.

Missing responses were excluded and the divisor adjusted accordingly by subtracting the missed items from the total count. If more than three items were missed, the scale was no longer considered valid.

The reliability of a test or instrument refers to the consistency, stability, and precision of the scores produced (Gall et al., 2007). There is solid evidence for the reliability of the MSES. Betz and Hackett (1993) reported internal consistency reliability values (coefficient alpha) of .96 for the total scale, and .92 and .92 for the Tasks and Courses subscales, respectively.

### **Procedures**

The researcher obtained IRB approval (see Appendix B) after successfully defending the dissertation proposal. In order to obtain IRB approval, a letter was written to the superintendent (see Appendix C) of Saltwater County Schools requesting permission to conduct the proposed research in a high school within the district. A letter was also sent to the principal of the high school requesting permission to conduct the approved research in the selected high school (see Appendix E). A time limit of two weeks for the reply was set before follow-up attempts could be made to secure permission to conduct the study. Once permission was granted from the superintendent (see Appendix D), the principal (see Appendix F), and IRB approval was obtained, the data manager for the school was contacted to obtain a spreadsheet of the current math class enrollments and required demographic information. Once the classes were identified, the teachers were contacted by email to solicit their participation in the study (see Appendix G). After the emails were sent out, face-to-face contact was made with each teacher that was involved in the study. Recruitment letters (see Appendix J and K) and opt-out consent forms (see Appendix H) were sent home with students, via the teachers, informing parents of the purpose of

this study and allowing them the opportunity to sign the opt-out consent form and return the forms to the student's teacher to remove their students from the study. Mind Garden, Inc. was contacted to add demographics to the MSES instrument (see Appendix A). The correct number of the MSES were ordered from Mind Garden, Inc. based on the numbers of students obtained from the data manager.

The next phase of the study was scheduling days for student to participate in the MSES survey. The school system was on a one-to-one technology standard; therefore, all the students had their own IPAD device. Arrangements were made with the media specialist to have the live survey link pushed down to all the identified students' devices. Any student whose individual device was not working was to be issued a school device for the survey. Time was set aside for training the teachers to administer the MSES. The teachers were given the access codes for the computer testing for students using school issued devices and final testing dates were set.

On the day of testing, final coordination with teachers to administer the MSES was made and contact was made with the media center to obtain a computer cart for use by students without their own devices. As the students entered the classroom, they were asked to open the link for the survey. The students who were not taking the survey would be assigned an IXL section to complete on the computers while the others were answering the survey. Once the students were in the instrument, the teacher read the instructions and administered the survey. The MSES takes approximately 20 minutes to complete, and the students were instructed to sign out as they finished the survey and begin their assigned IXL tasks until all students completed the survey. Once all students finished, the teachers resumed their regular lab schedule. This procedure was to be repeated for each class participating in the study.

### **Administration**

The MSES was administered using the online version of the scale. The required demographics were added to the survey, allowing all data to be collected electronically during one administration. The students were asked to log into the survey on their device and then the administrator read the directions for each section of the scale. To gain access to the test, the students were asked to click on the link to the survey on their IPAD or type the link address in their browser if they were using a school device. The link pushed down did not operate properly, so all students were then provided the link, asked to open the browser on their device and type the link in the address bar. The survey took approximately 15 minutes for most students. After completion of the survey, the students logged out and returned to their regular class lab. The results of the survey were electronically gathered by Mind Garden, Inc.'s transform system, compiled, and delivered electronically to the researcher in a .csv file. The researcher was granted permission to use the MSES on May 23, 2019 with a limited time of reproduction equal to one year from that date.

After completion of all the surveys, Mind Garden, Inc. was contacted in regard to receiving the collected data from the transform system. The data was received, and a random sample of 150 military dependent students and 150 general population students was selected to be analyzed.

### **Data Analysis**

The presence of two independent variables and three dependent variables in this study required the use of a MANOVA to analyze the data collected using the MSES (Green & Salkind, 2011). Statistical analysis of the data was conducted using the statistical tools present in Microsoft Excel and Statistical Software for Social Science (SPSS). Data screening for the

MANOVA included examining histograms to check for normality, box and whiskers to check for outliers, Komogrov-Smirnov for normality of distribution, and Box's M test to evaluate whether the variances and covariances among the dependent variables were the same for all levels of the factor. The significance of the MANOVA was determined by evaluating Wilks'  $\lambda$  (lambda). If the MANOVA was found to be significant, the data was then analyzed using a one-way analysis of variance (ANOVA) to evaluate each independent variable with each dependent variable.

Because of the inability of the ANOVA to account for the multivariance of the MANOVA, Bonferroni was used to control for Type 1 errors. The level of significance of  $\alpha=.05$  used for the MANOVA was divided by the number of dependent variables (3) yielding a level of significance of  $\alpha=.017$ . This level was used to evaluate the significance of each ANOVA. Effect size was measured using partial eta squared.

## CHAPTER FOUR: FINDINGS

### Overview

In this chapter, the data collection, assumption testing, and analysis is explained. Data screening for the MANOVA included examining histograms to check for normality, box and whiskers to check for outliers, Komolgrov-Smirnov for normality of distribution, and Box's M test to evaluate whether the variances and covariances among the dependent variables were the same for all levels of the factor. The significance of the MANOVA was determined by evaluating Wilks'  $\lambda$  (lambda). The results of the statistical data testing are presented, and the research question is examined with regard to the test results. The data provided an unexpected direction for the study.

### Research Question

The researcher in this study focused on the following research question:

**RQ1:** Is there a difference in total mathematics self-efficacy scores, mathematics task self-efficacy scores, and math-related school subject self-efficacy scores between military dependent students and general population students?

### Null Hypothesis

The null hypothesis for this study was:

**H<sub>0</sub>1:** There is no statistically significant difference in total mathematics self-efficacy scores, mathematics task self-efficacy scores, and math-related school subject self-efficacy scores between military dependent students and general population students.

### Demographic Statistics

There was a total of 411 participants in the study. A random sample of 150 military dependent students (n=150) and 150 general population students (n=150) was pulled from the

data provided by the Transform System of Mind Garden, Inc. For the purposes of this study, the demographics of gender, age and ethnicity were not taken into consideration. The participants in this study were all students enrolled in an accredited high school in Eastern North Carolina.

### **Results**

Data was collected from the Mathematics Self-Efficacy Scale (MSES) (see Appendix A) using the Transform system of Mind Garden, Inc. with 150 (n=150) military dependent students and 150 (n=150) general population students chosen at random. According to Gall et al. (2007), 126 students is the required minimum for a medium effect size with statistical power of .7 at the .05 alpha level. The 150 military dependent students have a mean score of 5.577 with a standard deviation for task self-efficacy of 1.979, a math school-subjects mean score of 4.685 with a standard deviation of 2.370, and a total math self-efficacy mean score of 5.156 with a standard deviation of 2.009; the 150 general population students have a mean score of 5.000 with a standard deviation for task self-efficacy of 2.043, a math school-subjects mean score of 4.368 with a standard deviation of 2.277, and a total math self-efficacy mean of score of 4.703 with a standard deviation of 2.055 (Table 2, see Appendix N).

The data was first screened for normality using histograms as shown in Figure 4 (see Appendix O). The histograms are shown for the three mathematics self-efficacy scores – task self-efficacy, math-related school subject self-efficacy, and total mathematics self-efficacy – as distributed in both independent variable groups of military dependent students and general population students. The distribution is not perfect, but it is normally distributed.

The next test of normality used was the Kolmogorov-Smirnov shown in Table 3 (See Appendix P). The Kolmogorov-Smirnov test was used to test for normality on each of the dependent variables. The percentage of Task SE for group 1,  $D(150)=0.092$ ,  $p>.05$ , and the

percentage of Task SE for group 2,  $D(150)=0.200$ ,  $p>.05$ , were both normal, indicating that the data was normally distributed in both groups. The percentage of School SE for group 1,  $D(150)=0.200$ ,  $p>.05$ , and the percentage of School SE for group 2,  $D(150)=0.094$ ,  $p>.05$ , were both normal, indicating that the data was normally distributed in both groups. The percentage of Total SE for group 1,  $D(150)=0.200$ ,  $p>.05$ , and the percentage of Total SE for group 2,  $D(150)=0.200$ ,  $p>.05$ , were both normal, indicating that the data was normally distributed in both groups.

Next, the data was screened for inconsistencies and outliers using box and whiskers plots as shown in Figure 5. The box and whiskers plots showed that the data was consistent and there were no outliers present. A Box's M Test, as shown in Table 4 (see Appendix Q), was run to evaluate whether the variances and covariances among the dependent variables was the same for all levels of the factor. According to Huberty and Petoskey's (2000) guideline (i.e.,  $p<.005$ ), the Box's M value of 13.587 associated with a p value of .037 was interpreted as non-significant (Table 4, see Appendix R). Therefore, the covariance matrices between the groups were assumed to be equal for the purposes of the MANOVA.

Next, a one-way multivariate analysis of variance (MANOVA) was run to test the hypothesis that there would be a statistically significant difference in total mathematics self-efficacy scores, mathematics task self-efficacy scores, and math-related school subject self-efficacy scores between military dependent students and general population students (Table 5). A statistically significant score was obtained: Wilks' Lambda = .974,  $F(3,296) = 2.67$ ,  $p = .048$ , partial eta squared = .026. Power to detect the effect was .648 (Table 5). Therefore, the hypothesis was confirmed. Since the hypothesis was confirmed but the p value of .048 was not highly significant a one-way analysis of variance (ANOVA) was run on each dependent variable.

Table 5

*Multivariate Tests*

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Observed Power <sup>c</sup>
Intercept	Pillai's Trace	.875	692.672 <sup>b</sup>	3.000	296.000	.000	.875	1.000
	Wilks' Lambda	.125	692.672 <sup>b</sup>	3.000	296.000	.000	.875	1.000
	Hotelling's Trace	7.020	692.672 <sup>b</sup>	3.000	296.000	.000	.875	1.000
	Roy's Largest Root	7.020	692.672 <sup>b</sup>	3.000	296.000	.000	.875	1.000
	Root							
Military	Pillai's Trace	.026	2.666 <sup>b</sup>	3.000	296.000	.048	.026	.648
	Wilks' Lambda	.974	2.666 <sup>b</sup>	3.000	296.000	.048	.026	.648
	Hotelling's Trace	.027	2.666 <sup>b</sup>	3.000	296.000	.048	.026	.648
	Roy's Largest Root	.027	2.666 <sup>b</sup>	3.000	296.000	.048	.026	.648
	Root							

A one-way ANOVA was conducted to compare each of the independent variables — military dependent students and general population students to the dependent variables — total mathematics self-efficacy scores, mathematics task self-efficacy scores, and math-related school subject self-efficacy scores. The results of the one-way ANOVA testing mathematics task self-efficacy scores were  $F(1,298) = 6.186$ ,  $p = .013$ : There was a significant effect of task self-efficacy for both military dependent students and general population students at the  $p < .017$  level. The results of the one-way ANOVA testing math-related school subject self-efficacy

scores were  $F(1,298) = 1.392$ ,  $p = .239$ : There was not a significant effect of school subject self-efficacy for both military dependent students and general population students at the  $p < .017$  level. The results of the one-way ANOVA testing total mathematics self-efficacy scores were  $F(1,298) = 3.720$ ,  $p = .055$ : There was not a significant effect of total mathematics self-efficacy for both military dependent students and general population students at the  $p < .017$  level (Table 6, Appendix T).

## CHAPTER 5

### Overview

This research was conducted to examine the differences in mathematics self-efficacy, the confidence that students have in their mathematics ability, between military dependent students and general population students in a Title 1 high school in Eastern North Carolina. The study was conducted in a high school that has a military dependent presence representing one third of the student body. In this chapter, a discussion of the research and the findings will be addressed. The implications and the limitations of the study are discussed. The chapter concludes with recommendations for expanding this study into a larger population with a future study.

### Discussion

The purpose of this study was to determine the difference in mathematics self-efficacy between military dependent students and general population students. To accomplish this purpose, a quantitative, causal comparative design was used to add to existing literature on the topic of self-efficacy in mathematics. The research question investigated in this study was: Is there a statistically significant difference in overall mathematics self-efficacy scores, mathematics task self-efficacy scores, and math-related school subject self-efficacy scores between military dependent students and general population students?

A one-way MANOVA was used to analyze the data collected to determine the validity of the research question. The data confirmed that there was a difference between the two groups of students as it pertained to mathematics self-efficacy, although the results showed that military dependent students scored higher on the survey than the general population students. The importance of this finding can be found in previous studies about mathematics self-efficacy. According to a study conducted by Skaalvik and Skaalvik (2009), the self-concept and self-

efficacy of middle school students as pertaining to mathematics, under the umbrella of self-perception, are directly related to academic success in mathematics. Therefore, it is vital that educators consider not only a student's ability to perform mathematical skills, but also the student's own perception of their ability to perform mathematical skills. To accomplish the task of increasing a student's self-efficacy, educators need to concentrate on enhancing the student's mathematical skills. Gonzalez-Castro et al. (2014) referred to the importance of intervention in the mathematical development of students at an early age. Likewise, the task of repairing the foundations of middle and high school students entails creating a successful intervention model (Balfanz et al., 2002). By helping students strengthen mathematical skills, educators can also help boost a student's confidence and increase their mathematics self-efficacy. The students involved in this study were enrolled in current high school math classes from grades 9 through 12. There were three areas of self-efficacy explored by the Mathematics Self-Efficacy Survey (MSES): mathematics task self-efficacy, math-related school subject self-efficacy, and overall mathematics self-efficacy. These three dependent variables were measured with respect to the two groups surveyed, military dependent students and general population students. Previous studies have focused on math self-efficacy as pertaining to demographics such as gender, socioeconomic status and ethnicity. Extending the study of math self-efficacy to include military dependents is based on the instability of military life.

The military life can be challenging for families. Lester et al. (2012), speaks to the psychological challenges faced by military families during periods of separation due to deployment. During these times of separation, the family left behind must learn to continue to function. Some of these families move back to where extended family lives for support, uprooting the children and moving them to new schools. Moving is a turbulent time for

children as they learn to cope with the loss of friends, familiar surroundings, and routines (Jagger & Lederer, 2014; Burrell et al., 2006; Palmer, 2008). This turbulence can cause stress and is a real concern for families and educators.

This study focuses on three areas of math self-efficacy: task, school-related subjects, and total self-efficacy. Task self-efficacy refers to those daily tasks involving math that we encounter such as calculating miles per gallon as one is driving, keeping track of how much one is spending at the grocery store, filling out one's taxes, etc. School-related subjects self-efficacy pertains to the confidence a student has in his or her ability to perform the mathematics skills needed to be successful in college level math classes. The total math self-efficacy score is based on a combination of task and school-subjects related self-efficacy. The MANOVA showed a slight significance in the data; therefore, separate ANOVAs were performed. The ANOVAs showed evidence that mathematics task self-efficacy was considered to have a significant effect, while school-subjects and overall math self-efficacy did not.

The significant effect of task self-efficacy indicates that educators need to focus on everyday math skills with students to strengthen their confidence in their mathematics abilities. These findings are in line with earlier research. The communication of confidence in a student's ability to complete assigned tasks or problems by someone of authority or someone the student respects can have a positive effect on the student's self-efficacy (van Dinther et al., 2010). The data in this study shows that there is a need to expand this study to a larger platform.

### **Implications**

The results of this study provide a platform for discussion and further study in the area of military dependent students and their academic journeys. A study by Pajares in 1996 reported math self-efficacy to be a strong predictor of college student academic success. Since math self-

efficacy is noted as a predictor of a student's future academic success, educators should be focusing on providing instruction that will help students strengthen their confidence. The awareness of a student's self-efficacy is especially important in the academic journey of military dependent students due to the instability in their lives and frequent moves required by military life. According to 2001 estimates, military students experience an average of nine military-related moves in their lives (Williams, 2013; Bradshaw et al., 2010). Moving can have both positive and negative effects. Moves often give students new chances after bad experiences, but they can also remove them from positive experiences. They may learn how to make friends easily, or they may become introverted. Academic instability is a disadvantage as well as a potentially growing hostility in the student as they tire of moving (Bradshaw et al., 2010). Identifying these needs and possible academic deficiencies in military dependent students could be crucial to helping them attain future success.

Identifying military dependent students as a subgroup on which to focus and be aware is an important step toward bridging any gaps in their education due to the stressors of military life. The use of the MSES to identify areas of concern in a student's mathematical confidence can aid educators in finding ways to encourage these students as they learn. As noted by Jungert & Andersson (2013), a child's perception of his self-efficacy and how he or she perceives his ability to learn or master skills determines the level of motivation and school accomplishment he or she will attain.

### **Limitations**

This study was conducted in the vicinity of a Marine Corps air base, so the students involved are dependents of parents involved in aviation. The cycle of deployments is much different in the aviation side of the Marine Corps than in the ground side. Therefore, the study

involves students that may not have experienced the same stressors of students in other areas of the military. There is a need to replicate this study on a broader scale involving families who are a part of other areas of military service.

### **Recommendations for Future Research**

This study brought to light some concerns and need for further study. The results of the study showed that there is a difference in the military dependent students and general population students in mathematics self-efficacy, no matter how slight, highlighting a need to replicate this study on a broader scale. The revelation that military dependent students scored higher on math self-efficacy in this study should not deter further investigations into the stressors of military life. The study can also be expanded to include students who are dependents of officers as compared to dependents of enlisted; the effects of the mother, father, or both being the military member; type and length of deployments; the amount of times a family has moved during high school; and the effect of having siblings with high or low mathematics self-efficacy.

The investigation into the effects of military life on the academic success of military dependent students is a worthy pursuit. We are currently in the longest war in the history of this nation and we have an obligation to provide the best support we can to those who serve and their families.

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**APPENDIX A: MATHEMATICS SELF-EFFICACY SCALE**

[www.mindgarden.com](http://www.mindgarden.com)

To Whom It May Concern,

The above-named person has made a license purchase from Mind Garden, Inc. and has permission to administer the following copyrighted instrument up to that quantity purchased:

**Mathematics Self-Efficacy Scale**

The two sample items only from this instrument as specified below may be included in your thesis or dissertation. Any other use must receive prior written permission from Mind Garden. The entire instrument may not be included or reproduced at any time in any other published material. Please understand that disclosing more than we have authorized will compromise the integrity and value of the test.

**Citation of the instrument must include the applicable copyright statement listed below.**

**Sample Items:**

How much confidence do you have that you could successfully:

Add two large numbers (e.g.,  $5379 + 62543$ ) in your head.

How much confidence you have that you could complete the course with a final grade of "A" or "B" in:

Basic College Math

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Sincerely,

Robert Most  
Mind Garden, Inc.  
[www.mindgarden.com](http://www.mindgarden.com)

**APPENDIX B: IRB APPROVAL****LIBERTY UNIVERSITY**  
INSTITUTIONAL REVIEW BOARD

May 24, 2019

Jeffrey Harris

IRB Approval 3824.052419: The Differences in Mathematics Self-Efficacy Scores between Military Dependent Students and General Population Students

Dear Jeffrey Harris,

We are pleased to inform you that your study has been approved by the Liberty University IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Your study falls under the expedited review category (45 CFR 46.110), which is applicable to specific, minimal risk studies and minor changes to approved studies for the following reason(s):

Your study involves surveying or interviewing minors, or it involves observing the public behavior of minors, and you will participate in the activities being observed.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

**G. Michele Baker, MA, CIP**

*Administrative Chair of Institutional Research*

**Research Ethics Office**

**LIBERTY**  
UNIVERSITY.

*Liberty University | Training Champions for Christ since 1971*

**APPENDIX C: REQUEST SUPERINTENDENT APPROVAL**

Dr. Doyle,

My name is Jeffrey Harris and I am a teacher in the math department at Havelock High School and a doctoral student at Liberty University. I have been working on my doctoral dissertation for several semesters but due to my wife's health the work has been put on hold and I am now soliciting your help. Dr. Mills had previously approved my research but I was not able to conduct the study during his tenure. I am now asking for your approval.

The topic of research for my dissertation is the math efficacy of military dependent students compared to the general student population. My request is to administer a self-efficacy survey to military dependent students and general population students at Havelock High School this spring. The test will take approximately 15 minutes from start to end. The students will be chosen randomly and I will be sending permission slips to the students who are chosen. I have spoken with and e-mailed Dr. Murphy and he has agreed to allow the testing in his school. I am seeking approval from you to conduct this survey in this district.

I know you are busy and I have sent this request previously but I am at a point now where I have to send my proposal to IRB for approval and I cannot until I have your and the Boards approval. Thank you for your consideration in this matter and I appreciate any support you can give me in this research.

Rev. Jeffrey Harris, EdS  
Havelock High School Math Teacher  
Asst. Varsity Baseball and Soccer Coach  
FCA Sponsor  
(252) 444-5112

"Train up a child in the way he should go. Even when he is old he will not depart from it."  
Proverbs 22:6

**APPENDIX D: SUPERINTENDENT APPROVAL**

5/27/2019

Craven County Schools Mail - (no subject)

**JEFFREY HARRIS**  
<jeffrey.harris@cravenk12.org>

---

**(no subject)**

1 message

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**MYRA FLOWERS** <Myra.Flowers@cravenk12.org>

Mon

, Mar 4, 2019 at 2:35 PM To: JEFFREY HARRIS &lt;Jeffrey.Harris@cravenk12.org&gt;

Mr. Harris,

I made Dr. Doyle aware of your request to meet with her for permission to conduct a study with students as part of your degree program. Pursuant to Craven County Board of Education policy 5230: Participation in Research Projects your project is approved contingent upon your compliance with the policies listed below.

Policy 5230: Participation in Research Projects -

<https://boardpolicyonline.com/bl/?b=craven#&&hs=143719> Policy

4720: Surveys of Students -

<https://boardpolicyonline.com/bl/?b=craven#&&hs=143698>

Policy 4700: Student Records -

<https://boardpolicyonline.com/bl/?b=craven#&&hs=230704>

Policy 4705/7825: Confidentiality of Personal Identifying Information -

<https://boardpolicyonline.com/bl/?b=craven#&&hs=143697>

Thank you.

Myra Flowers  
Admin. Asst. to the Superintendent  
Craven County Schools  
Office: 252-514-6346  
Fax: 252-514-6351

All e-mail correspondence to and from this address is subject to the North Carolina Public Records Law, which may result in monitoring and disclosure to third parties, including law enforcement.

**APPENDIX E: REQUEST PRINCIPAL APPROVAL**

Dr. Murphy,

My name is Jeffrey Harris and I am the chair of the math department at Havelock High School and a doctoral student at Liberty University. I am currently in the beginning phases of my doctoral dissertation and I am soliciting your help.

The topic of research for my dissertation is the math efficacy of military dependent students compared to the general student population. My request is to administer a self-efficacy test to 100 of your military dependent students and 100 general population students next fall. Kelly Williamson will be working with me to help test and train others to test if they are willing to help. The test will take approximately 15 minutes from start to end. The students will be chosen randomly and I will be sending permission slips to the students who are chosen. The only support I require of you and your staff is to allow me the time and opportunity to administer the test.

Thank you for your consideration in this matter and I appreciate any support you can give me in this research.

Have a Blessed Day  
Jeffrey Harris, Ed.S.  
HHS Math Department Chair  
FCA Sponsor  
252-463-1523  
jeffrey.harris@craven.k12.nc.us

**APPENDIX F: PRINCIPAL APPROVAL**

Mr. Harris,

I will assist you in any way and you have my permission to submit your tests. Thank you.

Dr. Jeffrey E. Murphy  
Principal  
Havelock High School  
252-444-5112

**APPENDIX G: TEACHER CONTACT LETTER**

Mathematics Teachers,

My name is Jeffrey Harris. I am a Doctoral student at Liberty University and I am currently in the process of researching the math self-efficacy of military dependent students. I have received permission to conduct the research here at Havelock High School. The research consists of a fifteen minute self-efficacy questionnaire that will be administered in all of the current mathematics classes. The test will be administered during seminar as to not impact class instruction. I will be administering all of the tests so the only participation on your part is to provide me with the best day to access your students. Further information will follow as the window for testing approaches. Thank you for your cooperation.

Jeffrey T. Harris, Ed.S.  
Mathematics Chair Havelock High School  
[Jeffrey.harris@cravenk12.org](mailto:Jeffrey.harris@cravenk12.org)

**APPENDIX H: REQUEST PARENTAL PERMISSION  
OPT-OUT PARENT/GUARDIAN CONSENT FORM**

**The Differences in Mathematics Self-Efficacy Scores between Military Dependent Students  
and General Population Students**

This research study is being conducted by Jeffrey Harris, a doctoral candidate in the School of Education at Liberty University. Your child was selected as a possible participant because he or she is currently enrolled in a math class at Havelock High School. Please read this form and ask any questions you may have before agreeing to allow him or her to be in the study.

***Why is this study being done?***

The purpose of this study is to determine if there is any difference in the way that students who are military dependents and students who are part of the general population feel about math.

***What will my child/student be asked to do?***

If you agree to allow your child to be in this study, he or she will be asked to do the following things:

1. Answer a survey, the Mathematics Self-Efficacy Scale, about his or her confidence in mathematics skills. The survey will take approximately 20 minutes.

***What are the risks and benefits of this study?***

**Risks:** The risks involved in this study are considered minimal, which means they are no more than students would expect to encounter when going about their everyday activities.

**Benefits:**

Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include learning more about the effects, if any, of the military lifestyle on high school student's confidence levels in their mathematics education.

***Will my child be compensated for participating?***

Your child will not be compensated for participating in this study.

***How will my child's personal information be protected?***

The survey will be anonymous. The records of this study will be kept private. Research records will be stored securely, and only the researcher will have access to the records. The retained data will have no identifying information.

***Conflicts of interest disclosure:***

I am a math teacher at Havelock High school but all data collected will be anonymous. The students will be required to click on a link to open the survey and no identifying information will be collected.

***Is study participation voluntary?***

Participation in this study is voluntary. Your decision whether or not to allow your child to participate will not affect his or her current or future relations with Liberty University. If you decide to allow your child to participate, he or she is free to not answer any question or withdraw at any time prior to submitting the survey.

***What should I or my child do if I decide to withdraw him or her or if he or she decides to withdraw from the study?***

If you choose to withdraw your child or if your child chooses to withdraw from the study, he or she should exit the survey and close his or her internet browser. Your child's responses will not be recorded or included in the study.

***Whom do I contact if my child or I have questions or problems?***

The researcher conducting this study is Jeffrey Harris. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him at [Jeffrey.harris@cravenk12.org](mailto:Jeffrey.harris@cravenk12.org) or [jharris211@liberty.edu](mailto:jharris211@liberty.edu). You may also contact the researcher's faculty advisor, Dr. Steven McDonald, at [samcdonald2@liberty.edu](mailto:samcdonald2@liberty.edu).

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd, Green Hall 2845, Lynchburg, VA 24515 or email at [irb@liberty.edu](mailto:irb@liberty.edu).

**DO NOT sign and return this form unless you DO NOT want your child to participate.**

**Opt-Out Consent:** I have read and understood the above information. I have asked questions and have received answers. I DO NOT consent to my child participating in this study.

---

Signature of Parent Date

**APPENDIX I: STUDENT ASSENT****CONSENT FORM****The Differences in Mathematics Self-Efficacy Scores between Military Dependent Students and General Population Students**

Jeffrey Harris  
Liberty University  
School of Education

You are invited to be in a research study to determine if there is any difference in the math self-efficacy between students who are military dependents and general population students. You were selected as a possible participant because you are currently enrolled in a math class at Havelock High School. Please read this form and ask any questions you may have before agreeing to be in the study.

Jeffrey Harris, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

**Background Information:** The purpose of this study is to determine if there is a difference in the way that students who are military dependents and students who are part of the general population feel about math.

**Procedures:** If you agree to be in this study, I would ask you to do the following things:

1. Answer a survey, the Mathematics Self-Efficacy Scale, about your confidence in your mathematics skills. The survey will take approximately 20 minutes.

**Risks:** The risks involved in this study are considered minimal, which means they are equal to the risks you encounter on a daily basis.

**Benefits:** Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include learning more about the effects, if any, of the military lifestyle on high school student's confidence levels in their mathematics education.

**Compensation:** Participants will not be compensated for participating in this study.

**Confidentiality:** The survey will be anonymous. The records of this study will be kept private. Research records will be stored securely, and only the researcher will have access to the records. The retained data will have no identifying information.

**Conflicts of interest disclosure:** I am a math teacher at Havelock High school but all data collected will be anonymous. The students will be required to click on a link to open the survey and no identifying information will be collected.

**Is study participation voluntary?** Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time prior to submitting the survey without affecting those relationships.

**How to Withdraw from the Study:** If you choose to withdraw from the study, please exit the survey and close your internet browser. Your responses will not be recorded or included in the study.

**Contacts and Questions:** The researcher conducting this study is Jeffrey Harris. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact him at [Jeffrey.harris@cravenk12.org](mailto:Jeffrey.harris@cravenk12.org) or [jharris211@liberty.edu](mailto:jharris211@liberty.edu) You may also contact the researcher's faculty chair, Dr. Steven McDonald, at [samcdonald2@liberty.edu](mailto:samcdonald2@liberty.edu).

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at [irb@liberty.edu](mailto:irb@liberty.edu).

*Please notify the researcher if you would like a copy of this information for your records.*

**APPENDIXJ: RECRUITMENT LETTER (PARENT)**

May 25, 2019

Dear Havelock High School Math Student Parents,

As a graduate student in the Education Department at Liberty University, I am conducting research as part of the requirements for a doctoral degree. The purpose of my research is to determine if there is a difference in total mathematics self-efficacy scores, mathematics task self-efficacy scores, and math-related school subject self-efficacy scores between military dependent students and general population students, and I am writing to invite your child to participate in my study.

All students who are currently enrolled in math classes at Havelock High School and whose parents are willing to allow them to participate, will be asked to take the Mathematics Self-Efficacy Scale (MSES) survey. It should take approximately 15 minutes for your child to complete the procedure listed. Your child's participation will be completely anonymous, and no personal, identifying information will be collected.

The students who have permission will participate in the survey during their mathematics class period. The survey will be taken online using a code provided to the teachers. There will be minimal interruption of class time used.

A consent document will be sent home with your child one week before the survey date. The consent document contains additional information about my research, please sign the consent document and return it to your child's teacher.

Sincerely,

Jeffrey T. Harris  
Math Teacher

**APPENDIX K: RECRUITMENT LETTER (STUDENT)**

May 25, 2019

Dear Havelock High School Math Students,

As a graduate student in the Education Department at Liberty University, I am conducting research as part of the requirements for a doctoral degree. The purpose of my research is to determine if there is a difference in total mathematics self-efficacy scores, mathematics task self-efficacy scores, and math-related school subject self-efficacy scores between military dependent students and general population students, and I am writing to invite you to participate in my study.

All students who are currently enrolled in math classes at Havelock High School and who are willing to participate, will be asked to take the Mathematics Self-Efficacy Scale (MSES) survey. It should take approximately 15 minutes for you to complete the procedure listed. Your participation will be completely anonymous, and no personal, identifying information will be collected.

The students who agree will participate in the survey during their mathematics class period. The survey will be taken online using a code provided to the teachers. There will be minimal interruption of class time used.

A consent document will be given to you one week before the survey date. The consent document contains additional information about my research, please sign the consent document and return it to your teacher.

Sincerely,

Jeffrey T. Harris  
Math Teacher

**APPENDIX L: INSTRUMENT ADMINISTRATION****Directions for Administration**

The *Mathematics Self-Efficacy Scale* (MSES) is designed to be administered using an answer sheet having 10 possible response options, that is 0 to 9, corresponding to “No Confidence at All” to “Complete Confidence” on the test booklet.

The scale may be administered either individually or in groups of individuals, and testing conditions should be sufficiently comfortable and quiet that the individual can attend to the task at hand. The scale should take no longer than 15 minutes to administer and in many cases less time will be required. After individuals are seated and provided with a copy of the scale and a pencil or pen, the instructions on the front of the test booklet should be read aloud while the examinees follow along. Go through the practice example on the first page and make sure that the examinees understand the task required of them. Then have them turn to page 3 of the test booklet and read the instructions for Part II, which uses school subjects as the stimulus to which the examinee responds, again while the examinee(s) follow along.

Return now to the beginning of the Scale and instruct examinees to begin. When they finish with Part I they should proceed immediately to Part II. Remind them that if they have any questions about either section of the scale they should be sure to ask. There is no time limit, but as indicated above the MSES should take no more than 15 minutes to complete.

**APPENDIX M: DEMOGRAPHICS**

Table 1

*Demographics Characteristics for Military Dependent and General Population Students from a Title I School*

*District Located in Eastern North Carolina*

		Military	Percentage	General Population	Percentage
Gender	Male	96	23.4	114	27.7
	Female	84	20.4	104	25.3
	Other	4	1	9	2.2
Ethnicity	Asian	2	0.5	6	1.5
	African American	30	7.3	57	13.9
	American Indian	5	1.2	3	0.7
	Hispanic	24	5.8	12	2.9
	Multi-Racial	26	6.3	38	9.3
	Other	6	1.5	17	4.1
	White	91	22.1	94	22.9

**APPENDIX N: DESCRIPTIVE STATISTICS**

Table 2

*Descriptive Statistics*

		Std.		
military		Mean	Deviation	N
Math Task SE	1	5.577	1.9769	150
	2	5.000	2.0432	150
	Total	5.289	2.0277	300
Math School SE	1	4.685	2.3798	150
	2	4.368	2.2773	150
	Total	4.527	2.3307	300
Math SE	1	5.156	2.0094	150
	2	4.703	2.0552	150
	Total	4.930	2.0417	300

**APPENDIX O: HISTOGRAMS TO CHECK FOR NORMALITY**

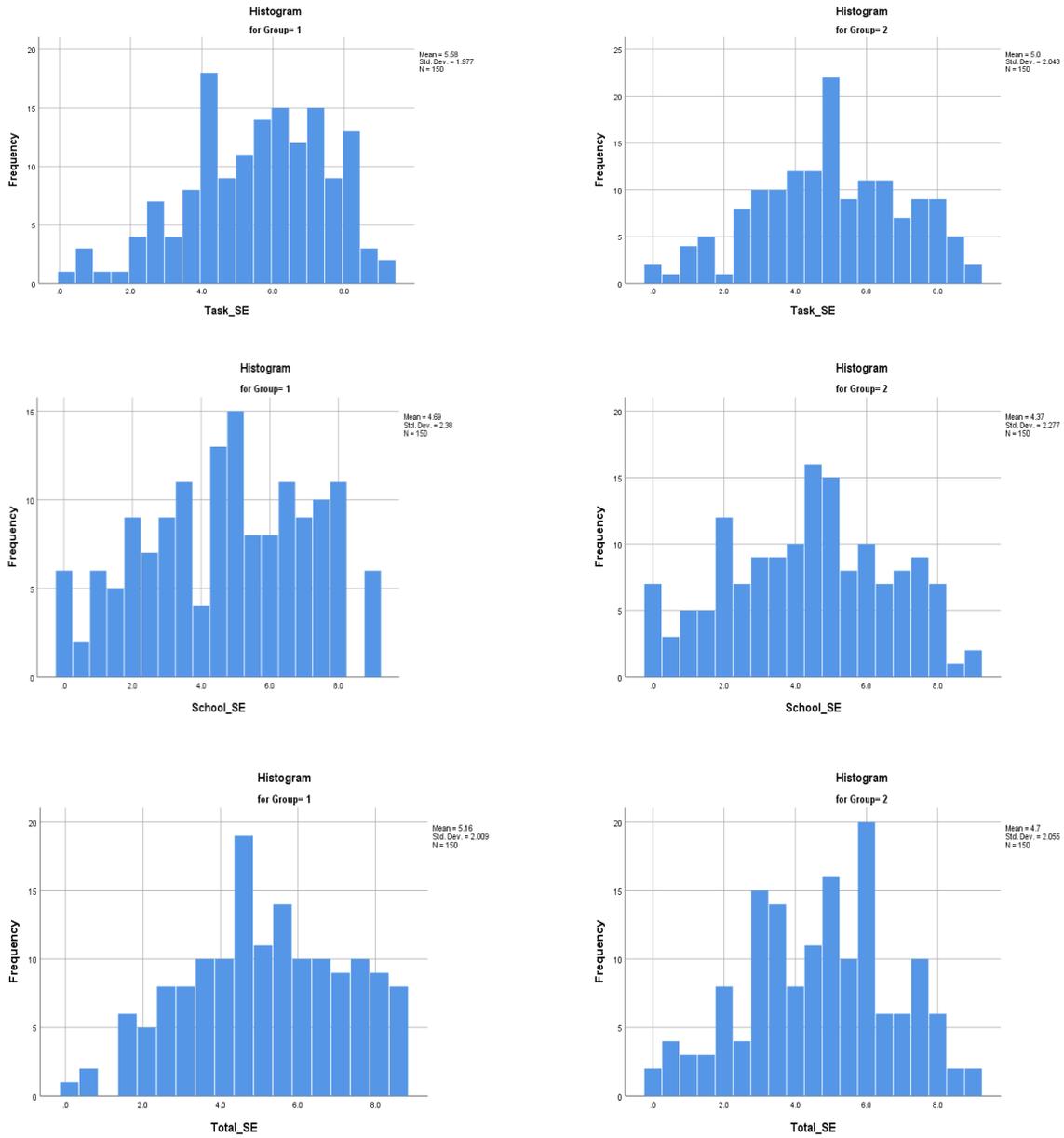


Figure 4. Histograms to check for normality.

Note: Group -1 (military dependents) Group-2 (General Population)

**APPENDIX P: TESTS OF NORMALITY**

Table 3.

*Tests of Normality*

1-military, 2-general population		Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Task_SE	1	.067	150	.092	.974	150	.006
	2	.041	150	.200*	.987	150	.179
School_SE	1	.065	150	.200*	.973	150	.005
	2	.067	150	.094	.978	150	.018
Total_SE	1	.053	150	.200*	.980	150	.031
	2	.060	150	.200*	.986	150	.129

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

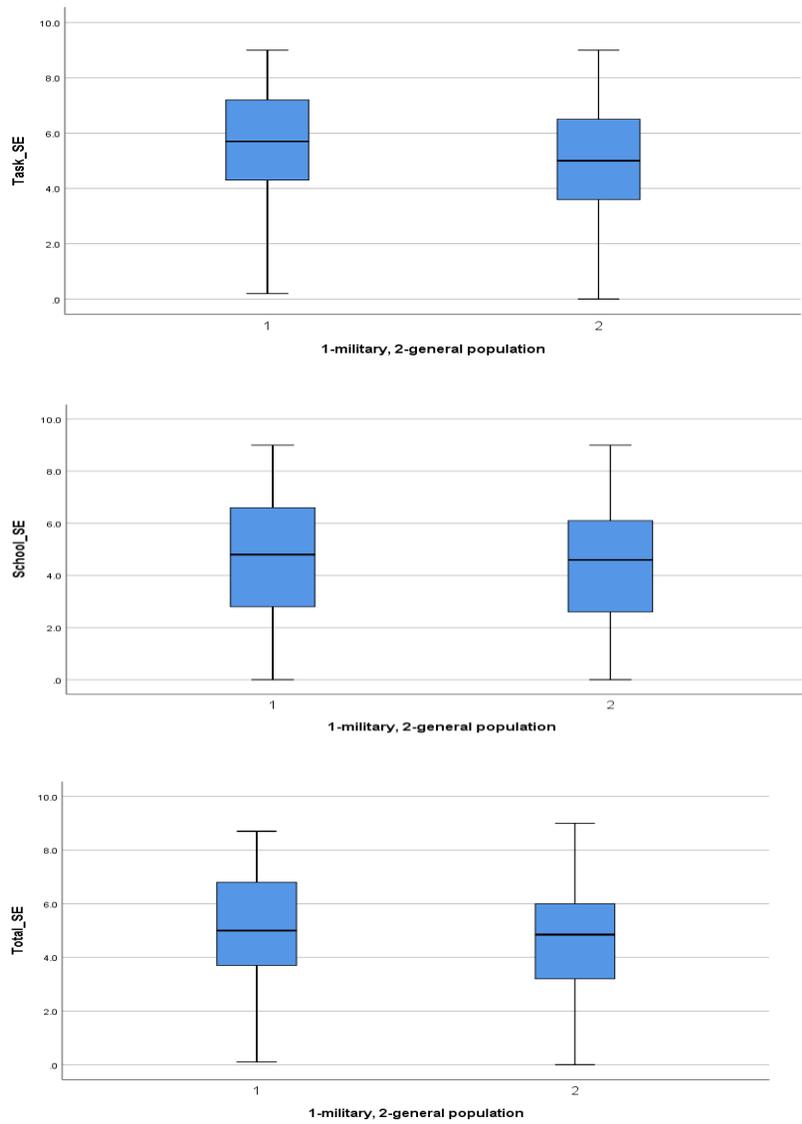
**APPENDIX Q: BOX PLOTS TO CHECK FOR OUTLIERS**

Figure 5. Box and Whiskers Plot for Task SE, School SE and Total SE to check for outliers.

**APPENDIX R: BOX'S M TEST**

Table 4.

*Box's Test of Equality of Covariance Matrices<sup>a</sup>*

Box's M	13.587
F	2.240
df1	6
df2	643410.113
Sig.	.037

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + Group

## APPENDIX S: MANOVA OUTPUT

Table 5

*Multivariate Tests*

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Observed Power <sup>c</sup>
Intercept	Pillai's Trace	.875	692.672 <sup>b</sup>	3.000	296.000	.000	.875	1.000
	Wilks' Lambda	.125	692.672 <sup>b</sup>	3.000	296.000	.000	.875	1.000
	Hotelling's Trace	7.020	692.672 <sup>b</sup>	3.000	296.000	.000	.875	1.000
	Roy's Largest Root	7.020	692.672 <sup>b</sup>	3.000	296.000	.000	.875	1.000
	Root							
Military	Pillai's Trace	.026	2.666 <sup>b</sup>	3.000	296.000	.048	.026	.648
	Wilks' Lambda	.974	2.666 <sup>b</sup>	3.000	296.000	.048	.026	.648
	Hotelling's Trace	.027	2.666 <sup>b</sup>	3.000	296.000	.048	.026	.648
	Roy's Largest Root	.027	2.666 <sup>b</sup>	3.000	296.000	.048	.026	.648
	Root							

**APPENDIX T: ANOVA OUTPUT**

Table 6

*Tests of Between-Subjects Effects*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power <sup>d</sup>
Corrected Model	Math Task SE	24.999 <sup>a</sup>	1	24.999	6.186	.013	.020	.698
	Math School SE	7.553 <sup>b</sup>	1	7.553	1.392	.239	.005	.217
	Math SE	15.368 <sup>c</sup>	1	15.368	3.720	.055	.012	.485
Intercept	Math Task SE	8390.999	1	8390.999	2076.319	.000	.874	1.000
	Math School SE	6147.213	1	6147.213	1133.152	.000	.792	1.000
	Math SE	7290.484	1	7290.484	1764.880	.000	.856	1.000
Military	Math Task SE	24.999	1	24.999	6.186	.013	.020	.698
	Math School SE	7.553	1	7.553	1.392	.239	.005	.217
	Math SE	15.368	1	15.368	3.720	.055	.012	.485
Error	Math Task SE	1204.303	298	4.041				
	Math School SE	1616.614	298	5.425				
	Math SE	1230.998	298	4.131				
Total	Math Task SE	9620.300	300					

	Math School SE	7771.380	300					
	Math SE	8536.850	300					
Corrected Total	Math Task SE	1229.301	299					
	Math School SE	1624.167	299					
	Math SE	1246.366	299					