UNIVERSITY OF CAPE COAST

AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN MATHEMATICS TEACHERS' EFFICACY AND THEIR STUDENTS' ACHIEVEMENT AT THE JUNIOR HIGH SCHOOL IN THE CAPE COAST METROPOLIS

WILHELMINA EFUA ARTHUR

2022

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BY

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Thesis submitted to Department of Basic Education of the Faculty of Educational Foundations, College of Education Studies, University of Cape Coast, in partial fulfilment of the requirements for the award of Master of Philosophy degree in Basic Education

JUNE 2022

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: ……. Date: …….

Name:

Supervisors' Declaration

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Supervisor's Signature: …… Date: ……..

Name:

ABSTRACT

The purpose of the study was to examine the relationship between the efficacy of mathematics teachers and the mathematics achievements of Junior High School students in the Cape Coast Metropolis. Specially, the study examines the sources of mathematics teachers' efficacy, assess the factors that influence mathematics teachers' efficacy, and assess the relationship between mathematics teachers' efficacy and student achievement. The study used the descriptive cross-sectional research design. A quantitative approach was used in the study. The study used a sample of 80 mathematics teachers and 333 JHS three students. The data collection instrument was a structured questionnaire and district mock examinations of JHS three students at the basic education. Responses from the questionnaire and the district mock examinations were coded and entered into the Statistical Package for Social Sciences software for processing. Descriptive and inferential statistics were used. Precisely, percentages, frequencies, means, correlation, and factor analysis were used as the data analytical tool. The study found that the sources of mathematics teachers' efficacy were enactive mastery experience, vicarious experience, verbal persuasion, physiological and emotional states. Also, the study found that the factors that affect mathematics teacher's efficacy were student engagement, classroom management, and instructional strategies (IS). Finally, the study found a positive significant relationship between mathematics teachers' efficacy as well as student achievement. It was therefore recommended that in mathematics, professional development must strengthen knowledge of content and pedagogical curriculum of mathematics.

KEY WORDS

Mathematics teachers' efficacy

Students' achievement

Junior High School

ACKNOWLEDGEMENTS

I give thanks to the Almighty God for being with me throughout my education. I wish to render my sincere thanks to my supervisor, Dr. Forster D. Ntow at the Department of Basic Education, University of Cape Coast, for his suggestions and remarks. His sagacity, expertise, academic rigour and guidance were of the highest quality. Most of all I thank him for the personal and professional beliefs he has always had in me. To him, I say his effort has been chronicled on my memory trajectory. I am also grateful to my family for their support throughout my years in education.

To Osman Light, who is the most dedicated mentor, friend, brother and prophet, I thank you for all the love and support. To my sister and her husband, Mr and Mrs Cobbina, who have always patted me at my back not to relent on my effort. To the family of grace, God bless you for reminding me to trust in God and to enjoy life and aspire to new adventures. I am grateful to Kojo Amoah for his support throughout my work. I am also grateful to Philip Ekumah and Ebenezer, who have always reminded me to finish my course on schedule. To my friends and to all of you, I say God should reward your efforts. I am also grateful to my mother, Gladys Baisie Wilson, who also gave me all the support I needed throughout my education, I say God bless you and may you live long.

My lecturers and colleagues, especially Dr. Isaac Buabeng, Mr. Kwaku Kissiedu, thank you for your unflinching support and encouragement to undertake this study. I say may God richly bless you.

DEDICATION

To my family

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

The Basic Education Certificate Examination (BECE) mathematics performance of Junior High School students in Cape Coast Metropolis has not been steady since 2015 even though the number of students sitting for the exam have been increasing (West African Examination Council, 2018). This has made students who could not score 40 and above in the mathematics paper stay at home and some end up as victims of social vices such as prostitution, armed robbery, pick pocketing, street hackers and many more (Abotsi, Yaganumah, & Obeng, 2018). In view of that literature has revealed that teacher's efficacy has become imperative in enhancing student's performance. As supported by the Bandura's social cognitive theory, teacher efficacy can affect their performance (Bandura, 1997, p.2). However, studies in Ghana have not paid attention to the efficacy of mathematics teachers and its relationship to achievement of students in basic education schools.

Background to the study

Research on factors influencing the achievement of students show that teachers are the most significant school element in the achievement of students (Appleton, Christenson, & Furlong, 2008). Researchers in education have attempted to describe the impacts of teacher characteristics such as, teachers' certification, teachers' experiences and many more on the achievements of students (Khan, 2011). Nevertheless, a discrepancy is found in the findings of those researches as to whether teachers' characteristics have a positive, negative, neutral or curvilinear relationship with the achievement of students (Nye, Konstantopoulos, & Hedges, 2004; Hess, Rotherham, & Walsh, 2004).

Studies on the traits of teachers associated with student achievement are divided into three groups (Boonen, Damme, & Onghena, 2014). This grouping is: beliefs of teachers and attitudes in the classroom, teachers' qualifications and teachers' practices. Beliefs of teachers are characterized as the subjective understanding of a teacher, and a representation of the common sense as well as the experience of a teacher (Turner, Christensen, & Meyer, 2009), for instance the efficacy of a teacher. A collection of beliefs about a given instructional concept shapes a mind-set of teachers that can direct behaviour (Pajares, 1992).

Dimension of teachers have obtained very little recognition (Scheerens *et al.*, 2005), partially because of difficulty in assessing and quantifying the behaviours and values of teachers (Palardy & Rumberger, 2008). Work in this field has centred on a number of values and attitudes, for instance epistemological views, the beliefs of teacher efficacy, high student aspirations, work fulfilment, confidence in the reliability or malevolence of knowledge, and perceptions about the wider school environment. For example, in Dutch elementary education, Driessen and Sleegers (2000) identified no effects on the efficacy of the teacher on student achievements in mathematics as well as language. Conflicting to such results, Muijs and Reynolds (2002) discovered an indirect influence of teacher efficacy on mathematics achievements by behaviourist teaching methods at British elementary schools.

Turner, Christensen and Meyer (2009) discovered that teachers who believe in the flexibility of intelligence most often use instructional strategies that are appropriate for all students and therefore positively influence the achievement of students. Furthermore, perceptions and beliefs towards the school environment tend to impact the achievement of students. These

comprises teachers' understanding of working partnerships and cooperation among teachers (Jacobs & Harvey, 2010; Leana & Pil, 2006), perceptions of services, budgets, school apparatus and tools, perceptions of formalizing policies and measures, and perceptions of teachers' participation into the decision-making process of the school (Jacobs & Harvey, 2010).

Beliefs of teachers is important and guide the teachers' practices and classroom choices. Nonetheless, when assessing for teacher certification, these teacher beliefs are not tested compared to other skills as well as knowledge. However, Porter and Freeman (1986) argued that educational beliefs of teachers should be tested so that they can form part of the criteria for teacher certification. In fact, there seems to be a commendation that further studies should be carried out on the beliefs of teachers to follow what can be inculcated during the planning programmes. Teacher efficacy is a sole critical component of the beliefs of teachers that can be linked to teacher actions regarding classroom teaching.

The efficacy of teachers has to do with personality-perceptions of competency rather than with real standards of competency (Tschannen-Moran *et al*., 1998). The assumption that a result was effective or ineffective increases or decreases the confidence in efficacy and adds to the likelihood of potential results at different tasks. According to Bandura (1986, 1997), there are four efficacy sources for the teachers: enactive mastery experience, which is the absolutely necessary source of efficacy is the real, past success of a mission. Self- perception resulting from success or failure to complete a task's past results may affect efficacy when an individual is considering engaging in a specific task. Vicarious experiences are those in which someone else

demonstrates the expertise at a specific job. The extent to which the observer interacts with the model can impact the efficacy of the observer. The more the observer interacts using the model the greater the effect on efficacy would be. When a model does better, the observer's efficacy is increased; if the model does poorly, the observer's efficacy decreases.

Verbal persuasion and physiological reactions are defined as particular response on results, such as a "pep talk" by a supervisor or colleague. Even verbal persuasion can be obtained from general conversation- lounge of the teacher. For instance – or from other outlets like media, for instance, a documentary on teachers' abilities to affect students. The impact of verbal persuasion and physiological reactions are restricted in their ability to bring about permanent rises or falls in effectiveness. If successful, however, they can lead to an individual starting a mission, attempting new tactics or attempting tougher to achieve. Performance set-backs may inculcate sufficient personal-distrust to interfere perseverance at a task. The effectiveness of persuading relies on the persuader's reputation, reliability and competence (Bandura, 1986). Teacher efficacy study emphasises the impact on student achievement in educational activities. This includes what teachers do for their students in their classroom, comprising teaching time, learning methodologies, and subject-definite lesson tasks.

There has been a lot of research on which teaching elements are beneficial for students' achievements in junior high school mathematics education. (Reynolds & Muijs 2000; Kyriakides, Charalambous, & Christoforou, 2013). Most of these researches centred on the efficacy of a series of teaching features, including time-on-task, some training techniques, the use

of the direct teaching model, higher standards communications, as well as the usage of textbook. This aspect may be defined in the case of mathematics education as the notch to which the course content relates to mathematics (Mathematics Learning for Teaching Project, 2010). Sammons, Mortimore and Hillman (1995) demonstrated that particular instructional methods for example orientation, directed guidance, comprehension testing, and summarization were extremely essential for learning.

The direct teaching model is also considered one efficient instructional method in junior high school mathematics education compared to the phasing-in of a lesson (Houtveen, Van de Grift, & Creemers, 2004; Seidel & Shavelson, 2007; Christoforou, Charalambous, & Kyriakides, 2013). Teachers who interact with students with high, but reasonable standards appear more successful (Sammons, Hillman, & Mortimore, 1995; Hiebert & Grouws, 2007; Reynolds & Muijs, 2000). According to Hill and Charalambous (2012b), the degree to which teachers employ lesson recommendations and textbook learning content impacts instructional efficiency.

Teacher efficacy addresses the concepts and beliefs about one's capacity to achieve or execute acts at specified stages (Bandura, 1997) and therefore has a degree that influences the decisions, emotional condition and behaviours of an individual. The beliefs that a person has of his or her own abilities and the results of his or her own actions have an influence on numerous strategies in a manner in which they perform. In teacher efficacy the consciousness of the link between individual beliefs and that of actions attracted the interest of scholars. In studying conditions teacher efficacy has been made relevant. Researchers such as Schunk (1995) and Pajares (1996) have explored the effects of teacher

efficacy in academic achievement, learning and motivation. Efficacy of teachers exerts a powerful result that explains teacher conduct that impacts student motivations and achievements. Both scholars and educationalists have worked to understand and even to assess the sense of teacher efficacy.

Furthermore, describing teacher behaviour, teacher efficacy residues as a key aspect of the researchers' predicting motivation or inspiration (Betts, Gordon, Klassen, & Tze, 2011). Studies argued that beliefs and efficacy affects the choices made by teachers about their classroom practices, where they also influence the classroom settings. Additionally, it has been recognized that the classroom environment influence on students' achievements (Brophy, 1986; Chiang, Miller, & Rowan, 1997; Hunt, 1976; Kagan, 1992; Nussbaum, 1992).

According to Bandura's social cognitive theory, teacher efficacy refers to "beliefs in one's abilities to establish as well as implement the course of actions necessary to manage possible circumstances". (Bandura, 1997, p.2). Teacher efficacy has the capability to influence a person's mission choices, inputs, continuity, perseverance and accomplishment (Bandura, 1997). As with mathematics teachers, teacher efficacy is seen as the beliefs of the teacher in his or her own competence to properly consolidate and carry out his teaching responsibilities (Knoblauch & Hoy, 2008, p.167). This is so because teachers' efficacy determines the level of effort invested, the targets set, the level of commitment and persistence, and the ability to stand tall above all possible challenges in carrying out their teaching duties (Tschannen-Moran & Hoy, 2007). In this regard, it may be argued that mathematics teacher's efficacy is likely to affect their students' achievement in national examinations such as the Basic Education Certificate Examination (BECE).

Statement of the Problem

In Ghana, the BECE has served as an examination for both qualification as well as selection into the country's Senior High Schools and Technical Institutes. The examination results are centred on both the continuous assessments and the external examination. The continuous assessment forms 30% whilst the external examination forms 70% of the total assessment (Waec-Gh, 2019). The Basic Education Certificate Examination (BECE) is an annual examination organised by the West African Examination Council to enable Junior High school grandaunts to transit to the Senior High School. This examination comes with four essential core subjects that must be passed (passed mark been 40% and above) by students to be able to gain admission into the second cycle. One of these core subjects is mathematics. The BECE mathematics performance in the Cape Coast Metropolis for the past five (5) is seen in Table 1.

Table 1: BECE Mathematics Performance in the Cape Coast Metropolis

Year	Total number of students that sat	Number of student that passed	Percentage of students that passed
2014	3063	1867	60.95
2015	2969	1756	59.28
2016	3158	2288	59.69
2017	3289	1949	49.90
2018	3237	2106	55.35

Source: West African Examination Council (2018)

Comparing these percentages, it is evident that the BECE mathematics performance of Junior High School students in Cape Coast Metropolis has not been steady since 2015 even though the number of students sitting for the exam have been increasing. This has made students who could not score 40 and above in the mathematics paper stay at home and some end up remaining at home because they were unable to rewrite the mathematics paper immediately after

the national examination. Some also tend to practice social vices such as prostitution, armed robbery, pick pocketing, street hackers and many more because they were unable cannot continue with their education as a result of they not passing the Basic Education Certificate Examination (BECE) mathematics paper (Abotsi, Yaganumah, & Obeng, 2018).

Literature has revealed that studies have been done to examine the possible factors or issues that could affect the mathematics performance of students. Guenther (2014) performed research in Canada regarding the degrees of efficacy of teachers' relationships and their working situations at school environment. The research by Etheridge (2016) in the USA has addressed how elementary mathematics teachers' efficacy affects their teaching of mathematics. Negreiros (2017) explored teachers' beliefs concerning how mathematics is, their instruction and learning as well as the role it plays in selecting and delivering teaching practices.

Mojavezi and Tamiz (2012) in Iran created a link between teacher efficacy and student inspiration and the variation in student achievements that focuses on teacher efficacy. Subsequent research carried out in Africa, Ayotola and Adedeji's work (2009) discussed a link between the efficacy of mathematics students and their academic achievements in mathematics in Nigeria. Matoti, Junqueira and Odora (2014) piloted a study to evaluate the beliefs of the teaching efficacy of trainees likening two institutions, concentrating on three categorisations: management and supervision in the classroom, teaching approaches and engagement of the students.

Research on the impact of teacher efficacy on achievements of students is increasing. Study by Cantrell, Almasi, Carter and Rintamaa (2012) and Ross

(1992) in Canada did a study on how to determine a positive relationship between teachers with higher level of efficacy as well as students with higher level of achievements. The efficacy of the teacher is challenging to assess because it is dynamic in terms of an individual's belief in accomplishment of results. Efficacy does not merely change because of the mission, but then modifications can be made for a person with the same task or mission over time.

Teachers have their personal precise tasks and results, which are exceptional to the profession, so it is merely rational for teachers' efficacy measures would also be exceptional. Recently, Kogan, Vacha-Haase and Henson, (2001) and Woolfolk Hoy and Tschannen-Moran (2001) examined teacher efficacy measurement tools, in which they established a measuring device which signifies teacher efficacy through three primary correlated variables: Efficacy of instructional practices, student engagement efficacy and classroom management efficacy.

Although some research has been conducted in Ghana on the efficacy of teachers in teaching, not much consideration has been paid to the efficacy of teachers in teaching mathematics and its relationship to achievement of students in basic education schools. For example, Marfo (2011) conducted a study to determine the perception of the efficacy of social studies teachers related to the teaching of social studies in senior high schools in the Greater Accra Region of Ghana at University of Cape Coast. Therefore, this research is to examine the sources of mathematics teachers' efficacy, factors that influence mathematics teachers' efficacy and to investigate any possible relationship between the efficacy of Junior High School mathematics teachers and their students' achievements in the subject.

Purpose of Study

The purpose of this study was to examine the sources of mathematics teachers' efficacy, factors that influence mathematics teachers' efficacy and any possible relationship between the efficacy of Junior High School mathematics teachers and the mathematics achievement of their students in the Cape Coast Metropolis.

Research Objectives

The study specifically looked to:

1. examine the sources of mathematics teachers' efficacy,
2. assess the factors that influence mathematics teachers' efficacy, and
3. assess the relationship between mathematics teachers' efficacy and student achievement.

Research Questions

The following research questions guided the study.

1. What are the sources of mathematics teachers' efficacy?
2. What are the factors that influence mathematics teachers' efficacy?
3. What is the relationship between mathematics teachers' efficacy and student achievement?

Significance of the Study

While self-efficacy has been related to conceptual and procedural understanding in only a few studies, the current study went beyond the current emphasis of both procedural and conceptual understanding among students and delved into how teachers teach differently based on these variables. The need lies for research investigating how teachers with different mathematics self-efficacy and mathematics teaching self-efficacy levels may teach differently.

The current study offers an instrument that measures both mathematics self-efficacy and mathematics teaching self-efficacy, as well as assessment strategies to evaluate procedural and conceptual teaching methods. The data may show a relationship between these variables and more specifically to identify conceptual or procedural teaching methods common among teachers with high or low mathematics self-efficacy and mathematics teaching self-efficacy. By clarifying the relationships among these variables, teachers and teacher educators may understand how their own self-efficacy affects their teaching practices.

Delimitations

This study focuses on examining the relationship between the efficacy of mathematics teachers and student achievements in the final year at the Junior High School level. The study was delimited to the concept of teachers' efficacy to teacher characteristics, such as teachers' beliefs and attitudes, teachers' classroom practices, teacher qualifications and teachers' years of experience with specific reference to the teaching of mathematics.

The key aim of this research is to examine whether factors such as mathematics teachers' education, teachers' beliefs about their role in classroom relates to the achievements of students. Moreover, the study will investigate mathematics teachers in the Cape Coast Metropolis in the Central Region of Ghana. Lastly, this study will not examine teachers' characteristics that are beyond teacher efficacy such as personality traits. Even though the analysis will be beneficial for future research but it will not be considered in this study.

Limitations

There were some limitations that were connected with this study. A five-point Likert-scale was used in the first place to gather teacher efficacy data. It was known that most respondents chose not to select the most extreme decisions on the scale and gradually raise the measure's sensitivity. In the opinion of Bandura (2006), because they are less sensitive and less reliable, scales that use only a few steps should be avoided. Typically, individuals avoid extreme positions, but a scale of just a few levels will diminish to one or two points in the real sense.

Definition of Terms

For the purpose of this study, the following definitions are applicable:

Efficacy

Beliefs in one's ability to plan and conduct a course of action essential to accomplish a specific achievement (Bandura, 1997).

Teacher's sense of efficacy

The teacher's judgment of his or her abilities, particularly for those students who may be challenging or unmotivated, to achieve the expected results of student participation and learning. (Tschannen-Moran & Woolfolk-Hoy, p. 783, 2001).

Teacher Efficacy

The degree to which teachers believe that their individual actions would have a positive influence on the achievement of students (Ross, 1994).

Student Achievement

It is determined by the district mock exams planned and conducted by the Ghana Education Service for all Ghanaian students in third junior high school. To obtain a 'Satisfactory' mark, students must meet a score of 50 out of 100.

District Mock Examination

An examination written by all form three Junior High Schools (JHS) of Government Basic Schools in Ghana, it is usually taken before the students write their final Basic Education Certificate Examinations (BECE).

Organisation of the Study

There are five chapters in this study, the first of which consists of the introduction to the study, statement of the problem, research questions, the purpose of the study, the significance of the study, delimitation and limitation of the study. In Chapter Two, there is the theoretical, conceptual and empirical context of the study. There is a literature review on theories of teacher efficacy and student achievement, teacher efficacy, mathematics teacher efficacy and sources of mathematics teacher efficacy. Measures of teacher efficacy as well as validation surveys of the teacher efficacy measures and various issues linked to these measures have been evaluated. Furthermore, literature concerning factors that influence mathematics teachers' efficacy will be discussed. Additionally, the researcher will also review the literature on the relationship between teacher efficacy and student achievements. Chapter Three outlines the methodologies employed to respond to the research questions, describing participants and procedures for data collection, including a description of the statistical analysis. Chapter Four presents the findings of the data analysis. Descriptive data analysis and statistical processes will be provided for each

research question together with results will be discussed. Furthermore, this chapter will provide an interpretation of the outcomes or results. Chapter Five presents the summary, conclusions and recommendations of the study. Also, suggestions for further research are presented in this chapter.

CHAPTER TWO

LITERATURE REVIEW

This chapter presented on the theoretical basis of the study as well as a review of existing literature related to the study objectives and research questions. The chapter specifically looked at three sections: theoretical review, empirical review and conceptual framework.

The key objective of this chapter is to show the relationships between the efficacy of mathematics teachers and the achievement of students through literature. The literature discussed the theoretical foundation, conceptual framework and the empirical review. The first part looked at the theories concerning teachers' efficacy and student achievements. The second part which is the conceptual framework viewed teacher's efficacy, mathematics teacher efficacy, sources of mathematics teacher's efficacy, factors that influence mathematics teacher's efficacy, measures of mathematics teacher's efficacy (Two-item rand questions, teacher locus of control, responsibility for student achievements, teacher efficacy scale, teacher sense of efficacy scale (TSES), three TSES subscales, teacher efficacy for student engagements, efficacy of teacher for instructional strategies, teacher efficacy for classroom managements) and student achievement. The last part was an argument in the area of teachers' efficacy and student achievements, which was the empirical review. This investigation is projected to give readers what literatures already exist in the related field.

Theoretical Review

The study employed the social cognitive learning and social learning theories.

Social Cognitive Learning Theory

The study is embedded in the social cognitive theory of Bandura (1977). Bandura purported behaviours can be unwavering as well as clarified by behavioural communication; cognitive, in terms of inner, individual causes; as well as ecological facets; this model is referred to as mutual determinism (Bandura, 1997). Bandura highlights the part that individual influences play in behaviour. In addition, Bandura argues, "Nothing is more important or omnipresent among the systems of personal agency than the expectations of individuals regarding their right to exert influence over circumstances which affects their lives" (1997, p.2). Belief in efficacy, an aspect of individual identity, affects humanoid perception as well as inspiration that affect behaviour. Efficacy influences the feelings that people have about their skills. Bandura (1997) again described Efficacy as "beliefs in an individual capacity to coordinate as well as conduct sequences of behaviour necessary to achieve the attainments assumed" (p. 3). The efficacy affects the ability of an individual to accomplish acts as well as the extent of time that they disburse. Notwithstanding challenges, efficacy still affects one's resilience (Bandura 1997).

Relative to this study efficacy which is an aspect of an individual's identity, affects mathematics teachers' perception and motivation; and it overall effects on their conduct during class hours. Efficacy influences the perceptions that mathematics teachers have about their abilities and skills. Efficacy

influences mathematics teachers' ability to perform their academic duties and this tend to affect the achievement of students. Notwithstanding challenges, mathematics teachers' efficacy affects their resilience (Bandura, 1997).

Theory of Social Learning

Approaches of describing as well as assessing the principle of efficacy are further centred in the literature on Rotter's social learning theory. The fundamental concept of the theory of social learning means behaviours can also be anticipated on the outcomes of these behaviours by one's expectation. Reinforcements boost one's belief that the same assurance will accompany a particular action or occurrence in the forthcoming. Individual's understanding of his or her own personal actions affects behaviour (Rotter, 1966). As part of his theory of social learning, Rotter (1954) as well presented the idea of the internal then external locus of control. According to Rotter (1966), if a result is perceived as a product of causes other than an individual's behaviour this assumption is termed external control. Alternatively, whether the result is linked to a person's own behaviour or personality, the assumption is considered as internal control.

According to Rotter (1966) and Bandura (1997), human behaviours derive from the relationship between behaviour, cognitive and personal variables, as well as environment, in social cognitive theory. What people perceive, believe, and experience influence their behaviours (Bandura, 1997). The beliefs of people as to their abilities to succeed effectively are essential for achieving desired results. Alternatively, Rotter's theory of social learning advocated that behaviours are acquired and can change. Rotter argued, similarly to the views of Bandura, that behaviours are explained by people's engagement

with their environment (Rotter, 1982). Another connection between the two theories is the role of prior knowledge. Reinforcements play a significant role in human behaviours, in social learning theory; whereas in theory of cognitive learning, Bandura stresses the part of facets of cognitive. All the theories have an influence on how researchers develop their efficacy conceptualization.

In relation to this study, student outcomes in terms of their academic performance is influenced by teachers' personality and behaviour. Students are likely to perform well in their mathematics course of study when their teachers are able to demonstrate the right behaviours and personality traits. In the nut shell, mathematics students' performance is dependent on the form of behaviour demonstrated by their teachers, hence good behaviours from teachers can guarantee student good performance.

Conceptual Review

This section of the chapter presented on the review of the various concepts of the study.

Teacher Efficacy

Efficacy of teachers was derived from perception of efficacy by Bandura (1986, 1997). Efficacy relates to people's beliefs about their abilities to accomplish a specific goal. With regard to Bandura, beliefs of efficacy might be self-disabling or self-ornamental and play a significant role in effecting a person's course of action, how much time an individual will set aside along with that course of action when confronted with difficulties, and also in an person's resistance to difficulty. The stronger the sense of efficacy in a task in a presumed field, the stronger the individual's determination to maintain it and the greater

the likelihood that the individual will successfully accomplish the carefully chosen task.

Allinder (1994) argued that efficacy appears to have an impact on the level of exertion a teacher will have to capitalize on in an instructional consignment; the higher the efficacy of a teacher, the higher the preparation, the higher the willingness and the organization for instruction appear to emerge. It would then be normal for school systems to want to partner with teachers who have higher or stronger efficacy. Alternatively, Wheatley (2000) argued that the higher efficacy can point in the wrong direction. For example, teachers might sense to be effective at a consignment when they have the impression that they are over-stretched when in reality they do not really know for sure that they can do the consignment that is what Wheatley branded as "imaginary efficacy", for example, to save a teacher or an individual pretending to be effective at other things. Conversely, teachers might perceive themselves as effective at some level of their instruction when they resist reform or change in the real sense. Wheatley (2002) described efficacy as "overly safe efficacy" in which teachers' feel they have "all figured out" the curriculum (p.19), suggesting that there is safe bureaucratic system of teaching that will eliminate chances for development and amendment.

Wheatley (2002) also expressed the view that doubting the teaching proficiencies of a teacher can replace a feeling of unsteadiness or indecision that can later be replaced by self-replication. Teachers who have or seek assistance will learn to tackle their concerns and will be open to alterations and greater diversity in the teaching and learning situation. Nevertheless, "too optimistic efficacy" will also prepare the way for disenchantment. In actual instruction

situations, which could be the centre for pioneering instructional practices to be unhindered for a recognized, safer teaching method, teachers' anticipations of their skills could be confronted.

According to Spero and Woolfolk Hoy (2005), one of the excessive applications of teacher efficacy for researchers is that it is one of the rare physical features of teachers that is interrelated with student achievements. Depending on the outcome of student achievements, teachers will render their own judgments about teaching. Consequently, teacher efficacy is self-awareness of competence rather than a sum of absolute competency. There are numerous features of teachers who have been acknowledged as having an influence on their job performance. Among some of these features are teacher competency, preparation, support services, and teacher efficacy are some of these features.

Woolfolk and Hoy (1990) advocated that teacher efficacy has been acknowledged as a significant feature of teachers which can definitely have impact on both teacher and student results as well as constantly relating to teaching and learning. Described as teachers' insight of his or her competences to influence change in students' achievements, teacher efficacy has for several decades been debated and investigated (Tschannen-Moran, Hoy, & Hoy, 1998). It ought to be remembered that "the efficacy of teachers is a personal perception, and not an unbiased degree of successfulness of teaching. It symbolises the expectations of teachers' that their exertions bring about students learning" (Ross *et al.*, 1999, p.786).

The concept of efficacy for teachers has been linked to several facets of education. For instance, it has been shown that a high sense of efficacy has a

positive association with the ability of a teacher to pursue new educational methods with their students (Berman *et al.*, 1977; Gibson & Dembo, 1984). It is important that teachers recognize the importance of their position and the level of influence they exert over student learning in an environment of high stakes testing and increasing student accountability. As schools embrace successful research-based teaching activities in an attempt to facilitate the learning of students, it is essential for teachers to be able to adapt their teaching methods and to implement strategies that have proved effective in their classrooms.

According to Ashton (1984) the efficacy of a teacher was described as "teachers' beliefs concerning their abilities to influence students learnings positively" (p. 142). He restates that teachers that have a high teaching efficacy discover that their teaching are significant and fulfilling, expect students to succeed, evaluate themselves when their students fail, establish their goals and develop strategies to achieve these goals, have positive attitudes towards themselves as well as their students, feel motivated and communicate their objectives with students.

Tschannen-Moran, Hoy and Hoy (1998) established that research on teacher efficacy emerged from efficacy research, an intellectual mechanism in which individuals build expectations concerning their capability to achieve their goals at a certain level. They added that these belief-related factors affect the effort people make, how far they cope with challenges, how prone they are to defeats, as well as how anxious or distressed they are in facing difficult situations. Several researchers have tried to increase perception about the part of those reciprocal associations in developing and maintaining teacher efficacy

(Hipp, Bredesqn, & Resenholtz, 1995; and Webb & Ashton, 1986). For example, Hipp and Bredesqn (1995) argued that the individual instruction efficacy and the universal efficacy of instruction were higher when the principal of a school exhibited suitable behaviour and delivered performance recompenses. In particular, the capacity of the principal to promote a shared sense of purpose for staff was linked to greater teacher scores. Resenholtz (1989) established that the teachers' efficacy was meaningfully linked to the four schools' variables. Those variables have been described as: positive response on the performance of teachers, cooperation with the other teacher, parents' participation in schools and school-wide management of students' behaviour.

Many works have looked at the degree to which the efficacy of teachers is a common concept. Hoy and Spereo (2005) established that, even with socio-economic status being regulated, the school environment affected student achievements. Generally, study in this area appeared to show that significant chapter of the school environment is the degree to which it enhances or weakens the beliefs of teacher efficacy. A limited sense of efficacy can be extremely transmissible between groups of teachers. Bandura (1997) indicated that a little level of teachers' efficacy leads to a little level of students' efficacy and associated with low accomplishments, that in order deteriorates teachers' efficacy. It should be pointed out that the efficacy of teachers can be affected in various contexts, such as, school culture, teacher characteristics educational contexts, curriculum issues and so on. It is essential in making sure that the actual performance of each teacher and the need to be examined.

According to Gibson and Dembo (1984) several researches have explored the idea of teachers' efficacy as well as its effects on teachers as well as students. Teachers who have a greater sense of efficacy are most likely to focus on academic practices rather than non-academic practices. Teachers with a deeper sense of efficacy are susceptible to have influence on students' achievements (Armor *et al.*, 1976) as well as they are not expected to recommend students for special education (Meijer & Foster, 1988). Furthermore, the efficacy of teachers is connected then liked to work fulfilment. Klassen and Chiu (2010) argued that higher levels of work satisfaction were reported by teachers that have higher efficacy levels. Al-Awan and Mahasneh (2014) established that an important connection among the efficacy of teachers as well as the assertiveness of students towards school. The definition of teachers' efficacy, their sources and measures were explored by several studies. This research examines the association between the teachers' efficacy and student achievements.

The efficacy of teachers consists of the efficacy and personal effectiveness of instruction (Ashton, Webb, & Doda, 1983 as cited in Warren, 2010). These constructs are described as the beliefs of teachers on the links between teaching and learning (teaching efficacy) and their teacher effectiveness (personal effectiveness). Teachers build beliefs about their own capacity to produce optimal results through experience and education.

Many factors have been related by researchers to increases or decreases in teachers' efficacy. A strong positive association between teacher efficacy and self-esteem was found by Huang, Lui, and Shiomi (2007). The information indicated that teacher efficacy and teacher self-esteem improve as teachers gain

experience. A positive significant association between teacher efficacy and emotional intelligence was discovered by DiFabio and Palazzeschi (2008). Emotional intelligence is defined as' the ability to accurately and effectively process emotional information, including the ability to interpret, assimilate, comprehend, and control emotions (Mayer, Salovey, & Caruso, 2000 p. 165). The results indicate that emotional intelligence is related to the efficacy of teachers in controlling actions in the classroom, engaging students, and incorporating useful strategies in teaching.

The intrapersonal results of Di Fabio and Palazzeschi (2008) indicate that the aspects of emotional maturity and adaptability are related to teacher efficacy. There tends to be poorer efficacy for teachers who have trouble knowing how they feel and trouble responding to problem circumstances. Additionally, it can be difficult for teachers with lower efficacy to recognize how they feel and respond to problem situations. In existence, this concept has the potential to become self-fulfilling and cyclical. Teachers will continue to re-indoctrinate themselves with unhelpful ideas that contribute to unproductive instruction and poor student achievement without adequate intervention.

Ross and Bruce (2007) discussed professional development and its influence on the efficacy of teachers. Professional development, intended to improve teacher efficacy, tended to create improvements in the beliefs of teachers regarding their abilities to control activities in the classroom. Many adjustments were not important in the beliefs of efficacy. Ross and Bruce (2007) argued that, while significant in the advancement of educational efforts, professional development lacks effectiveness in influencing the efficacy of teachers. Researchers have recently investigated the effectiveness of teachers in

relation to student achievements. Some researchers claimed that teacher efficacy and student achievements have a strong positive correlation (Goddard, Hoy, & Woolfolk Hoy, 2004; Ross, 1998). Ross and Bruce (2007) argued that teachers with higher efficacy are more probable to improve student achievement. Henson (2001) argued that academic achievement of students improves and students are more successful when their teacher has high level of efficacy.

Low efficacy has the possibility to hinder teachers' ability to operate efficiently in the classroom and educational environments. Pintrich and Schunk (1996) suggest that the belief of a teacher that he or she seems unable to handle behaviours in the classroom is likely to result to the avoidance of strategies of classroom management. The teacher would also "give way" to undisciplined students when the job of handling the class is perceived as challenging their expertise, thereby perpetuating further lack of efficacy of classroom management. It is possible that this cycle is extended to many other facets of instruction, such as dealing with poor performing students, interacting with teachers and parents, and lesson plan development and execution. The influence of teacher efficacy on the achievement of students is evident and well sponsored. Poulou (2007) found that the efficacy of teachers is determined by personality traits, self-perceptions, and drive. Nevertheless, educational scholars have dedicated less time and energy to investigating these variables and their true influence on the efficacy of teachers.

Mathematics Teacher Efficacy

Efficacy in mathematical teaching is linked to the personal teaching efficacy of an individual teacher in that it represents the values of a teacher that

he or she makes a declaration concerning the efficacy of their personal instruction or teaching. Efficacy in mathematical teaching often represents the belief that teachers are sufficiently qualified to teach mathematics, or that teachers have ample expertise to build strategies to address barriers to student learning in the mathematics subject field (Ashton & Webb, 1982). Efficacy of mathematical teaching is far more precise and personalized than a belief in what teachers in particular should actually achieve as it is connected not just to personal teaching values but also to a particular field of content (Tschannen-Moran *et al.*, 1998).

According to Kahle (2008), efficacy of the teachers' mathematical teaching was linked to teacher awareness, teacher readiness, student performance, individual efficacy, and vicarious experiences. This efficacy idea was in line with the theory of social cognitive learning (Bandura, 1986). As stated in past research concerning general teacher efficacy, positive teacher practices resulted in improved instruction, successful classroom management, student engagement and increased student performance (Pintrich & Schunk, 2002; Hoy & Woolfolk, 1990). These same findings, according to Kahle (2008), emerged when applicable to efficacy in mathematical instruction.

Starko and Schack (1989) established that efficacy instruction is improved by the application of techniques or practices in real or virtual interactions. While teachers are unlikely to use thought techniques that are not familiar to them in their classes, they are encouraged to become more successful so that new approaches can be put into action. Through watching other teachers who imitate the ideal teaching habits, teachers strive to develop their own training and training an attitude, which in effect improves the efficacy of

teachers' mathematical instruction (Sparks, 1986). Teaching efficacy is described as important in teachers' teaching activities, classroom attitudes, and student motivation (Pintrich & Schunk, 2002; Hoy & Woolfolk, 1990), and as a result, efficacy in Mathematics teaching is shown to have a positive, prominent impact on the same variables in the mathematics classroom (Midgley, Kaplan, & Middleton, 1989).

While influences such as mathematics insecurity have been found to have adverse impacts on the classroom attitudes and instructional activities of teachers (Jackson & Leffingwell, 1999), the findings of the research by Starko and Schack (1989) suggest that action can be occupied to definitely affect the efficacy of teachers to mitigate adverse influence.

The results of this suggest that the more successful a mathematics teacher is, the better her / his students are, and that, in effect, their mathematical achievement is facilitated. Teachers of mathematics must make comprehensive efforts to build a healthy and collaborative working and in-service learning environment that encourages the efficacy of mathematics teachers. Good teaching accomplishments tend to build a positive and robust confidence in the success of mathematics teachers, which then leads to the anticipation of potential outstanding performance. The successful learning accomplishments of students in mathematics are probably to be influenced by the productive teaching efficiency of their teachers, which is partly validated by the achievements of the teachers' efficacy beliefs.

Sources of Mathematics Teachers' Efficacy

Because scholars believe that efficacy beliefs affect the attitudes of students, it is important to learn how those beliefs are formed. Bandura (1997)

indicated four roots of confidence in efficacy. Bandura (1997) argued that knowledge about beliefs of efficacy derives from the enactive mastery of experience, vicarious experiences, verbal persuasion, physiological and effective states. Investigators measure apiece of the efficacy origins in a different way.

Enactive mastery experience or "performance achievements" are the utmost important and influential source of efficacy (Bandura, 1997, p. 399). In a given case, once one achieves success, he or she will in the future have strong hopes of success in specific circumstances. Performance achievements are the participants' direct interactions in particular circumstances, and they affect efficacy by means of offering members the ability to be revealed then constantly exposed to the success of a project (Bandura, 1977). Participants will have the ability to instruct their own success and learn from their own models. It offers the most credible proof as to whether people will do whatever it requires to be successful.

People persist in difficulty until they are persuaded, they will do whatever it requires to excel and acknowledge the degree of achievement they have accomplished on particular challenges (Bandura, 1997; De Montigny & Lacharité, 2005; Block, Taliaferro, Harris, & Krause, 2010; Margolis & McCabe, 2006). It is also a situation in which teachers discuss their own inspirational stories; therefore, they feel assured in their practices, which means they are knowledgeable and they trust in their skills. Success generates deep confidence in their strategies and in themselves, leading to a strong trust in their capabilities and the choosing of their practices. If these practices tend to be effective every time, they eventually increase the efficacy level of the

instructors, as well as the failure in practices, they experience less efficacy. If teachers are initially weak in efficacy, it can build suspicions and make their strategies unresolved; thus, self-reflection and self-confidence often play a role in efficacy. This expertise makes them feel that they can achieve something different and is similar to the actions they have already done (Bandura, 1977).

Failures, however, lower the standards. Task challenges and actions affect the creation of beliefs about efficacy. Barriers and challenges remind individuals that continuous efforts is needed for achievements. "A robust sense of efficacy needs practice of persevering commitment in overcoming challenges" (Bandura, 1995, p.3). Researchers used self-report items to evaluate this source of efficacy and requested students to measure their accomplishment according to their progress (Usher & Pajares, 2009).

Goddard *et al.* (2004) indicated that "the most powerful source of efficacy information is a mastery experience" (p. 5). When a person or institution successfully completes a task to specified expectations, a mastery experience happens. Usually, mastery experience is linked to prior student achievement. By partnering with teachers to develop demanding but realistic targets for student achievement, school principals may help influence the concept of a mastery experience (Ross *et al.*, 2004). Success tends to boost expectations about efficacy, whereas disappointment tends to decrease expectations about efficacy. It is necessary to remember, therefore, that the person or organisation must perceive that the positive experience happened because of the ability of those who complete the tasks in order to have a beneficial effect on efficacy. Experience may have a detrimental effect on

perceived mutual efficacy if success can be attributed to chance or other variables (Tschannen-Moran *et al.,* 1998).

The belief that a performance has been effective increases perceptions of efficacy, leading to potential expectations of outstanding performance. Efficacy beliefs significantly improve while attainment is accomplished on challenging missions with less support or while attainment is accomplished earlier in education with little disruptions; nevertheless, not too many positive experiences promote efficacy. For instance, when success is accomplished by substantial external support, relatively late in learning, or on a simple and insignificant mission, efficacy does not increase. The impression that an individual's success was a disappointment decreases the confidence in efficacy, which adds to the assumption that future performance will be useless too. This efficacy assault is probably when the loss occurs quickly in learning, and can never be due to insufficient effort or circumstances beyond the control of the participant (Bandura, 2006, 1997). Only in an actual teaching environment will a person evaluate the abilities she or he conveys to the task and feel the effect of those abilities.

They learn that the mission is one that is achievable and can be mastered as individuals strive and practice tasks, thereby improving efficacy, or they believe, after challenges and defeats, that they cannot achieve, undermining beliefs about efficacy. Access to success is critical as an individual works to learn new expertise. Novices are not tasked first with the most difficult challenges in classrooms, work education settings, and rehabilitation settings. Difficulty is enhanced as tasks are perfected after beginning with the most basic components to be learned. In this manner, good performance offers the efficacy

necessary to try the next mission. Students do not usually learn to read using books, new workers are not asked to operate a company, and customers with snake phobias are not automatically asked to keep pythons.

Along with sufficient input and assistance, achievable accomplishments are presented, so that confidence in ability improves. Then occasional failure may no longer be a concern after efficacy has been identified, and can help to reinforce durability (Bandura, 1977 as cited in Eells, 2011). Alternatively, performance that comes too quickly brings an illusion of fast outcomes, and simple discouragement as mistakes occur. A resilient sense of efficacy includes practice by perseverant commitment in facing challenges. By sticking it out in difficult times, individuals emerge from hardship more competent and stronger (Bandura, 1998, p. 54, as quoted in Eells, 2011).

It is by instruction that an individual perceives how the educational environment is influenced by acquired expertise and behaviours. Based on their use in practice, strengths and disadvantages can be measured, so mastery knowledge is the most important source of evidence on efficacy (Tschannen-Moran *et al.*, 1998 as quoted in Eells, 2011). Time spent in the classroom and in instructional environments, supporting, tutoring, and managing while gaining assistance and scaffolding, contributes to the list of mastery experiences for pre-service teachers. Nevertheless, it is not until student teaching and initial professional teaching that authentic, substantive experiences will be acquired by a teacher. In their specific contexts, teachers in the field establish efficacy by adapting their abilities to the task at hand and then witnessing the effect of those abilities (Tschannen-Moran *et al.*, 1998).

The second factor of efficacy influencing the development of beliefs about efficacy is vicarious experience (Bandura, 1997).Vicarious experience over the process of modelling is the conclusions taken by people regarding their capability to perform a mission effectively based on the results of different people. It is symbolic modelling and live. Vicarious experience occurs when people perceive others behaviours and draw comparisons with their own impressions of their ability to perform (Bandura, 1997). Observing somebody undertaking a particular task effectively convinces the observer that he or she is proficient of generating the same performance. Equally, watching others fall reduces the efficacy of the observer. Models affect the beliefs about the success of people as they realise the pattern as comparable to them Bandura (1995).

By witnessing another's acts, vicarious knowledge is gained. Watching a master teacher teach a lesson may be an example of vicarious experiences for teachers. Goddard *et al.* (2004) observed that "when a model that the observer associates with works well, the observer's efficacy beliefs are more likely to be enhanced" (p.5). In the context of efficacy, through examining the performance of co-workers, confidence in the capacity of workers to achieve desired learning results may be improved significantly. An example of meaningful vicarious experience will be the high-quality development of teachers intended to provide teachers with systematic education in procedures that have been shown to be successful and delivered by respected, highly skilled professionals. Although some studies may indicate that organisations can learn vicariously from others' interactions, it should be recognized that the body of research is not as mature as it is for individual learning (Goddard *et al.*, 2004).

Vicarious experience can be calculated by encouraging students to assess their level of access to models proficient of carrying out the mission (Usher & Pajares, 2009). A vicarious experience is where the efficacy beliefs are evaluated to suitable achievement expectations. Individuals with strong peculiar efficacy are convincing their selves that if anyone be able to ensure so, they can. They acknowledge that they have the potential to perform missions then participate in learning to improve behaviour. In this way, modelling is an important form of instruction (Bandura, 1997; Wang, Ertmer, & Newby, 2004; Block *et al.*, 2010; Siegle & McCoach, 2007; De Montigny & Lacharité, 2005). It is a learning process from the perspectives of other individuals, in particular from the achievements of many other teachers. Among other teachers these achievement stories create optimistic thinking and inspire them into doing something new and innovative. Efficacious teachers' actions have a major impact on other teachers, thereby increasing productivity.

Vicarious experiences are those where a teacher witnesses someone fruitfully execution of the teaching assignment; some of these skills have the biggest effect on efficacy because the teacher equally respects the person execution the assignment and feels that they enjoy comparable features to that person. It also refers to witnessing the strengths as well as shortcomings of other individuals that is models close to one's own. That is where this learning medium is sometimes called role-modelling (Bandura, 1977). Observing others teach, whether it's from a student's point of view or from pictures depicted in the media, gives opinions about the essence of the role of teaching and its meaning. Pictures that were created throughout teacher training, from professional literature, and from other places contribute information. Through

these and other perceptions of vicariousness one starts to determine who can know and how much, who seems to be accountable, and whether teachers can really make a change (McBer, 2000).

Effective teacher models are the basis for determining that the instruction role is adaptable, besides that there are sufficient situational as well as individual assets. Seeing others teach skilfully then expertly-specifically by perceiving esteemed as well as trustworthy models-may influence the personal teaching skills of the observer (Ornstein & Lasley, 2000). Comparisons with other individuals can push observers, especially beginning teachers, to conclude that under different situations they too have the capacity to be excellent instructors (Bandura, 1997; Schunk, 1987 cited in Khan, 2011). Similarly, witnessing the shortcomings of other teachers through good effort undermines confidence in efficacy by contributing to the assumption that the work is uncontrollable, unless the observer feels that he or she is more skilled than the model.

Efficacy that is obtained by observation is achieved vicariously. Observing another person perform a task effectively will affect personal expectations about the potential to do the same. This source of evidence on efficacy is less accurate than mastery experiences, but is more efficient when the spectator can identify with the model, when the modelled behaviour has clear results, and when good outcome is shown by a number of models (Bandura, 1977, 1986, 1997 as cited in Eells, 2011). A student may become persuaded of the capacity for achievement after watching other individuals effectively perform activities in similar situations. Students watch their classmates to figure out what tasks to try. Teachers learn how problems are

treated by their peers and are encouraged to do the same. Vicarious experience allows individuals to say, "I can do that as well".

According to Tschannen-Moran *et al.* (1998) teacher applicants continue to develop mastery and interpret physiological signs within the preserving experience when witnessing professionals in action. Such observations offer vicarious experience in order to identify an individual with the role of the teacher, picturing life as an educator. It is significant for candidates to start seeing themselves as successful teachers in order to develop teacher efficacy before authentic mastery experiences are available. Seeing others excel will develop beliefs of efficacy, which will then affect a candidate's ability to pursue and thus acquire mastery experiences and decrease anxiety levels. Furthermore, Tschannen-Moran *et al.* (1998) advocated that vicarious experience makes a candidate consider a teaching job, but does not affect the self-perceptions of teaching competency as much.

The third source of efficacy is verbal persuasion. Through another person's voiced constructive response on results, the sense of efficacy of individuals improves and they become more eager to make an attempt to complete the mission Bandura (1997, 1995). Verbal persuasion is measured by requiring students disclose whether constructive feedback has been provided from others, including their classmates, close relative or instructors (Usher & Pajares, 2009). Verbal persuasion requires suggestions, motivation and self-education, and even though verbal persuasion is a successful technique to foster efficacy, including vicarious experience that is not as per effective as performance achievements (Bandura, 1977). Verbal persuasion may occur as a result of a superior or a colleague's condemnation or motivation. In casual

environments, it could also occur as a result of group conversations. The influence of persuasion is clearly connected to the integrity of the persuader, irrespective of the environment (Bandura, 1997). The effect of social persuasion on efficacy can have a substantial influence on teachers, specifically for teachers that are new to the profession (Goddard *et al.*, 2004). To convey aspirations and to explain progress in meeting defined goals, teachers use social interaction.

Verbal persuasion helps the requisite trust to develop. Sustaining a sense of efficacy is simpler if important individuals are sharing confidence in one's ability, enhancing self-change practices and promoting improved attempts to achieve. If trustworthy individuals are in students' lives that is their teachers frequently allocate assignments on which students struggle, so verbal memos are less convincing and it's challenging for students on think they will excel. Efficacy of teachers by verbal persuasion can therefore be strengthened by making appreciative and supportive statements to enhance the teachers' morale level. If social elements of the community support them, their behaviour regarding teachers' efficacy could be realised as a significant improvement (Bandura, 1997; Siegle & McCoach, 2007; De Montigny & Lacharité, 2005).

Verbal persuasions attempt to encourage people who were not aware of their ability to have adequate expertise to be effective in a specific challenge (Bandura, 1986, 1997, as quoted in Rashidi & Moghadam, 2014). In fact, when individuals are convinced, they can achieve a specific mission, they are extra willing to accomplish the task and "assemble better commitment" (Bandura, 1994, p. 3). Verbal persuasion can be universal or particular; it may offer insight on the essence of the teaching instruction, provide motivation and techniques to address social challenges, as well as provide detailed response on the success of

a teacher. Workshops on the course work and career development provide teachers with knowledge on teaching activities. Such experiences can include techniques and approaches that could add to the skills arsenal of a teacher. But once they are effectively used to improve student learning, this fresh expertise might not have an effect on personal-insights of teaching competency. While a "pep chat" might indeed be restricted in improving individual teaching skills, for example encouragement can overcome irregular drawbacks that otherwise might inculcate personality-doubt and disrupt determination (Schunk, 1989 cited in Khan, 2011).

When a trustworthy and reliable source provides motivation by showing confidence in the ability of a learner to excel, it is possible to improve efficacy. Verbal persuasion alone creates poor perceptions of efficacy that can be easily disconfirmed, but can foster greater commitment when used combined with corrective suggestions and other assistance to achieve success (Bandura, 1977, 1986, 1997 as cited in Eells, 2011). They also give pep talks to foster resilience and raise inspiration (Bandura, 1988 as cited in Eella, 2011) as others that carefully structure opportunities for a leaner to both be successful and watch others becoming successful. Particular accomplishment input from colleagues, other teachers, even students, can be a powerful basis of knowledge regarding how the abilities then methods of a teacher fulfil the criteria of a specific teaching assignment. Relevant performance response offers collective contrast evidence, which is whether the instructional performance as well as results in a related teaching condition are satisfactory, inferior or superior to others when assessed.

It is important to complement observational learning with as many authentic experiences as necessary due to the vicarious nature of teacher training programs, while offering specific and supportive reviews on strengths and weaknesses. Much as a coach gives support and guidance to enhance athletic results, professionals, managers, and colleagues may provide insightful information on how the skills of a teacher meet contextual requirements (Tschannen-Moran *et al.,* 1998). Verbal persuasion is not as successful out of context because it can appear imagined or misleading, but when capable others speak frankly about the prospects for achievement of an individual, feedback may help to create the effectiveness required to try exceedingly difficult tasks. In schools, teacher efficacy may be improved by motivation, assistance, and input from supervisors, mentors, and colleagues, particularly when demanding circumstances challenge the beliefs of a teacher about personal capacity, or the criteria of a teaching role appear difficult to resolve (Tschannen-Moran *et al.*, 1998).

Finally, physiological and emotional states, including anxiety and stress, affect the appraisal of their abilities by the people (Bandura, 1997). Pressure may be described as "marks of low output susceptibility" (Bandura, 1995, p. 4). A positive response to carrying out a mission enables one to forecast achievement or disappointment (Usher & Pajares, 2009). The manner in which individuals perceive these physiological responses then manner conditions affects their efficacy. In academic environment, physiological conditions were used to determine the anxiety of the students (Usher & Pajares, 2009). The physiological and emotional excitement in a teaching situation an individual experiences contributes to the self-perception of teaching skills. Relaxation and

optimistic feelings are signs of personality-assurance and expectation of potential achievement (Bandura, 2006).

Arousal, including increased heart as well as breathing level, "excitements", amplified suddenness, or shaking hands, can be read either confidently as excitation or destructively as tension then nervousness, dependent on the situations, the background of the individual and the complete level of excitement (Bandura, 1997). Reasonable arousal levels can enhance efficiency through concentrating on the task with focus as well as energy. Great levels of enthusiasm can, however, impede operational as well as impede by creating the full usage of an individual's abilities then competences. They must be attended to if physiological states are to have an influence.

If the tasks itself needs the entire resources of an individual's attention, and emotional states that donate slightly to a sense of individual capability in teaching. If people think they might flop, they lift their stress level so high that they might really do what they thought would happen. People may read indicators like exhaustion, pains as well as discomforts as corporal ineffectiveness. Intensified beliefs in existence can able to handle then excel equate by increased individual results (Bandura, 1997; Siegle & McCoach, 2007). A source of information about perceived ability is the body itself. Physiological indications, such as fear, anger, and sorrow, make a contribution to the sense of personal competence of a person when faced with a task, as that person relies on bodily indications to warn them of vulnerability and anxiety. When they experience low arousal, people expect success, while high anxiety reduces trust in skills (Bandura, 1977, 1986, 1997).

The emotional or affective state of a person may impact their views of their personal competence or capability (Bandura, 1977). Goddard *et al.* (2004) indicated that organisations are often exposed to pressure just as individuals' perceptions of their own abilities are impacted by the affective state. They indicate that strong organisations are more resilient than poor organisations to stressors, because when exposed to external pressures, they are more able to sustain high levels of efficacy. In schools, since teachers not only form the organizational systems as individuals but also as a group, this means that efficacy may be affected by the affective state of the faculty. Goddard et al. (2004) have indicated that the body of studies relating to the affective condition of institutions is comparatively small, so when extending results to group interactions among individuals, researchers can be vigilant.

In circumstances that are initially viewed as uncomfortable or dangerous, another justification for gathering as many preservice experiences as possible is to get relaxed. The physiological reaction of an individual to experiences confirms their beliefs about abilities. Body information can be regarded positively or negatively, such as elevated heart rate, sweating hands, fatigue, shallow breathing, shaking, and a fluttering stomach, and this cognitive processing leads to the beliefs of a teacher about capacity and functioning. In front of a classroom full of fourth graders, some teachers feel relaxed, but ill at ease with adults. Similarly, the idea of being in charge of kindergarteners can frighten a high school teacher. Teachers who have never had experience in urban schools can assume that the teaching job is too difficult or intimidating, and so avoid it, just as leadership and supervision roles may be avoided by a teacher who hates confrontation.

Therapy clients may work through exposure therapy to resolve fear reactions, in which a client encounters a feared object in increasingly engaging ways, while creating efficacy in a healthy and calming atmosphere as anxiety is diminished or controlled (Bandura, 1977 as quoted in Eells, 2011). Similarly, by experiencing challenging situations, recording their levels of anxiety, and seeing how they can transcend their own emotional reactions and be productive, teachers learn to minimize or control their own physiological responses. When teacher applicants encounter difficult circumstances before they are actually accountable for teaching, they are able to reduce their anxiety reactions, encouraging them to take on more duties progressively.

Factors Influencing Mathematics Teachers' Efficacy

Efficacy of teachers is not determined by one factor only, but could be established from many diverse sources (Bandura, 1997). Influences of sources on efficacy may be external and may emerge from the environment of the teacher or interior, and may emerge from inside a teacher. A common discovery in the literature is that teachers working together and a positive atmosphere create efficacy of teachers (Fives, Hamman, & Olivarez, 2007; Knobloch, 2006; Moulding *et al.*, 2014; Tschannen-Moran & Hoy, 2002). Help rates earned during initial field experiences and teaching by students have a close relationship to teacher efficacy (Hoy & Spero, 2005). Teachers expressing perceptions of a positive community have overstated teacher efficacy rates according to the research (Knobloch, 2006). In the United States, Fives et al. (2007) examined 49 student teachers to regulate the teacher's efficacy and the relationships to exhaustion. They observed teacher efficacy to be the most influenced by their collaborating teacher's high supervision, specifically when

the collaborating teacher offered a chance to create efficacy initially in the teaching semester for students. Early on in the process, improved assistance and supervision from the teaching community helps student teachers to feel more effective in the last part of their student teaching process (Fives *et al.*, 2007). The incentives offered by the collaborating teacher in field experience prior to student teaching can also affect efficacy (Knobloch, 2001).

Moulding et al. (2014) point out that mentor help perceptions are what create efficacy during student teaching. Beginning teachers, such as student teachers, depend on -the perceived help they obtain as efficacy sources (Tschannen-Moran & Hoy, 2002). In the latter two studies the key word to remember is perception. Collaborating teachers are just a part of the supporting community which is mentioned to in the literature. Student accomplishment may also have an impact (Moulding *et al.*, 2014). Researchers found a linkage concerning the teachers' efficacy and the student achievements in a survey of 76 elementary education pre-service teachers; teachers at schools with high achievement of students had higher rates of efficacy (Moulding *et al.*, 2014). Additional reported factors of teacher efficacy are highly respected and supportive principals (Spector, 1990), resource availability, and parent engagement (Tschannen-Moran & Hoy, 2002).

In some research, the sense of efficacy leading through the student teacher experience has been identified as an affirmative indicator of student teacher efficacy throughout as well as at the close of student teaching (Fortman & Pontius, 2000; Nettle, 1998). For a group of student teachers at a small private college, statistically significant improvements in teacher efficacy have been identified, which suggests that efficacy before student teaching can assist as a

fair indicator of the efficacy of the teacher at the close of the semester of student teaching (Fortman & Pontius, 2000). Prior to efficacy student teaching can also forecast differences in teacher efficacy that arise after student teaching experience in the first few years of teaching (Nettle, 1998). Matching two teaching programs for agricultural students, Knobloch (2006) stated that student teachers who started with strong emotions of efficacy displayed zero shift in efficacy from the beginning to the end of their teaching experience.

Instead, efficacy was determined by personal and environmental factors at the end of their experience (Knobloch, 2006). A probable personal element identified in the literature is the willingness of a student teacher to teach (Knobloch & Whittington, 2003; Spector, 1990). If a student teacher is dedicated to a teaching career, at the beginning of their career they are expected to have more high feelings of teacher efficacy (Knobloch & Whittington, 2003), rather than being uncertain about their choice of career throughout their university experience. Spector's (1990) results support Knobloch and Whittington (2003) by advocating that teachers that were higher in efficacy showed greater dedication to teaching.

Mastery experiences are the most commonly documented in the literature among all recorded variables affecting student teacher efficacy; literature backed by Bandura's (1997) efficacy theory suggesting that mastery experiences create efficacy. Mastery teaching experiences can be the greatest influential impact on efficacy (Goddard, Hoy, & Hoy, 2004), specifically throughout the initial years of teaching and student teaching experience (Hoy & Spero, 2005). Genuine teaching practice (Aydin & Woolfolk Hoy, 2005) is a way of offering student teachers mastery experiences. Genuine teaching

experiences can contribute to the improvement of teaching skills and to an increase in awareness of the subject matter. Understanding of the subject matter is a significant factor for the efficacy of teachers (Wenner, 2001), so access to and familiarity with subject matter material may results in greater efficacy. Wenner (2001) suggests that teachers need to learn further information, skills and principles concerning the subject they are teaching. Developing instructional abilities and teaching skills emerges whenever teachers start practicing classroom instruction and remove possible stressors in the learning atmosphere that can results from ineffective teaching (Fives *et al.*, 2007). Authentic experiences are required to prevent inappropriate teaching (Aydin & Woolfolk Hoy, 2005). Increments in teaching skills and instructional skills arise when a teacher continues to handle challenges as well as take chances in instructional methods, leading to progress in efficacy (Rushton, 2000).

Wolf (2008) researched Ohio's agricultural education teachers in a scope of agricultural education. Results from this study indicate teachers who did not engage in FFA or high school agricultural education felt less successful in the FFA and SAE domains. These results agree with the notion that experience in a given domain can make a teacher in that domain more effective. In the context of Wolf (2008) research, previous experience in FFA and agricultural education should have rendered the teachers more effective in their programs or classroom implementation of FFA and SAE. Roberts et al. (2006) argue advanced degrees, as well as professional experiences might donate to the efficacy of agricultural teachers, encouraging the concept that experience building efficacy because advanced degrees and professional experience can provide a teacher with more knowledge to pull from the individual who has

none. Occupational experience is comparable to a career stage recommended by Tschannen-Moran & Hoy (2002) which creates a change in the efficacy of teachers. Their (2008) study of 255 in-service teachers from numerous grades identified experienced teachers to be more successful than inexperienced teachers, recognizing that experienced teachers show higher levels of teaching assets and administrative assistance. Tschannen-Moran and Hoy (2002) point out that more time has been provided to experienced teachers to improve classroom management skills and instructional techniques, assisting the notion that experience enhances efficacy.

In comparison, some studies have indicated that in some cases experience does not automatically construct efficacy (Jamil, Downer, & Pianata, 2012; Klassen & Chui, 2010). The Tschannen-Moran and Hoy (2001) The Teacher Sense of Efficacy Scale was used in a study of 509 pre-service teachers in a mixture of Bachelors as well as Masters teaching courses Jamil *et al.* (2012) measured the efficacy of the pre-service teachers throughout students teaching and in the last part of the training. The results indicate that mastery experience in the last part of the students teaching did not forecast teacher efficacy. Rather, physiological characteristics such as personality traits and values can serve as essential predictors of the efficacy of student teachers (Jamil *et al.*, 2012). The personality of an individual can influence how an occurrence is viewed as influencing a mastery experience or other efficacy (Matter, 2014). Other studies indicate that personality is not at all associated with teaching efficacy (Roberts *et al.*, 2007) indicating the specific context of the research should be considered when comparing personality to the efficacy of teacher.

Studying mechanisms of the environment that affect human improvement as well as education enables to discover whatever that facilitates human improvement. Ashton and Webb (1986) use the ecological structure of Bronfenbrenner (1976) as a context for examining the direct and indirect exogenous variables which impact the efficacy of teachers. This method aids in exploring prominent aspects of the sense of the teacher's efficacy. The ecological structure of Bronfenbrenner's educational climate is composed of: microsystem, mesosystem, exo-system, and macro system.

The microsystem reflects the direct influences of teachers, including the classroom, characteristics of students, characteristics of teachers, philosophy of teachers, concepts of tasks, size of classes and arrangement of activities. The second ecological framework is the mesosystem that involves size of school, demographic characteristics, school norms, collegial relationships, relationships between the principal and teachers, decision-making constructions, and relationships between household and schools. The third framework is the exo-system that refers to official and non-official social frameworks that may influence the immediate location of the teachers, such as the community's socio-economic status, the existence of the school circuit, the media, and the government and nationwide law-making activities. The fourth part is the macro system that involves learner concepts and educational role concepts (Ashton & Webb, 1986).

Professional learning and education also affect the sense of efficacy of the teachers. Tschannen-Moran and McMaster (2009) discovered the effects on teachers' efficacy of four specialised learning frameworks, and introduced recent instructional approaches. They developed the programme to provide the

sources of efficacy by Bandura. They observed entirely that the four program layouts donate to improving the efficacy of teachers, however the programs in question are not linked to the probability of teachers using the technique well learned. Furthermore, the model that requires a mastery of experience and continuation of training to use the latest technique has been identified to improve efficacy rates for teachers. Additionally, the mastery experience, as indicated by Bandura (1997), is an influential tool of efficacy and meaningfully rises the efficacy of teachers, with the help of training.

The influences of age, sex and experience were also identified as indicators of the teachers' level of efficacy. Research shows this efficacy rates differ between teachers according to their sex or gender. Female teachers show greater efficacy in teaching than male teachers (Riggs, 1991; Edwards, Green, & Lyons, 1996). Consequently, the efficacy level of teachers declined through experience, then pre-service teachers displayed the greatest teaching efficacy (Gibson & Dembo, 1958). Klassen and Chiu (2010) stated that creeds of efficacy among teachers decreased as their experiences improved.

Edwards, Green and Lyons (1996) analysed the association concerning the efficacy of teachers as well as expected multiple variables to forecast teacher efficacy. They observed that sex or gender affects the creeds of efficacy of teachers, as female teachers find their selves more effective than male teachers. The level of school even affects the efficacy of teachers; teachers in elementary school perform the highest while recording efficacy of teaching. Teachers in elementary school and nursery teachers informed greater efficacy rates matched to higher grade rates. In addition, the efficacy rates of the teachers differ within the same school. Younger student teachers have higher rates of efficacy within

elementary school than teachers of older students (Klassen & Chiu, 2010). Edwards, Green and Lyons (1996) recorded no substantial association between the level of education and the efficacy of teachers, but instead a somewhat negative association between the efficacy of teachers as well as the number of years of experience.

Walker and Slear (2011) conducted a study on about 366 teachers to determine the effects of key actions on the efficacy of teachers. They stated that only three principal traits were found to be substantially linked to the efficacy of teachers among the 11 characteristics identified in the literature. Modelling instructional standards and communications were identified to be confidently linked to the efficacy of teachers, whereas offering conditional incentives was linked negatively to the efficacy of teachers. Hoover-Dempsey, Bassler and Brissie (1987) indicate that relationships between parents and teachers affect the efficacy of teachers. They discovered the connection regarding the sense of teachers' efficacy and participation of parents. They discovered that the efficacy of teachers is significantly linked to the five parent participation requirements that are: participation in parent-teacher seminars, parents support, parents' education, parents' home teaching and parents volunteering.

Tschannen-Moran, Hoy and Hoy (1998) offered a detailed description of the teachers understanding of efficacy then its interventions. They survey information that studied the efficacy of teachers' principle from 1974 to 1997. In addition, they based their study on the theoretical foundations of Rotter's (1996) theory of social learning and Bandura's (1977) theory of social cognitive. Their job reflects the greatest significant study components in the teachers' sense of efficacy.

Measures of Mathematics Teachers' Efficacy

Generally, the efficacy of teachers has been difficult to describe, separate, and evaluate, and has been recognized as a context-specific framework (Henson, 2001; Raudenbush, Rowan, & Cheong, 1992 cited in Hoy, 2004; Wheatley, 2005). Specific studies from the literature indicate that a higher efficacy of the teacher is related with higher students accomplishment as well as enthusiasm, better engagement rates for teachers, a feeling of professional responsibility and dedication for teachers, a greater probability of introducing innovative ideas or instructional techniques and a greater abilities to cope with challenging students (Tschannen-Moran, Hoy, & Hoy, 1998; Tschannen-Moran & Hoy 2001; Hoy 2004). In contrast, low efficacy of teachers is associated with higher teacher stress levels (Tschannen-Moran, Hoy, & Hoy, 1998).

The efficacy of teachers is determined through grade level, student achievement rate, and degree of class planning, and differs among teachers and students (Raudenbush, Rowan & Cheong, 1992 cited in Hoy 2004). More research has indicated that the teachers' efficacy is affected through causes like availability of services, instructional procedures, school history, and teacher volume of work as well as school or grade level (Tschannen-Moran & Hoy, 2007).

Teachers who teach outside the sector were observed to have less efficacy than some of those teachers who taught within a subject area of which they were trained to teach (Ross *et al.* 1999). Most teacher efficacy studies have been quantitative, with an emphasis on identifying and assessing teacher efficacy characteristics across survey measures. There has also been a lot of

disagreement about the efficacy of teacher model validity (Guskey & Passaro 1994; Henson 2001).

Although some scholars focus their study on the principle of efficacy on the internal and external locus of control of Rotter's theory of social learning, others focus their studies on the definition of Bandura's efficacy established in his theory of social cognitive abilities (Tschannen-Moran, Hoy, & Hoy, 1998). Per se, researchers-built instruments which always represent one of these approaches. These approaches are: two-item rand questions, teacher locus of control, responsibility for student achievements, teacher efficacy scale, and teacher sense of efficacy scale. This research will explore further around teachers' efficacy in mathematics hence the adoption of the teacher sense of efficacy scale. Rand researchers created the two-item Rand Questions to explore multiple variables which contributes to improving the reading of elementary minority students. One of the factors examined was teachers' sense of efficacy and their connection to student achievements in reading tasks (Armor *et al.,* 1976). They tried to regulate to what degree teacher felt they have the expertise to affect the accomplishment of students.

Armor *et al.* (1976) created a Two-item Rand Questions for teachers to assess the skills of basic school teachers or the sense of efficacy of educating students that are minority. To use this device, the researchers found that the greater the teachers' sense of efficacy, the greater the student achievements in reading examinations (Armor *et al.,* 1976). The Rand investigators focused each of these questions on Rotter's internal and external locus of control. For each question tests a particular belief in efficacy. The first question was General Teaching Efficacy. In the other side, question two has been called the efficacy

of personal instruction. Concerns concerning the consistency of the two things prompted investigators to make further accurate, lengthier, and detailed teacher efficacy test (Tschannen-Moran & Hoy, 2001).

The Teacher Locus of Control (TLC) was established by Rose and Medway (1981) focusing on Rotter's internal and external locus of control. The TLC was created to assess the beliefs of elementary teachers about classroom regulations (Rose & Medway, 1981). TLC is a 28-item instrument which tests the attribution beliefs of teachers regarding student achievements, whether successes or failures (Tschannen-Moran, Hoy, & Hoy, 1998). 14 items identify circumstances of successes and 14 items detail circumstances of failures.

The reactions of the teachers to each case are either to assign the success of their students to themselves (internal) or to their students (external). The methods for teachers to explain the failure of students are to hold themselves accountable (internal) or to accuse students (external) (Rose & Medway, 1881; Tschannen-Moran, Hoy, & Hoy, 1998). Using TLC, Rose and Medway (1881) identified an essential relationship between teacher locus of control and student achievements. They considered the TLC scale to be a greater measure of teacher behaviours than Rotter's IE scale when checking the validity of the TLC. They indicated that the TLC scale is a reliable indicator for assessing teachers' beliefs in classroom control.

The Responsibility of Student Achievements (RSA). This efficacy instrument was pioneered by Gusky (1981) is Responsibility of Student Achievements (RSA), concentrated on the Rotter's internal and external locus of control. RSA was designed to determine teachers' beliefs regarding their attributions to student successes or failures. The RSA is a 30-item scale that has

allowed teachers to divide 100 percentage points between two choices. One choice states that the given circumstance is attributed to teachers, whether successes or failures, whilst the other alternative mentions that the given circumstance is not linked to teachers, but rather triggered by external causes. Other researchers did not utilize and test RSA (Tschannen-Moran & Hoy, 2001).

The Teacher Efficacy Scale (TES). Gibson and Dembo (1984) have sought to examine the teacher's sense of efficacy. The Teacher Efficacy Scale (TES) was finalized by 208 primary teachers, comprising of 30 elements on a 6-point Likert scale. A sample question for this measure is: "If a student attains higher than they normally do, it is usually because I have discovered new ways to teach the subject" (Gibson & Dembo, 1984, p.581). Teachers were requested to pick for each object from a number of one, which implied a strong difference, to six which implied a strong consensus. Factor analysis was used and the outcome was two variables. The first factor illustrates the teachers' sense of personal efficacy in teaching, while the second factor illustrates teachers' sense of efficacy in teaching. Then, in conjunction with two other steps, more checks were used for convergent and discriminant validity. Results demonstrate "validation evidence for using the Teacher Efficacy Scale to assess the teacher effectiveness model" (Gibson & Dembo, 1984, p. 576). In fact, Gibson and Dembo (1984) advocated the interaction in the classroom between the performance of teachers and their behaviour.

Multiple research has been carried out to determine this instrument's validity. Some represent previous work in disclosing a third dimension of teacher efficacy (Soodak & Podell, 1996). Some argue that the Teacher Efficacy

Scale is not an appropriate tool for measuring teachers' sense of efficacy (Brouwers & Tomic, 2003; Denzine, Cooney, & McKenzie, 2005; Hoy & Spero, 2005).

Teacher Sense of Efficacy Scale (TSES) Tschannen-Moran and Hoy attempted in 2001 to build a more dependent and effective mechanism that measures teacher efficacy. This mechanism was built to address inappropriate ideas about constructing teachers' sense of efficacy (Bong, Chong, Georgiou, Huan, Klassen, Usher, & Wong, 2009). The Teacher Sense of Efficacy Scale (TSES) was the name of this instrument. Furthermore, this instrument was built to measure three dimensions of teachers' sense of efficacy. Teacher efficacy for student engagements is the first factor. This first factor measures the beliefs of teachers concerning their abilities for student motivation. Teacher efficacy for instructional strategies is the second factor that measures TSES. The second factor measures teachers' beliefs regarding their abilities to use diverse teaching or instructional methods in their teaching activities. The efficacy of teachers for classroom managements is the third factor that TSES measures. This third factor measures the beliefs of teachers concerning their confidence in controlling or managing their classrooms.

The Teacher Sense of Efficacy Scale (TSES) comprises 24 items on a nine-point Likert scale in which one screens (nothing), three screens (very little), five screens (some degree), seven screens (quite) as nine screens (a great deal). The questions that arise from this assessment are: "How much can you do to help the most difficult students?"; "How many different appraisal methods can you use?" as well as "How well can you handle your students' tough questions?" Tschannen-Moran and Hoy (2001) evaluated and improved the

instrument in three trials. They considered: the nature of the component, the consistency, the accuracy of the test and the effective use of the scale teachers who are pre-service and in-service. Both Tschannen-Moran and Hoy (2001) minimized the items from 25 to 18 items in the first and second research. A factor analysis generated three variables; these variables were classified as follows: efficacy for student engagements, efficacy for instructional strategies, as well as efficacy for classroom managements. Those three dimensions are the criteria for productive teachers. They concluded, after evaluating the validity of the TSES, that the 12-item scale or the 24-item scale are valid scales that cover many and diverse facets of instructional activities. Furthermore, according to Tschannen-Moran and Hoy (2001), this scale will accurately measure teachers' sense of efficacy for both in-service and pre-service teachers, in any process. Lastly, they note that further research is necessary on the TSES scale.

There were initiatives to check the validity of the TSES in various environments. Fives and Buehl delivered the long and short version of TSES for in-service and pre-service teachers in 2010, in order to test the instrument's factor structure. After systematically evaluating teacher responses, they established that TSES is an appropriate indicator of teacher efficacy. (Fives & Buehl, 2010). Another attempt to test the TSES was made by Klassen, Bong, Usher, Chong, Huan, Wong and Georgiou (2009). In five nations, TSES was tested in Canada, Cyprus, Korea, Singapore and the United States of America (USA). They observed that when they check the instrument's cross-national validity the TSES has a good internal consistency. In other words, their findings indicated that the TSES is relevant not only for assessing teachers' sense of efficacy in the United States, but also in Canada, Cyprus, Korea, and Singapore.

Their results were reliable with Tschannen-Moran and Hoy (2001) on the three dimensions of the teachers' sense of efficacy: student engagements, instructional strategies, and classroom managements (Klassen, Bong, Usher, Chong, Huan, Wong, & Georgiou, 2009)

Charalambous, Philippou and Kyriakides (2008) observed that TSES is a reliable method that tests the teacher's sense of efficacy in mathematics and their overall sense of efficacy. They found that pre-service teachers were able to discriminate between instructional and classroom skills when they stated their beliefs in the efficacy of mathematics, contrary to other work (Tschannen-Moran, 2011). They also established that pre-service mathematics teachers' efficacy beliefs are accessible for improvement. The alternative results that coincide with Bandura (1997) is that the experience has significant effects on teaching mathematics in establishing sources of efficacy. Lastly, the results showed that mentors by teaching and providing insight either orally or latently affect pre-service teachers.

As mentioned above, multiple instruments exist in the literature, all directed at measuring teachers' sense of efficacy. Such measures of efficacy scale of teachers however include tests to assess validity (Denzine, Cooney, & McKenzie, 2005). Many scholars have investigated the validity of some of the instruments mentioned above. In short, the problem is related not only to the way in which result was considered, but also to how the data was viewed by researchers. Furthermore, as Tschannen-Moran and Hoy (2001) described it, the Teacher Sense of Efficacy Scale (TSES) showed positive outcomes. The TSES scale also includes numerous facets of the instructional activities. After multiple tests of the instrument by Tschannen-Moran and Hoy (2001), it generated three

factors: efficacy for student engagements, efficacy for instructional strategies, and efficacy for the classroom managements. These three variables reflect the dimensions as well as criteria for efficient teachers, according to Tschannen-Moran (2001). The Tschannen-Moran and Hoy (2001) Teacher Sense of Efficacy Scale was used to assess the level of teacher efficacy based on a review of the literature on evaluating teacher efficacy.

The Three Factors of the TSES

This section discusses literature on the three dimensions calculated by the TSES. These three subscales are: teacher efficacy for student engagements, teacher efficacy for instructional strategies, and teacher efficacy for classroom managements. For each of these dimensions, the TSES questions evaluating each factor were posed and a summary of the literature with respect to each element.

Teacher Efficacy for Student Engagement

The expectations of teachers that can inspire their students can be one of the key ways through which they affect the academic and cognitive growth of the students (Bandura, 1997). Ashton was the first to establish teachers' sense of efficacy as an unconscious personal philosophy of student motivation (1983), but this conceptualisation of TSE is a universal conviction about the locus of control in place of a task-specific perception of efficacy to inspire and involve students. Teacher motivational efficacy is usually conceptualized and assessed as inspiring individual students to enjoy learning or to feel that they can do fine in a specific class (e.g., Skaalvik & Skaalvik, 2007; Tschannen-Moran & Hoy, 2001).

The TSES development was the researchers' first effort to grasp student motivation and engagement concepts. Items for this subscale and others were established by conversations between researchers and teachers on essential teachers' tasks. Bandura's unpublished efficacy scale for teachers (n.d.) has established a basis for further creation of the products. No particular theoretical structure has been used regarding student motivation or engagement. The created elements included general approaches such as inspiring students to do better, promoting innovation, and motivating students to think creatively.

Blazevski (2006) was the first to build on current student motivation theories to build a measure for student motivation to teacher efficacy. Blazevski (2006) argued that some TSES subscale elements for student motivation are not in general unique to student motivation (e.g., promoting innovation, reaching through to challenging students). After studying previously existing instruments such as Teacher Sense of Efficacy Scale (TSES) and Science Teaching Efficacy Beliefs Instrument (STEBI).

In comparison, Bandura's unpublished and un-validated Teacher Sense of Efficacy Scale (TSES) (Tschannen-Moran & Hoy, 2001) was used as a framework for the creation of items. The TSES was established in collaboration with present and former teachers and scholars who generated items that "reflect essential tasks or teaching components". Analysis of the items on the subscale of instructional techniques reveals that this scale measures the efficacy of teachers in preparing for teaching and working with students in and out of the classroom, assumed to reflect pre-active and collaborative teaching components (Jackson, 1990). The bulk of duties are those that can be completed in classroom (interactive) or in classroom preparation (pre-active).

Particularly, TSES items measure the perceived ability of teachers to respond to challenging student questions, establish acceptable obstacles for competent students, gauge student understanding, use a range of assessment techniques and create good student questions. This activity should be pre-active or interactive so, for instance, when the teacher plans lessons, generating questions or modifying lessons can be performed at the moment where the need arises or before class. As teacher training systems tend to focus on pre-active elements of teaching (Grossman, Hammerness, & McDonald, 2009), there is less time constraint and cognitive requirement for teachers as they prepare for teaching relative to teaching engagement, if they consider only the pre-active side of assignments, teachers may feel more successful.

The Science Teaching Efficacy Beliefs Instrument (STEBI; Enochs & Riggs, 1990) strongly tests the efficacy of teachers for teaching, and it is intended to be content-specific, as the name suggests. However, A few instructional exercises of this scale can be found unique to the expertise and activities of the domain. For instance, a variety of things from the STEBI's individual teaching efficacy subscale require teachers to rate their over-all confidence that they can effectively teach science. Other items are more unique, but are tasks that teachers will need to do in any subject, such as answering science questions from students or accepting student questions. For activities specific to teaching science, only two items inquire about efficacy: tracking science experiments and demonstrating to students why science experiments operate. In addition, while the STEBI is not given a specific theoretical context, it is obvious that few items represent a constructivist or inquiry-based view of science teaching. Such critical elements of inquiry-based teaching, such as

promoting the ability of students to establish scientific explanations, are not assessed by the STEBI. As a separate construct, teacher efficacy for inquiry-based teaching has been explored in support of this interpretation of the STEBI (Cripe, 2009; Nie, Tan, Liau, Lau, & Chua, 2013).

This made Blazevski (2006) to establish a 6-piece scale explicitly intended to promote student engagement in mathematics (example, get students enthusiastic about mathematics, get through to unenthusiastic students). Using this measure, the efficacy of basic school teachers in terms of student engagement was linked indirectly to student achievement in mathematics. It was also an important indicator of variation in student efficacy for mathematics and interest in mathematics among students. Furthermore, years of experience for student engagement has been a strong negative indicator of TSE (Blazevski, 2006). The 6-piece scale was established mainly to promote student engagement and their interest in mathematics which was why it was the best among the other instruments. This measure was not published, and was thus not included in further research.

Taking advantage of the TSES, Hardré and Sullivan (2008, 2009) also constructed the Motivating Strategies Questionnaire (MSQ) which consisted of two subscales: efficacy to diagnose motivating needs and efficacy to respond adequately to this need. Diagnostic needs efficacy has appeared as a key contributor to most teachers' approaches applied to inspire students, such as offering emotional encouragement, striving for significance and interest, linking content to ambitions and future objectives, and understanding peer pressure. Follow-up research revealed that teachers lacked information of how to inspire students, but they were more comfortable in diagnosing motivational problems

rather than addressing them. Duffin (2010) observed that pre-service teachers had a great deal of declarative knowledge on how to empower students, but continued to focus on task-extrinsic benefits. Intrinsic motivation can be compromised by overreliance on task-extrinsic benefits (Lepper, Corpus, & Iyengar, 2005; Ryan & Deci, 2000), indicating that teachers can lack knowledge about how to empower students efficiently. Decreases in TSE to inspire students as teachers acquire expertise (Blazevski, 2006) may be linked to the awareness by teachers from practice missing this information. In brief, most current TSE motivation and engagement interventions for students are contextualized versions of the TSES. TSES items do not explicitly refer to dealing with students with motivational issues (for example, "challenging students"), although items from the lengthy edition of the scale do contain things more applicable to teaching (for example, promoting innovation as well as logical thinking).

As compared to the classroom efficacy environment, things usually question students about obtaining a desirable action or mind-set (for instance, encouraging a student, enabling them believe, etc.) rather than use concrete techniques that may contribute to accomplishment in influencing and encouraging students (for example, making content meaningful to the lives of students, building positive relationships with the students). Therefore, teachers can use proof of student achievement more often to evaluate their efficacy according to how things are expressed.

Numerous researches have studied the relationship involving teachers and engagement with the students. While analysing the literature on student engagements in the classroom, the behaviours of teachers in the classroom as

well as their values are several factors that affect student engagements (Skinner & Belmont, 1993). Wiseman (2012) reviewed the expectations of teachers regarding what encourages the views of students according to their own encouragement. He discovered that the attributions of teachers and the students are different. Students attribute their encouragement either to their own encouragement or their desired goals, while teachers relate the encouragement of students to their own characteristics.

Students that score better on standardized tests participate in the classroom (Skinner, Wellborn & Connell, 1990, as quoted in Skinner & Belmont, 1993). In a research examining the association concerning the behaviour of teachers and student engagements, it was discovered that the behaviour of teachers in the classroom influences the engagements of the students (Skinner & Belmont, 1993). Uden, Ritzen and Pieters (2013) explored the teacher efficacy and apparent engagements with the students. They discovered teachers with high efficacy ranked as higher on affecting student engagement.

The Teacher Efficacy for Instructional Strategies

Teachers' attitudes to teaching are affected by their sense of effectiveness (Tschannen-Moran, Hoy & Hoy, 1998). Bandura (1997) emphasised the part that human values play in the actions of individuals. Nevertheless, the efficacy of teachers is believed to affect the teaching activities of teachers in the classroom (Capara, Barbaranelli, Steca, & Malone, 2006).

Teacher efficacy questions for instructional strategies analyse many facets of teaching techniques, such as student evaluation, question forming, clarification of complex topics, and even lesson preparation. Many researches

have analysed classroom instruction; nevertheless, few studies have related the sense of efficacy of teachers to their teaching. Holzberger, Philipp and Kunter (2013) examined the part of the teacher's efficacy in their eminence of instruction. In this research teachers not merely graded their own performance, but students also graded the eminence of instruction of their teachers. The study, after evaluating the results, established a strong positive association between the efficacy of teachers and their quality of instruction. This is, the more effective the teachers are, the greater the perception of students of the instructional quality.

A research by Wertheim and Leyser (2002) examined the efficacy beliefs of pre-service teachers as well as their selection of instructional techniques. 191 Israeli pre-service teachers finished a Hebrew edition of the Gibson and Dembo (1984) Teacher Efficacy Scale, the Scale of Instructional Strategies, to determine their experience in using different teaching strategies in a comprehensive class. They found that there was a slight but substantial positive association between the efficacy of pre-service teachers' personal teaching and their ability to use any of the instructional techniques in the classroom, such as personalized distinguished teaching, teaching evaluation, behaviour control, and interaction. (with parents, school staff, principal, and students). Researchers observed, nevertheless, no substantial association between the pre-service teaching efficacy and teachers' ability to use distinguished instructional strategies. They reached the conclusion: "This finding indicated that the extent to which a student teacher assumes that teachers, given unfavourable external influences, would promote student

academic performance was not linked to their selections of instructional methods or insights of their efficacy" (p.57).

Precisely, TSES elements evaluate the expected abilities of teachers to respond to challenging student questions, create effective tasks for competent students, measure understanding of students, use a range of appraisal methods, and formulate successful student questions. These activities should be pre-active or collaborative, since, for instance, as the need occurs or before class when the teacher plans classes, it can be used to formulate questions or to change classes. As per teacher training plans tend to concentrate on proactive teaching components (Grossman, Hammerness, & McDonald, 2009), and teachers face less time pressure and cognitive stress as they prepare for instruction relative to teaching, teachers may experience more effectiveness if they only consider the proactive side of the activities. Whether teachers find all components for both assignments or what other considerations may affect their understanding of TSES items is unknown.

Furthermore, elements from the TSES may not make clear reference to the control of curriculum demands, considered a part of efficient classroom teaching (Newmann, 1996). As suggested by Cohen, Raudenbush and Ball (2003), teaching is relational, described as "what teachers perform, speak, and think in time with learners regarding content, particularly organizations and other settings" (2003, p. 124).

The Teacher Efficacy for Classroom Management

It is necessary for the teachers to be able to manage destructive behaviour in the classroom. Unavailability of this skill will result in lost teaching time and will lead to tension and exhaustion for teachers (Brouwers & Tomic, 1999).

Doyle (1986) argued that classroom management is an essential instruction activity (as cited in Woolfolk, Rosoff, & Hoy, 1990). Efficacy for classroom management is described as "teachers' beliefs in their ability to coordinate as well as implement the courses of action necessary to maintain the classroom discipline" (Brouwers & Tomic, 2000, p.242). Bandura (1997) argued that beliefs of efficacy have an influence on the actions of individuals towards successes or failures. Based on the theory of Bandura, Dicke, Kunter, Leutner, Marsh, Parker and Schmeck, (2014) concluded that teachers' beliefs of efficacy impact not just the actions of teachers in the schools, but also the efficacy beliefs of teachers affect the teachers' classroom management performance.

Dibapile (2012) examined research on the efficacy of teaching and the management of classrooms. Dibapile (2012) generally argued that classroom management isn't a simple job. Effective teachers can successfully control the classroom and create coordinated classes that have a beneficial influence on student learning and behaviours. Teachers with higher levels of efficacy can handle dispute with their students and are more willing to employ various types of management in their classes (Morris-Rothschild & Brassard, 2006).

Student Achievement

Teachers are still looking for means as to how to improve the achievements of student. Some of the approach is to develop the capabilities of those who teach the students directly. The connection that exist between the teachers and the students comprises several nuances and interactions. Teachers must be capable of meeting their students' diverse requests. Research has discovered that the expectations of teachers about their students' can meaningfully influence their academic accomplishments (Cowell, 2005; Rubie-

Davies, Hattie, & Hamilton, 2006; Montalvo, Mansfield, & Miller, 2007). Awan, Noureen and Naz (2011) identified academic achievement as the exam points, teachers provided grades and percentages as to what students earned in an academic subject. Achufusi (2018) referred to it as a degree of achievement as demonstrated by marks earned from standardized assessments or grades provided by a teacher.

Leschly (2003) indicated student achievement to be an educational result primarily assessed by standardized tests. Although each state defines the steps used to accomplish student achievement, the United States, as a whole, lacks uniformity and consistency (Grissmer, Flanagan, Kawata, & Williamson, 2000). This incongruence causes nation-wide difficulties in exploring and contrasting student achievement and successful strategies. Results of the study, nevertheless, indicate that teachers will maximize student achievement by perseverance (Ross & Bruce, 2007), handling their classroom efficiently (Woolfolk, Rosoff, & Hoy, 1990), pay particular attention to students at risk (Ashton, et. al, 1983; Ross & Bruce, 2007), seeking for fresh concepts that are challenging (Ross, 1998), and maximize student efficacy (Ross, 1998) (Ashton *et al*., 1983). Strong, Silver, and Perini (2001) argued that as a way to improve student achievement, teachers should integrate rigor, thinking, diversity, and credibility in the classroom.

Darling- Hammond (2000) argued that the best predictor of student achievement is teacher education and qualification. Although several ideas, methods, and initiatives are proposed by researchers, their investigations have found unsatisfying findings. However, teacher efficacy constantly tends to have a positive association with the achievement of students. This strong association

is indicated by results from multiple studies (Anderson, Greene, & Loewen, 1998; Ross, 1992; 1992 at Watson). For instance, Ross (1992) observed student achievement to improve because, relative to other classrooms and teachers, the classroom teacher retained higher efficacy. It is concluded that as teachers improve their beliefs of efficacy, student achievement will increase. The secret to increasing student achievement, then, is to use an intervention that can strengthen the beliefs of teacher efficacy.

Hootstein (1998) established the RISE model which describes the need to provide important information in innovative ways as well as emphasizing the significance of building students as key players in learning on their own. This stresses on the constructivist perspective that students ought to be vigorous partakers in the process of learning and that teachers are motivating students to make an important contribution to the instructional or teaching process. This model can be used to inspire students to improve the achievement of students. The model was presented in Table 2.

Table 2: The Rise Model

The Rise Model Components	Definitions	Major Teacher Questions
Relevance	Meeting students' personal needs; strengthening the value of learning	How is instruction valuable?
Interest	Catching and preserving the attention of students	How is instruction stimulating?
Satisfaction	Giving reinforcements for students successes	How can I enable students to feel great about their achievements?
Expectations	Helping students believe that they will succeed	How can I help students expect success?

Source: Hootstein (1998)

Teacher preparation and lucidity in the classroom are also essential to student achievement (Rodger, Murray, & Cummings, 2007). The students are mostly probable to be successful if teachers go to the classroom more equipped and not just having pedagogical expertise, but also with the ability to teach and meet the needs of various classroom capabilities.

Jamali, Noroozi and Tahmasobi (2012) advocated that academic efficacy to the understanding by students of their ability to do their class work. Academic efficacy states that convictions of individuals that they can perform effectively at defined rates, despite academic tasks. This belief is related to self-concept, a universal self-descriptive belief that integrates numerous aspects of self-knowledge and self-evaluative feelings. On the other hand, motivation is also an intrinsic urge which guides the action of a student towards achieving a goal. This affects the way and why people learn and their academic achievement. Efficacy is found as a primary ingredient in motivation in perceiving the relationship between efficacy and motivation (Bandura 2006).

Empirical Review

This part of the chapter worked on review of related literature in the area of teacher efficacy and student achievement.

Teacher efficacy and Student Achievement

Teacher efficacy is part of the causes which has been studied in order to understand whether or not it has effects on student achievements. The Rand Corporation was the first to investigate into this relationship, they had two different studies, and these two studies established that there was a positive relationship concerning the efficacy of teachers and student achievements (Armor, et al., 1976; Bass, Berman, Pauly, & Zellman, 1977). The findings gave

way for more study into these relationships, and Ashton and Webb (1986) advocated that the correlation between the efficacy of teachers and the student achievements was positive. They also advocated for teachers with a higher level of efficacy to have a classroom environment that were warm and also reinforced the desires of students.

So many researchers indicate that the productivity of teachers has a major positive correlation to student achievement (Ashton, Webb, & Doda, 1983; Berman, McLaughlin, Bass, Pauly, & Zellman, 1977). Ashton (1985) established that teacher efficacy as "the beliefs of teachers about their capacity to have a positive influence on student performance" (p. 142). Bandura (1997) indicates that these values influence the feelings, attitudes, actions, degree of anger resistance, and exertion of teachers while performing in the classroom. Teachers are less likely to feel intense feelings by attributing their shortcomings to external causes, thereby responding in more supportive ways thus displaying high efficacy levels (Bandura, 1977).

Conversely, teachers, depending on their assumed sense in classroom conditions, have the ability to assess personal attributes as flawed. When this happens, strong feelings such as fear, depression, and tension could be existing, contributing to disparaging attitudes and poor efficacy. Teachers frequently rate themselves as a whole, in addition to measuring their efficacy, and generate unjustified difficulties for themselves and others (Ellis, 2005). While many teachers feel these unhelpful feelings, school systems have made no attempt to offer mental health assistance to teachers as a means to promote their sense of efficacy. A teacher's mental health intervention will include a humanistic dimension often lacking in existing efforts to improve beliefs of efficacy. The

efficacy of teachers seems to have the potential to have a substantial impact on student performance, but methods for establishing and sustaining these beliefs have been widely overlooked.

In a Canadian study by Ross (1992) sampled teachers that were from rural Ontario, this was steered to comprehend the relationship that occurred between the tutoring of teachers and the achievement of students. Although, the research could not completely approve that tutoring strongly in greater performance, a link was found between classrooms with greater teacher sense of efficacy and higher achievements of students. Cantrell, Almasi, Carter and Rintamaa (2013) advocated that the efficacy of teachers was established that it had a greater effect on student achievements than that of initiatives for example reading intervention strategies. Though there were few participants in the above research, it found that students that have high efficacy teachers reached a higher degree than students with low efficacy teachers, irrespective of the degree at which the intervention program was implemented.

Several studies have explored the effects of efficacy of the teacher on student achievement and success in school (Muijs & Rejnolds, 2001; Tournaki & Podell, 2005). In several ways, teacher efficacy will influence student achievement: Teachers with a higher degree of efficacy remain more probable than teachers with a lower degree of efficacy to introduce educational strategies in the classroom, use instructional management techniques and effective training methods, and promote student flexibility, then take responsibilities for students that have special needs (Allinder, 19994), handle instructional issues (Chacon, 2005).

Ross (1992) argued that the association between student performances, teacher efficacy or engagement with designated coaches in 36 schools, using a study of 18 grade seven and eight history teachers. The research findings revealed that the performance of students was higher in the classrooms of teachers who had more interaction with their mentors, as well as in teachers' classrooms with better assurance in the quality of education.

Furthermore, Tournaki and Podell (2005) collected information from 384 teachers in general education to investigate how the relationship concerning the attributes in students and teachers influences the expectations of social and academic achievement of the pupils. The participants replied to one of the 32 potential case studies representing a student in which they experimentally controlled, sex, reading ability, social activity, and attentiveness, and to a teacher efficacy scale of 16 items. Their results suggested that teachers with higher efficacy made fewer pessimistic projections for students, and tended to alter their projections as characteristics of students adjusted, whereas teachers with low efficacy appeared to pay attention to a particular trait while making their projections. Likewise, almost all the teachers reacted equally to students who displayed a mixture of assertive and unobservant conducts, that is, if students were polite, they endured absentmindedness more than if they were defensive. Additionally, for students reading at the grade level, although they were violent, both teachers found higher academic achievement than for students who read below grade level even when they were amiable.

In a research carried out by Martin (2006) using the Scale of Student Movement and Enjoyment consisting of 40 items, 1,019 teachers were analysed to determine their understanding of the motivation and engagements of their

students and the amusement of their teaching and their trust in it. Learned that "the happiness and sureness of teachers is highly associated with the existence of functional aspects in the academic lives of their students" (p. 83). The exam was also distributed to students, addressing 10 inspiring aspects. Teachers at primary school recorded greater student encouragement than teachers at senior high school. The research did not compare the responses of the teachers with the responses of their own students to determine the legitimacy of the scores of students and teachers respectively.

Different research by Machado, Stern and Ray (2009) illustrated the need for professional teachers, a supportive school and classroom environment and inclusive leadership in rural Oklahoma to ensure the success of poverty-stricken learners. The research sought to evaluate the association between the achievement of students and teacher behaviours in elementary schools with high deprivation. Although poverty is recognized as a very powerful construct, a consistent relationship has been developed between a productive school environment and higher academic achievements for primary education students. Those features are important if academic achievement is the primary objective for students. The best teachers are certainly wanted by students that they live in high poverty and also in need of education to excel in life. Successful teachers are more dedicated to the work and develop the optimum learning opportunities for the performance of the students (Ware & Kitsantas, 2007; Tucker *et al.*, 2005).

Cowell (2005) examined how the efficacy of teachers and pre-service experience school teachers influenced the academic performance of students in urban early childhood settings. In New York City, a study was conducted of 66

pre-school teachers with teaching experience of 0-5 years. The metric was Teacher Efficacy Scale (TES), a scale of 16 elements with a co-efficient of reliability of .79. In phonemic comprehension, Cowell established a substantial relationship but there was no substantial relationship in phonetics, literacy, and verbal communication. Consequently, the results were not generally applicable to the population. Because efficacy decisions are personal beliefs about their own abilities, they are prone to mistake, because humans can overestimate or underestimate their real capabilities. As there was no statistically meaningful association observed in two cases, further study needs to be done to scrutinise the early childhood education teachers' efficacy beliefs and how they donate to the achievements of students.

In the research of Blazevski (2006) observed no theoretical model that explicitly associated teacher efficacy with the student performance, since there was no instrument precisely developed to test it. Her research supported this theory that finds "the efficacy of teachers to promote student motivation predicted the use of instructional methods associated with an achievement strategy target framework that anticipated student efficacy, which in order anticipated the achievements of students" (p.24). There were obvious drawbacks to the analysis, however, for example a small sample of teacher size (N = 50) incomplete student data and the problem of teachers not finishing the survey instrument given to them in full.

Researches have revealed that values in efficacy affect resilience, commitment and perseverance in difficult challenges (Bandura, 2007; Chong, et al., 2010; Dellinger, *et al.*, 2008; Henson, 2001; Schumacher, 2009; Yeo, *et al.*, 2008). As per Blazevski (2006) remarked that in the first case, she will be

much more eager to indulge in instructional activities intended to promote student encouragement, be more flexible when dealing with "difficult" students, and eventually be more effective in promoting the morale of student encouragements than a teacher who feels less productive in this respect (p. 11).

Numerous research explored the relationship concerning the sense of teachers' efficacy and student achievements. The efficacy of teachers' levels was related and regarded as a contributory factor to the achievement of students (Holzberger, Phipp, & Kunter, 2013). Caprara, Barbaranelli, Steca and Malone (2006) explored the sense of efficacy of teachers and their impact on the achievements of students and work fulfilment. They observed that the efficacy of teachers influences greatly on student achievements. Teachers that have high efficacy rating are most probable to exhibit great learning and achievement standards, whereas teachers with poor efficacy rates are more probable to display high standards of disappointment (Ashton & Webb, 1986).

Armor *et al.* (1976 examined the relationship between teachers' efficacy and student achievements in reading examinations. In fact, they analysed to what degree teachers assume they have the expertise to affect the achievement of students. Part of this research was the establishment of the Two-item Rand measure of efficacy. Armor *et al.* (1976) argued that the greater the teachers' sense of efficacy, the greater the students' achievement in reading examinations.

Ashton and Webb (1986) examined the relationship between basic experience that teachers have primarily on the Metropolitan Achievement Test (MAT) in ninth-eleventh grade student achievement in mathematics, vocabulary, and reading subtests. They studied 48 teaching staff, using different tests of efficacy. They found a positive link between the efficacy of teachers as

well as the achievement of students. The mathematics grades of students were significantly associated with the teachers' sense of efficacy in teaching. Alternatively, they observed no association between the grades of students in reading and teachers' sense of efficacy.

Of the studies undertaken, concrete solutions such as organizational skills (Fritz, Miller-Heyl, Kreutzer, & MacPhee, 1995) and peer coaching (Edwards, Green, Lyons, Rogers, & Swords, 1998) are the central focus of teacher professional development. This method of professional development fails to resolve the primary beliefs of teachers that impact their emotions as well as actions (Ellis & Dryden, 1997). While teachers are encouraged by this professional development approach, unrealistic attitudes are retained, contributing to undesirable negative feelings and inefficient behaviours. The beliefs of efficacy are a way for teachers to rate their perceived performance at a job. Since teachers are human, and people are genetically predisposed to unreasonable thought, they will always rate themselves as a whole, based on their performance (Ellis, 2005).

A teacher who has a strong sense of efficacy in a certain task is likely to have a high self-esteem, while when engaged in that role, the same teacher who maintains a low sense of efficacy for a different task is likely to present a low self-esteem. Findings by Huang, Lui and Shiomi (2007) indicate that this connection is present between the effectiveness of teachers and self-esteem. When individuals focus their self-esteem on a task, including instruction, and then adversely examine their success as a teacher, self-esteem decreases (Tschannen- Moran, Woolfolk Hoy, & Hoy, 1998).

The relationship between teacher efficacy and the achievement of high school students was examined by Khan (2011). He investigates the effect of high or poor teacher efficacy on student achievement and also the capacity of teachers to achieve low and unmotivated student achievement. After gathering and reviewing the data, Khan (2011) revealed that there is a strong relationship between the sense of efficacy of teachers and student achievements. The sense of the efficacy of teachers influences their perceptions of student achievements that affects the actions of teachers in the classroom to achieve and inspire students. Teachers with a strong sense of efficacy continue to have high expectations that their students will succeed, whereas teachers with a poor sense of efficacy produce high expectations of disappointments that are consistent with Ashton and Webb (1986) previous findings.

The relationship between teacher efficacy and student achievements was also investigated by Ross (1992). He noted that the teacher's assumptions about the efficacy and achievement of students are favourably correlated on written history assessments. Goddard et al. (2000) discovered that a major indicator of student achievement in mathematics and reading was collective teacher efficacy. The researchers found in a study of 47 elementary schools that, as measured by the seventh version of the Metropolitan Achievement Test (MAT), one unit increase in teacher efficacy as scored on the Collective Teacher Efficacy Scale coincided to an average gain of 8.62 points in mathematics achievement and an average gain of 8.49 points in reading achievement.

In another study of elementary schools, Goddard (2001) examined the association between collective teacher efficacy (CTE) and student achievement in elementary schools. The study had respondents from 91 schools in a big urban

midwestern school district. Using the collective efficacy scale of 21 items, CTE was assessed and student achievement was measured from student performance among fourth-grade students on the Metropolitan Achievement Test (MAT), seventh version (MAT7). Mastery experience was shown to have been a strong indicator of CTE, based on previous student performance on the MAT7. "CTE was also discovered to be meaningfully and strongly linked to discrepancies in student achievement between schools, including though school means were accounted for the previous achievement and demographic characteristics of students" (Goddard, 2001, p. 474).

CTE has also been found to have a positive correlation with students' achievement in middle schools. Tschannen-Moran and Barr (2004) established that there is a strong and meaningful correlation between CTE and student achievement in the Virginia Grade 8 Levels of Learning Exams in mathematics, writing, and English. Socioeconomic status was also considered in all three tests, with a strong negative correlation between socioeconomic status and student performance. CTE showed a significant relationship with student performance on the writing test by adjusting for socioeconomic status, but not so for the mathematics and English tests.

A positive association between CTE was found by Goddard, LoGerfo, and Hoy (2004). 12 grade teachers' and student achievement on state-required achievements exams. CTE among high school teachers was assessed using the short form of the Collective Teacher Efficacy scale (Goddard, 2002), and student achievement was determined by student performance on the state-mandated assessments in mathematics, science, social studies, reading, and writing. The researchers observed that a 1-SD rise in CTE corresponded with a

.23-SD rise in student performance in math and science and a .24-SD rise in student grades in reading, writing and social studies (Goddard *et al.,* 2004).

While some researchers have associated the sense of teacher efficacy to student achievements, researchers were not reliable in the way the instruments were used to assess teacher efficacy, nor in the way the student achievements have been measured (Austin, nd). The study focused on different matters allied to teacher efficacy, such as evaluating this construct and the validity testing. According to Klassen, Tze, Betts and Gordon (2011), work on connecting the sense of efficacy of teachers with the result of students is "modest". "It is important to create a stronger data base that provides proof of the connection between teacher efficacy and student outcomes" (Klassen, Tze, Betts, & Gordon, 2011, p. 40).

Ball (2010) established the efficacy of teachers who create mutual productivity that affects the whole school system. In addition, Porter and Brophy (1988) believed that teachers with high efficacy should be more effective in providing a learning environment. It has also been recognized that the teacher plays a significant role in maintaining the classroom, encouraging the students to make the activities more interesting and introducing effective learning approaches (Cardenas & Cerado, 2016). As a result, teachers with high efficacy prefer to use more collaborative methods of instruction and to use modern forms of instruction.

Researchers concluded that the central aspect of pedagogy is the sum and degree of students' participation in learning and classroom events (Cardenas & Cerado, 2016; Rink, 2013; Rivkin, Hanushek, & Kain, 2005; Gusthart & Springings, 1989). It was also reported that teachers' efficacy had a

positive effect on student performance, allowing teachers to execute better facilities for preparation and organization (Gowrie & Ramdass, 2014). Furthermore, teachers' efficacy has been recognized to be associated with fruitful instructional practices as well as good student accomplishments, as teachers with higher efficacy used unrestricted questions, cooperative instruction, enquiring approaches, and team learning experiences in the classroom (Gavora, 2010). Many studies also indicated that highly self-effective teachers are much more open to introducing fresh concepts and innovative approaches, encouraging student introduction and versatility, and growing curiosity in science among students (Brouwers & Tomic, 2003; Ross & Bruce, 2007).

According to Gavora (2010), teachers' efficacy is seen as a powerful self-regulatory feature that inspires teachers to maximize their abilities to develop learning for students. In addition, earlier works have shown that teachers' efficacy affected students' motivation and performance (Mojavezi & Tamiz, 2012; Stipek, Salmon & MacGyvers, 1998; Wentzel, 1998). Alvare-Nunez (2012) confirmed that teachers' efficacy as an indicator of basic school students' achievement in mathematics. Consequently, teachers' efficacy is indicated to be a significant trait of the teacher and is closely related to efficiency in performing difficult academic activities including mathematics education.

Chapter Summary

This chapter discusses literature related to studies on understanding teacher efficacy and its connection to student achievements. The literature review commences by explaining the significance of scrutinizing the beliefs of

teachers permissible to get an improved interpretation and comprehension of their actions in the classroom. Teachers who firmly believe in their capability to impact student achievement are regarded as highly successful teachers. Studies has revealed that teachers' sense of efficacy has a major impact on student achievements. Bandura (1997) suggested a theory on the formation and shaping of efficacy beliefs, also discussed in the section sources of efficacy. Furthermore, variables that affect the sense of efficacy of teachers, including direct influences such as the school environment or indirect influences such as home and society, were analysed and also factors that are expected to forecast the efficacy of teachers, including teaching experience, qualification, sex or gender, age, the parent teacher relationship and so many more.

Throughout the literature, approaches for describing and measuring the meaning of efficacy of teachers they are based either on Rotter's theory of social learning or on Bandura's theory of social cognitive. Since then, many instruments have been tested, some of which have not been tested for reliability and validity, but some have been evaluated by researchers and found to be invalid devices or instruments. However, Tschannen-Moran and Hoy (2001), Teacher Sense of Efficacy Scale (TSES) have made several attempts by different researchers in different contexts to test its validity, but there is agreement among researchers that TSES is sufficient for to assess teachers' sense of efficacy and shelter many aspects of instructional activities. TSES has three dimensions. These dimensions are: efficacy for student engagements, efficacy for instructional strategies as well as the efficacy for classroom managements. It provided literature on teachers and the relationship with each dimension.

CHAPTER THREE

RESEARCH METHODS

This chapter presents on the methodology employed to collect and analyse data to achieving the stated objectives of the study. The chapter covers the following: research design, population, sampling procedure, data collection instruments, data collection procedures, data processing and analysis.

Research Design

The study used descriptive cross-sectional research design. A descriptive research design is a design aimed at producing a detailed description of people, incidents and circumstances (Best & Kahn, 2016). The purpose of descriptive research design is to gather comprehensive and factual information that defines a prevailing phenomenon. It has strengths such as: it helps to produce strong response from a wide variety of individuals, it gives good statistical results and it is also used with greater assurance with respect to asking specific questions of interest (Kothari, 2004).

A descriptive cross-sectional research design involves analysing data from a population at given time point. Respondents of this type of study are selected on the basis of different interest variables. Descriptive cross-sectional research study helps a research to occur at a particular point in time, researchers to look at multiple factors at once (age, wealth, gender, etc), uncover dominant factors in a given population, and information on what is occurring in an actual population. In addition, this approach is also used to draw inferences about the future relationships, or to gather preliminary evidence to help further research and experimentation. Cross-section study is usually inexpensive, quick, permits for the assessments of various variables and paves the way for further research.

The descriptive design was used because the study sought to describe some findings as well as examining relationships between variables; that is mathematics teachers' efficacy and student achievement.

Study Area

The area of the study states that the location is where the data was gathered. The capital of the Central Region of Ghana is the Cape Coast. One of the sixteen administrative regions in Ghana is the Central Region. It is bounded to the north by the Ashanti and Eastern regions, to the west by the Western region, to the east by the Greater Accra region, and to the south by the coastline of the 168-kilometer-long Atlantic Ocean (Gulf of Guinea). It covers an area of 9,826 square kilometers, or 4.1% of the land area of Ghana, making it the third smallest area after the regions of Greater Accra and the Upper East (Ghana Statistical Service, 2013). The region was the first area to receive European explorers in the nation. Its capital, Cape Coast, was also the Gold Coast capital until the capital was shifted to Accra in 1877. It was in the Cape Coast Castle that the British and the Fante Confederation signed the historic Bond of 1844. One metropolis, six municipalities and 13 districts make up the region. In general, the Central Region has 20 Metropolitan, Municipal, and District divisions. The Cape Coast metropolis has six circuits, with 67 public junior high schools and basic schools and 38 private schools.

Population

According to Ogula (2005) a population refers to any group that has common features of organisations, individuals or items. The target population for the study was all mathematics teachers teaching at the junior high school and all junior high school (JHS) students in public basic schools in the Cape

Coast Metropolis. Cape Coast Metropolis has six circuits and 67 public basic schools. The study's accessible population was limited to all public mathematics teachers and all public JHS three students in Cape Coast Metropolis. The Public JHS was used in the Cape Coast Metropolis because the public Junior High Schools write District Mock Examinations which was needed for the study. Details on the populations are presented in Tables 3.

Table 3: Population of mathematics teachers in the Metropolis

Circuits	Total number of schools	Total number of mathematics teachers	Total number of JHS three students
Aboom	11	17	553
OLA	8	6	315
Abura/ Pedu	13	15	510
Bakaano	11	17	386
Efutu	12	13	339
Cape Coast	8	15	439
Total	67	83	2542

Source: Ghana Education Service (2020)

Sampling Procedure

The study used the census method for selecting mathematic teachers. The census method captures every unit in the population. It is identified as a complete enumeration, meaning total count. The census method is the greatest in a region or community, in terms of limited population categories. In the context of a research work, census captures or pays attention to every respondent of the study population. That is the sample size is the same as the population. The census method is usually used when there is the need to consider the input of every respondent so as to generate reliable results that can serve as a basis for generalization. In view of this, all mathematics teachers at the public junior high school totalling 83 were used. All the JHS mathematics teachers were asked to complete questionnaire.

In the case of student population which was 2,542 JHS three students; a sample size of 333 was generated by using Krejcie & Morgan (1970) sample size determination formula (see Appendix C). The sample size was apportioned to the various schools using ratios and proportion (see Appendix B). The sample schools were located in six circuits in the Cape Coast Metropolis: Aboom, OLA, Abura/ Pedu, Bakaano, Efutu and Cape Coast.

Data Collection Instruments

According to Bhandarkar and Wilkinson (2010) instrument relates to instruments or methods through which number of researched try to assess information collection variables or objects of concern. Data collection instrument is an instrument used by researchers for information collection. It concerns not only the design, choice, construction and evaluation of tools but also the circumstances of the administration of the tools (Hsu & Sandford, 2010).

Primary data was collected using structured questionnaire in order to answer research questions one, two and three. In addition, secondary data was collected through JHS three students district mock examinations scores to be able to provide a complete data for answering research question three. The instruments used for collecting information or data for the study was questionnaire and the scores of JHS three students' mathematics district mock examinations.

Teacher Sense of Efficacy Scale was developed by Tschannen-Moran and Hoy (2001). In previous work, they proposed that a valid measure of teacher efficacy should take into account both personal skills and assessment of the task,

especially teaching environments with some resources and limitations in a particular teaching setting. Therefore, a 24-item Teacher Sense of Efficacy Scale has been created with three variables, namely: efficacy for classroom managements, efficacy for instructional strategies and efficacy for Student Participation This instrument has been used because it is considered a valid and reliable measure of teacher efficacy and the three dimensions of TSES are significant aspects of teaching tasks (Tschannen-Moran & Hoy, 2001).

The questionnaire had four sections: the section A captured the demographics of the respondents, section B looked on the source mathematics teachers' efficacy, and section C presented on the mathematics teachers' efficacy. The questionnaire assumed a Likert scale of 1(least agreed) to 5 (highly agreed). The reasons for choosing the tools consist of describing the questionnaire as a structured tool for collecting information from possibly many participants within a short possible moment if it is readily available particularly to the population (Amedahe & Gyimah, 2005; Deng, 2010).

The district mock examination scores of the JHS three students were used as the data for student achievements. The mathematics district mock examinations were used because it is the type of examinations offered to all JHS three students across all schools in the circuit in the Cape Coast Metropolis which made it reliable and valid to be used for this study. The JHS three students in the Cape Coast metropolis are made to write this examination in order to prepare them for the national examination which is Basic Education Certificate Examination.

The district mock examination is a mixed referenced test whereby students' results are compared to a standard for satisfactory achievements.

There are range of scores that indicate the extent of performances from each student and their interpretation which is called the grade system. These are; scores of 75-100 is (A1) which is considered as excellent; 70-74 is (B2) which is considered as very good; 65-69 is (B3) which is considered as good; 60-64 is (C4) which is considered as credit; 55-59 is (C5) which is considered as credit; 50-54 is (C6) which is considered as credit; 45-49 is (D7) which is considered as pass; 40-44 is (E8) which is considered as pass; 43-0 is (F9) which is considered as fail. The test was designed and administered by the district education office of the Cape Coast Metropolis.

The background information of mathematics teachers is presented in a tabular form using frequency counts and percentages to allow comparisons to be made.

Item 5 on the questionnaire sought to find out the factors that influences mathematics teachers' efficacy (see appendix B). Responses ranged from "sex", "age", "experience" and "education". The weight for each item was computed and the results obtained indicated from the highest to the least factor that influences the efficacy of mathematics teachers. Items 6 to 33 on the questionnaire sought to identify and examine the sources of mathematics teachers' efficacy (see appendix B). The responses ranged from "1 (least agree) to 5 (highly agree)" five-point likert-scale. The weight of each item was computed and the results obtained revealed the sources of mathematics teachers' efficacy.

A secondary data was also used in addition to the item 34 to 57 in order to examine the relationship between mathematics teachers' efficacy and student achievement, which is research question three. The secondary data used was the

scores of districts mock examination of JHS three students. The item 34 to 57 and the student scores were computed and the results indicated the relationship between mathematics teachers' efficacy and student achievements.

The background information of the mathematics teachers was analysed using frequencies and percentages. This was done to each of the categories under the background information to describe the demographic nature of the mathematics teachers.

The sources of mathematics teacher's efficacy were analysed using mean, standard deviation and mean ranking to identify the highest sources of mathematics teacher's efficacy. This analysis was done at the individual item level under each of the construct of the sources of mathematics teachers' efficacy, and ultimately at overall level using their mean of means.

Validity of the Instrument

The instrument was subjected to validity tests. The degree of validity describes how accurate a method or instrument measures what it is intended to measure. The validity of the questionnaire was achieved through peer and expert review. For instance, the sample questionnaire was given to my supervisor to check its construct validity. The suggestions that were given by the supervisor were used to effect the necessary changes to improve upon the instruments. Also, the questionnaire was given to other lecturers and upon their comments, the necessary changes were made.

Pilot-Testing

A pilot-test was conducted in September 2020 in an attempt to fine tune the questionnaire for this study. This was intended to simplify the questionnaires so that while the actual study is carried out, no respondent has any difficulty

responding the questionnaires. Pre-tests are necessary for the following reasons ahead of a primary survey, according to Pallant (2007). First of all, they guarantee that orders, questions and items of scale are simple. They therefore ensure that prospective respondents comprehend and appropriately respond to questions. Finally, they help to recognize questions or items that can offend future respondents and exclude them.

The pilot-testing was conducted among 30 JHS three mathematics teachers who came to the University of Cape Coast for the sandwich programme in the 2019/2020 academic year. The pilot-testing was done to further correct any misleading question, and also to check the reliability of the instrument. There were no adjustments made to any of the questions in the structures in the questionnaire and all the questions were understood by the respondents. The reliability of the instrument is presented in the next section.

Reliability Test

According to Babbie (2005), a scale's reliability implies the degree to which a measurement device delivers reliable results if applied frequently to the same item. Test-retest reliability and internal consistency are the most frequently used indicators for testing a scale's reliability (Tabachnick & Fidell, 2007). The researcher used SPSS version 25 to produce Cronbach's alpha coefficient for the constructs in order to verify the internal accuracy of the study constructs. The reliability coefficients for pre-test data are presented in Table 4.

Table 4: Computed Reliability Co-efficient for Data Collected

Variable	Number of Items	Cronbach's Alpha
Enactive Mastery Experience	8	.89
Vicarious Experience	5	.76
Verbal persuasion	7	.72
Psychological and Emotional State	8	.71
Mathematics Teachers Efficacy Scale	24	.94

Source: Field Survey (2020)

Research has also shown that scales are considered reliable with Cronbach's alpha co-efficient of 0.70 or more (Pallant, 2007). This also indicates that all of the study's pre-test constructs have high reliability of internal consistency.

Data Collection Procedures

The administration of the questionnaires was preceded by a letter of introduction from the Head of Department, Department of Basic Education, University of Cape Coast and also from the Ethical Review Board which was sent to the Ghana Education Service, Cape Coast Metropolis for the collection of data on students mathematics district mock examinations, the number of public Junior High (JHS) Schools in the Metropolis, the number of mathematics teachers, the number of JHS three students, and the mathematics results of Basic Education Certificate Examinations. The introductory letter was also presented to the head teachers of the public JHS to enable the researcher to obtain permission to collect data from the mathematics teachers in each school. The purpose of the introductory letter was to seek permission and the cooperation from the GES, the head teachers and teachers. In order to ensure a high rate of return, the instruments were personally administered by the researcher.

At the GES office, I was introduced to the head of data analyst who asked questions and requested for the information I needed and through that I had all the information and the data needed for this study. At the schools, discussions were held with each head teacher of the schools who then introduced me to the mathematics teachers. Most mathematics teachers were not in school due to the COVID-19 so I had to go back to the schools another day and for some I did not get to meet them at all. Each respondent was briefed concerning how to respond to the items and was supervised by the researcher to complete the questionnaire.

All public JHS three schools in Cape Coast Metropolis take part in the mathematics district mock examinations. The examinations were marked and the results of the students were recorded by each school using the same grade system. The data for the study, the scores of the mathematics district mock examinations of the year 2019 was collected from the Ghana Education Service, Cape Coast Metropolis, which included all the 67 public Junior High schools in the Cape Coast Metropolis and was used. This is because it was the most current year at the time of this study and precisely reflected the achievements of the JHS three students in this study. The name of the schools remained anonymous in order to achieve the confidentiality as well as the teachers' questionnaires.

Data Processing and Analysis

In order to address the research questions formulated to guide the study, the responses from the collected questionnaires were coded (for example, let Male be "1" and Female be "2") and entered in the Statistical Package for Service Solution (SPSS 25.0) for processing. Before entering into SPSS, a data template was developed to capture all the possible variables of the study.

Data analysis is a critical examination of material in order to comprehend and uncover patterns in its elements and relationships (Twumasi, 2001). The analysis of the data that was done in this study was in two parts. That is, the first part included the preliminary analysis and the second part which also included the main analysis per the research questions.

In relation to the preliminary analysis attention was given to the demographics of the mathematics teachers which included sex, age, education, years of experience. The analysis under this part was done using descriptive statistics such as frequencies and percentages. The results were presented in tables. This part of the analysis was done to give information on the characteristics of the mathematics teachers who participated in the study.

With the main analysis, attention was given to each of the research questions. The first research question which says, "What are the sources of mathematics teachers' efficacy?" was analysed using means and standard deviation. These analytical tools were used due to their ability to include every data set in it computation as well as ensuring an absolute zero deviation margin. The second research question which says, "What are the factors that influence mathematics teachers' efficacy?" was also analysed using factor analysis. This analytical tool was used because there was the need to know if the survey items have similar response patterns, as to do these items "hang together" to create a construct? The basic assumption of factor analysis is that there is a set of underlying or latent variables called factors (smaller than the number of variables observed) for a collection of observed variables, which can explain the interrelationships between those variables.

The third research question which says, "What is the relationship between mathematics teachers' efficacy and student achievements?" This was analysed using Pearson moment correlation to determine the relationship that exit between mathematics teachers' efficacy and student achievements.

Ethical Considerations

The key ethical issues addressed in this research included voluntary participation, disclosure of the intent of the research, the privacy rights, anonymity and information of confidentiality and consent letter was acquired from the Ethical Review Board (ERB) at the university of Cape Coast. The letter from the Ethical Review Board was acquired through application; an introductory letter was acquired from the Department of Basic Education and also from my supervisor including his resume. This was added to the proposal of the study and the research instrument which was then sent to the office of ERB. The proposal of the study and the research instruments was reviewed and approved before the consent letter was provided by the ERB.

Nevertheless, all measures were directed at ensuring any of these ethical issues became resolved. For example, all respondents were required to engage voluntarily in the data collection process, through voluntary participation and could also withdraw from the study at any point in time. The possible questions of the right to privacy were also addressed by permitting respondents to reply to the questionnaires on their own and were also notified to leave unsure statements unanswered for additional clarifications via their own convenient medium. The researcher wanted to maintain the anonymity of the respondents and this prevented the respondents from including their names on the questionnaire and their contact numbers on it. The study guaranteed that

information was confidential by promising respondents that all information delivered was preserved as confidential. Eventually, all required information acquired for the study was adequately referenced to prevent any ethical plagiarism problem.

Chapter Summary

This chapter described the research methods used to achieve the purpose of this study. The chapter explicitly addressed the main aspects of the research methods used in the study, such as research design, population, sampling procedure, data collection instruments, data collection procedures, data processing and analysis. The report specifically explained the usage of the quantitative method of research and the descriptive research design. The chapter reported that, both descriptive and inferential statistical tools such as percentages, frequencies, charts, mean score and correlation were used to analyse the data processed by SPSS (v.25) in an attempt to address the research questions of the study.

CHAPTER FOUR

RESULTS AND DISCUSSION

The analysis of data from the field is presented in this chapter. In brief, the findings of the analysis are discussed. This chapter is divided into sections. The first section deals with the respondent demographics of respondents, and the second, third and fourth sections deals with the research objectives. In comparison to certain linked theoretical viewpoints, it also analyses the different findings.

Demographics of Respondents

This section describes the demographics of the mathematics teachers that were used for the study. The demographic variables were sex, age, education and years of experience in teaching the mathematics subject. The response rate was 96.4%, representing 80 mathematics teachers.

Sex

The respondents were asked to indicate their sex. The sex had two main options either male or female. The result for this outcome was presented in Table 5.

Table 5: Sex of Mathematics Teachers

	Frequency	Percent
Male	44	55.0
Female	36	45.0
Total	80	100.0

Source: Field Survey (2020)

The demographic variables of respondents are presented in Table 6. It can be shown from the Table 6 that 44 of the respondents are male, representing 55.0%, and 36 are female, representing 45%. This suggests that per the sample of the study there is a gender gap among JHS teachers

Age

The respondents were asked to indicate their age. The age section had a range of age limits where the respondents were asked to choose from. The result for this outcome is presented in Table 6.

Table 6: Age of Mathematics Teachers

	Frequency	Percent
18-28 years	31	38.8
29-39 years	38	47.5
40-50 years	10	12.5
51-60 years	1	1.3
Total	80	100.0

Source: Field Survey (2020)

With respect to the ages of the respondents, 31 of the respondents representing 38.8 % are 18-28 years of age, 38 of the respondents representing 47.5 % are 29-39 years of age, 10 of the respondents representing 12.5 % are 40-50 years of age, and 1 of the respondents representing 1.3 % are 51-60 years of age. This is a sign that JHS may have a young teacher population.

Education

The respondents were asked to indicate their level of education. The education had options like diploma, degree, MSc, and MPhil where the respondents were asked to choose. The result for this outcome was presented in Table 7.

Table 7: Education of Mathematics Teachers

	Frequency	Percent
Diploma	30	37.5
Degree	46	57.5
Msc	2	2.5
M.Phil.	2	2.5
Total	80	100.0

Source: Field Survey (2020)

With reference to the level of education of the respondents, 2 of the respondents representing 2.5 % were holders of the MSC certificate and 2 of the respondents representing 2.5 % were holders of the Mphil certificate. This indicated that per the sample of the study few of teachers have study beyond first degree.

Years of Teaching Experience

The respondents were asked to indicate their years of experience. The years of experience section had a range of years limits where the respondents were asked to choose from. The result for this outcome was presented in Table 8.

Table 8: Years of Teaching Experience of Mathematics Teachers

	Frequency	Percent
1-5 years	46	57.5
6-10 years	23	28.8
11-15 years	8	10.0
16-20 years	1	1.3
21-25 years	1	1.3
26 years and over	1	1.3
Total	80	100.0

Source: Field Survey (2020)

With respect to the number of years with the Basic School, 46 of the respondents representing 57.5 % spent 1-5 years with the Basic School; 23 of the respondents representing 28.8 % spent 6-10 years with the Basic School; 8 of the respondents representing 10.0 % spent 11-15 years with the Basic School; 1 of the respondents representing 1.3 % spent 16-20 years with the Basic School; 1 of the respondents representing 1.3% spent 21-25 years with the Basic School; 1 of the respondents representing 1.3% spent 26 years and above with

the Basic School. This indicated that for 1-5 years, most teachers have been with the Basic School.

Sources of Mathematics Teachers' Efficacy

The first research question, states that, what are the sources of mathematics teachers' efficacy? This was to examine the sources of mathematics teachers' efficacy. This research question was answered using mean and standard deviation. Specifically, means and standard deviation were generated for each item under each of the construct (sources of mathematics teachers' efficacy); and ultimately for each of the construct.

Enactive Mastery Experience

Enactive mastery experience is the utmost important and influential source of efficacy. In a given case, once one achieves success, he or she will in the future have strong hopes of success in specific circumstances. Enactive mastery experience are the participants' direct interactions in particular circumstances, and they affect efficacy by means of offering members the ability to be revealed then constantly exposed to the success of a project. Using the mean scores and standard deviation the descriptive statistics for enactive mastery experience was presented in Table 9.

Table 9: Enactive Mastery Experience

Statement	N	Mean	Std. Deviation	Mean Ranking
I feel successful in teaching students' all the mathematics topics	80	3.91	.845	6
I am successfully in collaborating with fellow mathematics teachers in accomplishing course targets.	80	3.86	.868	8
I am able to support my students in any topic in mathematics	80	4.11	.994	1
I am successful in practicing newly learned instructional techniques for teaching mathematics	80	3.98	.968	4
I am successful in practicing newly learned classroom management techniques for teaching mathematics students.	80	3.93	.952	5
I feel successful in participating in school-level decision making with regards to the mathematics syllabus	80	3.90	1.001	7
I am successful in meeting school improvement goals with respect to mathematics	80	3.99	.921	3
I feel successful in participating in classroom-level decision making with my colleagues with regard to the mathematics	80	4.04	.920	2

Source: Field Survey (2020)

In relation to enactive mastery experience, mathematics teachers were able to support their students in any topic in mathematics. The result for this was item was ranked 'high' this is because it had a mean score of 4.11 which is

between 3 and 5. The standard deviation of .994 revealed that the data points are gathered closely around the mean value confirming it as a greater value.

It was revealed in Table 9 that the mathematics teachers were successful in participating in classroom-level decision making with their colleagues with regard to the mathematics. The result for this item was ranked 'high' because it had a mean score of 4.04 which is between 3 and 5. The standard deviation of .920 revealed that the data points are gathered closely around the mean value confirming it as a greater value.

It was further revealed in Table 9 that mathematics teachers were successful in meeting school improvement goals with respect to mathematics. The result for this item was ranked 'high' this is because it had a mean score of 3.99 which is between 3 and 5. The standard deviation of .921 revealed that the data points are gathered closely around the mean value confirming it as a greater value.

Again, Table 9 indicated that mathematics teachers were successful in practicing newly learned instructional techniques for teaching mathematics. Results for this item was ranked 'high' because it had a mean score of 3.98 which is between 3 and 5. The standard deviation of .968 revealed that the data points are gathered closely around the mean value confirming it as a greater value.

Furthermore, it was indicated in Table 9 that mathematics teachers were successful in practicing newly learned classroom management techniques for teaching mathematics students. Results for this item was also ranked 'high' because it had a mean score of 3.93 which is between 3 and 5. The standard

deviation of .952 indicated that the data points are gathered closely around the mean value confirming it as a greater value.

Vicarious Experience

Vicarious experience over the process of modelling is the conclusions taken by people regarding their capability to perform a mission effectively based on the results of different people. Vicarious experience occurs when people perceive others behaviours and draw comparisons with their own impressions of their ability to perform. This is where a teacher witnesses someone fruitfully executing teaching assignment; some of these skills have the biggest effect on teachers' efficacy. Observing a fellow teacher undertake a particular task effectively convinces the teacher that he or she is proficient of generating the same performance. Using the mean scores and standard deviation the study revealed how mathematics teachers perceive vicarious experience. The result is presented in Table 10.

Table 10: Vicarious Experience

	N	Mean	Std. Deviation	Mean Ranking
I always attend workshops, in-services, video courses, etc. where successful demonstration of mathematical teaching-related tasks were observed.	80	3.96	1.024	1
I am learning about effective mathematical teaching techniques from other teachers	80	3.93	.759	2
I am imagining myself successfully teaching my students mathematics	80	3.91	.957	3
I am learning about effective mathematical teaching techniques from sources outside of my school	80	3.85	.843	4
I am learning about effective mathematical teaching techniques	80	3.72	.927	5

from administrators in my school.	

Source: Field Survey, 2020

In relation to vicarious experience, mathematics teachers were always attending workshops, in-services, video courses where successful demonstration of mathematical teaching-related tasks were observed. Results for this item was ranked 'high' because it had a mean score of 3.96 which is between 3 and 5. 1.024 was the standard deviation which indicated that the data points are gathered closely around the mean score value confirming it as a greater value.

It was revealed in Table 10 that mathematics teachers were learning about effective mathematical teaching techniques from other teachers. Results for this item was ranked 'high' because it had a mean score of 3.93 which is between 3 and 5. The standard deviation of .759 indicated that the data points are gathered closely around the mean score value confirming it as a greater value.

Again, Table 10 indicated that mathematics teachers were imagining themselves successfully teaching their students mathematics. Results for this item was ranked 'high' because it had a mean score of 3.91 which is between 3 and 5. The standard deviation of .957 revealed that the data points are gathered closely around the mean value confirming it as a greater value.

Furthermore, it was indicated in Table 10 that mathematics teachers were learning about effective mathematical teaching techniques from sources outside their school. Results for this item was also ranked 'high' because it had a mean score of 3.85 which is between 3 and 5. The standard deviation of .843 indicated that the data points are gathered closely around the mean value confirming it as a greater value.

Verbal Persuasion

Through another person's voiced constructive response on results, the sense of efficacy of teachers improves and they become more eager to make an attempt to complete their teaching task. Verbal persuasion helps the requisite trust to develop. Sustaining a sense of efficacy is simpler if important individuals are sharing confidence in teachers' ability, enhancing self-change practices and promoting improved attempts to achieve. The efficacy of teachers by verbal persuasion can therefore be strengthened by making appreciative and supportive statements to enhance the teachers' morale level. Using the mean scores and standard deviation the study revealed how mathematics teachers perceive verbal persuasion. The result is presented in Table 11.

Table 11: Verbal Persuasion

Statement	N	Mean	Std. Deviation	Mean Ranking
I receive positive feedback on the success of my mathematics teaching from standardized test results of my students.	80	4.30	.833	1
I receive positive feedback about the successfulness of my mathematics teaching abilities from my students.	80	4.25	.803	2
I am encourage by my abilities as a mathematics teacher	80	4.24	.783	3
I am receiving praise about the success of my mathematics teaching from evaluators	80	3.91	1.046	4

I receive encouragement from administration on my mathematics teaching practices.	80	3.86	.978	5
I have been reprimanded by my school authority for my mathematics teaching practices.	80	1.88	1.418	6

Source: Field Survey, 2020

In relation to verbal persuasion, mathematics teachers received positive feedback on the success of their mathematics teaching from standardized test results of their students. Results for this item was ranked 'high' because it had a mean score of 4.30 which is between 3 and 5. The standard deviation of .833 indicated that the data points are gathered closely around the mean score value confirming it as a greater value.

It was revealed in Table 11 that mathematics teachers were encouraged by their abilities as mathematics teachers. Results for this item was ranked 'high' because it had a mean score of 4.24 which is between 3 and 5. The standard deviation of .783 indicated that the data points are gathered closely around the mean score value confirming it as a greater value.

Furthermore, it was revealed in Table 11 that mathematics teachers received encouragement from administration on their mathematics teaching practices. The result for this item was ranked 'high' this is because it had a mean score of 3.86 which is between 3 and 5. The standard deviation of .978 revealed that the data points are gathered closely around the mean value confirming it as a greater value.

Physiological and Emotional States

Physiological and emotional states, including anxiety and stress, affect the appraisal of teachers' abilities by the people. Positive responses to carrying out teaching tasks enable teachers to forecast achievement or disappointment. The manner in which teachers perceive these physiological responses then manner conditions affects their efficacy. The physiological and emotional excitement in a teaching situation that teachers experience contributes to the self-perception of teaching skills as well as teacher efficacy. Using the mean scores and standard deviation the study revealed how mathematics teachers perceive physiological and emotional states. The result is presented in Table 12.

Table 12: Physiological and Emotional States

Statement	N	Mean	Std. Deviation	Mean Ranking
I feel successful in teaching above average mathematics students	80	4.35	.813	1
I feel excited when I am successfully reaching students struggling with mathematics.	80	4.16	1.012	2
I feel successful in teaching students who used to struggle with mathematics.	80	4.10	1.014	3
I feel pleasure when doing my job as a mathematics teacher.	80	4.01	1.248	4
I watch my other teachers successfully teach difficult mathematics students	80	3.90	1.165	5
I have stress-reduction because I learned ways to improve my mathematics teaching	80	2.50	1.263	6

I get frustrated when teaching my students mathematics	80	1.31	.789	7
I get uncomfortable physical sensations (e.g. elevated blood pressure, sweats, increased heart rate) when teaching my students' mathematics	80	1.25	.788	8
I feel hopeless when teaching my students mathematics	80	1.20	.701	9

Source: Field Survey, 2020

In relation to verbal physiological and emotional states, mathematics teachers were successful in teaching above average mathematics students. Results for this item was ranked 'high' because it had a mean score of 4.35 which is between 3 and 5. The standard deviation of .813 indicated that the data points are gathered closely around the mean score value confirming it as a greater value.

It was revealed in Table 12 that mathematics teachers were excited when they were successful in reaching students struggling with mathematics. Results for this item was ranked 'high' because it had a mean score of 4.16 which is between 3 and 5. The standard deviation of 1.012 indicated that the data points are gathered closely around the mean score value confirming it as a greater value.

It was revealed in Table 12 that mathematics teachers were successful in teaching students who used to struggle with mathematics. Results for this item was ranked 'high' because it had a mean score of 4.10 which is between 3 and 5. The standard deviation of 1.014 indicated that the data points are gathered closely around the mean score value confirming it as a greater value.

Overall Means for each of the Sources of Mathematics Teachers' efficacy

The final analysis for the first research question was captured in this section. This was done, first by computing the mean of means for each of the construct using the transformed option in SPSS; and ultimately with descriptive statistic function (mean). The results were presented in Table 13.

Table 13: Sources of Mathematics Teachers' Efficacy

Descriptive Statistics			
	N	Mean	Mean Ranking
Enactive mastery experience	80	3.9641	1
Vicarious experience	80	3.8750	2
Verbal persuasion	80	3.7804	3
Physiological and Emotional State	80	2.9764	4

Source: Field Survey (2020)

Four variables, enactive mastery experience, vicarious experience and physiological and emotional states were considered in this analysis. The analysis revealed the order of priority in relation to how the sources contribute to mathematics teacher's efficacy. The first preference was given to enactive mastery of experience when it comes to the mathematics teachers' efficacy. This was extracted from the average score of 3.9641 that was assigned to this factor, when it comes to the source's mathematics teacher efficacy. The mathematics teachers considered vicarious experience to be the second most contributing factor to teacher efficacy. For this factor, the mean score was 3.8750.

The third contributing factor to mathematics teachers' efficacy was considered to be verbal persuasion. Verbal persuasion had a score of 3.7804 on average. Physiological and emotional states have been classified as the least

contributing factor to the teachers' efficacy. The average was 2.9764 for this factor.

The findings in this study that enactive mastery of experience was rated as the highly perceived contributing factor to the sources of mathematics efficacy was affirmed in the study of Bandura (1997) that enactive mastery of experience is the utmost important and influential source of efficacy. He also stated that enactive mastery of experience create efficacy. According to Goddard, Hoy and Hoy (2004) enactive mastery experience can also be the greatest influential impact on teachers' efficacy.

Furthermore, the finding that vicarious experience was the second factor that contributes to the sources of mathematics teachers' efficacy according to Bandura (1997). Verbal persuasion been the third consider contributor to the sources of mathematics teachers' efficacy was not surprising because the study by Bandura (1977) revealed that verbal persuasion is a successful technique to foster efficacy, including vicarious experience but that is not as effective as that of enactive mastery experience. Physiological and emotional states been the last consider contributor to the sources of mathematics teachers' efficacy was also not surprising because the study by Bandura (2006) revealed that physiological and emotional excitement in teaching situations an individual experience contributes to the efficacy of their teaching skills.

Factors that Influence Mathematics Teachers' Efficacy

The second question states; what the factors that influence mathematics teachers' efficacy? The factors of the mathematics teacher's efficacy scale were examined using principal component analysis (PCA). This was essential in measuring the three dimensions of the mathematics teachers' efficacy.

Proceeding to performing the PCA, it was significant to examine the appropriateness of the dataset for this analysis. This was done by using Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. The results of the KMO test in Table 14 supported the use of principal component analysis due to the adequacy at .872 which is greater than the acceptable value of .7 recommended by Pallant (2011).

Table 14: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.872
Bartlett's Test of Sphericity	Approx. Chi-Square	1197.834
	Df	276
	Sig.	.000

Source: Field Survey (2020)

Table 14 revealed that the Bartlett's test of sphericity (χ 2 = 1197.834; df = 276) indicated that the p value was significant at $\rho<0.0001$, which means that the population was not an identity correlation matrix. These two tests supported the use of principal component analysis in investigating the dimensions or factors of mathematics teachers' efficacy (Pallant, 2011).

Scree Plot

The scree plot serves as a confirmatory check to the total variance Table 15.

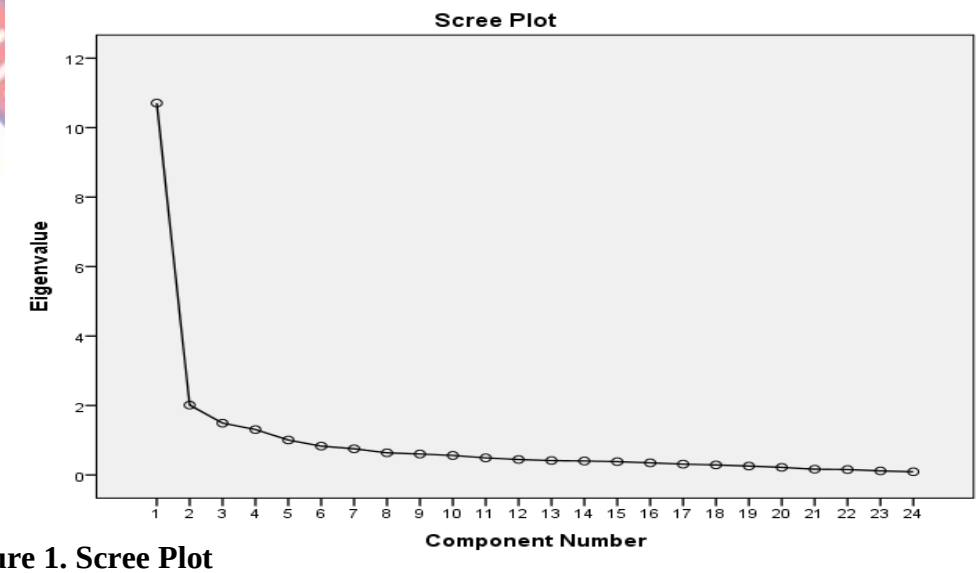

Figure 1. Scree Plot

The result in Figure 1 revealed that the twenty-four (24) item factors were reduced into three components namely; student engagement, classroom management and instructional strategies. Items with eigenvalues greater than 1 were retained (Pallat, 2011).

Table 15: Rotated Component Matrix

	Component		
	SE	CM	IS
Encouraging innovation among my mathematics students	.666		
Get my mathematics students to follow the rules of the classroom	.425		
Adopt strategies to relax disturbing or distracting mathematics students	.778		
I do create a classroom management system for each group of the mathematics students	.625		
I do well in responding to defiant mathematics students	.597		
I am able to modify my mathematics lessons to the correct standard for individual students	.737		
I am able to offer an answer or explanation to my mathematics when the need arises	.642		
I am able to present the right challenges for highly skilled mathematics students	.583		
I am able to support my mathematics students to think objectively.	.586		
I am able to increase my mathematics students value for learning the subject	.652		
I am able to clarify my expectations about my mathematics students' behavior	.704		
I am able to ask my mathematics students important questions	.750		
I do well in boosting the understanding of my students who are not doing well in the subject	.753		
\I am able to get the toughest mathematics students through.		.622	
I am able to make my mathematics students do a good work at school		.692	
I am able to monitor offensive behaviour in my mathematics classroom		.761	
I am able to set routines for the smooth running of my mathematics teaching activities		.674	
I am able to prevent some troubled mathematics students from ruining an entire lesson		.743	
I do well in answering challenging questions from my mathematics students		.687	
I do well in gauging my mathematics students' understanding on what I have taught them		.517	

I am able to help families in helping their children do better in their mathematics class	.551
I have different assessment strategies for my mathematics students	.776
I apply different approaches in managing my mathematics class	.653

Source: Field Work (2020)
NB: SE- Student Engagement, CM-Classroom Management (CM), and IS-Instructional Strategies

Table 15 presents the results on the rotated component matrix of the factors of mathematics teachers' efficacy scale. The rule thumb was that only factor loadings with values not less than 0.4 were retained in this table (Pallat, 2011). Varimax rotation was used because the variables were uncorrelated, and this orthogonal rotation method helps in maximizing the relationship among the variables, and the dispersion among the factor loadings (Gorsuch, 1983). Factors with high absolute values are deemed to have greater contribution to the extracted variable retained. By this, the aim of the principal component analysis was fulfilled by classifying and regrouping the 24 factors items of mathematics teachers' efficacy scale into three (3) components, which were titled student engagement (SE), classroom management (CM), and instructional strategies (IS). These components tally with the component in the original instrument on teacher's efficacy.

The first component which explained a variance of 44.61% was student engagement of mathematic teachers. The number and nature of variables loaded on this factor as shown in Table 15 did not come as a surprise. This is because teacher efficacy is usually conceptualised and assessed as motivating or engaging individual students to enjoy learning or feel that they can do fine in a specific class (Skaalvik & Skaalvik, 2007; Tschannen-Moran & Hoy, 2001). In a study by Bandura (1997) argued that the expectations of teachers that can

inspire and engage their students can be one of the key ways through which they affect the academic and cognitive growth of the students.

Furthermore, research of Skinner and Belmont (1993) discovered that the behaviour of teachers in the classroom influences the engagements of the students. Uden, Ritzen and Pieters (2013) explored the teacher efficacy and apparent engagements with the students. They discovered teachers with high efficacy ranked as higher on affecting student engagement.

The second component is classroom management. This component explained a variance of 8.38%. The nature of variables found under this component as shown Table 15 was not surprising. This is because Dicke, Kunter, Leutner, Marsh, Parker and Schmeck, (2014) concluded that teachers' beliefs of efficacy impact not just the actions of teachers in the schools, but also the efficacy beliefs of teachers affect the teachers' classroom management performance. Nevertheless, Dibapile (2012) examined research on the efficacy of teaching and the management of classrooms. Dibapile (2012) generally argued that classroom management isn't a simple job. Effective teachers can successfully control the classroom and create coordinated classes that have a beneficial influence on student learning and behaviours. Teachers with higher levels of efficacy can handle dispute with their students and are more willing to employ various types of management in their classes (Morris-Rothschild & Brassard, 2006).

The third component which explained a variance of 6.22% was student engagement of mathematic teacher's efficacy scale. The nature of variables found under this factor as shown in Table 15 did not come as a surprise. This is because teacher efficacy is usually conceptualized and assessed as motivating

or engaging individual students to enjoy learning or feel that they can do fine in a specific class (Skaalvik & Skaalvik, 2007; Tschannen-Moran & Hoy, 2001). In a study by Bandura (1997) argued that the expectations of teachers that can inspire and engage their students can be one of the key ways through which they affect the academic and cognitive growth of the students. Furthermore, a research of Skinner and Belmont (1993) discovered that the behaviour of teachers in the classroom influences the engagements of the students. Uden, Ritzen and Pieters (2013) explored the teacher efficacy and apparent engagements with the students. They discovered teachers with high efficacy ranked as higher on affecting student engagement.

Relationship between Mathematics Teachers Efficacy and Student Achievement

For the third research question, states that, what is the relationship between mathematics teachers' efficacy and student achievements. The third question was to examine the relationship between mathematics teachers' efficacy and student achievements. The Pearson's Product Moment Correlation to establish the relationship between mathematics teacher's efficacy and student achievement. The Pearson's Product Moment was used because it measures the strength and direction of association that exists between mathematics teachers' efficacy and student achievement. The result was presented in Table 16.

Table 16: Correlation Analysis

		Mathematics Teacher's Efficacy	Student Achievement
Mathematics Teacher's Efficacy	Pearson Correlation	1	.218*
	Sig. (1-tailed)		.026

*. Correlation is significant at the 0.05 level (1-tailed).

Source: Field Survey (2020)

The primary motive of Table 16 statistics was to present the correlational test between mathematics teachers' efficacy and student achievement. The decision rule for assessing if the test is significant (α=0.05), if the $\rho \leq 0.05$, the test is significant; and if the $\rho < 0.05$, the test is not significant. Table 16 revealed a positive significant relationship between mathematics teachers' efficacy and student achievement. Statistically, the relationship between mathematics teachers' efficacy and student achievement was presented as r (80) = .218, $\rho < .05$.

This finding was supported by studies done by the Rand Corporation who were the first to investigate into this relationship in which they had two different studies and these studies established that there was a positive correlation between mathematics teachers' efficacy and student achievement (Armor et al., 1976; Bass, Berman, McLaughlin, Pauly & Zellman, 1977). According to Ashton & Webb (1986) revealed that there was a positive correlation between mathematics teachers' efficacy and student achievement. A study done by Ross (1992) established that there was a link between classrooms with higher sense of teachers' efficacy and higher student achievements.

According to Caprara, Barbaranelli, Steca and Malone (2006) explored the sense of teachers' efficacy and their impact on student achievement and work fulfilment. They observed that teachers' efficacy greatly influences student achievement. In a study done by Khan (2011) investigated the relationship between teacher efficacy and high school student achievement. He established that there was a strong relationship between the sense of teachers' efficacy and student achievement. Alvare-Nunez (2012) affirmed in a study that teachers' efficacy is an indicator of basic school student achievement in

mathematics. Cantrell, Almasi, Carter and Rintamaa (2013) advocated that students that have teachers with higher efficacy achieved a higher level than students with teachers that have low efficacy. Holzberger, Phipp and Kunter (2013) established that teachers' efficacy was related and regarded as a contributory factor to the student achievement. According to a study done by Gowrie and Ramdass (2014) reported that teachers' efficacy had a positive effect on student achievement which allows teachers to execute better facilities for preparation and organization.

Chapter Summary

The chapter addressed the sources of mathematics teachers' efficacy in which the findings revealed the order of priority in relation to how the sources contribute to mathematics teacher's efficacy. It was also revealed that student engagement, classroom management and instructional strategies are the factors that influence mathematics teachers' efficacy. The discussions indicated a positive significant relationship between mathematics teachers' efficacy and student achievement. The next chapter provides the summary, conclusions and recommendations of the study.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Introduction

The purpose of the study was to examine the relationship between the efficacy of mathematics teachers and the mathematics achievements of Junior High School students in the Cape Coast Metropolis.

Specially, the study sought to:

1. examine the sources of mathematics teachers' efficacy,
2. assess the factors that influence mathematics teachers' efficacy, and
3. assess the relationship between mathematics teachers' efficacy and student achievement.

The study used the descriptive cross-sectional research design. A quantitative approach was used in the study. The study used a sample of 80 mathematics teachers and 333 JHS three students. The data collection instrument was a structured questionnaire and district mock examinations of JHS three students at the basic education. There was a 100% response rate from the respondents. Responses from the questionnaire and the district mock examinations were coded and entered into the Statistical Package for Social Sciences software for processing. Descriptive and inferential statistics were used. Precisely, percentages, frequencies, means, correlation, and factor analysis were used as the data analytical tool.

Summary of Key Findings

The study had the following as the key findings.

The first research question: What are the sources of mathematics teachers' efficacy? The findings of the study revealed that enactive mastery experience

was the most regarded source of mathematics teachers' efficacy. Vicarious experience was perceived by the mathematics teachers to be the second most contributing factor to the sources of mathematics teachers' efficacy. Verbal persuasion was perceived as the third contributing factor to the sources of mathematics teachers' efficacy. Physiological and emotional states were rated to be the least contributing factor to the sources of mathematics teachers' efficacy.

In relation to the second research question: What are the factors that influence mathematics teachers' efficacy? The findings of the study indicated that the three factors of mathematics teachers' efficacy scale were classified into three (3) components factors. These component factors were student engagement (SE), classroom management (CM) and instructional strategies (IS).

In relation to the third research question: What is the relationship between mathematics teachers' efficacy and student achievement? The findings of the study revealed a positive significant relationship between mathematics teachers' efficacy as well as student achievement. In the regression analysis, it was revealed that there was a positive relationship between mathematics teachers' efficacy and student achievement but mathematics teachers' efficacy negatively influenced student achievements.

Conclusions

The study provided relevant literature on the several variables of the study. Again, discussions were provided to the various findings of the study. The information presented in the study could aid and inform policy resolutions on mathematics teachers training and recruitment. It could also inform

mathematics education stakeholders to be conscious of the quality of teachers assigned to the classroom for teaching the subject. It can also enable the Ghana Education Service (GES) inspectorate to take decisions regarding training of teachers, teachers' practices in the classroom and implementing supervisory measures for the mathematics teachers at Basic Education School. The following conclusions were drawn based on the study's findings:

With respect to the first research question, the study revealed that enactive mastery of experience contributed to the sources of mathematics teachers' efficacy. That is, the mastery experience of mathematics teachers on their teaching practices, skills and abilities, subject matter and subject content, and instructional strategies increases their efficacy. Thus, mathematics teachers' mastery of experience enabled them to have self-reflection and deep self-confidence which eventually increases their efficacy. Also, the study found vicarious experience to be another contributing factor to the sources of mathematics teachers' efficacy. That is, learning process for mathematics teachers' since they learn from the achievements of many successful mathematics teachers. Among some of the mathematics teachers these achievements from other successful mathematics teachers create optimistic thinking and inspire them into doing something new and innovative which in turn increases their efficacy. It also allows mathematics teachers to witness some of the fruitful execution of certain difficult instructional strategies by some of their colleague mathematics teachers during instruction; during these instruction teachers learn the skills exhibited by their colleague teachers which in turn have a higher effect on their teaching skills as well as their efficacy. This learning process is sometimes called role-modelling (Bandura, 1977).

Furthermore, verbal persuasion was also described to be a factor that can lead to the sources of mathematics teachers' efficacy. That is, through constructive response on results about the performance of mathematics teachers in the teaching of the subject and the use of instructional strategies from other colleague mathematics teachers, head teacher, school administration and the school authorities positively influence their efficacy. Through verbal persuasion, some mathematics teachers who were not aware of their abilities to have adequate expertise in the teaching of mathematics and the use of instructional strategies tend to encourage them and also enable them to develop their efficacy. Finally, the study established that physiological and emotional states can also contribute to the sources of mathematics teachers' efficacy. That is, the physiological and emotional states such as excitement of mathematics teachers during instruction contributed to self-confidence which influences their efficacy.

In the case of the second research question, the study revealed that the factors that influence mathematics teachers' efficacy affects the efficacy of mathematics teachers. Specifically, the factors of mathematics teachers' efficacy scale are student engagement, classroom management and instructional strategies. This implied that, the factors of mathematics teachers' efficacy scale are an important aspect of the mathematics teacher because these factors improve the mathematics teachers' instructional skills and abilities which also influences their efficacy as well as affecting the achievements of their students.

In the case of the last objective, the study established a positive relationship between mathematics teachers' efficacy and student achievement. The results indicated that mathematics teachers that have a higher level of

efficacy are more probable to introduce instructional strategies and exhibit effective instructional skills in the classroom, use instructional management techniques and effective training methods, promote student flexibility and also take responsibilities for students than mathematics teachers that have a lower level of efficacy.

Recommendations

Linking mathematics teachers' efficacy and the achievement of students is an important relationship to consider so that teacher education programs and providers of professional learning can truly understand how to adapt instructional resources to improve the efficacy of teachers in mathematics. The findings of this study have many ramifications and recommendations. The following recommendations, based on the findings of this study, are intended to include valuable information to enhance the use of the Teacher Efficacy Scale Instrument as an instrument for measuring the efficacy of teachers, as well as to improve the level of teacher efficacy in teaching mathematics and any other subject in basic education schools.

In mathematics, professional development must strengthen knowledge of content and pedagogical curriculum of mathematics. There is also the need to relate teachers to a professional organisation that values their advancement as teachers of mathematics. In order to improve themselves and to learn from each other, mathematics teachers need to partner with each other, either in mentoring partnerships or in professional learning groups. Professional development should aim to improve mathematics teaching efficacy by ensuring that teachers are provided with expertise that can increase their classroom accomplishment.

Education policy makers, such as the Ministry of Education (MOE) and the Ghana Education Service (GES), should develop policies to ensure that all basic education schools have a standardized policy on the recruitment of subject teachers. In order to regulate efficacy levels as part of the recruitment process, the teacher efficacy instrument can also be used.

In partnership with teacher training institutions, in particular universities, the Ghana Education Service should develop a standard requirement for the certification and credentialing of teachers as a result of their recruitment for teaching in basic education schools. This is to guarantee the teachers chosen to teach have an appropriate degree of competence. The introduction of non-professional mathematics teachers into the profession would also serve to restructure it. A cordial yet professional teacher-teacher partnership should be established and sustained by mathematics teachers. This will enable foster a mutual, favourable, safe and welcoming atmosphere to increase their degree of efficacy in the classroom for better teaching and learning of the subject.

Suggestions for Further Research

Some indications have been given by the results of the study with regard to potential avenues for further studies. In order to provide a more detailed image of the teaching and learning of mathematics in Junior High Schools in Ghana, it is also proposed that some aspects of the study be investigated again. Therefore, the following areas should be examined: merely evaluating the discrepancies between the efficacy levels of different variables is just the first step in examining the efficacy of teachers. To learn more about the connections between particular variables and teacher efficacy, a more in-depth qualitative analysis should be performed. In similar studies, the field of research coverage

may be extended and the findings compared. Further research should be carried out in the area of teacher efficacy in the teaching of mathematics.

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APPENDICES
Appendix A

QUESTIONNAIRE ON SOURCES OF MATHEMATICS TEACHERS' SELF-EFFICACY

Dear Sir/Madam

This questionnaire seeks to solicit information from Junior High School mathematics teachers to aid Wilhelmina Efua Arthur, a final year student of University of Cape Coast, complete her thesis on the topic; **"Examining the Relationship between Mathematics Teachers' Efficacy and Students' Achievement at the Junior High School in the Cape Coast Metropolis"**, in pursuance of a Master's in Basic Education. This exercise is solely for academic purposes and therefore guided by all relevant ethical standards of research. Your views are very much important to the study. Every information you provide would be 100% confidential. Thanks for accepting to participate in the study.

PART A: DEMOGRAPHICS

Please indicate your response by ticking (√) in the applicable ox for each question.

1.	Sex	Male	[ ]
		Female	[ ]
2.	Age	18-28years	[ ]
		29-39years	[ ]
		40-50years	[ ]
		51-60years	[ ]
3.	Education	Diploma	[ ]
		Degree	[ ]
		Msc	[ ]
		Mphil	[ ]
		PhD	[ ]
4.	How many years have you been teaching mathematics?	1-5 years	[ ]
		6-10 years	[ ]
		11-15 years	[ ]

	16-20 years	[ ]
	21-25 years	[ ]
	26 years and over	[ ]
5. Which of these influence your self-efficacy	Sex	**[ ]**
	Age	**[ ]**
	Experience	**[ ]**
	Education	**[ ]**

PART B: SOURCES OF MATHEMATICS TEACHERS' EFFICACY

This section provides a description of sources of mathematics teachers' efficacy. Four sources have been identified with their corresponding statements as it's applicable to you. Please tick **(√)** appropriately, **from 1 (least agree) to 5 (highly agree)**

	1	2	3	4	5
Enactive mastery experience					
I feel successful in teaching students' all the mathematics topics					
I am successfully in collaborating with fellow mathematics teachers in accomplishing course targets.					
I am able to support my students in any topic in mathematics					
I am successful in practicing newly learned instructional techniques for teaching mathematics					
I am successful in practicing newly learned classroom management techniques for teaching mathematics students.					
I feel successful in participating in school-level decision making with regards to the mathematics syllabus					
I am successful in meeting school improvement goals with respect to mathematics					
I feel successful in participating in classroom-level decision making with my colleagues with regard to the mathematics					
Vicarious Experience					
I am imagining myself successfully teaching my students mathematics					
I am learning about effective mathematical teaching techniques from other teachers					
I am learning about effective mathematical teaching techniques from administrators in my school.					
I am learning about effective mathematical teaching techniques from sources outside of my school					

I always attend workshops, in-services, video courses, etc. where successful demonstration of mathematical teaching-related tasks were observed.					
Verbal Persuasion					
I receive encouragement from administration on my mathematics teaching practices.					
I have been reprimanded by my school authority for my mathematics teaching practices.					
I am receiving praise about the success of my mathematics teaching from evaluators					
I am encourage by my abilities as a mathematics teacher					
I receive positive feedback about the successfulness of my mathematics teaching abilities from my students.					
I receive positive feedback on the success of my mathematics teaching from standardized test results of my students.					
Physiological and Emotional States					
I have stress-reduction because I learned ways to improve my mathematics teaching					
I get frustrated when teaching my students mathematics					
I feel hopeless when teaching my students mathematics					
I get uncomfortable physical sensations (e.g. elevated blood pressure, sweats, increased heart rate) when teaching my students' mathematics.					
I feel pleasure when doing my job as a mathematics teacher.					
I feel excited when I am successfully reaching students struggling with mathematics.					
I feel successful in teaching students who used to struggle with mathematics.					
I watch my other teachers successfully teach difficult mathematics students.					
I feel successful in teaching above average mathematics students					

PART C: MATHEMATICS TEACHERS EFFICACY SCALE

This section provides a twenty-four (24) itemized statement on mathematics teachers' efficacy. Please tick **(√)** appropriately, **from 1 (least agree) to 5 (highly agree)**

	1	2	3	4	5
Student Engagement					
I am able to get the toughest mathematics students through.					
I am able to support my mathematics students to think objectively.					
I am able to inspire my mathematics students who have little interest in mathematics work					

I am able to make my mathematics students do a good work at school					
I am able to increase my mathematics students value for learning the subject					
I do well in encouraging innovation among my mathematics students					
I do well in boosting the understanding of my students who are not doing well in the subject					
I am able to help families in helping their children do better in their mathematics class					
Classroom Management					
I am able to monitor offensive behaviour in my mathematics classroom					
I am able to clarify my expectations about my mathematics students' behavior					
I am able to set routines for the smooth running of my mathematics teaching activities					
I am able to get my mathematics students to follow the rules of the classroom					
I am able to adopt strategies to relax disturbing or distracting mathematics students					
I do create a classroom management system for each group of the mathematics students					
I am able to prevent some troubled mathematics students from ruining an entire lesson					
I do well in responding to defiant mathematics students					
Instructional Strategies					
I do well in answering challenging questions from my mathematics students					
I do well in gauging my mathematics students' understanding on what I have taught them					
I am able to ask my mathematics students important questions					
I am able to modify my mathematics lessons to the correct standard for individual students					
I have different assessment strategies for my mathematics students					
I am able to offer an answer or explanation to my mathematics when the need arises					
I apply different approaches in managing my mathematics class					
I am able to present the right challenges for highly skilled mathematics students					

Appendix B

Circuits	Total number of schools	Total number of JHS three students	Percentage of students from each circuit	Sample size per each circuit
Aboom	11	553	21.8	72
OLA	8	315	12.4	41
Abura/ Pedu	13	510	20.1	67
Bakaano	11	386	15.2	51
Efutu	12	339	13.3	44
Cape Coast	8	439	17.3	58
Total	67	2542	100	333

Appendix C

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Note: N is Population Size; S is Sample Size *Source: Krejcie & Morgan, 1970*

Appendix D

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
ETHICAL REVIEW BOARD

UNIVERSITY POST OFFICE
CAPE COAST, GHANA

Our Ref: CES-ERB/ucc.edu/14/20-30 Date: 2nd June, 2020

Your Ref: .....

Dear Sir/Madam,

ETHICAL REQUIREMENTS CLEARANCE FOR RESEARCH STUDY

Chairman, CES-ERB
Prof. J. A. Omotosho
jomotosho@ucc.edu.gh
0243784739

Vice-Chairman, CES-ERB
Prof. K. Edjah
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Secretary, CES-ERB
Prof. Linda Dzama Forde
lforde@ucc.edu.gh
0244786680

The bearer Wilhelmina Efua Arthur., Reg. No. EF/BEP/18/0015 is an M.Phil. / ~~Ph.D.~~ student in the Department of Basic Education in the College of Education Studies, University of Cape Coast, Cape Coast, Ghana. ~~He/~~ She wishes to undertake a research study on the topic:

Examining the relationship between Mathematics teachers' efficacy and student achievement at the Junior High School in the Cape Coast Metropolis

The Ethical Review Board (ERB) of the College of Education Studies (CES) has assessed ~~his~~/her proposal and confirm that the proposal satisfies the College's ethical requirements for the conduct of the study.

In view of the above, the researcher has been cleared and given approval to commence ~~his~~/her study. The ERB would be grateful if you would give ~~him~~/her the necessary assistance to facilitate the conduct of the said research.

Thank you.
Yours faithfully,

Prof. Linda Dzama Forde
(Secretary, CES-ERB)

Appendix E

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
FACULTY OF EDUCATIONAL FOUNDATIONS
DEPARTMENT OF BASIC EDUCATION

Telephone: +233-(0)3321-33379
Cables: University, Cape Coast
Email: basic.education@ucc.edu.gh

UNIVERSITY POST OFFICE
CAPE COAST, GHANA

Our Ref: DBE/2/V.4/84

Your Ref:

14th May, 2020

Dear Sir/Madam,

LETTER OF INTRODUCTION

The bearer of this letter Wilhelmina Efua Arthur is a level 800 student at the Department of Basic Education, University of Cape Coast.

She is undertaking a study on **"Examining the Relationship between Mathematics Teachers' Efficacy and Students' Achievement at the Junior High School in the Cape Coast Metropolis"**. In connection with this, she needs to collect data.

The study is academic in purpose and data collected will be treated as confidential.

We would, therefore, be grateful if you could give her the necessary assistance.

Yours faithfully,

Thank you.

Nana (Dr.) Aaron Osafo-Acquah
HEAD OF DEPARTMENT