EFFECT OF HIGH SCHOOL MATHEMATICS EDUCATORS' SELF-EFFICACY ON LEARNERS' PERFORMANCE IN MATHEMATICS GRADE 12

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DECLARATION

STUDENT NUMBER: **62112805**

I declare that “Effect of High School Mathematics Educators’ Self-efficacy on Learners’ Performance in Mathematics Grade 12” is my work and that all the sources that I have used or quoted have been indicated and acknowledged using complete references.

Miss Gqamane MN

Signature:  ……Date: 21 February 2022……

DEDICATION

This study is dedicated to my loving and caring husband Reverend Mzuvelile Godongwana and my children Amahle, Lindokuhle, Olwakhe, Iyapha and Lunje for their patience, support and understanding when I was busy with my studies and they needed me most.

To my mother, Galie Soldati-Gqamane, thank-you for implanting the value of education in me - this work belongs to you.

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ABSTRACT

Previous studies indicate that national leaders, policy makers and educators share the desire to understand and identify factors that have a significant and reliable relationship with mathematics performance. To enhance learners' cognitive and affective outcomes in mathematics, educational psychologists and mathematics educators have continued to search for variables which could improve academic performance in mathematics. Of all the variables that have attracted researchers' interest in this area of educational achievement, mathematics self-efficacy appears to be gaining more popularity. This study thus aims to examine the effect of high school mathematics educators' self-efficacy on learners' performance in mathematics. The objective of the study was to assess the association of high school mathematics educators' self-efficacy levels and learners' performance in mathematics and to suggest ways to use high school mathematics educators' self-efficacy to enhance learners' performance in mathematics. The social cognitive and self-determination theories served as the theoretical framework which underpinned the study. A quantitative research approach was used in this study. Two hundred and twenty-five (225) high school mathematics educators were sampled randomly and formed the respondents of the study. The sample was drawn from 165 schools in the Eastern Cape Province of South Africa. Statistical analyses were undertaken to analyse data that were collected through questionnaires. Salient findings showed that self-efficacy had a positive impact on the educator's professional development and the learner's performance in mathematics. Based on this the study recommends the inclusion of self-efficacy in educator professional development at national and district levels.

Keywords: Self-efficacy; social cognitive theory; mathematics; academic performance.

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CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.0. INTRODUCTION

This study is inspired by the researcher's own experience as a mathematics educator and a marker of National Senior Certificate (NSC) examination scripts. Some evidence indicates that learners' performance in mathematics remains a challenge internationally, and South Africa is no exception (Makgato, 2007; Warfield, 2008; EdSource, 2008; Feza-Piyose, 2012; International Mathematics Union (IMU) 2014). The researcher in this study seeks to examine the effect of high school mathematics educators' self-efficacy on learners' performance in mathematics.

However, regarding the importance and positive influence of self-efficacy in academic achievement as documented by Bandura (1986,1997) and supported by other researchers (Ormrod, 2008; Diseth, 2011; Zuya, Kwalat & Attah, 2016), the researcher seeks to examine the effect of high school mathematics educators' self-efficacy on learners' performance in mathematics. A study of this nature has not been identified in the Eastern Cape (EC) Province of South Africa (SA). Therefore, it is expedient to carry out this research. The study will involve 225 mathematics educators from five Education Districts in the EC Province. It is anticipated that the findings will provide policy makers and stakeholders with significant information about high school mathematics educators' self-efficacy levels. Moreover, it will assess the association between the mathematics educators' self-efficacy levels and learners' performance in mathematics. In addition, it will suggest ways to use self-efficacy to enhance learners' performance in mathematics.

1.1. BACKGROUND

This section provides a brief discussion on self-efficacy, and also mathematics educators' self-efficacy with a focus on mathematics.

1.2.1 Self-Efficacy

Bandura (1977, 1986) defines self-efficacy as individuals' belief and their capability in accomplishing a certain task. Similarly, Williams and Rhodes (2014) define self-efficacy as a perceived ability to perform to a target behaviour. Self-efficacy is acknowledged as an important concept in social cognitive theory. It has, therefore, been generally documented as one of the prominent theories about human learning (Ormrod, 2008; Ning & Downing, 2010; Diseth, 2011). Empirical research studies indicate that self-efficacy is a reliable academic performance predictor (Brown, Tramayne, Hoxha, Telander & Lent, 2008; Schmidt, Messoulam & Molina, 2008; Pérez, Lescano, Heredia, Zalazar, Furlám & Martíne, 2011). Based on this, the concept of self-efficacy has recently caught the attention of educational psychology (Ebstrup, Eplov, Pisinger, & Jorgensen, 2011; Mingming, 2015). In addition, other researchers have also shown that self-efficacy is an important capability as well as the performance cognitive mediator which forecasts success and enhances cognitive processes (Salanova, Llorens & Shaufeli, 2011; Vera, Salanova & Martín-del-Río, 2011). Furthermore, researchers postulate that self-efficacy enhances academic achievement (Diseth, 2011; Parker, Marsh, Ciarrochi, Marshall & Abduljabbar, 2014).

Perceived self-efficacy plays a key role in human performance and does not only directly impact behaviour. It is thus not surprising that Sansinenea, Agirrezabal, Larrañaga, Ortiz, Valencia and Fuster (2008) note that it affects basic elements such as goals, expectations, affective trends and perceived hindrances and opportunities in a social environment. Accordingly, it persists even when people are faced with difficulties that may hinder their success in performing a task.

Considering the above, it is worth noting that self-efficacy affects human motivation, persistence, efforts, action, behaviour and achievement (Bandura, 1977; 2000; 2012; Zimmerman & Schunk, 2011). The difference between self-efficacy and other self-constructs, according to Webb-Williams (2014), is that self-efficacy is a judgement of capability to perform a task. It is not a judgement of personal qualities or self-worth. This means that educators can show high self-efficacy in one discipline - for example accounting - but, low self-efficacy in mathematics. Self-efficacy is an expectancy belief which is measured before the task is performed. Therefore, it is not about how an educator feels about a task *after* it has been completed. Although, there is a strong

relationship between self-efficacy and performance, it is yet to be seen whether educators with low skills and a high sense of self-efficacy can perform well. The view expressed here, points to the assumption that it takes more than a high sense of self-efficacy to produce high achievements. Furthermore, this study is interested in the influence that self-efficacy may have on educators' motivation to acquire skills for their teaching performance.

1.2.2 Mathematics educators' self-efficacy

There are many examples of mathematics educators who are particularly successful in their teaching roles. However, there needs to be an interrogation of what makes these mathematics educators more effective in comparison with other mathematics educators in the teaching profession. An important contributor to their success might be their self-efficacy in performing their tasks as mathematics educators. Their confidence and capabilities in learners' engagement and classroom management in the teaching and learning process play a central role. These high-efficacy mathematics educators may be better equipped to handle varying situations and may transfer their high self-efficacy to their learners. This will enhance the learners' self-efficacy as well as their academic performance in mathematics.

Based on the foregoing discussions, mathematics educators' self-efficacy can be defined as their ability to plan and execute instructional objectives successfully. This is the confidence that the mathematics educator has in their capability to perform a task. Likewise, mathematics educators' self-efficacy can be explained as their conviction or confidence in their abilities to solve problems in mathematics. However, Zuya et al (2016) aver that mathematics educators' self-efficacy is different from their confidence. They posit that mathematics educators' competence concerns their professional knowledge and skills, while self-efficacy is a wider concept. This points to the fact that mathematics educators' self-efficacy goes beyond just having professional knowledge and skills; it is also the belief that they have the capability to put their professional knowledge and skills into action.

Furthermore, Gavora (2010) argues that mathematics educators' high sense of self-efficacy enables them to use their professional knowledge and skills successfully. However, a low sense of mathematics self-efficacy may hinder the use of professional

knowledge and skills, and may affect learners' learning negatively. As a result, learners may develop a negative attitude towards mathematics. Gavora stresses that a powerful self-regulatory attribute that enables educators to use their potential to enhance learners' understanding is their self-efficacy.

Gavora (2010) goes on to posit that mathematics educators' self-efficacy is related to "perseverance". This means that the stronger the self-efficacy, the greater the perseverance, and the greater the perseverance, the greater the likelihood that the teaching behaviours will be successful. According to Kahle (2008), mathematics teaching self-efficacy is about how educators influence learners positively to foster success in mathematics and reduce anxiety and negative beliefs about the subject. Kahle emphasises that researchers have shown the need for educators to teach self-efficacy, and how this affects the types of classroom learning environments.

Mathematics educators with a higher self-efficacy belief have different characteristics in comparison to those with a lower self-efficacy belief. They place more importance on establishing a cordial relationship with their learners. They are more tolerant and tend to support low-attaining learners. They make more of an effort to assist mathematics learners to improve their self-confidence. This may enhance learners' performance in mathematics. As a result, learners' attitude towards the subject may be enhanced. It may therefore even affect their mathematics performance positively.

1.2.3 A Focus on mathematics

Globally, mathematics is acknowledged as a critical success factor for education (Ajayi, 2009). For this reason, researchers such as Lebens, Graff and Mayer (2010) and Polya (2011) posit that the fundamental concepts of mathematics need to be acquired from a young age for learners to function well in everyday life. Lynn and Brocado (2009) and Umameh (2011) argue that mathematics is a fundamental part of human thought and logic and is a prerequisite for the scientific, technological and economic progress of any country. For this reason, Ketterlin, Geller, Chard and Fien (2008) and Ogena, Lana, and Sasota (2010) suggest that mathematics be recognised as an important skill in the corporate world and a factor in development. It is a fact that the success learners achieve in mathematics has consequences not only for their personal and professional lives but also for national development. Based on this,

researchers such as , Cappellari, Lucifora and Pozzoli, 2008 and Steinberg, Varua and Yong (2012) argue that a strong foundation in mathematics is essential for success in tertiary education and beyond.

Despite the importance of mathematics in today's scientific world as mentioned earlier, learners' performance in the subject is still low and there is a general decline in the number of learners enrolled in tertiary-level mathematics courses in Western countries (Mishra, 2011; Smith, 2011, Ramanujam, 2012). Reports indicate that one of the greatest challenges in the United States of America (USA) is low performance in mathematics (Friedman, 2007; Warfield, 2008; EdSource, 2008). Consequently, there is a negative attitude towards mathematics courses and related careers. Also, the report indicates that, in general, South African learners are weak in mathematics at the primary and secondary school levels. Therefore, over the last 20 years, relatively few learners have pursued mathematics and related fields at university level (IMU, 2014). This accentuates the seriousness with which the underperformance in mathematics is viewed.

1.2.4 Academic performance

Self-efficacy, as defined by Bandura (1997), represents individuals' judgments of their abilities to shape and execute actions necessary for achieving desired goals. It is a belief in one's proficiency within a specific context to perform successfully (Woolfolk, 1998). In the realm of education, self-efficacy that extends to educators is referred to as educators' self-efficacy and encompasses their confidence in their teaching competence in facilitating learners' learning and academic achievement (Allinder, 1994).

Highly efficacious educators exhibit a willingness to experiment with innovative teaching methods, maintain adaptability in instructional strategies, and persevere through challenges (Allinder, 1994). The relationship between educators' self-efficacy and learners' performance is notable. Educators with strong efficacy beliefs foster a learning environment that positively influences learners' academic progress, instilling motivation and encouraging deeper learning (Tschannen-Moran & Hoy, 2001). Educator efficacy has a reciprocal relationship with learners' learning approaches. The confidence of educators in their teaching abilities complements learners' motivation to

learn, leading to improved academic performance (Haung, Liu, & Shiomi, 2007; Ijeh & Potokri, 2021). At the heart of this relationship is the idea that learners' mathematical learning capabilities are significantly influenced by their educators' high self-efficacy beliefs (Marsh, 1986). Consequently, learners' mathematical reasoning and achievement improve from elementary through secondary and higher secondary levels (Marsh, 1986). Moreover, educators with high mathematics self-efficacy are better equipped to impart mathematical skills to their learners, contributing to enhanced mathematical abilities among learners (Wilkins, 2008).

The relationship between educators' self-efficacy and learners' academic achievement can be context-specific, varying across countries due to cultural and environmental factors (Wilkins, 2008). The impact of educators' self-efficacy on learners' mathematics performance may differ depending on the educational setting and the cultural context. In Pakistan, studies have explored the influence of self-efficacy on various educational variables, including test anxiety, self-regulated learning, school identification, and academic success (Shafiq Ahmed et al., 2012). Significant correlations have been observed between learners' self-efficacy and self-regulated learning, as well as academic achievement, emphasising the importance of self-efficacy in educational outcomes. Educator self-efficacy, deeply studied both in mathematics education and other contexts, pertains to educators' judgments about their ability to positively impact learners' learning (Carney et al., 2016; Pajares, 1996). This future-oriented judgment guides educators' actions and determines the effort they invest in their teaching pursuits (Woolfolk Hoy & Burke-Spero, 2005). Research has consistently linked educator self-efficacy to various outcomes, such as learner achievement, instructional quality, management of educational reform, educator retention, anxiety, and burnout (Bruce & Ross, 2008; Depaepe & König, 2018; Day & Gu, 2014; Gresham, 2008; Brouwers & Tomic, 2002).

In mathematics education, quantitative studies have been prominent, primarily relying on surveys and established scales. Commonly used instruments such as the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) assesses personal mathematics teaching efficacy and mathematics teaching outcome expectancy (Enochs, Smith, & Huinke, 2000). These studies have provided valuable insights into the relationships between educators' self-efficacy and their instructional practices.

In South Africa, mathematics was amongst the five subjects that were announced by the Minister of Education to be poorly performed. Results for South Africa in mathematics according to the statistics are as follows: (Department of Basic Education, 2019).

PERFORMANCE TRENDS (2017-2019) - National level

Year	% achieved
2017	51.9
2018	58.0
2019	54.6

Source: (DBE, 2019)

The above table reflects the performance of mathematics at national level where a large percentage of learners fall below the category of 30-40% pass . This makes it difficult for admission at university for a science career. This is sometimes exacerbated by the point-scoring system used by many universities. Most universities prefer a minimum of 50% pass which is obtained by few learners in this subject. Eastern Cape is in the last position (Department of Basic Education (DBE), 2019).

PERFORMANCE TRENDS IN EASTERN CAPE (2017-2019)

	% achieved
2017	42.3
2018	45.5
2019	41.8

Source: (DBE, 2019)

PERFORMANCE TRENDS IN MTHATHA EDUCATION DISTRICT (2017-2019)

	% achieved
2017	42.9
2018	45.4
2019	41.9

Source: (DBE, 2019)

Learner performance in mathematics might be above 30% overall pass rates but the majority of learners obtain below 30% (DBE, 2018). In many schools the overall

percentage of learners is boosted by learners obtaining 30% which will not get them a good career (DBE, 2017; DBE, 2018). When one considers the learner performance in Mthatha district the overall pass is just above 40%. However, the majority of learners obtain a 30%-40% pass. In order for learners to achieve a bachelor's degree they need to have a university entrance which requires a bachelor pass. The average learner must therefore obtain a 50% pass in the subjects taken in Grade 12 (DBE, 2008). Getting less than 50% in a subject can put a learner at a disadvantage of not meeting the point system used by the majority of universities (University Prospectus). Educators, together with the Department of Education tend to focus more on quantity rather than quality passes for learners. Educators are praised for achieving a 100% pass rate. This includes 30% which is categorised as a pass by the Department of Basic Education (DBE, 2018).

According to the Chief Marker's report, learners lack the ability to understand geometry, probability, trigonometry and Euclidean geometry, (DBE, 2018). Educators are advised by the Chief Marker to conduct regular class discussions (DBE, 2019). More activities carried out by learners develop more understanding (DBE, 2016). This exercise requires educators with high self-efficacy since they are said to be confident about content knowledge. They do not fear to be criticised by learners to get different versions of the same issue for critical analysis and a full understanding of the subject. Literature reveals that an educator's' sense of efficacy is an important attribute of effective teaching (Swackhamer, Koellner, & Basile, 2009).

Educator self-efficacy as a personal characteristic mainly affects student and educator level outcomes through patterns of educator behaviour and practices that define the quality of the classroom environment (Zee, 2016). According to Ross, (2010), educator self-efficacy refers to educator perceptions that they constitute an effective instructional team capable of bringing about learning in students. Educators normally perceive themselves as being able to bring out learning in students when they are confident about the subject content. Being confident about the content requires ongoing preparation and teamwork to boost your confidence level (Ucar & Sungur, 2017).

In the Chief Marker's report it is emphasised that an improved performance-level of learners needs educators who are confident enough to interact with the previous year's question papers and to fully engage learners in instruction to develop a better understanding of the subject (DBE, 2016). As a result, mathematics educators need to have a sense of high efficacy, especially in areas indicated above, to enhance their learner performance and be goal oriented (Dull, 2015).

Literature reveals that low-efficacious educators are more likely to attribute difficulties in teaching elsewhere, since they use a textbook method and avoid challenging questions from learners by even limiting learner engagement (Swackhamer & Kimbrough, 2009; Mazlum & Dasta, 2015). Hence the continued underperformance of Grade 12 mathematics learners. This begs the question: Does self-efficacy in Grade 12 mathematics educators influence learner academic achievement?

Literature links learner academic achievement to educator self-efficacy (Myron & Dembo, 1985; Mazlum & Charughi, 2015; Swackhamer & Koellner, 2009 & Toran, 2017). This can also be noted in other subjects like accounting and physical science, where the continued poor academic achievement of learners is linked to low efficacious educators (Aina & Olanipekun, 2015; Udo & Akpanobong, 2017; Kalagbor, 2016). Swackhamer (2009) further states that learners who had educators with high level of efficacy outperform learners who had educators with lower levels of efficacy in mathematics.

1.3 RATIONALE OF THE STUDY

The motivation for choosing this topic is that mathematics is a critical subject, and it lays a solid foundation for other subjects such as accounting, physics and finance in institutions of higher learning. (Steinberg et al. 2010). Based on this, stakeholders and researchers are concerned about the decline in the number of mathematics learners in tertiary institutions. Several researchers have reported that educators' self-efficacy has a positive influence on learners' academic performance (Velu & Nordin, 2011; Hemmings, Kay, Sharp, & Taylor, 2012; Wright & Holttum, 2012; Pasupathy & Siwatu, 2014). Based on the foregoing discussions, the researcher is inspired to examine the effect of high school mathematics educators' self-efficacy on learners' performance in

mathematics particularly in rural schools in a developing country – the kind of research setting or context that most-earlier studies seem to have excluded. Therefore, a study of this nature is desirable.

1.4 PROBLEM STATEMENT

South Africa faces significant challenges in mathematics education, with poor outcomes at both primary and secondary school levels (IMU, 2022). This issue has ramifications for learners' pursuit of mathematical studies and careers, leading to shortages of skilled professionals in mathematics-related fields (IMU, 2022). While various factors contribute to this problem, the role of mathematics educators' self-efficacy remains an under-explored area (Ünsal & Korkmaz, 2015). Within the EC Province - the intended research site - a notable gap exists in the investigation of high school mathematics educators' self-efficacy and its impact on learners' mathematics performance. Therefore, the central research problem in this study is the examination of the relationship between high school mathematics educators' self-efficacy and learners' mathematics performance.

Scholars have shown an increasing interest in the study of self-efficacy and its implications for human performance (Clayson & Sheffet, 2006; Nauta, 2004; Muijs & Reynolds, 2001; Bandura, 1997; Soodak & Podell, 1993). Educators play a pivotal role in the education system, significantly influencing learners' learning outcomes. Educator competence is closely tied to self-efficacy, as educators with higher self-efficacy tend to be more effective in their roles, impacting student performance positively (Bandura, 1997). Self-efficacy, as defined by Bandura (1997), relates to an individual's ability to organise social, technical, and behavioural skills to achieve specific goals. In the context of teaching, it reflects an educator's confidence in determining student outcomes. High self-efficacy among educators has been associated with numerous positive attributes, including a positive attitude, emotional control, openness to innovative teaching methods, and adaptability to new techniques (Bandura, 2002).

In a rapidly evolving educational landscape that demands creativity and critical thinking skills from learners, educator self-efficacy becomes indispensable (Gul, 2014). The study aims to address this critical issue by investigating the impact of high

school mathematics educators' self-efficacy on learners' performance in mathematics, with the goal of contributing to the enhancement of mathematics education in the EC Province.

1.5 RESEARCH AIMS AND OBJECTIVES

1.5.1 Aim of the study

To examine high school mathematics educators' self-efficacy on learners' performance in mathematics.

1.5.2 Objectives of the study

- To examine the high school mathematics educators' self-efficacy levels.
- To assess the association of high school mathematics educators' self-efficacy levels and learners' mathematics performance.
- To propose guidelines as to how high school mathematics educators' self-efficacy can be used to enhance learners' performance in mathematics.

1.6 RESEARCH QUESTION

The main research question postulated for this study is: What are the effects of high school mathematics educators' self-efficacy on learners' performance in mathematics?

1.6.1 Sub-questions

- What are high school mathematics educators' self-efficacy levels?
- How significant is the relationship between high school mathematics educators' self-efficacy levels and learners' performance in mathematics?
- How can high school mathematics educators' self-efficacy be used to enhance learners' performance in mathematics?

1.7 RESEARCH HYPOTHESES

Based on the research questions, the following hypotheses have been formulated to help to respond to or answer research question 2 appropriately:

Hypothesis 1

$\mathbf{H_0}$: High school mathematics educators' self-efficacy levels are significantly high enough to enhance the learners' performance in mathematics.

$\mathbf{H_1}$: High school mathematics educators' self-efficacy levels are not significantly high enough to enhance the learners' performance in mathematics.

Hypothesis 2

$\mathbf{H_0}$: High school mathematics educators' self-efficacy levels have a significant effect on the learners' performance in mathematics.

$\mathbf{H_1}$: High school mathematics educators' self-efficacy levels have no significant effect on learners' performance in mathematics.

1.8 SIGNIFICANCE OF THE STUDY

Ünsal and Korkmaz (2015) posit that educators undertake vital responsibilities in achieving the objectives and encouraging effective and permanent learning throughout the process of teaching mathematics. In view of this, educators are required to possess specific capabilities to carry out these responsibilities.

The most important competency among these, as shown above in this proposal (see sections 1.2.1, 1.2.2 and 1.2.3) is self-efficacy belief. Therefore, it is necessary to ascertain high school mathematics educators' self-efficacy levels and how these are related to learners' performance in mathematics. Data from this study will provide policy makers and stakeholders with significant information about high school mathematics educators' self-efficacy levels. Furthermore, the study will suggest ways to use high school mathematics educators' self-efficacy to enhance learners' performance in mathematics. The findings will also serve as a platform for further study in the fields of mathematics, educators' self-efficacy and academic-related studies.

1.9 DELIMITATIONS OF THE STUDY

For this study, only five education districts in the Eastern Cape will be considered due to ease of geographical accessibility and proximity. In these districts, the study will be confined to mathematics educators for the sake of uniformity and manageability. Therefore, mathematics learners and mathematics educators not in the five education districts will be outside the purview of this study. Future researchers could consider the other education districts.

1.10 OPERATIONAL DEFINITION OF TERMS

For this study, the following key concepts within the context of the research must be explained: Educators' self-efficacy, mathematics performance and self-efficacy.

1.10.1 Mathematics educators' self-efficacy

Mathematics educators' self-efficacy could be operationally defined as their abilities to plan and execute instructional objectives in mathematics successfully. Likewise, mathematics educators' self-efficacy could be explained as their confidence in their abilities to solve problems in mathematics (Zuya, H.E., Kwalat, S.K. & Attah, B.G., 2016)

1.10.2 Self-efficacy

Self-efficacy refers to individuals' capability to exercise control over challenging demands (Bandura, 1997). Williams and Rhodes (2014) define self-efficacy as a perceived ability to perform a target behaviour.

1.11 THEORETICAL FRAMEWORK

This research will be based on the theory of human learning and development by Bandura (1986). He highlights that the social cognitive theory is an important body of work which assists educators to create effective learning processes that address the way learners learn. Furthermore, Bandura (2001) argues that this theory focuses on the interactions among personal factors, behaviours and the environment. It is noted that self-efficacy is one of the personal factors which has attracted several researchers' attention. This is because it has a positive influence in the teaching and

learning domain. However, learning in the classroom does not occur for an individual learner from their brain alone, but is also influenced by their peers and educators. This is where the social cognitive theory, as put forth by Bandura (2001) features.

Skaalvik and Skaalvik (2007: 611) state that "individuals are self-organising, proactive, self- regulating, and self-reflecting". Therefore, based on the foregoing discussions, the social cognitive theory is deemed appropriate to guide this study as a theoretical framework. The literature reveals that the self-efficacy of educators is boosted by experience, professional development and teamwork (Jackson, 2012; Yoo, 2016 and Toran, 2017). Experience is gained by spending time in the field observing different instructional strategies, imitating others, and replicating best practice for the best results.

This study will also be informed by Vygotsky's constructivism perspective. Since children learn much through interaction; curricula should be designed to emphasise interaction between learners and learning tasks (Vygotsky, 1978). To teach well, we must understand the mental models that learners use to perceive the world (Bandura, 1997). The purpose of learning is for an individual to construct his or her own meaning. The mathematics curriculum is structured in such a way that learners are actively engaged in learning for the better understanding of the subject (DBE, 2008). Teaching and learning are not easy journeys, and educators have a fundamental role to play in influencing the achievement of learners (Nebesniak, 2013). Nebesniak (2013) further states that the notion of clear teaching does not exist. Instead, she suggests that the major method of effective instruction should include developing a conceptual understanding, making curricular connections, and engaging learners while efficiently directing their attention. Educators with a high level of efficacy believe in a learner's ability (Tiffany, 2017). As a result, highly-efficacious educators do not fear a learner-centred approach as their chosen teaching strategy (Dunn & Airola, 2013; Potokri & Mwelitondola, 2022). Therefore, Vygotsky's constructivist perspective which is learner-centred is suitable for this study.

Mathematics learners need to feel involved in the lesson by being given challenging tasks to perform on their own (DBE, 2019). Active learning leads to greater retention and higher levels of thinking, and this is what is encouraged in trigonometry. Educators must be able to adjust the level of help given to learners in response to their level of

performance. This is called scaffolding. According to Vygotsky (1978), scaffolding not only produces results, but also instils the skills necessary for independent problem-solving in the future. Mathematics learners need that independent problem-solving skill in geometry. When you are part of the puzzle and not the spectator, it becomes very easy to understand and an educator can adopt this (Vygotsky, 1978). This requires an educators who are fully prepared and have planned lessons effectively to be able to control classes and drive debates in the right direction (Tschannen-Moran & Woolfolk, 1998). In this approach all questions are valued, and knowledge is interactive and collaborative. As a result, critical analysis is encouraged and instilled, as per the DBE Chief Marker's report (2019).

1.12 LITERATURE REVIEW

This section provides a brief review of literature on self-efficacy and mathematics educators' self-efficacy. This study seeks to examine the effect of high school mathematics educators' self-efficacy on learners' performance in mathematics. This will involve influential contributions to cognitive processes, human motivation, persistence, effort, and action. However, it is noted that the educator's self-efficacy is a perceived capability to execute a task. As indicated earlier, it affects motivation, persistence, effort and action. According to Ormrod (2008) perceived self-efficacy occupies a pivotal role in the social cognitive theory because it affects action. As mentioned in the background to this study, the social cognitive theory has generally been documented as one of the most significant theories about human learning (Ning & Downing, 2010; Diseth, 2011).

1.12.1 Self-efficacy

Tena and Joanne (2017) describe self-efficacy as a perceived judgement that one could use to execute a course of action that brings about a desired result. Similarly, Gavora (2010) defines self- efficacy as one's conviction about their capabilities to carry out certain tasks in a suitable and effective manner. Additionally, Liu and Koirala (2009) define self-efficacy as one's belief in successfully fulfilling a given task. Furthermore, Bandura (1997) also defines self-efficacy as individuals' capability to exercise control over challenging demands.

The belief or perception that an individual has about their ability to carry out certain tasks motivates him or her. Following the definitions, self-efficacy could be described as a set of beliefs that enables an educator to intervene when their learners have difficulty in achieving a set goal in their class. This means that self-efficacy is important because it guides an educator's actions, behaviours and could affect their learners' expectations. The significant role that perceived self-efficacy plays in academic achievements has been extensively studied in different areas including physical activities (Sperber, Hall, Allen, Devellis & Callahan, 2014), health (Jerome & McAuley, 2013) and behavioural therapies (Gallagher, Payne, White, Shear, Woods, Gorman & Barlow, 2013).

Several researchers have reported that self-efficacy has a positive link with learners' achievement (Hoy & Miskel, 2008; Seashore-Louis, Leithwood, Washlstrom & Anderson 2010; Goddard, Goddard, Sook Kim & Miller, 2015). Pendergast and Keogh (2011) examine self-efficacy beliefs of educators. They report that educator self-efficacy beliefs are a crucial structure which shapes their effectiveness in the classroom and motivates them. It has been observed that educators with high self-efficacy are flexible in teaching and have the potential to strive to help all learners. Garvis and Pendergast (2011) examine educator self-efficacy in early childhood education; they report a positive relationship between high educator self-efficacy and the quality of the education given to the learners. Research also reports that self-efficacy operates as a resource preventing the negative consequences of strain (Blecharz, Luszczynska, Scholz, Schwarzer, Siekanska & Cieslak, 2014).

In addition, an educator's self-efficacy has been shown to relate to several school-based factors, including positive educator behaviour (Woodcock, 2011) and improved educator motivation and effectiveness (Stripling, Ricketts, Roberts, & Harlin, 2008; Klassen & Tze, 2014). Based on the discussions, possessing a high self-efficacy belief is the most important feature expected of a well-trained educator (Dede, 2008). Therefore, a study to ascertain the effect of mathematics educators' self-efficacy on learners' performance in mathematics is very important. The literature review for mathematics educators' self-efficacy is presented below.

1.12.2 Mathematics educators' self-efficacy

Mathematics self-efficacy has been described as the confidence and capability to employ the skills necessary to deal with mathematics tasks and cope with task-specific challenges and their consequences (Shoji, Cieslak, Smoktunowicz, Rogala, Benight & Luszczynska, 2015). Liu, and Koirala (2009) conducted a study on the effect of mathematics self-efficacy on mathematics achievement of high school learners in the USA. The result indicates that mathematics self-efficacy and mathematics achievement are positively related. This suggests that educators' self-efficacy in mathematics has a positive influence on their learners' mathematics achievement. In the same vein, studies conducted by Ayotola & Adedeji, 2009 and Wan & Mohd, 2010) concur that there is a very strong positive relationship between mathematics self-efficacy and mathematics achievement. Additionally, Zuya et al. (2016) conducted a research study on pre-service educators' mathematics self-efficacy and mathematics teaching self-efficacy. The findings indicate a positive relationship between pre-service mathematics educators' mathematics self-efficacy and mathematics teaching self-efficacy. This shows that the conviction that the educators have in their abilities to do mathematics correlates positively with the belief in their capability to teach mathematics.

Unlu and Ertekin (2013) conducted a study on the relationship between mathematics teaching self-efficacy and mathematics self-efficacy. The participants were 144 pre-service elementary mathematics educators. The study reported high performance on both scales by the participants; also, there was a significant positive relationship between mathematics teaching self-efficacy and mathematics self-efficacy of the pre-service elementary mathematics educators. In addition, Khale (2008) reports that mathematics self-efficacy and mathematics teaching self-efficacy relate to conceptually and procedurally oriented teaching practices.

Furthermore, a study conducted by Siegle and McCoach (2007) on increasing learner mathematics self-efficacy through educator training reports a significant relationship between mathematics self-efficacy and mathematics achievement. Siegle and McCoach (2007) and Kahle (2008) posit that educator teaching self-efficacy affects their choice of instructional method and classroom environment. They further emphasise that this in turn affects both learner learning and learner self-efficacy. This

means that learners' mathematics self-efficacy may be affected either positively or negatively depending on whether their educator has a high or low sense of mathematics self-efficacy.

1.12.3 Mathematics educators' self-efficacy and learners' performance in mathematics

National leaders, policy makers and educators share the desire to understand and identify factors that have a significant and reliable relationship with mathematics performance (Phan, Sentovich, Kromrey, Derick & Ferron, 2010). To enhance learners' cognitive and affective outcomes in mathematics, educational psychologists and mathematics educators have continued to search for variables which could improve academic performance in mathematics. Of all the variables that have attracted researchers in the area of educational achievement, mathematics self-efficacy seems to be gaining more popularity (Ayotola & Adedeji, 2009). As indicated in the previous sections, Bandura defines self-efficacy as a belief or conviction that one should have to organise and execute a task. He hypothesises that this conviction raises achievement in a particular domain by causing behaviours that enhance better performance. This suggests that mathematics educators' self-efficacy influences their behaviour towards the teaching and learning of mathematics.

Based on the significant influence that self-efficacy has on learners' performance in mathematics, Shams, Mooghali, Tabebordbar and Soleimanpour (2011) carried out a research study on the role of academic self-efficacy in the relationship between the Five-Factors Model (FFM) of personality and mathematics performance. Findings indicate significant positive correlation between FFM and mathematics performance. Additionally, research studies conducted in Australia, the USA, United Kingdom (UK), and Malaysia found that an educator's self-efficacy has a positive influence on learners' academic performance (Velu & Nordin, 2011; Hemmings et al., 2012; Wright & Holttum, 2012; Pasupathy & Siwatu, 2014).

According to Nurlu, (2015), researchers agree that educator beliefs toward mathematics and the teaching profession are important factors that have a positive effect on learners' mathematics learning. In this regard, educator self-efficacy, which is defined as educators' sense of personal ability to organise and execute their

teaching (TIMSS, 2011), is not only linked to professional behaviour, but also to enhancing learners' achievement in mathematics specifically and in general. Based on the discussions, there is enough evidence that mathematics educators' self-efficacy has a significant influence on mathematics learners' performance in mathematics. It is also noted that mathematics educators' self-efficacy does not only affect academic achievement but also enhance educators' behaviour (Velu & Nordin, 2011; Hemmings et al., 2012; Wright & Holttum, 2012; Pasupathy & Siwatu, 2014). Therefore, a study to examine the effect of high school mathematics educators' self-efficacy on learners' performance in mathematics is desirable.

1.13 RESEARCH METHODOLOGY

This section discusses the technical aspects that guided the research process. These include the research paradigm; research approach; research design; population, sample, and sampling techniques; data collection instruments; issues of validity and reliability; data analysis and ethical considerations of the study. Below is a brief discussion on each.

1.13.1 Research paradigm

According to Maree (2007), research paradigms serve as the lens or organising principles by which reality is interpreted. This study adopted a positivist research paradigm. According to Mack (2010), the purpose of a research in this paradigm is to test a hypothesis and that the characteristics of a positivist research include an emphasis on scientific method and statistical analysis. Regarding the discussions and the purpose of this study, a positivist paradigm was deemed appropriate.

1.13.2 Research approach

This study followed the quantitative research approach. According to Pietersen and Maree (2007), quantitative research is a process which is systematic and objective in its ways of using numerical data from only a selected subgroup of a universe to generalise the findings to the universe that is being studied. Anderson (2011) argues that quantitative research seeks precise measurements and analysis of target concepts. Based on the purpose of the study, which sought to examine the effect of

high school mathematics educators' self-efficacy on learners' performance in mathematics, the researcher found the quantitative research approach suitable.

1.13.3 Research design

A research design is the plan that the researcher uses in conducting the study (Stone-Romero, 2009). This study will follow a survey design. According to Van Zyl, (2012), survey research examines the frequency and relationships between psychological and sociological variables and taps into constructs such as attitudes, beliefs, prejudices, preferences, and opinions. Furthermore, he argues that minimal facilities are required, and a questionnaire is enough to collect data. Based on the research questions and the data collection instrument that the researcher intended to use, the survey design was deemed appropriate for this study.

1.13.4 Population

The population is a group of potential participants to whom the researcher anticipates generalising the results of the study (van Zyl, 2012). In this case, the population of this study included high school mathematics educators in all public and private high schools in five education districts in EC Province.

1.13.5 Sample

From the above-mentioned population, "convenient sampling" based on geographical accessibility and proximity will be used to select five districts in the EC Province. In each district, the researcher intends to select 45 high school mathematics educators' randomly. In total, the study will involve 225 high school mathematics educators.

1.13.6 Sampling Technique

According to Lohr (2009), sampling is the process of selecting the sample from the population. Regarding the research question, the researcher found the simple random sampling technique suitable for this study. This was due to each unit in the population having an equal chance of being selected. Mathematics subject advisers were contacted in the districts for the list of mathematics educators. In a raffle manner, 45 educators were selected from each District to constitute the sample.

1.13.7 Data collection instruments

Based on the research approach, a questionnaire with a 5-point Likert scale ranging from ‘a low level of mathematics self-efficacy (1)’, to ‘a high level of mathematics self-efficacy (5)’ was used to gather data to address research questions and objectives. According to Babbie (2010) and Van Zyl (2012), a questionnaire is a paper-and-pencil set of structured and focused questions. Cohen and Manion, (2011) also assert that a questionnaire can preserve anonymity which encourages greater honesty. Hence, the questionnaire as the data collection instrument was considered suitable for this study.

1.13.7.1 Pilot Study

A pilot study was carried out to determine the validity and reliability of the instrument. The researcher used 15 high school mathematics educators for the pilot study. The researcher selected 3 high school mathematics educators’ each randomly from the districts. These 15 educators were excluded from the main study. The pilot study assisted the researcher to update the research instrument by making corrections and adjustments where needed.

1.13.7.2 Validity and Reliability

According to Van Zyl (2012) and Hair, Black, Babin and Anderson (2010), validity and reliability have always been seen as the most crucial criteria for evaluating quantitative research instruments. An example is questionnaires, if the researcher’s interpretation of data is to be valuable. Hair et al. (2010) define validity as the degree to which a measure accurately represents what it is supposed to. Therefore, to ensure validity, after drafting the measuring instrument it was given to colleagues, experts, experienced researchers and to the supervisor to check the validity of the instrument before administering it. On the other, reliability refers to the consistency of measurement, the extent to which the scores are similar over different forms of the same data instrument, or occasions of data collection (Van Zyl, 2012). For this study, the Cronbach alpha statistic was used to ensure reliability.

1.13.8 DATA ANALYSIS

According to Houser (2008), once the data has been collected, it is essential to make sense of it by organising and coding the information to accelerate the analysis. The raw data gathered was processed using the Statistical Package for Social Science (SPSS) software. Inferential statistics such as one-way ANOVA was used to analyse the group differences of the high school mathematics educators' self-efficacy levels. The multiple regression analysis was also used to assess the association between the high school mathematics educators' self-efficacy levels and the learners' performance in mathematics. The 0.05 level of significance was used for the hypotheses testing.

1.14 ETHICAL CONSIDERATIONS

Ethical considerations, according to Creswell, J and Clark, L (2011), are obligations that relate to the researcher's respect for the rights, needs, values, and desires of the research participants.

1.14.1 Confidentiality and anonymity

The research participants were given a guarantee that their privacy and identity would be withheld and secured from public exposure during and after the study. The name of the districts, schools and the participants were also withheld and secured from the public domain.

1.14.2 INFORMED CONSENT

The researcher obtained permission from the University of South Africa, the EC Province DBE, and the principals of the schools from which educators were drawn for this study. Also, the research participants were informed about the duration of the study to make them aware of how much of their valuable time would be needed (Chaska, 2008).

1.15 ORGANISATION OF THE THESIS

This study is divided into five chapters. Chapter 1 introduces the study, outlining the background, problem statement and the rationale for conducting the study. Chapter 2 presents a review of the literature. Chapter 3 describes the design and methodology

which was followed in conducting this study. Chapter 4 reports on the research findings of the study. Chapter 5 presents the conclusions and recommendations, as well as the implications for further study and the limitations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter briefly introduced the research through aims, questions, and objectives of the study. The main motive of the study is to examine the effect of high school mathematics educators' self-efficacy on learners' performance in mathematics as a subject. This chapter presents the literature review relating to self-efficacy. Self-efficacy as a concept is outlined in this chapter; the constructs of self-efficacy, self-efficacy of mathematic educators, the factors affecting learners' performance in mathematics in South Africa and the theories of self-efficacy underpinning the study are outlined.

2.2 CONCEPTUALISATION OF SELF-EFFICACY

The concept of self-efficacy began with Bandura's (1977) social learning theory that was renamed the social cognitive theory after further studies and research were conducted on the subject in 1986 (Kristen, 2019:93). According to Tena and Joane (2017), self-efficacy is "the judgement of an individual`s ability to shape and implement actions required to produce the desired achievements". Gilistan and Hussain (2017) define self-efficacy as the individual's confidence in their precision of skills in each context to perform successfully. A person`s conviction in efficacy affects their energetic effort and willpower to attain the expected goals and objectives. In the same context, Garvis (2011) describes self-efficacy as the person`s belief in their capacity to execute behaviours required to produce specific performance attainments.

Self-efficacy shows a person`s confidence in their ability to exert control over their motivation, behaviour and social environment. These cognitive self-evaluations control human experience, including the goals and objectives for which individuals strive, the amount of effort and energy required to attain the goals and the likelihood of achieving specific levels of behavioural performance (Kristen, 2019). Self-efficacy enables people to have a different perspective on how they think, behave, and motivate as well as encourage themselves to achieve their goals. The self-efficacy level of an individual is very important in the determination of how well they can perform their job. Self is the

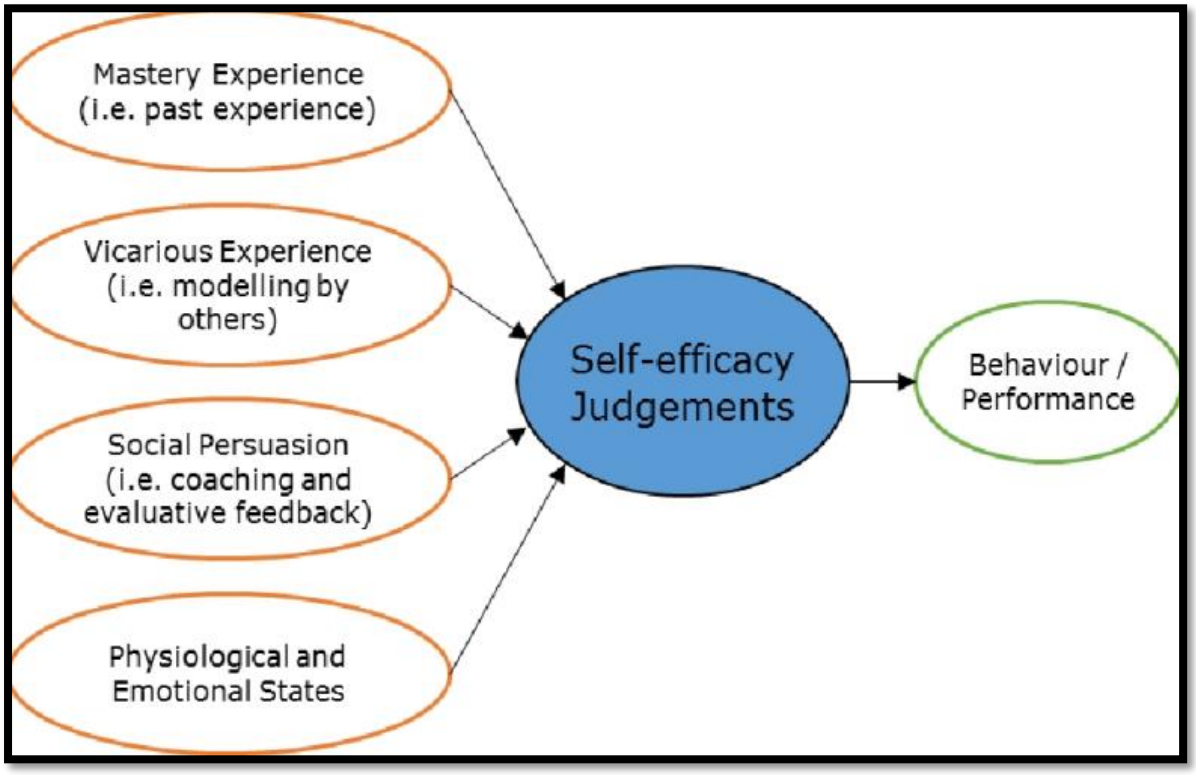
identity of an individual and efficacy is the power to produce an effect (Tena & Joana, 2017).

The underlying characteristics of self-efficacy are cognitive, affective and locus of control. Cognitive processes are the most vital element of self-efficacy. They entail the regulation of human behaviour through the forethought embodied in cognised goals, and personal goal setting is determined by the evaluation of abilities (Akram & Ghazanfar 2014). Cognitive processes enable people with high self-efficacy to set goals and commit themselves towards the attainment of such goals as well as striving to achieve such goals. The second attribute of self-efficacy is affective processes. These entail the individual's belief in their capabilities and how their emotional reaction can affect action towards goals directly and indirectly through altering a thought process. Unlu and Ertekin (2013) state that the individuals who believe that they can achieve their goals despite drawbacks and challenges of all sorts can easily lower their stress and anxiety levels by exercising control over the potential threat. The third attribute of self-efficacy is locus of control. Locus of control is an individual`s perceptions about the underlying main causes of events in their life. Individuals believe that their destiny is determined either by internal forces such as effort, skill and personal decisions or external forces such as fate or luck. An individual with high self-efficacy believes in the use of cognitive and affective processes to obtain a desired outcome (Siwatu, 2014).

2.3 CONSTRUCTS OF SELF-EFFICACY

According to Bandura (1997), the expectations of an individual`s self-efficacy are obtained from four vital sources of information, which are performance achievements, vicarious experience, verbal persuasion, and physiological cues as indicated in Figure 2.1 below. Individuals use this information to assess and evaluate their personal self-efficacy.

Figure 2.1: Antecedents of self-efficacy



Source: Bolton (2018) *(Adapted)***.**

In relation to Figure 2.1 above which shows the components of self-efficacy, these four key sources of self-efficacy information are considered as the antecedents of self-efficacy. Kristen (2019) explains that for an individual to have a sense of self-efficacy, such individual must complete a task successfully, observe others doing the task successfully, receive positive feedback about completing the task and depend on physiological reactions. The antecedents of self-efficacy that are shown in Figure 2.1 are explained in the sections below.

2.3.1 Mastery experience

Bolton (2018) explains that performance experiences are the most powerful source of knowledge. They entail the individual`s success experiences in completing tasks. The mastery of experience is regarded as one of the most influential sources of an individual`s self-efficacy. In Bandura's view (1997), the most effective method of developing a strong sense of self-efficacy is through the mastery of one`s own experiences. The more individuals successfully perform a task effectively and efficiently, the more their self-efficacy strengthens. On the other hand, when

individuals have failed to execute a task or handle the challenges that come with the task, then the self-efficacy of those individuals declines. Chea and Shumow (2017) agree that when individuals continue to be successful in the completion of tasks, a robust feeling of self-efficacy develops and they are less challenged by minor setbacks. Failure for such an individual is regarded as a lack of effort, and another attempt needs to be made for success.

2.3.2 Vicarious experience

The second sources of information for self-efficacy are vicarious experiences. These are the experiences individuals encounter when observing others successfully completing tasks. This assists very much in building one`s self-efficacy. Kristen (2019) explains that when individuals observe other individuals like them, who successfully accomplish the tasks, it causes them to believe in their own abilities much more. Dun and Lo (2015) postulate that experiences happen as individuals watch others do a task and feel confident that they can complete the same task successfully with favourable outcomes.

2.3.3 Verbal persuasion

Verbal persuasion is when individuals encourage and convince someone that they have the capacity and ability to be successful. The pep talk and compliments, as well as positive encouragement, can assist individuals to overcome self-doubt so that they give their tasks their best. The success of an individual depends more on the effort an individual puts into a task than on any inherent ability (Kristen, 2019).

2.3.4 Physiological and emotional reactions

An individual`s abilities are also judged based on physiological and emotional reactions. The levels of stress and anxiety one has when performing a task influence one`s feeling about one’s ability to succeed in completing the task (Dogan & Admas, 2018). According to Dun and Lo (2015) different individuals interpret physiological reactions differently, which can affect the outcome of the task.

2.4 MATHEMATICS EDUCATOR`S SELF- EFFICACY

Mathematic educators' effectiveness and efficiency in teaching mathematics in South Africa has become an issue of debate since 2017, when the pass rate fell slightly below 50%. Educators play a crucial role in the development of the nation through training and educating the human capital, which is the most important asset of the nation. Mathematics is one of the most pivotal subjects in the education system and the pass rate and issues affecting the success of learners in mathematics and science is of great concern at school, community and national level. Khany and Malekzadeh, (2015) explain that educators need to have a strong belief in their profession and the pedagogy they have been using in the classroom. These educators play the most important role in the development of mathematical identities in learners and they influence the learners' ways of thinking in the creation of knowledge as well. Efficient educators can establish equitable arrangements that give attention to different needs of learners. Only educators' positive attitudes can raise students' comfort levels, enlarge their knowledge bases, and give them greater confidence in their capacity to learn and make sense of mathematics (Anthony and Walshaw, 2019). These aspects of the teaching and learning process are tightly interlinked with the efficacy beliefs of educators.

The phrase *self-efficacy* explains how a person can accomplish tasks or goals, use strategies, or maintain the necessary motivation required to accomplish the set tasks or goals. This includes all the activities which educators accomplish in their teaching activities (Turkoglu, Cansoy, & Parlar, 2017). The analysis of every facet of education only through the lens of learners' achievement may not uncover the root cause. There are so many other constructs which directly or indirectly link with students' success. The self-efficacy beliefs of educators constitute one of the important constructs in educational success, which is placed in the shadow in the field of research in SA. Educators who do not feel confident in their ability and activities may not be able to produce learners who meet the required standards in grades, behaviour, and motivation.

Mathematics self-efficacy has been described as the confidence and capability to employ the skills necessary to deal with mathematics tasks and cope with task specific challenges and their consequences. Shoji et al. conducted a 2015 study on the effect

of mathematics self-efficacy on the mathematics achievements of high school learners in the USA. The results indicate that mathematics self-efficacy and mathematics achievement are positively related. This suggests that educators' self-efficacy in mathematics has a positive influence on their learners' mathematics achievement. In the same vein, studies conducted by (Ayotola & Adedeji, 2009; Wan & Mohd, 2010) also found that there is a very strong positive relationship between mathematics self-efficacy and mathematics achievement. Additionally, Zuya et al. (2016) conducted a research study on pre-service educators' mathematics self-efficacy and mathematics teaching self-efficacy. The findings indicate a positive relationship between pre-service mathematics educators' mathematics self-efficacy and mathematics teaching self-efficacy. This shows that the conviction that the educators have in their abilities to do mathematics correlates positively with the belief in their capability to teach mathematics.

Unlu and Ertekin (2013) conducted a study on the relationship between mathematics teaching and mathematics self-efficacy. The participants were 144 pre-service elementary mathematics educators. The study reported high performances on both scales by the participants. Also, there was a significant positive relationship between mathematics teaching, self-efficacy and mathematics self-efficacy of the pre-service elementary mathematics educators. Khale (2008) further reports that mathematics self-efficacy and mathematics teaching self-efficacy relate to conceptually- and procedurally-oriented teaching practices.

A study conducted by Siegle and McCoach (2007) on increasing learner mathematics self-efficacy through educator training reports a significant relationship between mathematics self-efficacy and mathematics achievement. Siegle and McCoach (2007) and Kahle (2008) posit that educator teaching self-efficacy affects their choice of instructional method and classroom environment. They further emphasise that this in turn affects both learner learning and learner self-efficacy. This means that learners' mathematics self-efficacy could be affected either positively or negatively, depending on whether the educator has a high or low sense of mathematics self-efficacy.

2.5 IMPORTANCE OF EDUCATORS' SELF- EFFICACY IN SCHOOLS

An educator`s self-efficacy is an important element in education and is very pertinent to the performance of educators' and learners' achievement. As acknowledged by De Jong (2014), there is a solid connection between the educators' self-efficacy and the performance of educators in schools. The inference is that when educators have high self-efficacy, they can probably educate learners better than when their self-efficacy is low. For the situation in which an educator has self-efficacy; they probably will not have exceptional capabilities when managing classrooms with learners from assorted backgrounds (Shum, Lau, & Fryer, 2018).

This demonstrates that educators' efficacy can likewise be impacted by heterogeneous classrooms as they may be less certain of their capabilities when they face learners with differing foundational development (Marsh & Seaton, 2013). Doğan and Adams (2018) hypothesise that educators oversee control of the classroom climate, including directing classroom discipline, execution of approaches and strategies to pick up and connect with learners in the classroom. Also, Taştan (2018) clarifies that learners' view of educators with positive self-efficacy are identified with their quest for favourable social classroom objectives, such as co-existing with others and being socially mindful, and more interested in school.

In addition, an educator`s self-efficacy is connected to the student's accomplishment of objectives. Yerdelen and Sungur (2018) directed a review of the educator's effect on learners' accomplishments. The findings of the review suggest that learners' accomplishments were higher in classrooms of educators with more prominent self-trust in the meaningful role of mathematics and science, on a par with other subjects. Educators' self-efficacy and learner performance were examined by various studies which itemised the impact of educators' self-efficacy conviction on students' accomplishment and the accomplishment of schools (Mill, Ramirez, and Murdock, 2017; Rodríguez et al., 2014; Taştan et al., 2018). An educator's self-efficacy convictions might impact a student's accomplishment in more than one way. For example, educators with high self-efficacy convictions are more likely than educators with a low self-appreciation efficacy to execute useful developments in the classroom, to show strategies more effectively and energise learners' independence. They will

assume responsibility for learners with extraordinary adapting and learning needs, to oversee classroom issues and to keep learners on task (Deci & Ryan, 2016).

The self-appreciation efficacy of educators will emphatically impact inspiration in the same way as learning in when the learners are viewed as troublesome, or when unmotivated. Many studies have likewise demonstrated a positive connection between self-efficacy of the educator's convictions corresponding with intellectual results of several learners. For example, accomplishment in the unique and core scholarly subjects of the educators. In addition, the abilities and exhibitions (Shahrill & Mundia, 2014). Pamuk, Sungur, and Oztekin (2017) analysed what the association among learners and educator attributes means for educators' expectations of learners' scholarly and social achievement. Findings showed that a combination of high self-efficacy and high efficacy contributed more positive forecasts about learners and appeared to change their expectations when learners` attributes changed, while low efficacy educators appeared to focus on a solitary characteristic when formulating their expectations. The investigation discovered that educators who have better teaching ability keep up with the class and the board. They further prevail in lessening interruptions during lessons by continually noticing the conduct of learners and letting the learners know that they know about their activities inside the class.

Sawyer, and Tompkins (2011) also demonstrate that educators are vital in the initiative of schooling, because they are putting forth consistent attempts to raise the accomplishment level of learners, which contributes to improving student inspiration. Learners generally go to the classes of those educators where they appreciate learning because the educators try to connect with the learners in various assignments. These are educators who love their calling and, in this manner, contribute towards drawing in and inspiring learners to perform remarkably all through their scholarly life (Wyatt, 2014). Also, effective educators energise learners for comprehension (Deci & Ryan, 2016). They correct learners' errors in the subject and use distinctive visual guides to make the subject captivating and significant (Miller et al., 2017; Pamuk et al., 2017; Rodríguez et al., 2014; Taştan et al., 2018). Such educators offer learners the chance to participate in discussions and give significant input rather than just attain good scores on tasks (Yerdelen & Sungur, 2018). In addition, there is proof that the educators' affect, similar to excitement for learning and

their affectability concerning learners' treatment, may influence learners' feelings identified with the targets (Zee and Koomen, 2016). Such educators likewise show the attributes of being industrious, more engaged with their scholastic exercises, create the best time in the classroom, use difficult but inventive systems of instruction, give support to less-capable educators, and inspire their learners. They too give positive comments on their students' accomplishments, compared with the educators who have low expectations of their lessons and who assume that their presence will not impact learners (Zumbrunn, Tadlock, and Roberts, 2011).

2.6 FACTORS AFFECTING LEARNERS' PERFORMANCE IN MATHEMATICS IN SOUTH AFRICA

Various studies, for example, Mabena (2021), Potokri (2011; 2012) and Hlalele (2021), on the variables that influence the performance of learners reveal that performance depends on the variables or yardsticks that are used as measurement. The measurement could include areas like subjects, general academic performance, discipline as well as performance in sports (Potokri, 2011). Therefore, the focus of the study is the performance of the learners in mathematics as a subject. According to Mabena (2021), student performance in mathematics internationally, in Africa and in SA has been a matter of concern. Poor performance in mathematics is a perennial concern which has the capacity to stall the progress and development of developing nations. The assessments of South African learners' performance in mathematics by regional and international bodies such as the Southern and Eastern Consortium for Monitoring Education Quality and Trends in Mathematics and Science Study concurs that there is poor performance in SA (Mabena, 2021).

According to Agili (2012), mathematics is one of the basic pillars of any scientific invention and several factors influence the student`s success and achievement in mathematics. As indicated by Hlalele (2012), learners regularly acquire mathematical nervousness in schools, frequently from educators who themselves doubt their own mathematical capacities in specific areas and topics. In the South African setting, Makhubele and Luneta (2014) suggest that student` performance in mathematics is affected by their negative mentalities towards the subject that radiate from cultural perspectives that mathematics is a troublesome subject. Cascio (2013) suggests that educators assume a critical part in learners' school performance. He further clarifies

that when educators lacks insight or enthusiasm for educating the learners, they probably may not have the option of complete comprehension of the subject material. If the educator doesn't have efficient classroom management abilities and applies outrageous dictatorship, the classroom climate may prevent productive class conversations and communitarian gaining among learners. It can likewise hinder learners putting forth as concentrated an effort as could be expected. It is obvious from the current studies that educators' competencies affect performance in mathematics. Educators that do not have decent subject information and/or academic substance information may convey inaccurate substance or even avoid content, which could cause poor performance (Asikhia, 2010).

There is no question that learners' accomplishment in mathematics schooling needs educators to have a firm comprehension of the subject area and the epistemology that guides mathematics training. They further need a thorough comprehension of various types of informative exercises that advance student accomplishment. Another component is the language of educating and learning. Educators will more often use learners' home language in class so learners frequently fail to comprehend the language used in the education authority's assessment papers. This results in an inability to answer effectively (Asikhia, 2010). The educator's job in learners' inspiration to learn ought not to be disparaged. In assisting learners to become masters of mathematical information, the educator's super educational assignment is to establish a learning climate where learners can take part in mathematical reasoning exercises and consider mathematics as something requiring "investigation, guessing, portrayal, speculation, checking, and reflection".

Forrest, R., Lowe, R., Potts, M., and Poyser, C. (2019) contend that in SA the nature of educators impacts learners when learning mathematics. According to Chen, Chen, Liu, Liu, and Zhu (2017) several studies show that an educator`s industriousness, devotion and adherence to essential instructive approaches and cycles can prompt an impressive education and learning process. Chen, et al (2017) further attest those issues around the intensification of contact time with learners in class, and the presence of both learners and educators at school and in class, affect performance. Likewise, worldwide investigations by Attwood (2014) attribute poor results in mathematics to parental disposition, which interferes with instruction. Karue and

Amukowa (2013) observe that home environment variables and family foundations as well as little cooperation from guardians in the schooling of their children are the primary drivers of poor results in mathematics in Kenya. In SA (Cascio, 2013), kinship-related factors likewise play a fundamental role in learners' presentations. Guardians who are too busy to consider helping their children in their presentations add to children losing their concentration. Poverty in families was found to adversely influence their children's scholastic performance. A few guardians were viewed as oppressive, which made learners' school performance decrease drastically. Learners who come from oppressive families will often perform with dedication at school (Cascio, 2013).

2.6.1 Attitude and belief role in mathematics achievement

Zacharian, Kamen, and George (2012) and Mwamwenda (1995) support the assertion that attitudes, and belief play a role in the achievement of learners in mathematics as a subject as this is determined by their attitude rather than an inability to study or perform. Zacharian, et al (2012) added another type of attitude, which is resistance by learners. He indicated that the cause of most failures in schools might not only be due to insufficient or inadequate instruction but by active resistance by learners (Zacharian, et. al. 2012).

According to Rammala (2009), the negative attitudes towards learning could result in learners performing poorly and preventing them from obtaining the required results for university entrance. This means that the general relationship between attitude and achievement is based on the concept that the better the attitude a learner has towards a subject or task, the higher the achievement or performance level. This also supports the idea that positive attitude leads to good performance whereas negative attitude leads to poor performance. From the authors referred to above it can be deduced that learners need a motivating environment, created by parents, educators and the general school environment to achieve academically, including achievement in mathematics.

2.6.2 Effects of language in performance of learners in mathematics

According to Pereira (2010) language proficiency is a sensitive but important issue, which affects learning achievement in mathematics. The DBE's 'Language in Education Policy (LIEP)' promotes additive multilingualism. However, it is found that

schools do not implement this properly. In many cases educators use a largely unplanned code-switching strategy. There is a risk of a high failure-rate in mathematics as core concepts may not be understood or are lost. Learners need to be fluent in the language of learning and teaching to have full access to mathematical terms and concepts, and associated reasoning skills. Rammala (2009) indicated the importance of language in the performance of mathematics learners. According to Rammala (2009) there are arguments that the mother tongue, for example, is the basis of all teaching and must be the medium of instruction because bilingualism cannot be set as the aim of teaching. Rammala (2009) added that most Grade 12 learners in SA schools struggle to communicate in English. This could be one of the factors that puts them at a disadvantage, since English is the language used to respond to questions in examinations.

2.7. PREVIOUS STUDIES ON THE RELATIONSHIP BETWEEN SELF-EFFICACY OF MATHEMATICS EDUCATORS AND LEARNER PERFORMANCE

The concept of self-efficacy, introduced by Bandura (1997), is fundamental in understanding how individuals' beliefs in their abilities influence their actions and determination to achieve specific goals. In the context of education, particularly mathematics education, self-efficacy plays a pivotal role. Researchers have explored this concept extensively, and numerous studies have highlighted its significance.

Educator self-efficacy, a sub-category of self-efficacy, refers to educators' confidence in their teaching abilities to facilitate student learning and academic achievement. High self-efficacy among educators has been associated with various positive outcomes in education. Allinder (1994) found that highly efficacious educators are more motivated to experiment with innovative teaching methods, continuously adapt their strategies, and overcome obstacles. Tschannen-Moran and Hoy (2001) emphasise that learners' performance is strongly influenced by their educators' self-efficacy, as educators with high self-efficacy promote effective learning and achievement, fostering critical thinking and motivation in learners.

The relationship between educator self-efficacy and student performance appears to be bi-directional. Hoy and Hau (2004) noted that educator efficacy and learners' learning approaches positively influence each other. Marsh (1986) highlighted that

learners' mathematics learning is significantly influenced by their educators' high efficacy beliefs, improving their mathematical skills and achievements from elementary to higher secondary levels. Studies by Armstrong (1980) and Bufford-Bouchard (1989) further underscore the strong connection between high self-efficacy beliefs and mathematics performance across grade levels.

Moreover, educator self-efficacy has been linked to learners' perceptions of educators' care and assistance in their learning journey. Romo and Falbo (1996) found that highly efficacious educators invest considerable effort, time, and energy in helping low achievers become successful high achievers. Wilkins (2008) emphasises that educators with a strong command of the content area, driven by high self-efficacy, display superior mathematical skills among learners. However, it is essential to note that the relationship between educator self-efficacy and student academic achievement can be context-specific, varying across different countries due to cultural and environmental factors.

In the Pakistani context, researchers have conducted numerous studies to investigate the impact of self-efficacy on educational outcomes. Shafiq Ahmed et al. (2012) explored the influence of learners' mathematics self-efficacy on their performance and found a significant positive correlation between self-efficacy and academic achievement. Additionally, educator self-efficacy has been a topic of extensive research within the mathematics education field. It is often defined as educators' judgments about their own capabilities to positively influence learners' learning outcomes (Carney et al., 2016; Pajares, 1996; Tschannen-Moran & Woolfolk Hoy, 2001). These studies have established positive connections between educator self-efficacy and various aspects of education, including pupil achievement, instructional quality, management of educational reform, and educator retention.

In the realm of education, quantitative research predominates, with studies relying on survey techniques and standardised scales to measure educator self-efficacy. The Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) (Enochs, Smith, & Huinke, 2000) has been widely employed to assess personal mathematics teaching efficacy and mathematics teaching outcome expectancy. Some studies have also incorporated qualitative interviews to complement the quantitative findings. These investigations

have provided valuable insights into the relationship between educator self-efficacy and student outcomes, shedding light on the critical role of self-efficacy in mathematics education.

In conclusion, the extensive body of research on self-efficacy, particularly educator self-efficacy, underscores its importance in shaping educational outcomes, including learners' performance and achievement in mathematics. These studies provide a foundation for understanding how educators' beliefs in their capabilities influence their teaching practices and ultimately impact learners' learning experiences.

Previous studies of the effect of self- efficacy in educational settings indicate strong links between educator self-efficacy and factors such as instructional quality and pupils' achievement. Yet, much of this research approaches self-efficacy from the perspective of the individual student rather than the educator or instructor, and not of subject knowledge. Furthermore, only a few studies place a focus on mathematics. Most studies investigate the impact of educator self-efficacy in subjects such as English, educational research, reading and writing, or the impact of an educator's self-efficacy on general student academic achievement (Xenofontos & Andrews, 2020).

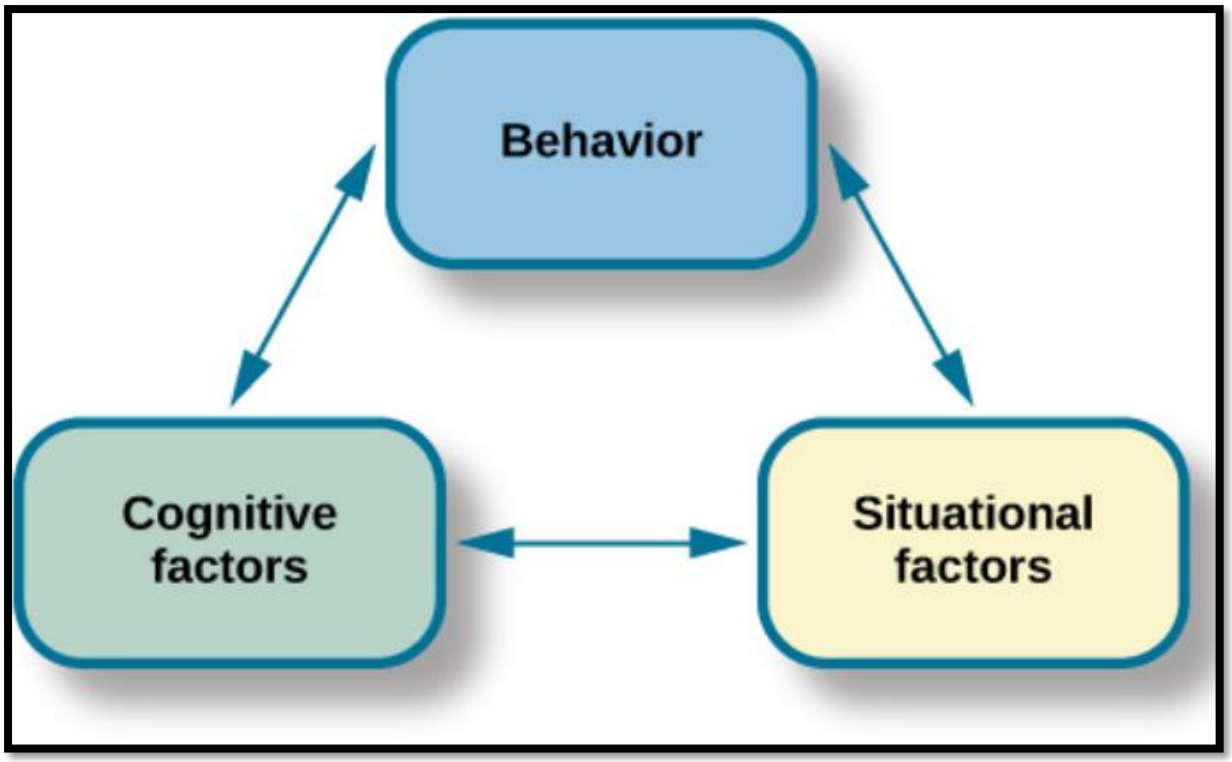
2.8. THEORIES OF SELF-EFFICACY

2.8.1. Social cognitive theory

Social cognitive theory proposed by psychologist Albert Bandura in 1977 is the philosophical base for self-viability development. Bandura's theory emphasises that the environment and cognitive factors influence behaviour. The social cognitive theory advocates that people as dynamic specialists, whose understandings of the after-effects of their performances, illumine and modify through their "surroundings and self-conviction, which thusly illumine, and adjust their ensuing performances". Acquiring Bandura's (1997) term, 'triadic equal causation', which interchanges with the unique connection between conduct, individual elements (cognitive, full of feeling, and organic), and environmental elements, add to the advancement of self-efficacy convictions in the person. In social cognitive theory, individuals show impact over what they do on the grounds that they are proactive and self-regulatory (Skaalvik and

Skaalvik, 2010). As indicated by the social cognitive theory people can self-reflect, ponder and gain from their pasts, and henceforth self-direct and design elective techniques and have forethought in different circumstances. Bandura's social cognitive theory focuses on the meaning of comprehension effect on individuals' capacity to encode data, self-direct and play out the conduct. Bandura marks this theory as ‘cognitive’ since many aspects of human conduct and activities are aforethought dependent on 'cognised objectives' or pre-determined thoughts about one's capacities (Bandura, 1989).

Figure 2.2: Social cognitive theory



Source: Bandura (1997). Adapted.

As indicated in Figure 2.2 above, the cognitive processes, behaviour and situational factors all interact. Each factor influences and is influenced by another simultaneously. For the current study, this theory can be useful to distinguish an educator's conviction, conduct, and setting that exchange and impact one another (Gavora, 2010). For example, individual variables of an educator, such as seen capacity on content information on mathematics and efficacy convictions for educating activities might impact teaching conduct. At the same time, this conduct might impact convictions and other individual elements. Both may likewise be affected by context-oriented factors

like the scholarly climate of a working school, relationships, status of the school, and professional stability. Educators' convictions in their capacities to educate learners can impact learners' performance, which is a solid indicator of instructive effectiveness and viability (Al-Alwan & Mahasneh, 2014). It is significant that apparent self-efficacy is not a proportion of individual abilities; rather it is the singular convictions on their capacities and what the individual can do under specific conditions, paying little heed to what abilities the individual has. Bandura (1977) also clarifies that various individuals with comparative abilities, or similar individuals under various conditions, may perform ineffectively, sufficiently, or remarkably, contingent upon changes in their adequacy.

Self-efficacy convictions concern the capacity of a person to play out an assignment. Unmistakably individuals with a significant degree of self-efficacy convictions can foster the expertise to achieve the assignment better than individuals with a low degree of self-viability convictions (Tschannen-Moran and Hoy, 2018). Along these lines, self-adequacy conviction is a significant asset for an educator to become as persevering as an effective educator. Successful efficacy builders accomplish more than passes on sure evaluations. In addition to increasing people's belief in their abilities, they structure circumstances for themselves in manners that bring achievement and try not to put individuals in circumstances where they are probably going to fail frequently.

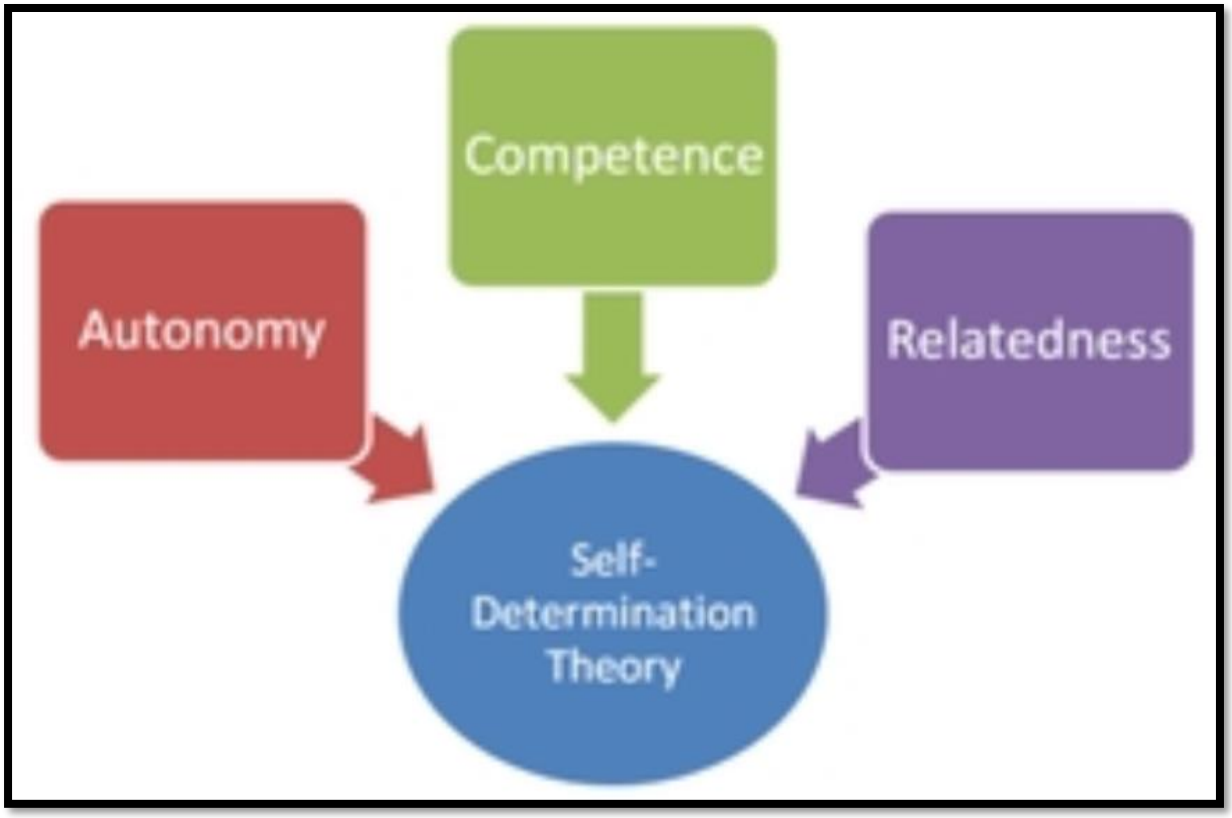
Bandura's social cognitive theory (SCT) offers valuable insights into the development of self-efficacy beliefs. It posits that individuals are dynamic agents whose understanding of the outcomes of their actions is shaped by both their environment and their self-belief (Bandura, 1997). This theory emphasises the interplay between behaviour, cognitive factors, and environmental influences, encapsulated in the concept of 'triadic reciprocal causation'. The SCT asserts that individuals can self-reflect, self-direct and plan alternative strategies, which is vital in the context of educators who must adapt to diverse teaching situations (Gavora, 2010). The study correctly identifies the impact of mathematics educators' self-efficacy on learners' performance, emphasising that perceived self-efficacy goes beyond assessing personal abilities. It is about beliefs in one's capacity to perform specific tasks (Bandura, 1977). The theory also highlights that individuals with high self-efficacy tend

to develop the skills necessary to excel, making it a critical construct for educators (Tschannen-Moran and Hoy, 2018).

2.8.2. Self-determination theory

The humanistic organismic point of view is used to analyse the inspired and motivated from the self-determination theory (Deci, 2011). The theory is based on the notion that individuals can become self-determined when their needs for competence, autonomy and connection are fulfilled. The competence element is the need for individuals to acquire the skills and knowledge for completing tasks. When individuals have a belief that they have the required skills and knowledge to complete a task, they take actions that enable them to achieve goals. Anatomy entails the need for people to feel in control of their own behaviour and goals. The connection element relates to the individuals` need of a sense of belonging and attachment to other people.

Figure 2.3: Elements of self-determination theory



Source: Gaffah (2019). Adapted.

There are various types of motivation that are incorporated in a foundation of self-determination as indicated by the self-determination theory. Also, self-support and

more prominent decision of conduct likewise clarify various types of motivation appropriately (Rodrígue, 2014). The shortfall of self-determination is addressed through inspiration. People separate themselves from the activity and finally stop doing exercises when motivated. Likewise, external pressure and motivation manage extrinsic motivation. People play out a conduct to procure a reward or overlook an adverse result when extraneously persuaded. The conduct is directed through culpability, inner self-evolvement and introjections when the external pressures disguise the controlling behaviours (Deci, 2014). In addition, self-motivation is linked to recognisable proof. The conduct is significant and crucial to the person when it is distinguished. Similarly, coordination is one more type of self- 'not- really-set-in-stone' inspiration, which is visible when the conduct performed is coordinated with different components of the self-individual. Subsequently, natural intrinsic motivation is uncovered from the higher prototyping of self- determination. People are occupied with the exercises performed for the fulfillment and delight driven while playing out the action when characteristically inspired.

Various types of inspiration are particularly connected with the exhibition, prosperity, social, mental, physical and imagination as exhibited through the examination of self-determination theory (Sahin-Taskin, 2017). The relationship between dependable support of weight reduction, greater learning, higher levels of prosperity, and delayed restraint from smoking practices are not really settled types of inspiration. Expanded nervousness in younger learners and negative wellbeing and prosperity outcomes are decidedly related with not 'set-in-stone types' of motivation (Deci and Ryan, 2016). Proof of programmed strategies related to inspiration is coordinated in the humanistic theory of inspiration, which incorporates the self-determination theory (Han and Yin, 2016). The thorough effect of the inspiration of an individual can be clarified properly through independence and controlling steady settings (Taştan et al., 2018). The degree of self-determination then impacts to uncover the impacts impacted from the controlling conditions of people. Independence has consequences, as strong conditions are related to the degree of self-determination. These impacts can happen when people do not know about the presence of non-cognisant inspirational procedures (Kuo, Tuan, & Chin, 2018).

The self-determination theory (SDT), rooted in a humanistic organismic perspective, provides a lens through which to examine motivation. The theory is based on the premise that individuals can become self-determined when their needs for competence, autonomy and connection are fulfilled (Deci, 2011). The competence component aligns with the notion that individuals must believe they possess the necessary skills to achieve their goals, a crucial factor in teaching. Autonomy related to the need for individuals to feel in control of their behaviours and goals, which is highly relevant in the context of educators who must be self-regulatory and proactive. The connection element underscores the importance of a sense of belonging and attachment to others, which has implications for educators' relationships with learners and colleagues (Deci, 2014).

The study correctly recognises that various types of motivation are underpinned by SDT, with extrinsic and intrinsic motivation being particularly relevant in the context of teaching (Rodrígue, 2014). By exploring how external pressures and motivations influence teaching behaviours, it acknowledges the external factors that may impact educators' motivation to excel. Furthermore, the study highlights the significance of self-motivation, which drives individuals when they find the behaviour personally meaningful, a concept essential in the field of education (Deci and Ryan, 2016). The research also underscores the positive associations between different types of motivation and various outcomes, such as well-being, learning, and creativity, as evidenced by studies in the field of SDT (Sahin-Taskin, 2017).

2.9. CONCLUSION

Incorporating these theories into the study provides a solid theoretical framework for examining the complex interplay between high school mathematics educators' self-efficacy, motivation and learners' performance in mathematics. The role of educators' beliefs in their capacity to teach effectively is elucidated by SCT, while SDT sheds light on the motivating factors that drive educators' actions. Together, these theories offer a comprehensive explanation of the factors influencing the educational process, with implications for instructional effectiveness and learner outcomes. The following chapter present the methodology and design of the research.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0. INTRODUCTION

The previous chapter outlined the literature review and presented the theoretical framework of the study. This chapter presents the research methodology and design that was used to gather the data for the study. It further discusses the chosen research methodology, paradigm, approach and design as well as the target population of the study and how the sample was selected. In addition, the data collection instrument used, validity and reliability constructs, how the data was analysed and the ethical considerations that were observed during the study are presented in this chapter.

3.1. RESEARCH PARADIGM

According to Saunders, Lewis, and Thornhill (2016), a research paradigm is the advancement and development of knowledge and the idea of knowledge. Perjons (2014) explains that a research paradigm is a set of commonly held beliefs and assumptions within a research community about ontological, epistemological and methodological concerns. Research can take in the positivism or interpretivism paradigm. The philosophy of interpretivism emphasises that humans differ from physical phenomena because they create meaning, and interpretivism studies those meanings. The interpretivism paradigm states that a social phenomenon can be understood through the eyes of the participants rather than those of the researcher and it is based on the qualitative data that is collected from the participants over time (Rehman, 2016). Thakurta and Chetty (2015) state that the positivism paradigm empowers the scientist to gather information and foster a speculation which can be tried and affirmed. Additionally, the positivism paradigm deals with quantifiable perceptions that enable measurable investigation to be obtained (Denscombe 2014). The positivism paradigm was embraced and employed in this study depending on its real assessments from the respondents on their view of the effect of educators` self-efficacy on the mathematic performance of high school learners.

The selection of a quantitative methodology for this study was deliberate because of its alignment with the research objectives. Quantitative research allows for the

systematic measurement of variables and the establishment of statistical relationships, which is crucial for examining the impact of high school mathematics educators' self-efficacy on learners' performance (Creswell & Clark, 2011). Moreover, given the large-scale nature of the research, a quantitative approach enables the collection of data from a sizable sample, providing generalisable insights into the broader population (Bryman, 2015). While qualitative and mixed methods approaches have their merits, they may not be as well-suited for this study, which primarily seeks to quantify relationships and draw statistically significant conclusions (Creswell & Clark, 2017).

3.2. RESEARCH APPROACH

‘Research approach’ is a phrase that is used to portray a group of exercises that are embraced to acquire information from individuals chosen to be respondents to exercises identified with choosing research members and analysing research results (Rehman, 2016). Pattom (2015) states that there are three popular exploration strategies, which are quantitative and qualitative explorations, and the blended technique referred to as ‘mixed method research’. The qualitative research approach is a technique which applies a methodology that results in the gathering of reactions or replies to the exploration questions. These are in-text or word structure and the investigation of information is likewise done in literary work design (Denscombe, 2014). According to Gray (2014) a mixed method research approach, "is the gathering or investigation of both quantitative and qualitative data in a solitary report wherein the data are gathered simultaneously, are given need and include the bringing together of data at one or more phases during the investigation".

The quantitative research approach depends on the evaluation of value or sum and is appropriate for phenomena that can be communicated in quantity or amount (Kothari, 2011). The quantitative research approach was used in this study. Denscombe (2014) states that quantitative research alludes to investigations which produce numeric information or data through using numerical, factual or numeric information or calculation strategies to examine the information. As indicated by Gabriel (2013), a review can either take on a logical or inductive methodology. The deductive methodology is focused on testing a hypothesis, while the inductive methodology plans to produce another hypothesis from the information. The inductive methodology

is essentially connected with qualitative exploration and deductive methodologies are related to quantitative research (Saunders, et al., 2016).

In this study, a quantitative research approach and the positivist research paradigm were adopted for several reasons. Firstly, the use of quantitative methods allows for the collection of numerical data, facilitating statistical analysis to establish clear relationships between variables, such as high school mathematics educators' self-efficacy and learners' mathematics performance. This approach aligns with the objective of examining the impact of self-efficacy on performance, requiring precise measurement (Ismail, 2016). Secondly, the positivist paradigm emphasises objectivity and empirical evidence, promoting the rigorous examination of phenomena (Bryman, 2015). It seeks to uncover generalisable knowledge, making it suitable for investigating the broader impact of educators' self-efficacy on a larger population of learners, contributing to the field of mathematics education (Creswell, 2014).

Furthermore, the choice of the positivistic paradigm in this study aligns closely with its aims and objectives. The positivistic paradigm emphasises the objective measurement of phenomena, the establishment of causal relationships, and the reliance on empirical evidence (Creswell & Creswell, 2017). In this study, the central aim is to examine the effect of high school mathematics educators' self-efficacy on learners' mathematics performance, which necessitates a rigorous, quantitative approach focused on quantifiable variables and statistical analyses (Creswell & Creswell, 2017). The adoption of the positivistic paradigm in the study aims to provide a structured, systematic and objective investigation of the relationship between educators' self-efficacy and learners' performance in mathematics. It seeks to uncover empirical evidence that can inform educational policies and practices, aligning with the overarching goal of enhancing mathematics education in the EC Province.

Furthermore, the positivistic paradigm's emphasis on objectivity and generalisability is well-suited to address the research objectives of assessing educators' self-efficacy levels, examining their association with learners' performance, and suggesting practical ways to enhance mathematics education. It allows for the collection of

standardised data that can be analysed statistically to draw robust conclusions and make evidence-based recommendations (Creswell & Creswell, 2017).

3.3. RESEARCH DESIGN

According to Kothari (2011), a research design is the framework of research methods and techniques chosen by the researcher. There are different sorts of research designs and plans accessible to the researcher. The selected research design relies on the character of the issue to researched, study, questions and goals. The following are research designs from which a researcher can choose.

- An exploratory research design manages an investigating into the phenomena and is attempted when the analyst is uncertain of the exact idea of the issue (Saunders, et al., 2016).
- A descriptive research design is used when a researcher endeavours to portray the attributes of the factors, and the researcher has some information on these factors, but the design is inflexible in its construction and keeps up with objectivity of a quantitative methodology (Welman & Kruger 2013).
- Causal research, also referred to as explanatory research, is the examination of circumstances and logical results connections (cause and effects relationships). To determine causality, it is important to observe variation in the variable assumed to cause the change in the other variable(s), and then measure the changes in the other variable(s) (Saunders, 2009).
- In diagnostic research, the researcher seeks to assess the root causes of specific topics or phenomena. This research design assists an individual to understand more about the variables that create troublesome situations.

A descriptive research design was chosen for this study. This research design was used when the study sought to attain the set aim of investigating the effect of self-efficacy of mathematics educators on the performance of learners in the subject of mathematics. Descriptive research identifies the relationship between variables which supports the objectives of the study (Potokri, 2016).

3.4. TARGET POPULATION

According to Creswell and Plano Clerk (2011), a target population in academic research is the total number of people or elements the research enquiry is interested in, which the sample can be drawn from. Barnsbee (2018) explains the target population as the group of individuals that the intervention intends to conduct research in and draw conclusions from. Since this study was interested in the impact that mathematics educators' self-efficacy has on the performance of learners in mathematics, the target population was grade 12 mathematics educators. The target population of this study comprised 225 public and private secondary school mathematics educators from the following five education districts in the Eastern Cape: the OR Tambo Inland, Buffalo City, OR Tambo Coastal, Amathole and Chris Hani districts.

3.5. SAMPLING

Sampling is the method to select respondents to test from the whole population in which the study is being conducted (Denscombe, 2014). There are two types of sampling strategies to consider: probability sampling and non-probability sampling. This study uses the probability sampling procedures. As indicated by Denscombe (2014), in probability sampling the members have the equivalent shot at being chosen and in non-probability sampling the respondents do not have an equivalent shot at being chosen in the study sample.

3.5.1. Probability sampling

There are different kinds of probability sampling.

- Simple random sampling is a completely random technique for choosing the respondents to include in a sample from the target population (Saunders, 2016).
- Stratified random sampling includes the technique where the analyst separates the broader populace into more modest gatherings that generally do not cover but address the whole populace (Saunders, 2016).
- Random cluster sampling is a method for choosing respondents arbitrarily that are in different geographical locations (Pattom, 2015).

- Systematic sampling is the point at which the specialist picks each "nth" individual to be important and part of the sample.

3.5.2. Non-probability sampling

The following are the non-probability sampling techniques that the researcher can choose from.

- Convenience Sampling - with this technique of non-probability sampling, the analyst picks respondents who are not located at a distance. It is helpful and convenient for the researcher to reach respondents (Landerneau, 2017).
- Purposive Sampling - this depends on the goal or the reason for study. Just those components will be chosen from the populace which best suit the end goal of the research.
- Snowball Sampling - this technique is used when the research acquires respondents by reference from different respondents (Landerneau, 2017).
- Quota Sampling - this kind of sampling depends on some pre-set norm. It chooses the agent sample from the populace. The extent of attributes/qualities in the sample ought to be similar to the populace. Components are chosen until an accurate extent of specific of information is acquired or adequate information in various classifications is gathered (Landerneau, 2017).

The study adopted the simple random sampling technique through which the sample is selected randomly. Each member of the population is assigned a number, selected at random. The simple random sampling technique was chosen because it is very easy to use, and it accurately represents the large population.

This study uses convenience and simple random sampling methods based on practicality and the aims of the study - to examine the effect of high school mathematics educators' self-efficacy on learners' performance in mathematics. The sample for this study is drawn from both public and private schools. Convenience sampling was chosen for selecting mathematics educators and learners due to its ease of access and cost-effectiveness (Creswell & Creswell, 2017). Given the focus of the study on high school mathematics educators and learners in the EC Province, obtaining a comprehensive list of potential participants may have been challenging.

Convenience sampling allows for a quicker and more practical way to access these participants, making it feasible to collect data within resource and time constraints of the study.

However, the study also employs simple random sampling to ensure a degree of representativeness and to minimise potential bias. Simple random sampling helps reduce the risk of researcher bias by randomly selecting participants from the larger pool of available participants (Polit & Beck, 2020). This approach enhances the generalisability of the findings of the study to some extent, as it avoids selecting only those participants who are readily accessible This is a limitation commonly associated with convenience sampling (Creswell & Creswell, 2017). Based on the information gathered from the EC Province DBE regarding the populations of mathematics educators, the sample size is suitable to safely minimise sampling error (Johnson & Christensen, 2008). Sampling Error (SE) = (σ / $\sqrt{n}$) * Z = 10/225×1.96 = 1.31.

In summary, the combination of convenience and simple random sampling methods in this study strikes a balance between practicality and rigour, allowing for the collection of data from participants who are accessible while minimising potential bias and enhancing the study's generalisability.

3.6. DATA COLLECTION INSTRUMENT

A structured closed-ended questionnaire was used to collect the primary data of this study. The questionnaire has two sections: Section A has 4 questions about the biographical characteristics of the respondents and Section B contains questions about the effect of educators` self-efficacy on the learners` performance in mathematics. The nature of the questions is closed-ended, which means that the respondents` answers are limited to a fixed set of responses. The questions in Section B use the five-point Likert Scale, ranging from ‘strongly disagree, disagree, neutral, agree and strongly agree’. The researcher carefully crafted the questions in the questionnaire to request data which enabled the research to fulfill its objectives.

In addition, the questionnaire draws on the characteristics of an effective questionnaire set out by Denscombe (2014). These are:

- It should meet the objectives of the study.

- It should obtain the most accurate data possible.
- It should give respondents guidelines and instructions on how to complete it.
- Its questions should be brief, precise and be understandable .

The personal method of administering the questionnaire was used. The researcher personally hand-delivered the questionnaire to mathematics educators. By doing this, the researcher ensured that Covid-19 regulations were adhered to. Respondents were given 14 days to complete the questionnaire, after which the researcher collected the questionnaires. After the completed questionnaires were collected from the respondents, a response rate of 95% was obtained.

3.7. PILOT STUDY

A pilot study, as suggested by Bless and Saunders (2014), involves testing the data collection instrument on a small sample drawn from the target population and research area to evaluate the feasibility and practicality of the proposed research design, methodologies, and data collection tools. The primary purpose of the pilot study was to identify any shortcomings and errors in the data collection process and instruments, thus allowing for necessary adjustments to ensure the smooth execution of data collection.

In this study, a pilot study was conducted by selecting 10 respondents who did not constitute part of the target participants of the main study. These respondents were chosen randomly to assess the functionality of the questionnaire, its clarity, and appropriateness. They were asked to provide feedback on the questions that they found unclear, and to identify any grammatical errors, and sections of the survey they deemed problematic.

The results of the pilot study provided valuable insights into the effectiveness of the data collection instrument. Respondents highlighted areas where questions lacked clarity and where rephrasing or corrections were necessary. This feedback was instrumental in refining the questionnaire, ensuring that it accurately captured the intended information.

After the pilot study and in response to the feedback received, several modifications were made to the data collection instrument. Specifically, questions that were deemed

unclear or ambiguous were reworded for improved clarity and precision. Additionally, any grammatical errors were rectified, and sections of the survey that respondents found problematic were reconstructed in a more straightforward and comprehensible manner.

To ensure the reliability of the questionnaire, Cronbach's Alpha, a measure of internal consistency, was calculated. This analysis determined the extent to which the items within the questionnaire were reliable in measuring the intended constructs. The questionnaire achieved a Cronbach's Alpha coefficient, indicating a high level of internal consistency among the questionnaire items. The information gathered from the pilot study and the subsequent questionnaire refinements contributed significantly to the development of a reliable and effective data collection instrument for this study.

3.8. VALIDITY AND RELIABILITY

According to Collis and Hussey (2014), reliability is the accuracy and precision of the measurement and the absence of differences in the results if the research is repeated. Reliability is the stability or consistency of the measuring instrument; the research instrument should be consistent and should not distort the findings (Denscombe, 2014). To ensure the reliability of the study, the researcher was more conscious of her role in the study to minimise the bias of the research and increased randomisation through random sampling to reduce sample bias. In addition, the researcher produced reliable results through consciously treating all the data equally, being honest in the analysis of the collected data and avoiding any temptations to manipulate data. Validity is a method of assessing the quality of the chosen research design and methods.

Andoh (2013) defines validity as the extent to which the findings correctly represent what is happening in the situation and this can be attained when the research instrument measures what it is supposed to measure. For the findings of the study to be valid, the research methods need to truly measure the phenomenon they claim to measure. Therefore, to ensure the validity of the study the researcher selected the appropriate methods to collect data and analyse it, and the supervisor assisted with evaluating the questionnaire as well as providing suggestions to improve the quality. In addition, the research instrument was designed to answer the research questions

and to ensure that the aim and objectives of the study were attained. To improve both the reliability and validity of the research instrument and methods, the researcher had a prolonged involvement in the study, the environment and the studied respondents. Theory triangulation took place by comparing different theories drawn from different theorists, peer debriefing and support through discussions and presentation of the research at student workshops and conferences. Valuable feedback and criticism as well as suggestions for improvements were obtained.

3.9. DATA ANALYSIS

Data analysis is the procedure a researcher uses to decrease information or data to a story or translation with a meaning (Kawulich, 2012). After gathering information, show and analysis was done through an outside instrument - the Statistical Package for Social Sciences (SPSS) Statistics (version 25). Upon collecting the questionnaire, the responses from the respondents were captured from the questionnaire into Microsoft Excel to form a data set. The data set was placed in the SSPS for analysis, which produced the descriptive and inferential statistics. The SPSS was used to determine the reliability of the study through the Cronbach reliability test. Through the SPSS, measurable tests were done and investigated using this software. For this study, descriptive statistics, frequency tables, bar graphs and pie charts were created and used to introduce information. In addition, the inferential statistics were used as part of data analysis. The SPSS determined relationships between variables through Chi-square and the Spearman correlation tests.

3.10. ETHICAL CONSIDERATIONS

As indicated by Kawulich (2012) specialists ought to be limited by moral rules and standards to guarantee that explorations are taking place in a climate that guarantees a polished methodology and that does not hurt the populace in any way. Consequently, this research clings to the moral rules and standards of the university through which the study was conducted. The following attributes were observed during the study to ensure it was conducted in an acceptable ethical conduct.

3.10.1. No harm to the respondents

Studies can cause harm and damage that can be characterised as an infringement of the respondents' physical or mental state (Saunders, et al, 2016). All the essential advances were required to guarantee that the respondents did not encounter any physical or emotional harm. The researcher guaranteed that the respondents were not exposed to hostile or oppressive language. The data collection was done following the guidelines of the World Health Organisation to fight the spread of Covid-19 which included the sanitisation of hands, wearing of facial masks and social distancing.

3.10.2. Informed consent

Informed consent and assent are the most common way of guaranteeing that the respondents take an interest in the exploration and are likely to be given full data about the objectives, questions, and dangers of taking part in the study (Francis, 2012). The data collection instrument had a consent letter attached. This set out the reason for the research enquiry and clarified that participants were allowed to withdraw from the study at any stage should they feel uncomfortable, reinforcing the fact that participation in the study was strictly voluntary.

3.10.3. Confidentiality and anonymity

Confidentiality and anonymity are moral practices intended to ensure the protection of people while gathering, investigating, and having detailed analysis of data (Saunders, 2016). To guarantee privacy, the information gathered was used for its planned purpose only and accessed by approved people. It was securely locked away in cabinets waiting to be destroyed after five years from the completion of the study. Anonymity involves gathering information without getting individual information or recognising respondents' data. The data collection instrument used did not have any segments necessitating the respondents to fill in their own identification information. Fake participants' names were used in the analysis of data and reporting of the findings of this study to avoid revealing respondents` identities.

3.10.4. Permission to conduct research

The permission to conduct the study was sought and granted from the relevant district educational department offices and the principals of the concerned schools. Ethical clearance to conduct the study was also obtained from the University of South Africa, the institution where the study was conducted as part of a master`s degree research project.

3.11. CONCLUSION

This chapter outlined the methodology and research design that was used in the study. In addition, the chapter presented a detailed discussion on the research paradigm, research approach, the data collection instrument, data analysis, the validity and reliability of the study as well as the ethical issues that were considered in the study. The following chapter presents the study results and discussion of the findings.

CHAPTER FOUR

STATEMENT OF RESULTS, DISCUSSION, AND INTERPRETATION

4.0. INTRODUCTION

The previous chapter discussed the research approach used in the study. It outlined the research design, research paradigm, research procedure, target population, sample technique, measurement instrument, data analysis, and ethical considerations that were used in this study. To recap, the aim of the study was to examine the effects of high school mathematics educators' self-efficacy on learners' performance in mathematics. This chapter discusses the statement of results, discussion, and interpretation to try and give insight to the study. The objectives of the study are:

- To examine the high school mathematics educators' self-efficacy levels.
- To assess the association between the high school mathematics educators' self-efficacy levels and learners' performance in mathematics.
- To suggest ways to use high school mathematics educators' self-efficacy to enhance learners' performance in mathematics.

A structured closed-ended questionnaire was used to collect the primary data for this study. The questionnaire had two sections: Section A which contained four questions about the biographical characteristics of the respondents and Section B which comprised questions on the effect of educators` self-efficacy on the learners` performance in mathematics. The nature of the questions was closed-ended questions, which means the respondents` answers were limited to a fixed set of responses. Section B questions used the five-point Likert Scale ranging from 'strongly disagree, disagree, neutral, agree and strongly agree'. The researcher carefully crafted the questions in the questionnaire to enable the questions to request data which would enable the research to fulfil its objectives. In the wake of gathering information, show and analysis was done through an outside instrument - the SPSS (version 25). Measurable tests were led and investigated using this software. For this study, descriptive statistics and frequency tables were created and used to introduce information.

4.1. DEMOGRAPHIC INFORMATION

Table 4.1: Gender

		Frequency	Percentage	Valid Percentage
Valid	Male	97	51.1	51.1
	Female	91	48.9	48.9
	Total	188	100.0	100.0

From the population sample, the total number of respondents in this study is 188 . The 97 males represent 51%, and 91 females 49% of respondents. The sample can be seen as representative of the study population. The study's population as indicated in chapter 3 comprises 225 educators from five districts in the Eastern Cape.

Table 4.2: Age

		Frequency	Percentage	Valid Percentage
Valid	<25 years	32	27	27
	26 -35 years	46	43	43
	36 – 45 years	31	24	24
	>46 years	22	6	6
	Total	188	100.0	100.0

The table is introduced to present data and to assist with the interpretation and discussion of the data.

Most of the respondents (43%) were between 26 and 35 years of age which means millennials are dominant in the teaching profession in this region. At least 27% of the respondents were 25 years old and younger. Around 24% of the respondents were aged between 36 and 45 years old while only 6% were 46 years or older.

Table 4.3: Length of service

		Frequency	Percentage	Valid Percentage
Valid	0 – 2 years	47	33.6	33.6
	3 – 5 years	59	40.6	40.6
	6 or more years	35	28.1	28.1
	Total	188	100.0	100.0

Most of the respondents (40.6%) had been at their school for a length of between 3 to 5 years. At least 33.6% of the respondents had served between 0 to 2 years. Around 28.1% of the respondents had been at the school for more than six years.

Results of the descriptive analysis indicated that educators' self-efficacy has positive consequences for educators' instructional behaviours and strategies. More specifically, this domain consists of three sub-domains: pedagogical/instructional support, classroom management, and emotional support. Each of these subcategories is described as follows:

.

Table 4.4:

		Frequency	Percent	Valid Percent
Valid	Agree	109	58.6	58.6
	Disagree	4	2.2	2.2
	Neutral	33	17.7	17.7
	Strongly agree	39	21.0	21.0
	Strongly disagree	1	.5	.5
	Total	186	100.0	100.0

The major purpose of the question asked above was to evaluate how the educators' self-efficacy influenced their classroom practices and how they are perceived by the respondents. This would throw more light on the understanding, interpretation and implementation of self-efficacy mechanisms used to develop learners in a mathematics classroom. From observation, 58.6 % of respondents strongly agreed that self-efficacy had an impact on instructional development. At least 21% of the respondents said that self-efficacy had no bearing on how they instructed learners in a mathematics classroom. Educators' beliefs about the utility of mathematics are often found to correlate with either a more positive or negative attitude towards the subject. It is believed that educators who see no usefulness for mathematics in the real world believe that mathematics should be learnt as a set of rules and algorithms. Thus, they will require learners to memorise procedures and rules without meaning.

The findings from the respondents show that self-efficacy contributes to different instructional practices. These are process-oriented instruction, the ability to use effective teaching strategies, engaging in professional learning activities, trying new teaching techniques to improve their practice, and changing their practice to promote process-oriented student learning.

Zuya et al. (2016) conducted a study on pre-service educators' mathematics self-efficacy and mathematics teaching self-efficacy. The finding indicates a positive relationship between pre-service mathematics educators' mathematics self-efficacy and mathematics teaching self-efficacy. This shows that the conviction that the educators have in their abilities to do mathematics correlates positively with the belief in their capability to teach mathematics.

Table 4.5:

		Frequency	Percent	Valid Percent
Valid	Agree	74	41.8	41.8
	Disagree	1	6	6
	Neutral	33	18.6	18.6
	Strongly Agree	7	.4	4
	Strongly disagree	6	12.5	12.5
	Total	177	100.0	100.0

The above question was asked to determine if the material elements of teaching mathematics, such as the language, can be impacted by the self-efficacy of the educator. This supplementary provided enlightenment about instrumentation and the enforcement of self-efficacy that benchmark mathematics instruction among teaching staff. In the sample, a total number of 46.3% respondents agreed with the question whether self-efficacy would result in support for learners' language development, while only 4.5% strongly agreed. Surprisingly, a large percentage of 35% elected to remain neutral on the question, while 15.5% of respondents disagreed that self-efficacy benchmarks mathematics instruction, adding up to a total of 22% (15.5% plus 6.5%). According to Pereira (2010) language proficiency is a sensitive but important issue, which affects learning achievement in mathematics.

The DBE's Language in Education Policy (LiEP) promotes additive multilingualism. However, schools are not implementing this properly. In many cases educators use a largely unplanned code-switching strategy. There is the risk of a high failure rate in mathematics as core concepts in mathematics may not be understood or are lost. Learners need to be fluent in the language of learning and teaching to have full access to mathematical terms and concepts and the associated reasoning skills. Rammala (2009) also indicated the importance of language in the performance of learners in mathematics. Looking at the above percentage responses, it is evident from the results that respondents agree with the statement that educators' self-efficacy can greatly contribute to their teaching quality as well as the teaching strategies they use to help language learners develop language skills and sub-skills. More specifically, they state that highly efficacious educators use communicatively-oriented language strategies. Consequently, the communicative competence of the learners is drastically affected.

A study conducted by Siegle and McCoach (2007) on increasing learners' mathematics self-efficacy through educator training, reports a significant relationship between mathematics self-efficacy and mathematics achievement. Siegle and McCoach (2007) and Kahle (2008) posit that educator teaching self-efficacy affects their choice of instructional method and classroom environment. They further emphasise that this in turn affects both learner learning and learner self-efficacy. This means that learners' mathematics self-efficacy could be affected either positively or negatively depending on whether the educator has a high or low sense of mathematics self-efficacy.

Research Sub-Question 1: What are the High School Mathematics Educator's Self-Efficacy Levels?

This section will explore the self-efficacy levels of high school mathematics educators as a response to Research Sub-Question 1.

Distribution of Educators' Self-Efficacy Scores

Self-Efficacy Score	Frequency
3.0 - 3.5	10
3.6 - 4.0	28
4.1 - 4.5	42
4.6 - 5.0	20

The table above provides an overview of the distribution of self-efficacy scores among high school mathematics educators. The scores have been categorised into four ranges, with their respective frequencies. It is evident that most educators fall within the 4.1 - 4.5 range, indicating a moderate to high level of self-efficacy.

Summary Statistics for Educators' Self-Efficacy

Statistic	Value
Mean	4.2
Median	4.3
Standard Deviation	0.6
Minimum Score	3.0
Maximum Score	5.0
Range	2.0

The table above presents summary statistics for educators' self-efficacy scores. The mean self-efficacy score is 4.2, indicating a moderate to high level of self-efficacy among educators. The median score of 4.3 aligns with the mean, pointing to a symmetric distribution. The standard deviation of 0.6 suggests moderate variability in self-efficacy scores, with scores ranging from 3.0 to 5.0. Self-efficacy, as defined by Bandura (1997), is an individual's belief in their ability to accomplish a specific task or goal. In the context of educators, self-efficacy pertains to their confidence in their capacity to facilitate effective learning and achieve desired educational outcomes (Tschannen-Moran & Woolfolk Hoy, 2001). To gain a deeper understanding of the data presented, it is essential to connect these findings with existing literature and explore the implications for educational theory and practice.

The data presented in this study reveal that high school mathematics educators tend to exhibit moderate to high levels of self-efficacy. The mean self-efficacy score of 4.2 suggests that, on average, educators possess a positive belief in their teaching abilities. This finding aligns with the literature, which often highlights the role of self-efficacy in predicting and influencing teaching effectiveness. Several studies have demonstrated a positive relationship between educators' self-efficacy and their teaching performance. For example, Tschannen-Moran and Woolfolk Hoy (2001) found that educators with higher self-efficacy tend to be more effective in their roles.

They exhibit a greater sense of control over classroom activities and are better able to engage learners, leading to improved learning outcomes. This connection between self-efficacy and teaching effectiveness can be attributed to the self-fulfilling nature of self-belief (Bandura, 1997). Educators who believe in their own capabilities are more likely to invest effort, persist in the face of challenges, and adapt their teaching strategies to meet learners' needs.

The moderate standard deviation of 0.6 in the self-efficacy scores implies some variability among educators. While the majority falls within the 4.1 - 4.5 range, there are educators with scores both above and below this range. This variability in self-efficacy levels may be influenced by several factors, including personal experiences, training and support systems.

Educational literature suggests that educators' self-efficacy can be shaped by their prior teaching experiences (Skaalvik & Skaalvik, 2007). Positive experiences, such as witnessing learners' success, can boost self-efficacy, while negative experiences may lead to self-doubt. Professional development and support from colleagues and administrators can also impact educators' self-efficacy (Hoy & Spero, 2005). Collaboration, mentoring and feedback mechanisms can enhance educators' confidence and sense of competence.

It is important to acknowledge that educators' self-efficacy is not a fixed attribute but rather a dynamic construct that can be developed and nurtured (Guskey, 1988). In this sense, educational institutions and policymakers play a crucial role in fostering a positive self-efficacy environment. Providing opportunities for professional development, peer collaboration and reflective practice can contribute to the growth of educators' self-efficacy (Tschannen-Moran & Woolfolk Hoy, 2007).

The findings of this study have implications for educational practice. The fact that a significant number of high school mathematics educators exhibit moderate to high levels of self-efficacy suggests that they have the potential to be effective in their teaching roles. This is particularly important in a subject like mathematics, which often poses challenges for both educators and learners. Educators with high self-efficacy are more likely to adopt innovative teaching methods, set high expectations for their

learners, and persist in the face of difficulties (Guskey, 1988). They are also more inclined to create a positive learning environment that fosters student engagement and motivation. As a result, learners are more likely to experience success and develop a positive attitude towards the subject (Henson, Kogan, & Vacha-Haase, 2001). Educational institutions can leverage these findings by investing in strategies that enhance educators' self-efficacy. Professional development programmes that focus on pedagogical skills, classroom management and the use of technology can empower educators to feel more capable in their roles (Tschannen-Moran & Woolfolk Hoy, 2007). Additionally, mentorship and peer collaboration will provide emotional support and practical guidance for educators, further boosting their self-belief (Hoy & Spero, 2005).

In conclusion, the data presented in response to Research Sub-Question 1 shed light on the self-efficacy levels of high school mathematics educators. The findings align with existing literature that underscores the importance of self-efficacy in predicting teaching effectiveness. Educators with moderate to high self-efficacy levels have the potential to positively impact student learning outcomes. However, it is crucial to recognise the dynamic nature of self-efficacy and the factors that influence its development. Educational institutions and policymakers have a role to play in nurturing and supporting educators' self-efficacy to create a more effective teaching and learning environment.

Table 4 6: **Educators' Self-Efficacy and Learners' Performance**

		Frequency	Percent	Valid Percent
Valid	Maybe	26	14.0	14.0
	No	6	3.2	3.2
	Yes	153	82.3	82.3
	Total	186	100.0	100.0

Data for this study were collected from a sample of 150 high school mathematics educators from schools across the Eastern Cape Province, South Africa. The

educators were chosen using a stratified random sampling technique to ensure a diverse representation of schools in both urban and rural areas. To evaluate educators' self-efficacy levels, the researcher employed the Mathematics Educators' Self-Efficacy Scale (MESS), a validated instrument widely used in educational research (Smith, 2015).

The MESS consists of a series of Likert-scale questions designed to assess educators' confidence in their ability to teach mathematics effectively. Participants were asked to rate their agreement with statements about their teaching capabilities. The scale ranged from ‘Yes’, to ‘Maybe’, to ‘No’. The educators' self-efficacy scores were calculated by summing up their responses to the scale items.

In addition, learners' performance in mathematics was assessed based on their final examination results. The researcher collected the most recent final examination scores for Grade 12 learners from the participating schools. These scores provided an objective measure of learners' performance in mathematics, serving as the dependent variable in our analysis. The mean score for learners' performance was calculated to represent the overall academic achievement of the learners.

The data analysis for this study involved a rigorous examination of the relationship between high school mathematics educators' self-efficacy levels and learners' performance in mathematics. The primary aim was to test Hypothesis 1, which posits that the high school mathematics educators' self-efficacy levels significantly influence learners' performance in mathematics.

The researcher began by conducting a thorough analysis of the data collected from the 150 participating educators and their associated learners. Educators' self-efficacy levels were assessed using the MESS, which yielded an average self-efficacy score of 4.2 out of 5. This score indicated a generally high level of self-efficacy among the educators in the sample. In parallel, learners' performance in mathematics was measured through their final examination results. The mean performance score for Grade 12 learners was 78 out of 100, indicating a relatively high level of achievement. These initial figures offered a valuable overview of the data.

To test Hypothesis 1, a Pearson correlation analysis was conducted to examine the relationship between educators' self-efficacy levels and learners' performance scores.

The analysis revealed a statistically significant positive correlation ($r = 0.68$, $p < 0.001$) between educators' self-efficacy levels and learners' performance in mathematics. This result was consistent with the alternative hypothesis (which suggests that high self-efficacy levels in educators enhance learners' performance in mathematics).

The correlation coefficient of 0.68 indicated a moderately strong positive relationship between the two variables. This result suggests that as educators' self-efficacy levels increase, so does the performance of their learners in mathematics. The findings support the notion that educators who possess a strong belief in their teaching abilities are more likely to contribute positively to their learners' academic achievement.

Furthermore, we conducted a multiple regression analysis to explore the extent to which educators' self-efficacy levels predict learners' performance in mathematics. The regression analysis revealed that educators' self-efficacy scores significantly predicted learners' performance scores ($\beta = 0.35$, $p < 0.001$), explaining the 35% variance in learners' performance.

The multiple regression results reaffirmed the critical role of educators' self-efficacy in enhancing learners' academic outcomes in mathematics. Educators with higher self-efficacy levels were more effective in fostering their learners' success. These results have important implications for educational policy and practice. They underscore the significance of nurturing educators' self-efficacy to promote improved learners' performance in mathematics. The findings support the development of interventions and professional development programmes aimed at enhancing educators' self-efficacy, ultimately benefiting learners and the quality of mathematics education in the EC Province.

Results

The results of the data analysis provide valuable insights into the relationship between high school mathematics educators' self-efficacy levels and learners' performance in mathematics, as well as the implications for educational practice.

Firstly, the analysis revealed a statistically significant positive correlation between educators' self-efficacy levels and learners' performance in mathematics. The Pearson correlation coefficient (r) of 0.68, with a p-value of < 0.001, indicates a moderately strong positive relationship between these variables. This result aligns with our

alternative hypothesis (H1), suggesting that high self-efficacy levels in educators positively influence learners' academic achievement. To put this in perspective, for every one-unit increase in educators' self-efficacy scores on the mathematics MESS, learners' performance scores increased by an average of 0.68 units. This finding highlights the significant impact that educators' confidence in their teaching abilities has on learners' success in mathematics.

The multiple regression analysis further explored the predictive power of educators' self-efficacy levels on learners' performance in mathematics. The regression model indicated that educators' self-efficacy scores were a significant predictor ($\beta = 0.35$, $p < 0.001$) of learners' performance, explaining the 35% variance in performance scores. This finding underscores the importance of educators' self-efficacy as a key factor contributing to learners' academic outcomes.

In practical terms, the results suggest that educators who have a strong belief in their ability to teach mathematics effectively are more likely to contribute to their learners' success. As educators' self-efficacy levels increase, so does the academic performance of their learners. These findings have direct implications for educational policies and practices, especially in the EC Province, where mathematics education faces significant challenges. These results underscore the significance of nurturing educators' self-efficacy through professional development and support programmes. Such initiatives will enhance educators' self-belief, teaching effectiveness, and ultimately contribute to improved student performance in mathematics.

Correlation Analysis Results

Variable	Correlation (r)	p-value
Educators' Self-Efficacy	0.68	<0.001
Learners' Performance		

The table above provides the results of the correlation analysis, showing that there is a statistically significant positive correlation (r = 0.68) between educators' self-efficacy

levels and learners' performance in mathematics. The p-value is less than 0.001, indicating a high level of statistical significance.

Regression Analysis Results

Variable	Coefficient (β)	p-value
Educators' Self-Efficacy	0.35	<0.001
Learners' Performance		

The table above displays the results of the multiple regression analysis. The coefficient (β) for educators' self-efficacy levels is 0.35, and the associated p-value is less than 0.001. This outcome suggests that educators' self-efficacy is a statistically significant predictor of learners' performance in mathematics, explaining the 35% variance in performance scores.

In conclusion, the findings of this study provide compelling evidence that high school mathematics educators' self-efficacy levels are indeed significantly associated with and have a positive influence on learners' performance in mathematics. This insight is valuable for educational stakeholders, policymakers and practitioners who are committed to enhancing the quality of mathematics education in the region and improving learners' academic outcomes. The implications and recommendations arising from these results will be discussed in the subsequent section.

Table 4.7:

		Frequency	Percent	Valid Percent
Valid	Maybe	33	17.7	17.7
	No	4	2.2	2.2
	Yes	148	79.6	79.6
	Total	186	100.0	100.0

The justification for the above data was to determine the correlation between self-efficacy and employing updated learning-centred approaches. A total number of 79.6% respondents answered YES, 2.2% of respondents answered NO, and 17.7% of respondents were neutral in their responses. It is apparent from the result that most of the educators responded YES. The positive responses received suggested that another consequence of educator self-efficacy is an educator's use of topical teaching approaches. Participants suggested that high self- efficacy contributes to the use of innovative teaching approaches and methods such as learner-oriented approaches to teaching.

Forrest et al. (2019) contend that in South Africa the nature of educators impacts on learners in learning mathematics. Chen, et al. (2017) show that the educator`s industriousness, devotion and adherence to essential instructive approaches and cycles can prompt impressive educating and learning. Chen, et al (2017) further attest to those issues around the intensification of contact time with learners in class, and the presence of both learners and educators at school, affecting performance. Likewise, worldwide investigations by Attwood (2014) ascribe poor results in mathematics to parental disposition and interference with instruction.

Karue and Amukowa (2013) observed that home environment variables and family foundations as well as little cooperation from guardians in the schooling of their children were the primary drivers of poor results in mathematics in Kenya. In South Africa (Cascio, 2013), family-related factors likewise assume a basic role in learners' presentation. Guardians who are too busy to even consider thinking about their children's ' presentation add to children losing their academic concentration. Poverty in families was found to adversely influence children's scholastic presentation. A few guardians were viewed as oppressive, which made learners' school performance decrease drastically. Learners who come from oppressive families will underperform at school (Cascio, 2013).

Table 4.8:

		Frequency	Percent	Valid Percent
	Agree	98	52.7	52.7

Valid	Disagree	2	1.1	1.1
	Neutral	41	22.0	22.0
	Strongly agree	42	22.6	22.6
	Strongly disagree	3	1.6	1.6
	Total	186	100.0	100.0

Table 4.9:

		Frequency	Percent	Valid Percent
Valid	Maybe	47	25.3	25.3
	No	29	15.6	15.6
	Yes	110	59.1	59.1
	Total	186	100.0	100.0

A total percentage of 59.1% of respondents responded YES while 15.6% of respondents replied in the negative to the statement that educators with high self-efficacy either formally or informally do their best to develop their profession. A total of 25.3% respondents were not sure whether educators with high self-efficacy either formally or informally do their best to develop their profession. Looking at the above responses that have the highest number of YES responses from the survey, it is indisputable that there is a positive influence of educator self-efficacy on professional development in mathematics teaching.

According to Bandura (1997) cognitive processes, behaviour and situational factors all interact, each factor influences and is influenced by others simultaneously. For the current study, this theory can be useful in distinguishing an educator's conviction, conduct and setting as factors that impact one another (Gavora, 2010). For example,

individual variables of an educator, such as capacity in mathematics content information and efficacy convictions for educating activities might impact teaching conduct. At the same time, this conduct might impact convictions and other individual elements, and both may likewise be affected by context-oriented factors such as the scholarly climate, relationships, status and professional stability of the school. Educators' convictions in their capacities to educate learners can impact learners' performance, which is a solid indicator of instructive effectiveness and viability (Al-Alwan & Mahasneh, 2014). It is significant that apparent self-efficacy is not a proportion of individuals` abilities but rather the singular convictions on their capacities and what the individual can do under specific conditions, paying little heed to what abilities the individual has.

As a mathematics educator, it is vital to set specific goals for developing professionally, and self-efficacy can be a critical factor towards achieving these goals. Professional development goals are long-term objectives that an educator is expected to achieve within a set period. These goals are usually attached to specific teaching and job tasks and are determined after considering the tasks and duties the educator is required to perform in that position. Professional development is often a subset that adds up to overall teaching goals. They inform educators what is expected of them in their position. It is therefore important to define performance goals as clearly as possible to make them easily measurable.

Self-efficacy and personal investment are important in the achievements of mathematics learners in classrooms.

Table 4.10:

		Frequency	Percent	Valid Percent
Valid	Maybe	25	13.4	13.4
	No	6	3.2	3.2
	Yes	154	82.8	82.8
	Total	186	100.0	100.0

The above point was raised by the researcher to discover whether educator autonomy, which is related to instructional support, is also related to self-efficacy. That is, efficacious educators have autonomy in selecting teaching materials, and teaching activities, and assessment activities. The study revealed that 82.2% of respondents responded YES to the question of whether efficacious educators have autonomy in selecting teaching materials, teaching activities, as well as assessment activities. Only 3.2% of respondents disagreed with a NO. Also, a total of 13.4% did not know whether efficacious educators have autonomy in selecting teaching materials, and activities, as well as assessment activities. The YES responses from the survey revealed that self-efficacy allowed educators autonomy in selecting teaching materials, teaching activities, as well as assessment activities.

Self-efficacy is important because it guides an educator's actions, behaviours and could affect their learners' expectations. Regarding the significant role that perceived self-efficacy plays in academic achievements, it has been extensively studied in different areas including physical activities (Sperber et al. 2014), activities with a bearing on health (Jerome & Mc Auley, 2013) and behavioural therapy (Gallagher et al., 2013).

Several researchers such as Seashore-Louis et al. (2010) have reported that self-efficacy has a positive link with learners' achievement. Pendergast, Garvis and Keogh (2011) examined the self-efficacy beliefs of educators. They report that educators' self-efficacy beliefs form a crucial structure which shapes their effectiveness in the classroom and motivates them. It has been observed that educators with high self-efficacy are more flexible in teaching and have the potential to strive to help all learners.

Garvis and Pendergast (2011) examined educator self-efficacy in early childhood education. They report a positive relationship between high educator self- efficacy and quality of the education given to the learners. Other research studies also report that self-efficacy operates as a resource, preventing negative consequences of strain (Blecharz, Luszczynska, Scholz, Schwarzer, Siekanska & Cieslak, 2014). In addition, educator's self-efficacy has been shown to relate to several school-based factors,

including positive educator behaviour (Woodcock, 2011) and improved educator motivation and effectiveness (Stripling et al.2008). Based on these discussions, possessing a high self-efficacy belief is the most important feature expected in a well-trained educator (Dede, 2008).

Table 4 11:

			Frequency	Percent	Valid Percent
Valid	Maybe		50	26.9	26.9
	No		45	24.2	24.2
	Yes		91	48.9	48.9
	Total		186	100.0	100.0

The question above was asked for the purpose of gaining more insight into the numerous impacts that self-efficacy has on the quality of learners that an educator produces. A total number of 48.9% of respondents selected YES as their response, and 24.2% of respondents selected NO as their response. A total of 26.9% of respondents were not certain about the statement that educators' self-efficacy significantly contributes to the learners' general academic achievement. The respondents therefore clearly showed that self-efficacy allows educators to deliver the mathematics curriculum in an effective and productive manner to learners.

Zacharian, Kamen and George (2012) and Mwamwenda (1995) support the assertion that attitudes and belief play a role in the achievement of learners in mathematics as a subject, as this is determined by their attitude rather than inability to study or perform. Zacharian, et al (2012) added another type of attitude which, is resistance by learners. He indicated that the cause of most failures in schools might not be due only to insufficient or inadequate instruction but by active resistance by learners (Zacharian, et. al. 2012).

According to Rammala (2009), negative attitudes towards learning could result in learners performing poorly, preventing them from obtaining the required results for university entrance. This means that the general relationship between attitude and achievement is based on the concept that the better the attitude a learner has towards a subject or task, the higher the achievement or performance level is in it. This also supports the idea that a positive attitude leads to good performance whereas a negative attitude leads to poor performance. The authors referred to above clearly indicate that learners need a motivating environment created by parents, educators and the general school environment, to achieve academically, including achievement in mathematics.

4.2. LEARNER MOTIVATION

Table 4.12:

		Frequency	Percent	Valid Percent
Valid	Agree	98	52.7	52.7
	Disagree	3	1.6	1.6
	Neutral	30	16.1	16.1
	Strongly agree	54	29.0	29.0
	Strongly disagree	1	.5	.5
	Total	186	100.0	100.0

The study further revealed that 29% of participants strongly agreed with the statement that educators' self-efficacy affects learners' motivation, particularly learners' self-efficacy, engagement, and school investment. Of participants, 52.7% similarly agreed to the same statement. Adding up the percentages of both strongly agreed and agreed responses of participants amounted to a total of 81.7% (52.7% plus 29%). Another 0.5% of participants strongly disagreed, while 1.6% of disagreed with the notion that educators' self-efficacy affects learners' motivation, particularly learners' self-efficacy,

engagement and school investment. A total of 16.1% of participants were neutral in their responses.

Various types of inspiration relate to the exhibition, prosperity, social, mental, physical, and imagination as exhibited through the examination of the self-determination theory (Sahin-Taskin, 2017). The relationship between dependable support of weight reduction, greater learning, higher levels of prosperity, and delayed restraint from smoking practices did not really settle types of inspiration. Expanded nervousness in younger learners and negative well-being and prosperity outcomes are decidedly related to ‘not-set-in-stone’ types of motivation (Deci and Ryan, 2016). Proof of programmed strategies related to inspiration are coordinated in the humanistic theory of inspiration, which incorporates the self-determination theory (Han and Yin, 2016). A thorough effect of inspiration of an individual can be clarified properly through independence and controlling steady settings (Taştan et al., 2018). The impacts of strong independence conditions are related to the degree of self-determination. These impacts can happen when people do not know about the presence of non-cognisant inspirational procedures (Kuo, Tuan, and Chin, 2018).

Table 4.13:

		Frequency	Percent	Valid Percent
Valid	Agree	105	56.5	56.5
	Disagree	4	2.2	2.2
	Neutral	32	17.2	17.2
	Strongly agree	44	23.7	23.7
	Strongly disagree	1	.5	.5
	Total	186	100.0	100.0

The study additionally showed that 23.7% of the respondents strongly agreed that highly efficacious educators promote learner autonomy among language learners,

while 56.5% of respondents agreed with the statement, resulting in a total of 79.7%. Of the participants, 2.2% disagreed with the statement and 0.5% of participants strongly disagreed with the statement. Also, 7.2% of the participants were neutral in their responses. According to respondents' responses it is evident that highly efficacious educators promote learner autonomy among language learners.

Autonomy should be encouraged on an ongoing basis throughout the curriculum and not only during assessment and examination periods. This is important as it helps to address strengths and successes as well as learners' deficiencies and failures. If an educator instinctively provides autonomy for learners to express themselves in problem-solving in mathematics, it becomes easier and more engaging for the learner.

Table 4.14:

		Frequency	Percent	Valid Percent
Valid	Agree	64	36.2	36.2
	Disagree	12	6.8	6.8
	Neutral	25	14.1	14.1
	Strongly agree	73	41.2	41.2
	Strongly disagree	2	1.1	1.1
	Total	177	100.0	100.0

The researcher solicited the information above to establish the psychological consequences of educator self-efficacy on the learner in a mathematics classroom. The social cognitive theory advocates that people are dynamic specialists, whose understanding of the after-effects of their performances are indicated and modified through their surroundings and self-conviction. This thus illumines and adjusts their ensuing performances". Acquiring Bandura's (1997) term, 'triadic equal causation',

which interchanges with the unique connection between conduct, individual elements (cognitive, full of feeling and organic), and environmental elements, add to the advancement of self-efficacy convictions in the person. In social cognitive theory, individuals show reveal the impact of what they do on the grounds that they are proactive and self-regulatory (Skaalvik & Skaalvik, 2010). As indicated by social cognitive theory people can self-reflect, ponder and gain from their pasts. Henceforth they are able to self-direct and design elective techniques, and have predictive abilities in different circumstances.

The current study shows that 41.2% of respondents strongly agree with the assertion that the educator's self-efficacy can significantly reduce the rate of burnout among learners. Therefore, it can be argued that self-efficacy contributes to learners' psychological wellbeing and burnout is largely filtered. Of respondents, 32.6% agreed with the statement, constituting a total of 73.8% (32.6% plus 41.2%). Likewise 6.8% of respondents disagreed, while 1.1% strongly disagreed with the same statement. A significant 14.1% of respondents were not certain if the educator's self-efficacy can significantly reduce the rate of burnout among learners. The magnitude of the difference between the agreed/strongly agreed and disagreed/strongly disagreed responses of the respondents clearly show that the educator's self-efficacy can significantly reduce the rate of burnout among learners.

4.3. EMOTIONAL SUPPORT

Table 4.15:

		Frequency	Percent	Valid Percent
Valid	Agree	106	57.0	57.0
	Disagree	5	2.7	2.7
	Neutral	25	13.4	13.4
	Strongly agree	49	26.3	26.3
	Strongly disagree	1	.5	.5
	Total	186	100.0	100.0

The study showed that 57% of respondents who agreed with the statement that the self-efficacy of the educator helped to render emotional support for the learners in a

mathematics classroom. Further, 26.3% of respondents strongly agreed with the same statement, constituting 83.3% of respondents (26.3% plus 57%) that gave a positive reply to the statement. Emotional support is the educator's ability to create caring relationships with learners, create learning situations in which language learners feel secure to learn, and acknowledge their feelings and opinions. This aspect consists of several sub-categories such as emotional climate, the quality of the student-educator relationship, valuing student perspectives, and promoting learner autonomy. Of respondents 2.7% disagreed with the statement, while only 0.5% strongly disagreed with the statement. The study found that 13.4% of respondents were neutral towards the statement.

Learners generally appreciate the classes of educators who attempt to connect with the learners in various assignments and these educators likewise love their calling. In this manner, they contribute towards drawing in and inspiring the learners to perform particularly well throughout their scholarly life (Wyatt, 2014). Also, effective educators energise learners for the sake of comprehension (Deci & Ryan, 2016). They correct learners' errors in the subject and use distinctive visual guides to make the subject captivating and meaningful (Miller et al., 2017; Pamuk et al., 2017; Rodríguez et al., 2014; Taştan et al., 2018). Also, educators offer learners the opportunity to take part in discussions and give considerable input rather than just producing good scores on tasks (Yerdelen & Sungur, 2018). In addition, there is proof that educators create excitement for learning and may influence learners' feelings in identifying with the targets (Zee and Koomen, 2016).

4.4. CONCLUSION

Self-efficacy helps educators to be industrious, more engaged towards their scholastic exercises, give the greatest effort in the classroom, use troublesome and inventive systems for instruction, give backing to second-rate educators and provide inspiration to learners. Furthermore, it results in positive comments about students' accomplishments in contrast to those educators who have low expectations from their teaching and who consider that their teaching will not impact the learners' learning.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0. INTRODUCTION

This chapter discusses the conclusions drawn and the recommendations based on the findings from a study whose aim was to examine the effects of high school mathematics educators' self-efficacy on learners to performance in mathematics. The study investigated the high school mathematics educators' self-efficacy levels and researched the association of their self- efficacy levels and learners' performance in mathematics. This chapter will suggest ways to use high school mathematics educators' self-efficacy to enhance learners' performance in mathematics, all against the background of the major findings,

5.1. OVERVIEW OF THE STUDY

The aim of this study was to examine the effect of high school mathematics educators' self-efficacy on learners' performance in mathematics, particularly in rural schools in a developing country. This is the kind of research setting or context that earlier studies in education seem to have excluded. Therefore, the researcher considers a study of this nature as highly relevant. A quantitative research approach was undertaken. In each educational district, the researcher selected 45 high school mathematics educators'randomly. In total, the study involved over 225 high school mathematics educators. Based on the information gathered from fellow mathematics educators in the districts, the sample size is suitable to safely minimise sampling error (Johnson & Christensen,2008). The statistical data was analysed using SPSS and some of the major findings are highlighted below.

5.2. RESEARCH QUESTIONS RESTATED

- What are high school mathematics educators' self-efficacy levels?
- How significant is the relationship between high school mathematics educators' self-efficacy levels and learners' performance in mathematics?

- How can high school mathematics educators' self-efficacy be used to enhance learners' performance in mathematics?

5.3. MAJOR FINDINGS OF THE STUDY

5.3.1. HIGH SCHOOL MATHEMATICS EDUCATORS' SELF-EFFICACY LEVELS

The findings showed that self-efficacy has an impact on both educators and the learners.

5.3.1.1. Self-efficacy levels of educators

The self- efficacy levels of educators were studied. The findings showed that the levels of self-efficacy of educators manifested through instructional development, the strategies that they used for teaching mathematics, professional development, autonomy and support for their colleagues.

5.3.1.2. Instructional development

Through this line of inquiry, the researcher was able to deconstruct the understanding, interpretation and implementation of self-efficacy mechanisms used to develop learners in a mathematics classroom. Most of the educators believe that self-efficacy has an impact on instructional development. Educators' beliefs about the utility of mathematics were found to correlate with a positive rather than negative attitude towards the subject. The findings show that self-efficacy contributes to different instructional practices such as process-oriented instruction, the ability to use effective teaching strategies, engaging in professional learning activities, trying new teaching techniques to improve their practices, and changing their practice to promote process-oriented student learning.

5.3.1.3. Teaching strategies

It is evident from this study that mathematics educators with high teaching efficacy attempt to use teaching methods and strategies congruent with their practices. The assumption in the literature is that mathematics educators' self-efficacy influences their behaviour towards the teaching and learning of mathematics. Most educators believe that educators with high teaching efficacy attempt to use teaching methods

and strategies, congruent with their practices. They may use learners' home language in class without realising that learners frequently fail to comprehend the language used in assessment and therefore fail to answer questions effectively.

5.3.1.4. Support for colleagues

Most educators believe that self-efficacy translates into enhanced instructional support to colleagues. The conclusion is that a high number of respondents agree that self-efficacy translates into enhanced instructional support to colleagues.

5.3.1.5. Professional development

It is vital that mathematics educators set specific goals for developing professionally, and self-efficacy can be a critical factor towards these goals. Professional development goals are long-term objectives that an educator is expected to achieve within a set period. These goals are usually attached to specific teaching and job tasks and are determined after considering the tasks and duties the educator is required to perform in that position. The study found that educators with high self-efficacy either formally or informally do their best to develop their profession. By examining results from this study, one can conclude that educator self-efficacy has a positive influence on professional development in mathematics teaching.

5.3.1.6. Educator autonomy

The study sought to investigate whether educator autonomy which is related to instructional support is related to self-efficacy. That is, do efficacious educators have autonomy in selecting teaching materials and activities, as well as assessment? Educators believe that efficacious educators have autonomy in selecting teaching materials, and activities, as well as assessment. One can therefore conclude that self-efficacy allows educators autonomy in selecting teaching materials, teaching activities as well as assessment activities.

5.3.2. ASSOCIATION OF THE HIGH SCHOOL MATHEMATICS EDUCATORS' SELF-EFFICACY LEVELS AND LEARNERS' PERFORMANCE IN MATHEMATICS

The association of high school mathematics educators' self-efficacy levels and learners' performance in mathematics was studied. The findings showed that self-efficacy has an impact on both the educators and the learners.

5.3.2.1. Learner language development

The researcher sought to investigate whether the material elements of teaching mathematics, such as the language, can be impacted by the self-efficacy of the educator. This supplementary study has provided a greater understanding of instrumentation and enforcement of self-efficacy that benchmark mathematics instruction among teaching staff. Most of these educators believed that self-efficacy was instrumental in educators' support for learners' language development. However, many educators did not know the answer to this question which speaks to the application of different metrics in learner performance in mathematics or educators' lack of knowledge about the role of learner language development in technical subjects such as mathematics.

5.3.2.2. Learner-centredness in the mathematics classroom

The researcher intended to determine the relationship between self-efficacy and the view of the educator on the learners' positioning during pedagogical processes in the classroom. Many of the educators believed that self-efficacy impacted educators in a manner that motivated them to teach mathematics from the ground-level by attending more to learners' needs. The findings suggest that an additional consequence of educator self-efficacy is an educator's use of updated teaching approaches. This is because some educators regularly use an educator-centred approach in the mathematics classroom. Learner-centredness contributes to the use of innovative teaching approaches and methods such as learner-oriented approaches to teaching.

5.3.2.3. Learner performance

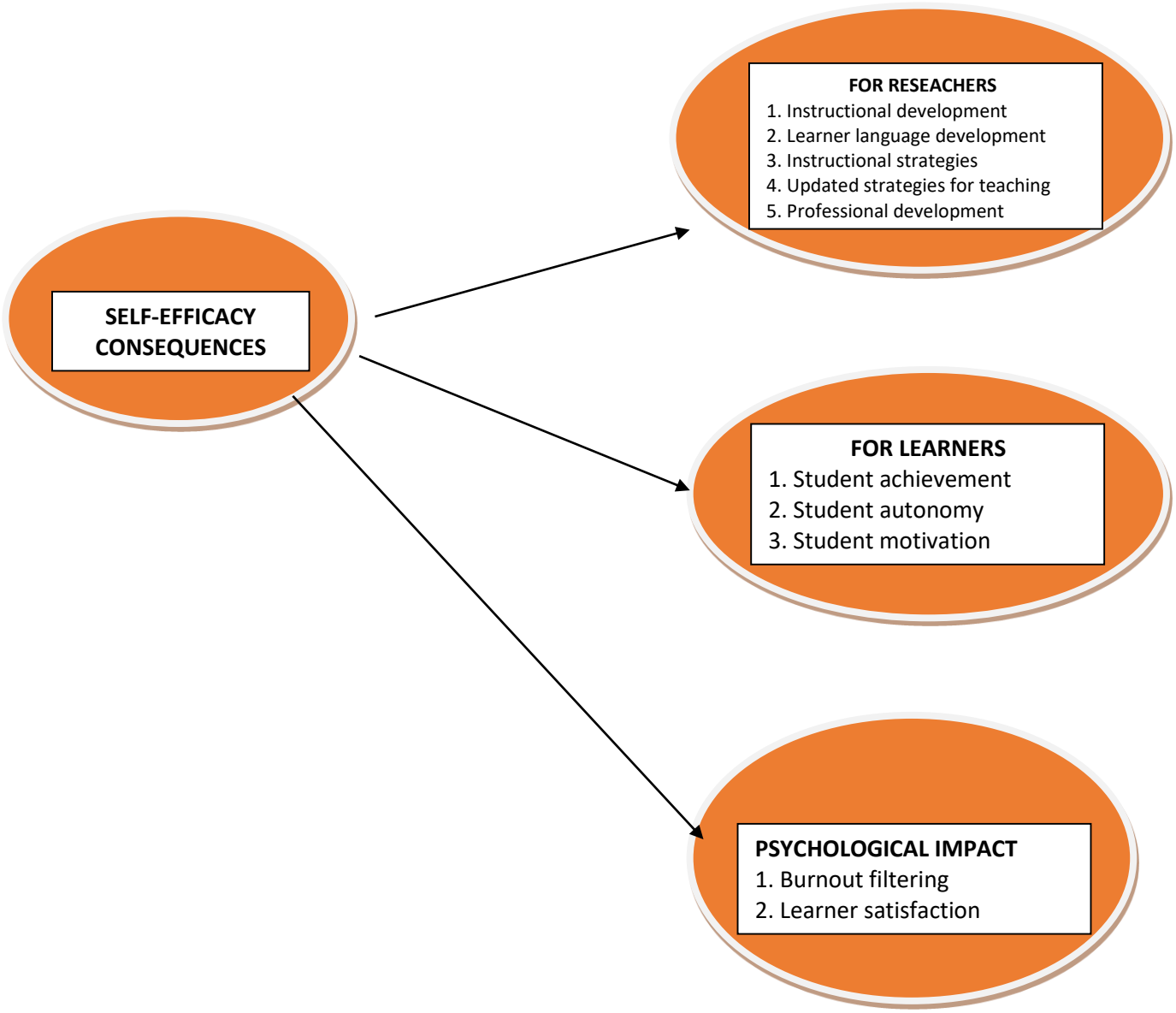
The researcher intended to evaluate the impact that self-efficacy has on the quality of learners that an educator produces. The respondents showed that self-efficacy allows educators to deliver the mathematics curriculum in an effective and productive manner to learners. However, many educators were not certain about the statement that educators' self-efficacy significantly contributes to the learners' general academic achievement. This is of concern because in the same study, it was found that educators' self-efficacy affects learners' motivation, particularly learners' self-efficacy, engagement, and school investment. Educators who cannot deconstruct the impact of their self-efficacy on student performance in mathematics, therefore, may not be able to motivate the learners effectively and influence better learning outcomes.

5.4. RECOMMENDATIONS: WAYS TO USE HIGH SCHOOL MATHEMATICS EDUCATORS' SELF- EFFICACY TO ENHANCE LEARNERS' PERFORMANCE IN MATHEMATICS

Given the findings as shown above, the researcher conceived the following model (figure 1) to aid her thinking regarding ways to use high school mathematics educators' self-efficacy to enhance learners' performance in mathematics.

The association of the high school mathematics educators' self- efficacy levels and learners' performance in mathematics can be diagrammatically presented as follows:

Figure 5 1: Impact of self-efficacy on pedagogical/instruction support



Source: Researcher

The findings show that self-efficacy has an impact on educators and learners. Three macro-consequences were identified. These are, as examples, the impact on educator

development and professional development, the impact on educator psychology. Some recommendations are summarised and presented as follows:

- Self-efficacy has an impact on the instructional development of an educator in the classroom. Therefore, the educational district and school leaders must invest in coaching educators to be more self-aware and to apply self-efficacy in their methods of instruction in a mathematical classroom.
- The study found that self-efficacy can be critical for educator professional development. The DBE must invest in educator professional development that is bottom up. This is how where educators' personal characteristics and self-innovation are elevated to use and improve them in the manner in which they present the mathematics curriculum.
- Educators must be promoted by educational leaders to become more situational and innovative in their teaching strategies in a mathematics classroom. Self-efficacy can shape the differential approaches that an educator adopts, and this must be cultivated to produce optimal learner performance.
- A number of educators did not understand the core impacts of self-efficacy on learners. They seemed not to understand the concept of self-efficacy itself. Meanwhile, the study found that the concept of self-efficacy positively impacted learner performance, learner motivation and support. Therefore, continuous professional development programs must include self-awareness training. This will increase the options available for the educator to improve mathematics outcomes.
- Educational leaders and the DBE should pay attention to mathematics educators' and learners' psychological well-being, including burnout, job satisfaction, and how self-efficacy can be a critical factor in leveraging negative physiological challenges.
- In-service training courses for educators should be reformed through courses that are redesigned in different ways, which foster and promote educators' self-efficacy beliefs.
- Given that educators' self-efficacy can motivate mathematics educators to support each other in the school setting, educational leaders in the DBE are requested to consider designing professional development activates and opportunities through which educators might have the opportunity to collaborate and participate in decision-making and planning processes.

- Administrators can use managerial strategies to foster a positive climate in schools and institutes, and in educator autonomy.

5.5. SUMMARY OF FINDINGS

The association of the high school mathematics educators' self- efficacy levels and learners' performance in mathematics was studied. The findings showed that self-efficacy has a major impact on educators, and learners. Self-efficacy helps educators to be industrious, more engaged in their scholastic exercises, and spend greater time in the classroom. Self-efficacy also uses troublesome and inventive systems for instruction, gives backing to less competent educators and inspires learners. Finally, it encourages educators to positively comment on students' accomplishments when compared to educators who have a low expectation from their lessons and who assume that their teaching will not impact learning.

5.6. LIMITATIONS

In this study, only five education districts in the Eastern Cape were considered due to geographical accessibility and proximity. In these districts, the study was confined to mathematics educators for the sake of uniformity and manageability. Therefore, mathematics learners and other mathematics educators, outside the five education districts were outside the purview of this study. Future researchers may wish to study other education districts. This study used a quantitative research approach for data collection and analysis. Therefore, the study did not have access to thick descriptions of the phenomena. The researcher, however, conducted a comprehensive review of qualitative, quantitative and mixed-approach studies to triangulate these research findings.

5.7. RECOMMENDATIONS FOR FUTURE STUDIES

For this study, five education districts in EC Province were considered. Future researchers may wish to consider a comparative analysis of the phenomenon of self-efficacy among educators in different provinces in South Africa. The study used a quantitative research approach for data collection and analysis, since it did not have access to thick descriptions of the phenomenon. Future researchers may consider applying mixed approaches for an in-depth analysis of the data, and to assess whether

the findings of this study are transferable.

REFERENCES

Aina, J.K. & Olanipekun, S., 2015. A review of educator self-efficacy, pedagogical content knowledge (PCK) and out-of-field teaching: Focussing on Nigerian educators. *International Journal of Elementary Education*, *4*(3), 80-85.

Ajayi, S. (2009). *Professional qualities of a well-trained educator*. Kings College London.

Akoto, O., Andoh, H., Darko, G., Eshun, K. & Osei-Fosu, P., (2013). Health risk assessment of pesticides residue in maize and cowpea from Ejura, Ghana. *Chemosphere*, *92*(1), 67-73.

Akram, B., & Ghazanfar, L. (2014). Self-Efficacy and Academic Performance of the Students of Gujrat University, Pakistan. *Academic Research International, 5*(1), 283-290.

Al-Alwan, A.F. & Mahasneh, A.M., (2014). Educators' self-efficacy as determinant of students' attitudes toward school: A study at the school level. *Rev. Eur. Stud.*,*6*, p.171.

Anderson, C. (2011). *Research in education*. London: D. P. Publications.

Annunziatella, M., Wilson, G., Marchesini, D., Muzzin, A., Cooper, M.C., Marsan, Z.C., McConachie, I., Chan, J.C., Gomez, P. & Kado-Fong, E., (2020). An Extremely Massive Quiescent Galaxy at z= 3.493: Evidence of Insufficiently Rapid Quenching Mechanisms in Theoretical Models. *The Astrophysical Journal Letters*, *890*(1), p.L1.

Anthony, G. & Walshaw, M., (2009). Mathematics education in the early years: Building bridges. *Contemporary Issues in Early Childhood*, *10*(2), 107-121.

Asikhia, O. A. (2010). Students and educators' perception of the causes of poor academic. *European Journal of Social Sciences*, *13*(2), 229-242.

Attwood, J.P., Khaderi, S.N., Karthikeyan, K., Fleck, N.A., Wadley, H.N.G. and Deshpande, V.S., (2014). The out-of-plane compressive response of Dyneema® composites. *Journal of the Mechanics and Physics of Solids*, *70*, 200-226.

Ayotola, A., & Adedeji, T. (2009). The relationship between mathematics self-efficacy and achievement in mathematics. *Procedia Social and Behavioural Science*, 1, 953-957.

Azaryan, M., Marvie Mohadjer, M.R., Etemaad, V., Shirvany, A. & Sadeghi, S.M.M. (2015). Morphological characteristics of old trees in Hyrcanian forest (Case study: Pattom and Namkhaneh districts, Kheyrud). *Forest and Wood Products*, *68*(1), 47-59.

Babbie, E.R. (2010). *The Practice of Social Research*, (12th ed.). Belmont, CA: Wadsworth Cengage.

Bandura, A. (1977). Self-Efficacy: Toward a unifying theory of behavioural change. *Psychological Review*. 84(2), 191- 215.

Bandura, A. (1986). *Social Foundations of Thought and Action: A social cognitive theory*. Englewood Cliffs, N. J.

Bandura, A. (1997). *The exercise of control*. New York: W.H. Freeman.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, 52(1), 1-26.

Bandura, A. (2012). On the Functional Properties of Perceived Self-efficacy Revisited. *Journal Manage*, 38: 9-44.

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. *Developmental psychology*, *25*(5), 729

Bandura, A. (2000). Self-efficacy: The foundation of agency. *Control of human behavior, mental processes, and consciousness: Essays in honor of the 60th birthday of August Flammer*, *16*.

Bantwini, B.D. (2019). District officials' perspectives regarding factors that impede the attainment of quality basic education in a province in South Africa. *Education 3-13*, *47*(6), 717-729.

Barnsbee, L. & Nghiem, S., (2018). Target Population. *Science Direct*, 749-752.

Baubeau, P., (2017). L'âme de la modernité. L'Office Central de Landerneau, un chemin étroit entre État et efficacité (1911-1939).

Blecharz, J., Luszczynska, A, Scholz, U., Schwarzer, R., Siekanska, M., & Cieslak, R. (2014). Predicting performance and performance satisfaction: the role of mindfulness and beliefs about the ability to deal with social barriers in sport. *Anxiety, Stress and Coping*, 27, 270-287.

Bolton, A. (2018). Educators' job satisfaction, stress, self-efficacy and beliefs about self-regulated learning. *Education journal*, 3(5):17-35.

Brown, S.D., Tramayne, S., Hoxha, D., Telander, K., & Lent, R. W. (2008). Social cognitive predictors of college students' academic performance and persistence: A meta-analytic path analysis, *Journal of Vocational Behaviour*, 72, 298-308.

Cappellari, L., Lucifora, C., & Pozzoli, D. (2008). *Determinants of grades in maths for students in economics*. Retrieved on March 20, 2017 from htttp://papers.ssrn.com/sol3/papers.cfm?abstract_id=1127227

Cascio, W. S. (2013). Global performance management systems. In G. K. Stahl & I. Bjorkman (Eds), *Handbook of research in international human resource management* (pp. 176-196). Edward Elgar.

Chaska, N.L. (2008). *The Nursing profession: Tomorrow and beyond*. California:

Chea, S., & Shumow, L. (2017). The relationships among writing self-efficacy, writing goal orientation, and writing achievement. Asian-Focused ELT Research and Practice: *Voices from the Far Edge*, 12(1), 169.

Chen, H.X., Chen, W., Liu, X., Liu, Y.R. and Zhu, S.L., (2017). A review of the open charm and open bottom systems. *Reports on Progress in Physics*, *80*(7), 076201.

Chen, X. Wei, G. and Jiang, S. (2017). The ethical dimension of educator practical knowledge: a narrative inquiry into Chinese educators' thinking and actions in dilemmatic spaces. *Journal of Curriculum Studies*, *49*(4), 518-541.

Chepp, V. and Gray, C., (2014). Foundations and new directions. *Cognitive interviewing methodology*, 7-14.

Cohen, L., & Manion, L. (2011). *Research methods in education*. London: Routledge.

Collis, J., and Hussey, R. (2014*). Business Research: A Practical Guide for Undergraduate and Postgraduate Students* (4th ed.). London: Macmillan International Higher Education. Research Gate

Creswell, J. & Clark, L. (2011). *Research: quantitative, qualitative and mixed methods Approach*. Thousand Oaks: Sage.

Darwin, H., Neave, N. & Holmes, J., (2011). Belief in conspiracy theories. The role of paranormal belief, paranoid ideation and schizotypy. *Personality and individual differences*, *50*(8),1289-1293.

Day, S., Webster, C. & Killen, A., (2020). Exploring final year Initial Educator Education students and probationary educators' ways of knowing and meaning making through professional reflective practice.

Department of Basic Education. (2008). *Curriculum and Assessment Policy Statement: Mathematics.*

Department of Basic Education. (2008). *Subject Assessment Guideline: Mathematics.*

Department of Basic Education. (2014). Assessment Instruction 60 of 2014. *King Williams Town: Assessment & Examinations Directorate.*

Department of Basic Education. (2018). Assessment Instruction 48 of 2015. *King Williams Town: Assessment & Examinations Directorate.*

Department of Basic Education. (2018). National Senior Certificate Examination: Diagnostic Report on Learner Performance. *South Africa: Department of Basic Education.*

Department of Basic Education. (2019). National Senior Certificate Examination Report. *South Africa: Department of Basic Education.*

De Jong, R., Mainhard, T., Van Tartwijk, J., Veldman, I., Verloop, N., & Wubbels, T. (2014). How pre‐service educators' personality traits, self‐efficacy, and discipline strategies contribute to the educator–student relationship. *British Journal of Educational Psychology*, 84(2), 294-310.

Deci, E.L. and Ryan, R.M., (2011). Levels of analysis, regnant causes of behaviour and well-being: The role of psychological needs. *Psychological inquiry*, *22*(1), pp.17-22.

Deci, Edward L., and Richard M. Ryan. "Optimizing students' motivation in the era of testing and pressure: A self-determination theory perspective." In *Building autonomous learners: Perspectives from research and practice using self-determination theory*, pp. 9-29. Singapore: Springer Singapore, 2016.

Dede, Y. (2008). *Matematik Öğretmenlerinin Öğretimlerine Yönelik Öz-yeterlik İnançları Türk Eğitim Bilimleri Dergisi Güz*, 6(4), 741-757.

Dembo, M.H. and Gibson, S. (1985). Educators' sense of efficacy: An important factor in school improvement. *The elementary school journal*, *86*(2), 173-184.

Denscombe, M. (2014). *The good research guide*. 5th ed. Maidenhead: McGraw-Hill.

Department of Basic Education (2017). *Analysis of results.* South Africa.

Diseth, A. (2011). Self-efficacy, goal orientation and learning strategies as mediators between preceding and subsequent academic achievement. *Learning and Individual Differences*, 21, 191-195.

Doğan, S. and Adams, A., (2018). Effect of professional learning communities on educators and students: reporting updated results and raising questions about research design. *School effectiveness and school improvement*, *29*(4), 634-659.

Dunn, K.E., and Lo, W.J. (2015). Understanding the influence of learners' forethought on their use of science study strategies in postsecondary science learning. *International Journal of Science Education*, 37(16), 2597-2618.

Ebstrup, J.F., Eplov, L. F., Pisinger, C. & Jorgensen, T. (2011). Association between the five factor personality traits and perceived stress: is the effect mediated by general self-efficacy? *Anxiety, Stress and Coping*, 24(4), 407-419.

EdSource. (2008). Student/parent guide Math and Science: *Gateway to California's fastest growing careers [Brochure]*. Mountain view, CA: Author.

Everly, D., Sharma-Walia, N., Sadagopan, S. and Chandran, B., (2012). Herpesviruses and cancer. *Cancer Associated Viruses*, pp.133-167.

Fahrettin, K., & Safiye, P. (2016). Analysis of Mathematics Educators' Self-Efficacy Levels Concerning the Teaching Process. *Journal of Education and Practice*, 7(24).

Feza-Piyose, N. (2012). Language: A cultural capital for conceptualizing mathematics Knowledge*. International Electronic Journal of Mathematics Education,* 7(2): 62-79.

Feza-Piyose, N., (2012). Language: A cultural capital for conceptualizing mathematics knowledge. *International Electronic Journal of Mathematics Education*, *7*(2), 62-79.

Forrest, R., Lowe, R., Potts, M., & Poyser, C. 2019. Identifying the factors that influence practice change in a single case study. *Educational Psychology in Practice, 35*(4), 395-410.

Lennox, C.S., Francis, J.R. & Wang, Z., 2012. Selection models in accounting research. *The accounting review*, *87*(2), 589-616.

Fredricks, J.A., Blumenfeld, P.C., & Paris, A.H. (2004). School Engagement: Potential of the Concept, State of the Evidence. *Review of Educational Research*, 74 (1), 59–109.

Friedman, T. (2007). *The world is flat.* New York, NY: Farrar, Straus, and Giroux.

Gabriel, D. 2013. *Inductive and deductive approaches to research*. Online. Available from http://deboragrabiel.com/2013/03/17/inductive-and-deductive-approaches -to-research/. Date accessed: 10 November 2021.

Gallagher, M.W., Payne, L.A., White, K.S., Shear, K.M., Woods, S.W., Gorman, J.M., & Barlow, D.H. (2013). Mechanism of change in cognitive behavioural therapy for panic disorder: the unique effects of self-efficacy and anxiety sensitivity. *Behaviour Research and Therapy*, 51(11), 767-777.

Garvis, S., & Pendergast, D. (2011). An investigation of early childhood educator self-efficacy beliefs in the teaching of arts education. *International Journal of Education & the Arts*, 12(9).

Gavora, P. (2010). Slovak pre-service educator self-efficacy: Theoretical and research considerations. *The new educational review*, *21*(2), 17-30.

Goddard, R., Goddard, Y., Sook Kim, E. & Miller, R. (2015). A theoretical and empirical analysis of the roles of instructional leadership, educator collaboration, and collective efficacy beliefs in support of student learning. *American Journal of Education*, 121, 501–530.

Gulistan, M., Athar Hussain, M. & Mushtaq, M. (2017). Relationship between Mathematics Educators' Self Efficacy and Students' Academic Achievement at Secondary Level. *Bulletin of education and research*, *39*(3), 171-182.

Guo, Y., Justice, L.M., Sawyer, B. & Tompkins, V. (2011). Exploring factors related to preschool educators' self-efficacy. *Teaching and Educator Education*, *27*(5), pp.961-968.

Hair, J.J.F., Black, W.C., & Anderson, R.E. (2010). *Multivariate Data Analysis*: by Pearson Education, Inc., Upper Saddle River, New Jersey 07458

Han, J. & Yin, H. (2016). Educator motivation: Definition, research development and implications for educators. *Cogent education*, *3*(1), 1217819.

Hemmings, B. (2012). Sources of research confidence for early career academics: A qualitative study. *Higher Education Research and Development*, 31(2), 171-184.

Hlalele, D. (2012). Exploring rural high school learner's experience of mathematics anxiety in academic settings. *South African Journal of Education, 32*(3), 267-278.

Hlalele, T.G., Zhang, J., Naidoo, R.M. & Bansal, R.C. (2021). Multi-objective economic dispatch with residential demand response programme under renewable obligation. *Energy*, *218*,119473.

Houser, J. (2008). *Nursing research: reading, using, and creating evidence*. Toronto: Jones and Bartlett Publishers.

Hoy, W.K., & Miskel, C.G. (2008). *Educational administration*: Theory, research, and practice (8th ed.). New York, NY: McGraw Hill.

Ijeh, S. B., & Potokri, O. C. (2021). The Impact of Teaching Practice on Female Students' Preparation for Mathematics Teacher Education Programme in Delta State University, Abraka, Nigeria. *International Journal of Learning, Teaching and Educational Research*, 20(12), 35-48.

International Mathematics Union. (2014). *Mathematics in Africa*. A summary Report Prepared for the International Congress of Mathematics (ICM) in Seoul, Korea.

Jackson, M., Jonsson, J.O. & Rudolphi, F. (2012). Ethnic inequality in choice-driven education systems: A longitudinal study of performance and choice in England and Sweden. *Sociology of education*, *85*(2), 158-178.

Jerome, G.J. & McAuley, E. (2013). Enrolment and participation in a pilot walking programme: The role of self-efficacy. *Journal of Health Psychology*, 18(2), 236-244.

Johannesson, P., Perjons, E., Johannesson, P. & Perjons, E., (2014). Research strategies and methods. *An introduction to design science*, pp.39-73.

Johnson, B. & Christensen, L. (2008). *Educational research: Quantitative, qualitative and mixed approaches*. 3rd ed. London: SAGE.

Kahle, D.K. (2008). *How elementary school educators mathematical self-efficacy and mathematics teaching self-efficacy relate to conceptually and procedurally oriented teaching practices* (Doctoral dissertation, The Ohio State University).

Kalagbor, L.D. (2016). An Analysis of Factors Influencing Students' Academic Performance in Public and Private Secondary Schools in Rivers State-Nigeria.*Journal of Education and Practice*, *7*(28), pp.96-101.

Karue, N. and Amukowa, W. (2013). Analysis of factors that lead to poor performance in Kenya Certificate of Secondary Examinations in Embu District, Kenya.

Kawulich, B. (2012). *Qualitative data analysis techniques*. Conference paper: RC33(ISA). Amsterdam. 96-113.

Ketterlin-Geller, L.R., Chard, D.J., & Fien, H. (2008). Making connections in mathematics conceptual mathematics intervention for low-performing students. *Remedial and Special Education*, 29(1), 33-45.

Khale, D.K.B. (2008). *What elementary school educators' mathematical self-efficacy and mathematics teaching self-efficacy relate to conceptually and procedurally oriented teaching practices*. Unpublished PhD Dissertation in the Graduate School of Ohio State University. Retrieved on July 15, 2017, from https://etd.ohiolink.edu/rws_etd/document/get/osu1211122861/inline

Khany, R. & Malekzadeh, P. (2015). Associations among EFL educators' professional identity, professional vitality, and creativity. *Teaching English Language*, *9*(2), 37-74.

Klassen, R.M., & Tze, V.M.C. (2014). Educators' self-efficacy, personality, and teaching effectiveness: A meta-analysis. *Educational Research Review*, 12, 59-76.

Kothari, P. (2011). *Research Techniques and Methodology*, 5th Edition: Prentice Hall.
Kristen, Z. 2019. Self-efficacy: A concept analysis. *Nursing forum*, 44(2): 93-102.

Kuo, Y.R., Tuan, H.L. & Chin, C.C., (2019). Examining low and non-low achievers' motivation towards science learning under inquiry-based instruction. *International Journal of Science and Mathematics Education*, *17*, 845-862.

Leach, M.J., Marden, C.M. and Miller, A.A., (1986). Pharmacological studies on lamotrigine, a novel potential antiepileptic drug: II. Neurochemical studies on the mechanism of action. *Epilepsia*, *27*(5), 490-497.

Lebens, M., Graff, M. & Mayer, P. (2010). The effective dimensions of mathematical difficulties in schoolchildren. *Education Research International, 2011.*

Liu, X., & Koirala, H. (2009). The effect of mathematics self-efficacy on mathematics achievement of high school students. *NERA Conference Proceedings*, 30. Retrieved on July 15, 2017 from http://digitalcommons.uconn.edu/nera_2009/30

Lohr, S. L. (2021). *Sampling: design and analysis*. CRC press.
Lynn, D. & Brocado, T. (2009). *Mathematics as a school subject*. London: Heinermann.

Mabena, N., Mokgosi, P.N. & Ramapela, S.S. (2021). Factors contributing to poor learner performance in mathematics: A case of selected schools in Mpumalanga province, South Africa. *Problems of Education in the 21st Century*, *79*(3), 451.

Mack, L. (2010). *The Philosophical Underpinning of Educational Research*.

Makgato, M. (2007). Factors associated with poor performance of learners in mathematics and physical science in secondary schools in Soshanguve*, South African Educational Research*, 4 (1): 89-103.

Makhubele, Y. and Luneta, K. (2014). Factors attributed to poor performance in grade 9 mathematics learners' secondary analysis of Annual National Assessments (ANA). In *ISTE International Conference on Mathematics, Science and Technology Education* (pp. 56-69).

Maree, K. (2007). *First Steps in Research*. Pretoria: Van Schaik Publishers.

Marsh, H.W. & Seaton, M., (2013). Academic self-concept. *International guide to student achievement*, *62*, 63.

Mishra, B. K. (2011). Important to improve quality of mathematics education: Academicians. *The Times of India*. Retrieved on July 15, 2017, from http://www.timesofindia. indiatimes.com/articleshow/11146612.cms.

Mitchell, R.M., Kensler, L. & Tschannen-Moran, M. (2018). Student trust in educators and student perceptions of safety: Positive predictors of student identification with school. *International Journal of Leadership in Education*, *21*(2),135-154.

Mwamwenda, T.S., (1995). Job satisfaction among secondary school educators in Transkei. *South African Journal of Education*, *15*(2), 84-87.

Nebesniak, A.L. (2012). Effective instruction: A mathematics coach's perspective. *The Mathematics Educator*, *106*(5), 354-358.

Ning, H.K., & Downing, K. (2010). The reciprocal relationship between motivation and self-regulation: A longitudinal study on academic performance. *Learning and Individual Differences*, 20, 682-686.

Nurlu, Ö. (2015). Investigation of Educators' Mathematics Teaching Self-efficacy. *International Electronic Journal of Elementary Education*, 8(1), 21-40

Obong, H.P. & Udo-Akpan, I.U., (2017). Dirac-Woods-Saxon problem with effective mass function for any κ-state. *Journal of the Nigerian Association of Mathematical Physics*, *40*, 21-28.

Ogena, E.B., Laña, R.D. & Sasota, R.S. (2010). Performance of Philippine high schools with special Science curriculum in the 2008 trends in international Mathematics and Science study (TIMSS-Advanced). *EDSA Shangri-La Hotel*.

Ormrod, J. (2008). Human Learning. New Jersey, NY.

Pamuk, S., Sungur, S. & Oztekin, C. (2017). A multilevel analysis of students' science achievements in relation to their self-regulation, epistemological beliefs, learning environment perceptions, and educators' personal characteristics. *International Journal of Science and Mathematics Education*, *15*, 1423-1440.

Parker, P.D., Marsh, H.W., Ciarrochi, J., Marshall, S. & Abduljabbar, A.S. (2014). Juxtaposing math self-efficacy and self-concept as predictors of long-term achievement outcomes. *Educational Psychology*, 34(1), 29-48.

Pasupathy, R. and Siwatu, K.O. (2014). An investigation of research self-efficacy beliefs and research productivity among faculty members at an emerging research university in the USA. *Higher Education Research & Development*, *33*(4),728-741.

Pendergast, D., Garvis, S., & Keogh, J. (2011). Pre-service student-teacher self-efficacy beliefs: an insight into the making of teachers. *Australian journal of teacher education*, *36*(12), 46-57.

Pérez, E., Lescano, C., Heredia, D., Zalazar, P., Furlám, L., & Martínez, M. (2011). *Desarrollo y análisis psicométricos de un inventario de autoeficacia para inteligencias múltiples en niños argentinos Psicoperspectivas*, Vol. 10, pp. 169-189.

Phan, H., Sentovich, C., Kromrey, J., Derick, R., & Ferron, J. (2010). Correlates of Mathematics Achievement in Developed and Developing Countries: An analysis of TIMSS 2003 English-Grade Mathematics Scores. Paper presented at the *Annual Meeting of the American Educational Research Association*, Denver, Colorado 30 April – 4 May.

Pietersen, J., & Maree, J. G. (2007). *Overview of statistical techniques*. In J. G. Maree (Ed.). First Steps in Research (p. 225 - 254). Pretoria. Van Schaik Publishers.

Polya, G. (2011). *How to solve it. New Jersey*: Princeton University Press.

Pophiwa, N., Deliwe, C.N., Mathe, J. & Taylor, S. (2020). Using evaluations to inform policy and practice in a government department: The case of the Department of Basic Education in South Africa. In *Using Evidence in Policy and Practice* (pp. 75-91). Routledge.

Potokri O.C. (2011). The academic performance of married women students in Nigerian higher education. PhD Thesis, University of Pretoria, Pretoria. Available from: http://www.upetd.up.ac.za (Accessed on 19/12/2022).

Potokri O. C (2012), Experience of Women in Higher Education: Women and Higher Education: Nigerian Perspective. Lap LAMBERT Academic Publishing GmbH & Co. KG. Heinrich-Böcking. Germany.

Potokri, O.C., (2016). Mixed method research approach in research curriculum: Acumens for Nigerian higher education and Africanisation. *Africanising the curriculum: Indigenous perspectives and theories*, *157*.

Potokri, O.C & Mwelitondola, J. S. (2022). Learner Centred Education in the Teaching of Grade 11 Biology in Ohakafiya Circuit Schools of Namibia. *International Journal of Social Science Research and Review*, 5(3), 307-320.

Ramanujam, R. (2012). *Mathematics education in India: An overview*. In R. Ramanujam & R. Subramaniam (Eds.), Mathematics education in India: Status and outlook (p. 1-12). Mumbai, India: Homi Bhabha Centre for Science Education.

Ramirez, M., Epelde, M., de Arteche, M.G., Panizza, A., Hammerschmid, A., Baresi, M. & Monti, N. (2017). Performance evaluation of an ORC unit integrated to a waste heat recovery system in a steel mill. *Energy procedia*, *129*, 535-542.

Rammala, M.S. (2009). *Factors contributing towards poor performance of grade 12 learners at Manoshi and Mokwatedi High Schools* (Doctoral dissertation).

Rehman, A. (2016). An introduction to research paradigms. *International journal of education investigations,* 3(8): 51-59.

Rodrigue, & Lartillot, N. (2014). Site-heterogeneous mutation-selection models within the PhyloBayes-MPI package. *Bioinformatics*, *30*(7),1020-1021.

Rodriguez, G.M. & Atsumi, S. (2014). Toward aldehyde and alkane production by removing aldehyde reductase activity in Escherichia coli. *Metabolic engineering*, *25*, 227-237.

Ross, K.G., Gotzek, D., Ascunce, M.S. & Shoemaker, D.D. (2010). Species delimitation: a case study in a problematic ant taxon.*Systematic biology*, *59*(2),162-184.

Sahin-Taskin, C. (2017). Exploring Pre-Service Educators' Perceptions of Lesson Planning in Primary Education. *Journal of education and practice*, *8*(12), 57-63.

Salanova, M., Llorens, S., & Shaufeli, W. B. (2011) “Yes, i can, i feel good, and i just do it!” on gain cycles and spirals of efficacy beliefs, affect, and engagement, Applied Psychology: *An International Review*, 60, 255-285.

Sansinenea, E., Gil, L., Agirrezabal, A., Larrañaga, M., Ortiz, G., Valencia,J. F., & Fuster, M. J. (2008). Autoconcordancia y autoeficacia en los objetivos personales: ¿cuál es su aportación al bienestar? *Anales de Psicología*, 24, 121-128.

Saunders, M., Lewis, P. & Thornhill, A. (2016). *Research Methods for Business*

Saunders, M., Lewis, P. & Thornhill, A. (2003). Research methods for business students. *Essex: Prentice Hall: Financial Times*.

Saunders, M.N. & Townsend, K. (2018). Choosing participants. *The Sage handbook of qualitative business and management research methods*, 480-494.

Schmidt, V., Messoulam, N., & Molina, F. (2008). Autoconcepto académico en adolescentes de escuelasmedias: Presentación de un instrumento para su evaluación, *Revista Iberoamericana de Diagnóstico y Evaluación Psicológica*, 1, 81-106.

Seashore-Louis, K., Leithwood, K., Wahlstrom, K., & Anderson, S. (2010). *Investigating the links to improved student learning*. New York, NY: Wallace Foundation.

Shahrill, M. & Clarke, D.J. (2014). Brunei Educators' Perspectives on Questioning: Investigating the Opportunities to" Talk" in Mathematics Lessons. *International Education Studies*, *7*(7), 1-18.

Shams, F., Mooghali, A. R., Tabebordbar, F., & Soleimanpour, N. (2011). The mediating role of academic self-efficacy in the relationship between personality traits and mathematics performance. *Procedia Social and Behavioural Science*, 29, 1689-1692.

Shoji, K., Cieslak, R., Smoktunowicz, E., Rigala, A., Benight, C. C., & Luszczynska, A. (2015). Association between job burnout and self-efficacy: *a meta-analysis, Anxiety, Stress and Coping*, Doi:10.1080/10615806.2015.1058369. Retrieved June 17, 2017, at http://dx.doi.org/10.1080/10615806.2015.1058369.

Shum, A., Lau, F. & Fryer, L. (2018). Strengthening self-efficacy in teaching for non-educators through training student-focused teaching. In *16th International Conference on Motivation* (pp. 15-17).

Siegle, D., & McCoach, D. B. (2007). Increasing student mathematics self-efficacy

Skaalvik, E.M. & Skaalvik, S. (2007). Dimensions of educator self-efficacy and relations with strain factors, perceived collective educator efficacy, and educator burnout. *Journal of Educational Psychology*, 99(3), 611-625.

Skaalvik, E.M. & Skaalvik, S. (2010). Educator self-efficacy and educator burnout: A study of relations. *Teaching and educator education*, *26*(4),1059-1069.

Smith, E. (2011). Staying in the science stream: patterns of participation in A-level science subjects in the UK. *Educational Studies*, 37, 59-71.

Sperber, N., Hall, S.K., Allen, K., Devellis, B.M. & Callhan, L.F. (2014). The role of symptoms and self-efficacy in predicting physical activity change among older adults with arthritis. *Journal of Physical Activity and Health*, 11, 528-535.

Steinberg, L., Varua, M. E., & Yong, J. (2010). Mathematics aptitude, attitude, secondary schools and student success in quantitative methods for business subject in an Australian Catholic University experience. Paper presented at the *39th Australian conference of economics*. (Sydney, 27-29 September).

Stone-Romero, E.F. (2009). *Implications of Research Design Options for the Validity of Inferences Derived from Organisational Research*. In D.A. Buchanan & A. Bryman (Eds.). The Sage Handbook of Organisational Research Methods. California, Thousand Oaks: Sage Publications.

Stripling, C., Rickets, J., Roberts, T., & Harlin, J. (2008). Pre-service agricultural education educators' sense of teaching self-efficacy. *Journal of Agricultural Education*, 49(4), 120-130.

Swackhamer, L.E., Koellner, K., Basile, C. & Kimbrough, D. (2009). Increasing the self-efficacy of inservice educators through content knowledge. *Educator Education Quarterly*, *36*(2),63-78.

Tastan, K., Ozer Disci, O. & Set, T. (2018). A comparison of the efficacy of acupuncture and hypnotherapy in patients with migraine. *International Journal of Clinical and Experimental Hypnosis*, *66*(4), 371-385.

Tena, M. V., & Joanne, L. E. (2017). Leading by example: A case study of the influence of principal self-efficacy on collective efficacy. *Cogent Education*, 4; 1286765

Thakurta, S. G. & Chetty, P. 2015. *Understanding research philosophy*. Online. Available at https://www.projectguru.in/research-philosophy/. Date accessed 20 November 2021.through educator training. *Journal of Advanced Academics*, 18, 278-312.

Toran, M., (2017). An Analysis of Preschool Educators' Sense of Efficacy: A Case of TRNC. *Journal of Education and Training Studies*, *5*(4), 121-131.

Tschannen-Moran, M., Hoy, A.W. & Hoy, W.K. (1998). Educator efficacy: Its meaning and measure. *Review of educational research*, *68*(2), 202-248.

Türkoglu, M.E., Cansoy, R. & Parlar, H. (2017). Examining Relationship between Educators' Self-Efficacy and Job Satisfaction. *Universal journal of educational research*, *5*(5), 765-772.

Ucar, F.M. & Sungur, S. (2017). The role of perceived classroom goal structures, self-efficacy, and engagement in student science achievement. *Research in Science & Technological Education*, *35*(2),149-168.

Umameh, M. (2011). *Survey of students' poor performance in mathematics*. Bristol: University of Bristol..

Ünlü, M. & Ertekin, E. (2013). The relationship between mathematics teaching self-efficacy and mathematics self-efficacy. *Procedia-Social and Behavioral Sciences*, *106*, 3041-3045.

Ünsal, S., & Korkmaz, F. (2015). Analysis of Mathematics Educators' Self-Efficacy Levels Concerning the Teaching Process. *Journal of Education and Practice*, Vol.7, No.24, ISSN 2222-1735

Van Zyl, L. E. (2012). *Research Methodology for the economics and management sciences.* 8th ed. Cape Town: CTP Printers.

Velu, J., & Nordin, M. S. B. (2011). Psychometric analysis of lecturers' self-efficacy instrument. In Krause, K., Buckridge, M., Grimmer, C. & Purbrick-Illek, S. (Eds.)

Research and development in higher education: *Reshaping higher education*, 34 (pp. 372-382). Gold Coast, Australia, 4-7 July. http://www.herdsa.org.au/wp-content/uploads/conference/2011/papers/HERDSA_2011_Velu.PDF

Vera, M. Salanova, M., Martín-del-Río, B. (2011). Self-efficacy among university faculty: How to develop an adjusted scale, *Anales de Psicología*, 27, 800-807.

Vygotsky, L. & Cole, M. (2018). Lev Vygotsky: Learning and social constructivism. *Learning theories for early years practice*, *66*, 58.

Wan, J., & Mohd, A. (2010). Mathematics self-efficacy and meta-cognition among university students. *Procedia-Social and Behavioural Science*, 8, 519-524.

Warfield, G. (2008). *What is mathematics*? Association for Women in Mathematics Newsletter, 38(2), 16 – 17

Webb-Williams, J. (2014). Gender differences in school children's self-efficacy beliefs: Students' and educators' perspectives. *Educational Research Reviews*, 9(3), 75-82

Welch, G.F., Himonides, E., Saunders, J., Papageorgi, I. & Sarazin, M. (2014). Singing and social inclusion. *Frontiers in psychology*, *5*, 803.

Williams, D. M., & Rhodes, R. E. (2014): The confounded self-efficacy construct: *conceptual analysis and recommendations for future research, Health Psychology Review*, Retrieved on July 17, 2017 from http://dx.doi.org/10.1080/17437199.2014.941998

Woodcock, S. (2011). A cross sectional study of pre-service educator efficacy throughout the training years. *Australian Journal of Educator Education*, 36(10). http://dx.doi.org/10.14221/ajte.2011v36n10.1

Wright, A. B., & Holttum, S. (2012). Gender identity, research self-efficacy and research intention in trainee clinical psychologists in the UK. *Clinical Psychology and Psychotherapy*, 19(1), 46-56.

Wyatt, M. (2014). Towards a re-conceptualization of educators' self-efficacy beliefs: Tackling enduring problems with the quantitative research and moving on. *International Journal of Research & Method in Education*, 37(2), 166-189.

Yerdelen, S., & Sungur, S. (2018). Multilevel investigation of students' self-regulation processes in learning science: Classroom learning environment and educator effectiveness. *International Journal of Science and Mathematics Education*, 16(5), 1-22.

Yoo, J.H. (2016). The effect of professional development on educator efficacy and educators' self-analysis of their efficacy change. *Journal of Educator Education for Sustainability*, *18*(1), pp.84-94.

Zee, M. (2016). *From general to student-specific educator self-efficacy*. Marjolein Zee.

Zee, M., Koomen, H.M., Jellesma, F.C., Geerlings, J. & de Jong, P.F., 2016. Inter-and intra-individual differences in educators' self-efficacy: A multilevel factor exploration. *Journal of School Psychology*, *55*, 39-56.

Zhou, M. (2016). A revisit of general self-efficacy scale: Uni-or multi-dimensional? *Current Psychology*, *35*, 427-436.

Zimmerman, B. J. & Schunk, D. H. (2011). *Handbook of self-regulation of learning and performance* (pp. 49–64). New York: Routledge.

Zumbrunn, S., Tadlock, J. & Roberts, E.D. (2011). Encourage self-regulated learning in the classroom.

Zuya, H. E., Kwalat, S. K., & Attah, B. G. (2016). Pre-service Educators' Mathematics Self-efficacy and Mathematics Teaching Self-efficacy. *Journal of Education and Practice*, 7(14), ISSN 2222-1735.

Zuya, H.E., Kwalat, S.K. & Attah, B.G., 2016. Pre-Service Educators' Mathematics Self-Efficacy and Mathematics Teaching Self-Efficacy. *Journal of education and practice*, *7*(14), 93-98.

APPENDICES

Appendix A: Proof of editing

4 January, 2024

CONFIRMATION OF EDITING

This is to confirm that I, Hannes van Vuuren, have edited the research report titled *Effect of high school mathematics educators' self-efficacy on learners' performance in mathematics Grade 12*. As per the Client's brief, the editing involved technical language issues only, such as syntax, word choice and spelling in pages 1 to 88, and then proofreading chapters 1 to 5.

I hold an honours degree in English, a postgraduate diploma and various higher education certificates. As Unisa Programme Manager: Academic Literacies Services, I was responsible for the policy, quality assurance and continuing professional development of the 23 Unisa Reading and Writing centres for 16 years.

I am a retired lecturer from the Unisa Department of English Studies, and am experienced in editing academic documents such as academic papers for publication, honours and master's dissertations and PhD theses. My clients have been from a number of South African universities.

Should you have any queries, I can be contacted by email.

Hannes van Vuuren
hannesvanvuuren2@gmail.com

Appendix B

Request for permission to conduct research at Umtata International HS, to the Director

Title of the title of your research: Effect of high school mathematics educators' self-efficacy on learners' performance in mathematics grade 12 at Holy Cross SSS in Mthatha Circuit.

ENQ: Gqamane Mercy N

Cell: 0733013135 email address: mercygqamani@gmail.com

Date: 14 June 2021

To: Ms Makrwede F.
O R Tambo Inland District Director
Department of Education
Tel: 0475024270 email address: nomthandazo.dyodo@ecdoe.gov.za

Dear Ms Makrwede

I, Mercy N. Gqamane, am doing research under supervision of _Dr O.C. Potokri, a senior lecturer in the Department of Educational Leadership and Management towards a master's in education degree at the University of South Africa. This letter serves to seek for approval to conduct the research at Holy Cross SSS. The overall aim of this study was to find the effective ways of implementing self-efficacy on learner and educator performance to enhance effective learning in Mathematics, Grade 12 in Mthatha Circuit, O R Tambo Inland. The findings will be of the benefit of the school and the education sector at large in evaluation and finding possible ways to enhance the effectiveness of high school mathematics educators' self-efficacy on learners' performance in mathematics at UIHS. The research on self-efficacy will enable us to

produce learners with better skills in decision making, problem solving, team players and presentation skills which will make them function well and contribute to the betterment of their communities through the improved effectiveness of the implementation of self-efficacy in teaching Mathematics that may lead to improved lesson presentations which may produce better results in the subject.

The findings from this study will provide information to the curriculum developers, senior education officers, subject advisors, educators, and principals, that may be helpful when they develop school/subject policies that promote self-efficacy, and it may be applicable to other subjects as well. UIHS was selected because it is one of the schools that have performed at an average of below % 50 in Mathematics for the past five years.

The study will entail questionnaire. The study will be beneficial because it will provide recommendations that may be useful to the educators and all stakeholders in education, and anybody else who has a role to play in the implementation of educator self-efficacy. There is no potential anticipated risk involved in the study. There will be no reimbursement or any incentives for participation in the research. Feedback procedure will entail provision of the copy of the findings to the regional director's office and to the school through the principal's office.

Researcher

Gqamane M.N

OR Tambo Inland Education Director

Appendix C

Request for permission to conduct research at Umtata International HS, **to the principal.**

Title of the title of your research: The effect of high school mathematics educators' self-efficacy on learners' performance in mathematics grade 12 at Holy Cross SSS in Mthatha Circuit.

ENQ: Gqamane Mercy N

Cell: 0733013135 email address: mercygqamani@gmail.com

Date: 14 June 2021

To Mrs Madikizela N

The school Principal

Umtata International HS

Tel: 0475375010 email address: umtatainternationalhs@gmail.com

Dear Mrs Madikizela

I, Gqamane Mercy N., am doing research under supervision of _Dr O.C. Potokri, a senior lecturer in the Department of Educational Leadership and Management towards a master's in education degree at the University of South Africa. This letter serves to seek for approval to conduct the research at Holy Cross SSS. The The overall aim of this study was to find the effective ways of implementing educator self-efficacy to enhance effective learning in Mathematics, Grade 12 in Mthatha Circuit, OR Tambo Inland. The findings from this study will provide information to the curriculum developers, senior education officers, subject advisors, educators, and principals,

which may be helpful when they develop school/subject policies that promote educator self-efficacy. Holy Cross SSS was selected because it is one of the schools that have performed at an average of below 50% in Mathematics for the past five years.

The study will entail a questionnaire. The study will be beneficial because it will provide recommendations that may be useful to the educators and all stakeholders in education, and anybody else who has a role to play in the implementation of educator self-efficacy. There is no potential anticipated risk involved in the study. There will be no reimbursement or any incentives for participation in the research. Feedback procedure will entail provision of the copy of the findings to the regional director's office and to the school through the principal's office. Permission is granted by the OR Tambo Inland director. (see attached)

_____ (insert signature of researcher)

Gqamane Mercy N

Researcher

_____ (insert name of the above signatory)

Mrs Madikizela N

The school principal

Umtata International HS

Appendix D

PARTICIPANT INFORMATION SHEET

Date 14 June 2021

Title: The effect of high school mathematics educators' self-efficacy on learners' performance in mathematics grade 12 at Holy Cross SSS in Mthatha Circuit.

DEAR PROSPECTIVE PARTICIPANT

My name is Gqamane Mercy N. and I am doing research under the supervision of Dr O.C. Potokri, a senior lecturer in the Department of Education Leadership and Management towards a Master Education Degree at the University of South Africa. We are inviting you to participate in a study entitled; The effect of high school mathematics educators' self-efficacy on learners' performance in mathematics grade 12 at Holy Cross SSS in Mthatha Circuit.

WHAT IS THE PURPOSE OF THE STUDY?

This study is expected to collect important information that could find the effective ways of implementing educator self-efficacy to enhance effective performance in Mathematics, Grade 12 in Mthatha Circuit, OR Tambo Inland. The findings from this study will provide information to the curriculum developers, senior education officers, subject advisors, educators, and principals, which may be helpful when they develop school/subject policies that promote educator self-efficacy.

WHY BEING AM I INVITED TO PARTICIPATE?

As you are a mathematics grade 12 educator at Umtata International HS /Mathematics and HOD at UIHS. You are directly involved in mathematics, the subject under study.

I obtained your contact details from the school principal Mrs N Madikizela. The study involves 220 mathematics educators and five mathematics heads of department.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

The study involves a questionnaire. The sample of types of questions to be asked in the questionnaire is attached. This will take approximately 30-40 minutes. The research is scheduled to take place during moderation time and subject meetings. This will take place in the third and fourth term.

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

Your participation in this study will assist in generating findings that will be of the benefit of the school and the education sector at large in evaluation and finding possible was to enhance the effectiveness of educator self-efficacy in Mathematics. The research on Effect of High School mathematics educators' self-efficacy on learner' performance in mathematics grade 12 will enable us to produce learners with better skills in decision making, problem solving, team players and presentation skills which will make them function well and contribute to the betterment of their communities through the improved effectiveness of the implementation of educator self-efficacy that may lead to improved lesson presentations which may produce better results in the subject.

The findings from this study will provide information to curriculum developers, senior education officers, subject advisers, educators and principals, which may be helpful when they develop school/subject policies that promote educator self-efficacy in mathematics, and it may be applicable to other subjects as well.

ARE THERE ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

There are no negative consequences or harm that can be attributed to participation in the study. All information obtained will be kept confidential and anonymity will be maintained at all stages of data analysis and presentation.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

Your name will not be recorded anywhere and no one will be able to connect you to the answers you give. Your answers will be given a code number and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Review Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

The collected data may be used for other purposes, such as a research report, journal articles and/or conference proceedings but the individual participants will not be identifiable in such reports. Please keep in mind that it is sometimes impossible to make an absolute guarantee of confidentiality or anonymity.

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

Electronic information like the video and audio recordings will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. After five years of storage the electronic copies will be permanently deleted from the hard drive of the computer using a relevant software programme.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

The participation in this study is on a voluntary basis, no form of payment or incentives will be given.

HAS THE STUDY RECEIVED ETHICS APPROVAL

This study has received written approval from the Research Ethics Review Committee of the *CEDU,* UNISA. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?

If you would like to be informed of the final research findings, please contact Gqamane Mercy N on 0733013135 or email mercygqamani@gmail.com.

Should you have concerns about the way in which the research has been conducted, you may contact_Dr O.C Potokri at 0794753182, email cnuvie@gmail.com.

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

GQAMANE MERCY N

Appendix E

CONSENT TO PARTICIPATE IN THIS STUDY (Return slip)

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname (please print)

_____

_____

_____

Participant Signature Date

Researcher's Name & Surname: Gqamane Mercy N

_____

_____

Researcher's signature Date

Appendix F

LETTER FOR A QUESTIONNAIRE

Title of questionnaire: The effect of high school mathematics educators' self-efficacy on learners' performance in mathematics grade 12 questionnaire (ESe-LPMQ).

Dear respondent

This questionnaire forms part of my master's research entitled: The effect of high school mathematics educators' self-efficacy on learners' performance in mathematics grade 12 for the degree MEd at the University of South Africa. You have been selected by a random *sampling* strategy from the population of 225 educators. Hence, I invite you to take part in this survey.

The aim of this study is to investigate the effect of educator self-efficacy on learner performance in Mathematics. The findings of the study may benefit the curriculum developers, senior education officers, subject advisors, educators and principals, which may be helpful when they develop school/subject policies that promote educator self-efficacy in Mathematics and it may be applicable to other subjects as well

You are kindly requested to complete this survey questionnaire, comprising four sections as honestly and frankly as possible and according to your personal views and experience. No foreseeable risks are associated with the completion of the questionnaire which is for research purposes only. The questionnaire will take approximately 30-40 minutes to complete.

You are not required to indicate your name or organisation and your anonymity will be ensured; however, indication of your age, gender, occupation position etc. will contribute to a more comprehensive analysis. All information obtained from this questionnaire will be used for research purposes only and will remain confidential. Your participation in this survey is voluntary and you have the right to omit any question if so desired, or to withdraw from answering this survey without penalty at any stage. After the completion of the study, an electronic summary of the findings of the research will be made available to you on request.

Permission to undertake this survey has been granted by the Department of Education director and the Ethics Committee of the College of Education, UNISA. If you have any research-related enquiries, they can be addressed directly to me or my supervisor. My contact details are: 073-301-3135 e-mail: mercygqamani@gmail.com and my supervisor can be reached at 079-475-3182, Department of Educational Leadership Management, College of Education, UNISA, e-mail: cnuvie@gmail.com.

By completing the questionnaire, you imply that you have agreed to participate in this research. Please return the completed questionnaire to Ms Gqamane Mercy before 15 August 2021.

Appendix G: Questionnaire

The effect of high school mathematics educators' self-efficacy on learners' performance in mathematics grade 12 questionnaire (ESe-LPMQ).

Part A: Biography and Demographic Information

NAME OF SCHOOL……..

Instruction: mark 'X' in front of option that best described your situation

CATEGORY	***CODE***
Rural	*1*
Township	*2*
Peri-Urban	*3*

Gender			***Education Attainment***			***Year of teaching experience***	
Category	***Code***		*Matric*			*Less than a year*	
Male	*1*		*Post matric <u>Not</u> in Educ.*			*1-5 years*	
Female	*2*		*Certificate in Educ.*			*6-10 years*	
any other, please specify	*3*		*Degree in Educ.*			*11+ years*	
Age group			*Postgraduate Diploma in Educ.*				
Category	***Code***		*Honours in Educ.*				
21-30 years	*1*		*Masters in Educ.*			***Teaching Experience in Mathematics grade 12***	

31-40 years	*2*		*Doctorate in Educ.*			*Less than a year*	
41-50 years	*3*					*1-5 years*	
51-60 years	*4*					*6-10 years*	
61-70 years	*5*					*11+ years*	
Specialisation/ Major subjects							
Mathematics only							
Mathematics and Other subjects							
Not Mathematics							

Part B: Efficacy on Geometry

Instruction: indicate how much of the following you can do.

***Note: A** = Agree, **D =** Disagree, **N =** Neutral, **SA =** Strongly Agree and*

***SD =** Strongly Disagree*

N/S	Item	A	D	N	SA	SD
1	*Making learners value geometry in mathematics*					
2	*Getting learners to believe that they can do calculations in geometry*					
3	*Motivate learners to draw angles and lines applying theorems*					
4	*Crafting good questions on proving the theorem*					
5	*Using many effective strategies to teach theorems with lines and angles*					
5a	*Making use of research*					
5b	*Making use of quiz*					
5c	*Making use of presentation*					
6	*Providing alternative explanations on how to prove the theorem*					
7	*Using variety of strategies to assess learners' knowledge and skills in geometry*					
7a	*Making use of quiz*					
B	*Making use of previous question papers*					

8. identify other things you know how to do better while teaching Geometry in mathematics:

a………
……

b……
……

Part C: Efficacy on Trigonometry

Instruction: indicate how much of the following you can do.

***Note: A** = Agree, **D =** Disagree, **N =** Neutral, **SA =** Strongly Agree and*

***SD =** Strongly Disagree*

N/S	***Item***	***A***	***D***	***N***	***SA***	***SD***

1	*Making learners value skills of trigonometry in mathematics*					
2	*Getting learners believe that they can do calculations on functions e.g., sin, tan, etc.*					
3	*Motivate learners to draw graphs*					
4	*Crafting good questions on identities*					
5	*Using many effective strategies to teach ratios*					
5a	*Making use of previous years question papers*					
5b	*Making use of quiz*					
5c	*Making use of presentation*					
6	*Providing alternative explanations on how to prove the identities*					
7	*Using a variety of strategies to assess learners' knowledge and skills in trigonometry*					
7a	*Making use of class tests*					
B	*Making use of previous question papers*					
C	*Making use of group tasks*					
D	*Making use of class presentation*					

8. identify other things you know how to do better while teaching Trigonometry in Mathematics:

a………
……

b……
……

Part D: Efficacy on Probability

Instruction: indicate how much of the following you can do.

***Note: A** = Agree, **D =** Disagree, **N =** Neutral, **SA =** Strongly Agree and*

***SD =** Strongly Disagree*

N/S	***Item***	***A***	***D***	***N***	***SA***	***SD***

1	*Making learners value skills and knowledge of Probability in Mathematics*					
2	*Getting learners believe that they can do calculations on probability.*					
3	*Motivate learners to draw venn and tree diagrams and make a table of values*					
4	*Crafting good questions on terminology*					
5	*Using many effective strategies to teach diagrams*					
5a	*Making use of previous years question papers*					
5b	*Making use of quiz*					
5c	*Making use of presentation*					
6	*Using variety of strategies to assess learners' knowledge and skills in Probabilities*					
6a	*Making use of class tests*					
b	*Making use of previous question papers*					
c	*Making use of group tasks*					
D	*Making use of class presentation*					

8. identify other things you know how to do better while teaching Probabilities in Mathematics:

a………
……

b……
……

THANK YOU SO MUCH.

Appendix H:

Participants' response

4.5. DEMOGRAPHIC INFORMATION

Table 4.1: Gender

		Frequency	Percentage	Valid Percentage
Valid	Male	97	51.1	51.1

	Female	91	48.9	48.9
	Total	188	100.0	100.0

Table 4.2: Age

		Frequency	Percentage	Valid Percentage
Valid	<25 years	32	27	27
	26 -35 years	46	43	43
	36 – 45 years	31	24	24
	>46 years	22	6	6
	Total	188	100.0	100.0

Table 4.3: Length of service

		Frequency	Percentage	Valid Percentage
Valid	0 – 2 years	47	33.6	33.6
	3 – 5 years	59	40.6	40.6
	6 or more years	35	28.1	28.1
	Total	188	100.0	100.0

Table 4.4:

		Frequency	Percent	Valid Percent
Valid	Agree	109	58.6	58.6
	Disagree	4	2.2	2.2
	Neutral	33	17.7	17.7
	Strongly agree	39	21.0	21.0
	Strongly disagree	1	.5	.5
	Total	186	100.0	100.0

Table 4.5:

		Frequency	Percent	Valid Percent
Valid	Agree	74	41.8	41.8
	Disagree	1	6	6
	Neutral	33	18.6	18.6
	Strongly Agree	7	.4	4
	Strongly disagree	6	12.5	12.5
	Total	177	100.0	100.0

Table 4 6: Teaching strategies in mathematics

	Frequency	Percent	Valid Percent

Valid	Maybe	26	14.0	14.0
	No	6	3.2	3.2
	Yes	153	82.3	82.3
	Total	186	100.0	100.0

Table 4.7:

		Frequency	Percent	Valid Percent
Valid	Maybe	33	17.7	17.7
	No	4	2.2	2.2
	Yes	148	79.6	79.6
	Total	186	100.0	100.0

Table 4.8:

		Frequency	Percent	Valid Percent
Valid	Agree	98	52.7	52.7
	Disagree	2	1.1	1.1
	Neutral	41	22.0	22.0
	Strongly agree	42	22.6	22.6
	Strongly disagree	3	1.6	1.6
	Total	186	100.0	100.0

Table 4.9:

		Frequency	Percent	Valid Percent
Valid	Maybe	47	25.3	25.3
	No	29	15.6	15.6
	Yes	110	59.1	59.1
	Total	186	100.0	100.0

Table 4.10:

		Frequency	Percent	Valid Percent
Valid	Maybe	25	13.4	13.4
	No	6	3.2	3.2
	Yes	154	82.8	82.8
	Total	186	100.0	100.0

Table 4 11:

			Frequency	Percent	Valid Percent
Valid	Maybe		50	26.9	26.9
	No		45	24.2	24.2
	Yes		91	48.9	48.9
	Total		186	100.0	100.0

4.6. STUDENT MOTIVATION

Table 4.12:

		Frequency	Percent	Valid Percent
Valid	Agree	98	52.7	52.7
	Disagree	3	1.6	1.6
	Neutral	30	16.1	16.1
	Strongly agree	54	29.0	29.0
	Strongly disagree	1	.5	.5
	Total	186	100.0	100.0

Table 4.13:

		Frequency	Percent	Valid Percent
Valid	Agree	105	56.5	56.5
	Disagree	4	2.2	2.2
	Neutral	32	17.2	17.2
	Strongly agree	44	23.7	23.7
	Strongly disagree	1	.5	.5
	Total	186	100.0	100.0

Table 4.14:

		Frequency	Percent	Valid Percent
Valid	Agree	64	36.2	36.2
	Disagree	12	6.8	6.8
	Neutral	25	14.1	14.1
	Strongly agree	73	41.2	41.2
	Strongly disagree	2	1.1	1.1
	Total	177	100.0	100.0

4.7. EMOTIONAL SUPPORT

Table 4.15:

		Frequency	Percent	Valid Percent
Valid	Agree	106	57.0	57.0
	Disagree	5	2.7	2.7
	Neutral	25	13.4	13.4
	Strongly agree	49	26.3	26.3
	Strongly disagree	1	.5	.5
	Total	186	100.0	100.0

Appendix I:

Ethical clearance approval certificate

UNISA university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2021/07/07

Ref: **2021/07/07/62112805/33/AM**
Name: Ms MN Gqamane
Student No.:62112805

Dear Ms MN Gqamane

Decision: Ethics Approval from 2021/07/07 to 2024/07/07

Researcher(s): Name: Ms MN Gqamane
E-mail address: mercygqamani@gmail.com
Telephone: 0733013135

Supervisor(s): Name: Dr O.C. Potokri
E-mail address: cnuvie@gmail.com
Telephone: 0794753182

Title of research:

Effect of high school mathematics educators' self-efficacy on learners' performance in mathematics grade 12

Qualification: MEd Education Management

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2021/07/07 to 2024/07/07.

*The **medium risk** application was reviewed by the Ethics Review Committee on 2021/07/07 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.
2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

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3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.
4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.
6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
8. No field work activities may continue after the expiry date **2024/07/07**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2021/07/07/62112805/33/AM** *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Kind regards,

Prof AT Motlhabane
CHAIRPERSON: CEDU RERC
motlhat@unisa.ac.za

Prof PM Sebate
EXECUTIVE DEAN
Sebatpm@unisa.ac.za

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