

UNIVERSITY OF GHANA

COLLEGE OF EDUCATION

**STUDENTS' PERCEPTIONS OF MATHEMATICS AND THE IMPACT
ON THEIR ACHIEVEMENT AMONG SELECTED SENIOR HIGH
STUDENTS IN GHANA**

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**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA,
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DECLARATION

I declare that this thesis is an original report of my research and has not been submitted for any degree in this university or elsewhere. References to other people's works have been duly acknowledged.



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CERTIFICATION

I hereby certify that this thesis was supervised in accordance with procedures laid down by the
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DEDICATION

I dedicate this research work to my dear husband, Rev. Ellis Cofie, for his unflinching love, provision and dedication to seeing me come out successfully and to my children David, Elisa, Daniella and Lois for their cooperation during the time of this research work.

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ABSTRACT

This study investigated the perceptions senior high students in Ghana have about mathematics and the impact of these perceptions on their mathematics achievements. Specifically, the study identified students' perceptions of mathematics in senior high schools, examined the factors that influence these perceptions, and determined the relationship that exists between the perception constructs identified and students' performance in mathematics. Additionally, this thesis investigated the influence of other factors such as gender and age on students' perceptions about mathematics. The study used three hundred students (300) from three senior high schools. The sample population was drawn from two senior high schools in the Eastern region and one senior high school in the Greater Accra region. The study employed quantitative research method with the use of questionnaire as data collection instrument. Descriptive and inferential statistics were employed to analyse the data. The findings were that students' perception of their self-confidence, their interest in mathematics, motivation received from their teachers, competence of the teacher, difficulty of the subject, myths, and beliefs, as well as the usefulness of the subject do exist. However, three of these constructs which are students' interest in learning mathematics, usefulness of mathematics, and difficulty in learning mathematics were significantly related to the students' performance. It is recommended that mathematics teachers make their students see the relevance of mathematics to boost their interest for the study of the subject. This will help the students discard the negative perceptions about the study of mathematics. Also, mathematics teachers in the senior high schools must devise some interesting and easy ways to make mathematics more attractive and engaging to their students. Students are also advised to respond positively to the learning process.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Mathematics is one of the core subjects in schools, all over the world, in which students are expected to study throughout their educational lives from the considerably basic level through to the secondary. According to Murugan and Rajoo (2013), “mathematics was designed to produce competent people with knowledge of mathematics in their everyday life and enhance effective problem-solving and decision making among individuals”. Students’ achievement in mathematics is often considered necessary for the success of the students and the country. Therefore, the training and preparation of students to do well in mathematics have become a fundamental goal of education in most countries (Butakor, 2016). Several education systems all over the world, require students to have basic mathematical knowledge at early grade levels to progress to upper classes, secondary school and further to tertiary (Zakaria, Chin, & Daud, 2010). For instance, in the Ghanaian context, senior high students who undertake the West African Senior School Certificate Examination (WASSCE), are required to get a minimum of C6 (which is from 50% - 54%, representing a pass) in their core mathematics to gain admission into any university in the country.

Performance of students in Mathematics, relative to other subjects, has generally been low. Such low achievements in mathematics have been attributed largely to the perceptions students have towards the subject. Arthur, Addo and Assuah (2017) assert that these perceptions are because of experiences that learners went through at the early stages of their educational lives. According to Aguilar, Rosas and Zavaleta (2012), perceptions about mathematics are believed to originate

from past experiences. For instance, while some students think of mathematics as a difficult and uninteresting subject (Zakaria et al., 2010), others have stereotyped the subject to be for males, and this has generated a mathematics-phobia for female students (Sam, 2002). In addition, some students have the perception that mathematics, as a subject, is suitable for only engineering and the natural sciences students. (Ampadu, 2012). Again, students view mathematics as an abstract subject, although they attest to its importance development in science and technology in any society (Kiwauka, Damme, Noortgate, Anumendem & Namusisi, 2015). Zakaria et al. (2010) emphasised that students who performed poorly in mathematics often felt less confident and thus, avoided choosing science related courses in furtherance of their education. They would rather opt for other subjects they consider to be void of mathematics, easier and one they can easily pass. In Ghana, for instance, mathematics is highly perceived by many students as a difficult subject even though its importance in disciplines such as engineering, economics and the sciences cannot be underestimated. This perception about mathematics as being a difficult subject has resulted in mass failure by students in the study of the subject and has thus resulted in only few individuals pursuing the subject to the higher level of education (Ampadu, 2012).

The processes which teachers adopt in teaching their students and the expectations of parents emphasise the memorisation of mathematical facts, and this has been viewed to be a contributing factor to the negative perception students form about the subject of mathematics. Overtime, this negative perception tends to have an adverse effect on the students' mathematics achievement. According to Posamentier, Smith and Stepelman (2006), the teaching of mathematics is not merely to get students to memorise rules, definitions and procedures dispensed by teachers but rather to engage students through the use discussion and collaboration so that students become active participants during the teaching and learning process. Engaging learners of mathematics in

discussion and collaborations helps students overcome their frustrations with the study of the subject. Lau, Singh, and Hwa (2009) explain that the mathematics skills required for the youth of today and adults of tomorrow to function in the workplace are different from that for youth and adults of yesterday. Thus, in terms of pedagogy, the current education now requires teaching strategies that gives pre-eminence to students getting actively involved in the learning process.

According to Mutodi (2014), students should be allowed to communicate mathematically, reason mathematically and develop self-confidence in solving mathematical problems, to improve their mathematics achievements. A strategy that has been figured out in helping students achieve this is cooperative learning. Cooperative learning encourages small group studies among students to achieve the same goals when social skills is used. In the literature, many studies have demonstrated that cooperative learning can improve performance, long-term memory and positive attitudes towards mathematics, self-concept, and social skills, which in turn increases students' mathematics achievement (see for example, Isik & Tarim, 2009; Tarim, 2009; Tarim & Akdeniz, 2008). It is, however, important to treat the individual needs of students accordingly for teaching and learning to be effective.

In a more recent time, The Trends in International Mathematics and Science Study (TIMSS) (2015), which also utilises nationally representative samples of fourth- and eighth-grade students to test students' achievements in mathematics and science, reports that students' performance in mathematics are falling. Students have had to drop the mathematics courses and opt for the courses considered to be much easier and which students feel they can pass because of the difficulties associated with the study of mathematics. In the Ghanaian context, mathematics is one of the compulsory subjects at all levels in pre-university education. This is intended to improve mathematical literacy and steer the country towards economic growth and development.

Due to its importance, the Government of Ghana is committed to ensuring the provision of high-quality mathematics education (Agyei & Voogt, 2011). Various attempts have been made to improve the achievement of mathematics in schools. The Government of Ghana in collaboration with various stakeholders in the education sector have introduced a number of initiatives with the aim of promoting effective teaching and learning of mathematics, in order to make the subject enjoyable (Ampadu, 2012). According to Addae and Agyei (2018), the latest of these initiatives was the review of the mathematics curriculum in September 2010, buttressing the importance that the country attaches to mathematics education. Although the applicability of mathematics is wide and its importance undeniable, a lot of students consistently perform poorly in the subject. As a result, Ghana loses economic advantage over other countries, attributed to the fact that its students lag behind their counterparts in Mathematics and Science. Mathematics achievement (MA) has therefore become a great concern for researchers, policymakers, educators, teachers, parents and students.

Nonetheless, mathematics performance of students from Korea and Japan have been high as compared to their counterparts globally. Evidently, they have been in the top-performing groups, represented in international academic assessments, including Programme for International Student Assessment (PISA) (Organisation for Economic Cooperation and Development, 2004). American students, on the other hand, were observed to perform poorly in international assessments irrespective of the good educational support systems in their schools (Shin, Lee & Kim, 2009). Shin, Lee and Kim (2009) pointed out that one key outcome that determines effectiveness of an educational system in a country is academic achievement. However current educational researchers are concentrating more on comparative studies on academic achievement as means to ascertain factors that will improve students' academic performance in their nations.

Several reasons have been identified to be underlying factors of underachievement in mathematics among high school students (Saritas & Akdemir, 2009). In addition, several theories have been developed to explain the reason for the overall poor performance recorded in mathematics at all grade levels. While cultural differences in education systems have been seen to contribute to the differences in mathematics achievement among students from different countries, students' attitudes towards the subject has been singled out as a major factor (Khaliq & Rodrigues, 2012).. This therefore suggests that favourable attitudes towards mathematics should be developed by students if success is to be attained.

1.2 Statement of Problem

The positive achievement of students with respect to mathematics represents one of the desired outcomes in any educational system. Individuals all around the world encounter different challenges with respect to various disciplines of study, and mathematics is not an exception. The growing decline in mathematics achievement (with few making progress) worldwide is of concern to stakeholders. In Ghana, for instance, the growing inconsistencies in mathematics achievements, as reflected in the country's Basic Education Certificate Examination (B.E.C.E) and West Africa Senior Secondary Certificate Examination (W.A.S.S.C.E), leave much to be desired. Although the year 2019 saw a significant improvement in mathematics achievement rate in the WASSCE taken by senior high students in the country, mathematics achievements have generally not been encouraging. A brief breakdown of mathematics achievement over the past 13 years has been tabled below as reported in the nation's educational sector performance report.

Table 1: Breakdown of mathematics achievement over the past 13 years in Ghana

Year	2006	2007	2008	2009	2011	2012	2013	2014	2015	2016	2017	2018	2019
% Passed	32	25	26	29	44	50	37	48	24	34	42.73	38.33	65.3

Source: MOE ESPR, 2019; figures are in percentages

N/B: There is no result for 2010 because the educational system was changed from 3 years to 4 years so students did not sit for exams that year. Also, though it is a report for 2018, 2019 has been added since the results had been released and the statistics given at the time of this research.

Considering the negative trend with respect to performance in mathematics, researchers in the country have given the issue much attention so as to conduct studies on the subject matter in order to get to the root cause of these inconsistencies in the mathematics achievements.

A study on the relationship between contextual factors and mathematics performance by Butakor, Ampadu and Cole (2017) revealed that the variations in mathematics achievement of students is mainly attributed to factors within the school. The study posited that the poor performance of Ghanaian students in mathematics is at least partially the problem of teacher's inadequate preparation, emphasis placed on lower rather than higher thinking skills, conflicting use of homework, failure to actively engage students in learning, lack of progress of girls, among others. Another research by Ampadu (2012) on students' perceptions of their teachers teaching of mathematics revealed that students' perceptions of their teachers varied, as the results established that both teacher-centred and student-centred approaches were used by mathematics

teachers. The study revealed also that teachers' actions and inactions impacted positively and negatively on students learning experiences.

In addition to the above, Butakor (2016) also revealed that factors like students' gender, educational aspirations, self-confidence in mathematics, value for mathematics, and frequent use of some instructional variables were significant positive predictors when it comes to mathematics achievement. A further study by Addo, Apawu and Ansah (2016) revealed that the usage of ICTs in the teaching and learning of mathematics influences students' performance in mathematics. In this study, it was posited that most teachers agreed or strongly agreed to the positive effects the use of ICT has on students learning outcomes.

In the foreign context, Gilbert et al. (2013) investigated students' perception of classroom environment and mathematics achievement and revealed that students' perception of their teachers' belief of their capability of learning and understanding of mathematics related to the mastery of the subject and mathematics utility. Furthermore, the study revealed a relationship between students' perception of reform practice use in their mathematics classroom and mathematics efficacy. Shin et al. (2009) conducted a study into student and school factors affecting mathematics achievements, whereby a comparison between Korea, Japan and USA was made. The finding of the study revealed that factors such as student and school level, competitive learning preference, mathematics interest, school disciplinary climate, student –teacher relations, etc. constitute some of the predictive factors of students' achievement in mathematics.

According to Townsend and Wilton (2013), several researchers make claims that students' beliefs about mathematics are formed from a history of experiences. Changing these beliefs

presents huge challenges for instructors, educational policy makers and even parents; and thus, it becomes imperative to have accurate insights into the factors influencing these perceptions.

Although a lot has been researched into perceptions of students and its impact on mathematics achievement in Ghana, these studies have not adequately explored the factors which account for various perceptions of students on mathematics. More so, these studies explore the perceptions of students from a generalised perspective without looking at it from specific dimensions of various perception constructs like interest in mathematics, confidence in mathematics, perceptions on mathematics difficulty, teacher competence, teacher motivation, myth and beliefs and perception of the usefulness of mathematics. Again, those factors that do influence these perceptions have not been investigated thoroughly, especially in Ghana. It is upon this backdrop that researcher has chosen to investigate the proposed topic.

1.3 Objectives of the Study

The main objective of this study is to assess the perception and issues that affect students' performance in mathematics in senior high schools. The specific objectives are:

- i. To identify the various perceptions of students on mathematics in senior high schools
- ii. To determine the factors which influence students' perception of mathematics.
- iii. To assess the relationship between the identified perception constructs and student performance in mathematics
- iv. To examine whether other factors such as gender and age influence perceptions

1.4 Research Questions

This study is guided by the following research questions:

- i. What are the various perceptions of students on mathematics in senior high schools?
- ii. What factors influence students' perception of mathematics?
- iii. What relationship exists between the identified perception constructs and student performance in mathematics?
- iv. What is the influence of gender and age on students' perceptions?

1.5 Significance of the Study

The significance of this study was assessed along three areas: practice, policy development and academic. This study in practice serves as a document that aids educational practitioners to know and address the negative perceptions students form about the subject of mathematics and factors that impede their mathematics achievement. For policymakers, the findings of this study serve as a document that provides practical measures and insight that aids in the educational policy decision making process that would help to improve the mathematics achievement of students. In the academic field, this study adds up to existing literature which would be used by future researchers and serves as a reference document for potential researchers to draw important lessons from.

1.6 Scope of the Study

This study was conducted on students in senior high schools and did not extend to students in basic schools and tertiary institutions, which may also have similar perceptions like those in the senior high schools. Only 3 senior high schools were sampled, which consist of one all-male senior high school in Accra (Presbyterian Boys SHS), one all-female senior high school in the Eastern Region of Ghana (Aburi Girls SHS) and one mixed senior high school (Adonteng SHS) in the Eastern Region of Ghana. The selection of schools in the Greater Accra and the Eastern Region is because, even though researchers in Accra have done some little study into the matter using students in Accra, it appears no study has focused on the Eastern part of the nation. Since the researcher seeks to fill these gaps, this decision was made to also carry out the research in the same region and further extend it to other regions of Ghana. The study posits that, responses from these students may also reflect that of students in other regions. Due to the time and the cost of data collection constraints, the study limits itself to 300 students. One hundred students from SHS 1, 2 and 3 were sampled from the selected schools. The study adopted the quantitative approach to research. Albeit these limitations do not in any way mar the reliability of the findings of the study.

1.7 Organisation of study

This study is grouped into five chapters. Chapter one introduces the study by providing a brief background, followed by the problem statement, research objectives and questions, significance of the study, the scope of the study, and disposition of the study. In Chapter two, relevant and existing literature is gathered on the topic. Chapter three presents the method that the study used to gather the information needed. Chapter four analyses and presents the results for the study.

Chapter five summarises the study and provides conclusions, limitations, recommendations and suggestions for future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter of the study is a review of relevant literature on the perception and attitudes students have towards mathematics as a subject. The researcher refers to studies already conducted in this regard as well as the findings made and assesses them to help give a thorough understanding of what has been done in the past to get a better view of the findings to be produced by this study. The review of literature covers areas including the concept of perception and theories of perception, overview of Ghana's educational system; the study of mathematics in Ghanaian schools; the perceived ideas and attitudes developed by students towards mathematics; the impact of demography, teachers and the environment in all of these; theories that explain the perception and attitudes developed towards the subject, and a review of empirical studies. The chapter finally presents a conceptual framework to summarise the problem identified and the various studies reviewed.

2.2 The Concept of Perception

The word perception is a commonly used word in various works and in our daily lives, and often it is believed that everyone knows what it stands for and as such, it is not important to define it. Perception is quite a complex thing and what it means is largely dependent on the context in which it is found. Some writers see attitudes and perceptions as two different concepts by using the conjunction 'and' to differentiate the two terms (Greenfield, 1997). Other authors such as Peterson and Yaakobi (1979) explained 'perceptions of behaviour' to mean "how an individual sees him/herself, the behaviour of other people, or a fictitious ideal". Some authors also used the

terms ‘views’ and ‘perceptions’ interchangeably (Barman, 1999). Again, Yager and Yager (1985) in their article titled “Changes in Perceptions of Science for Third, Seventh, and Eleventh Grade students”, stated four main groups with respect to perceptions in science, and these include views of science teachers, views of science classes, views concerning the usefulness of science study, as well as views of what it is like to be a scientist. In this same paper, they used terms ‘perception’, ‘view’, ‘observation’, and ‘feeling’ and ‘believe’ interchangeably (Yager & Yager, 1985). Students’ perceptions are thoughts, beliefs and feelings about persons, situations and events, says Schunck and Meece (1992). There appears to be a consensus that perception is similar in meaning to the term view (Bruno, 2002). Even though there is a clear distinction between the term perception and attitude, this research made use of perception as a more general term to be inclusive of attitude, views, beliefs as well as opinions. The study’s operational definition of perception is the attitude or point of view or opinion of a person about mathematics and its related issues.

2.3 Ghana’s Educational System: An Overview

Education in Ghana is said to have had a series of developments, starting from the mercantile era, and then the colonial era, to the post-independence era. The country’s educational system has had a series of changes over the years. The current educational system in the country begins with basic level education comprising two years of kindergarten, six years of primary school, and three years of junior high school. The next level is the senior high level and then tertiary (Adu-Gyamfi, Donkoh, & Addo, 2016). Proceeding from the basic level to the senior level depends on one passing an exam called the Basic Education Certificate Examination (BECE). Likewise qualifying for the tertiary level requires passing the West Africa Senior Secondary Certificate Examination (WASSCE), organised by the West Africa Examinations Council (WAEC).

Armah (2017) referred to this educational system as the “2-6-3-3-4” education system, structured along three progressive levels. This is to say that 2 years of kindergarten, 6 years of primary education, and then 3 years of junior high education all of which make the basic level; and then 3 years at the senior high level; and lastly 4 years at the tertiary level. The number of years at the tertiary level varies though, some 2 years, some 3 years, whereas others go beyond 4 years depending on the course being read or the degree sought after. Ghana’s educational system however allows for some international exams like the GCE at the senior high level, with which students might progress to the tertiary level. The table below shows a breakdown of the structure of education in Ghana. The age difference may not always be as it is in the table.

Table 2: Structure of Education in Ghana

CYCLE	LEVEL	INSTITUTIONS	AGE	YEARS
Tertiary Education	Tertiary	University/Polytechnics	19+	2+ years
		Professional Institutes		
		College of Educations		
		Nursing Training		
Second Cycle Education	Senior High Schools	Grammar/Technical/Vocational/Agriculture/Apprenticeship programme	16-18	1-3 years
First Cycle Education	Basic Education	Junior High School	12-15 years	3 years
		Primary	6-11 years	6 years
		Kindergarten	4-5 years	2 years

Source: (Armah, 2017)

Tan and Sosale (2003) assert that educational policymakers are obliged to develop a vision and strategy for the improvement of education, as well as assemble the relevant support and cooperation for implementing such policies. This assertion is what has resulted in the various

reforms seen in the educational sector. These reforms, according to Adu-Gyamfi, Donkoh, and Addo (2016), are aimed at finding lasting solutions to the challenges encountered in the educational sector. One of such reforms is the number of years spent by students at the second cycle level of education which for some time now has been changing; the last 4 years batch was in 2013. Among the very recent reforms in Ghana's education sector is the free SHS policy. The free SHS policy was instituted to give school-going children an opportunity to further their education (Lee, 2018). This is believed to bring a reduction in the rate at which students drop out of school.

Regardless of education being free or not, the Ghanaian educational sector has been faced with a myriad of challenges over the years. Armah (2017) categorised these challenges into 3: fragmented and overloaded education curriculum, unequal access to education and lifelong learning, as well as a weak and ineffective school management system. Aside the problems believed to be identified nationally, there is also the challenge faced with respect to the perception and attitude students have developed towards some subjects or courses. Some believe that some subjects studied in school are too broad and overloaded (ibid), whereas others wonder the necessity of studying such subjects - where in life they would apply what they study? The mathematics subject is one of such subjects that have had to deal with some mixed attitudes from students. The next subheadings look at the study of Mathematics in Ghanaian schools and the attitudes and perceived ideas students have about it.

2.4 The Study of Mathematics as a Subject in Ghana

Mathematics is considered an especially important subject in the school curriculum, not just in Ghana but across the globe. It is one of the most pivotal subjects both in its own right and because of its relevance in other fields of studies like in the Sciences (UK Essays, 2018; Jones, 2000). For this reason, the way maths is being taught and learnt in schools is of great relevance to education sectors worldwide (Törner & Sriraman, 2006). The relevance of the subject has however ensured that attention is drawn to it, and it is this attention that leads to the teachers, students, parents and educational experts realising the difficulty with which some students study the subject. It is worth noting that some teachers also have difficulty teaching the subject the way it ought to be taught.

According to Seah and Wong (2012), the commencement of the Third Wave Project in 2008 expedited the large scale study of what students value in effective study of mathematics. This necessitated the need to examine, in international comparative educational assessment in mathematics, what students from less developed countries like Ghana who persistently perform poorly in the subject value in the study of the subject (Davis, Carr, & Ernest, 2019).

The study of mathematics is compulsory for students at the basic and second cycle levels as it is believed it forms the basis for study of the other subjects. All second cycle students study core mathematics, however, there is an additional mathematics course called elective mathematics which is mostly optional, depending on the course studied- either Business, Science, or the Arts. This makes the study of mathematics relevant in the diverse study areas of our education system. Mereku and Mereku (2015) have observed that the use of information and communication technology in the teaching and learning of mathematics is limited. The teaching and learning of mathematics at the second cycle level of education allow for the use

of calculators, whereas at the basic level, students have very little exposure to the use of such tools. Perhaps, it is this way because the system expects students at the basic level to be able to easily perform calculations without necessarily using calculators since the mathematics subject is not that complex at the basic level.

Davis, Carr, and Ernest (2019) assert that at the primary level, teachers of the mathematics subject are generally educated, which is to say that primary school teachers teach almost all subjects. At the Junior High School level and at the Senior High School level, teachers who take the mathematics subject are specialised. More often than not, mathematics teachers at the second cycle institutions are graduates with a Bachelor of Education Degree or its equivalent in Mathematics. It is however common to find teachers at the second cycle level who do not have such qualifications but are teaching mathematics mostly because of unavailability or inadequacy of teachers. Many of these people may be very good in the subject, and based on their grades, they are given a class to teach. The study of mathematics at the tertiary level is far more complex and requires much knowledge and experience as a lecturer, mostly at the PhD level, while students who study mathematics study the subject in detail than they did at the Senior High level.

The study of mathematics has proven to be very important in the country as many scholars and professionals in the Sciences, Banking and Finance, Economics, Business Management, among other fields and sectors use it every time in their day to day activities. Traders, bus conductors, and the ordinary Ghanaian do basic addition and subtraction in their day to day activities, and this is made possible because of the little mathematics they were taught or learnt on their own.

2.5 Students' Perceptions and Attitudes towards the Study of Mathematics

Experiences through school present a general impression to students who tend to like some subjects and not like others. Whereas some students are always on the lookout for a particular class or subject period, others wish they will escape that class; mathematics class has not been an exception. Whereas some students always look out for the maths class, others wish they could avoid such classes. As far back as 1977, Hogan, following his study of students' interests in mathematics utilising a nationally representative groups of students, found that students lacked interest in certain mathematics topics, and that, there were variations in students' liking for mathematics. Mostly, a student's interest in a particular subject could be as a result of some factors including how interesting or uninteresting the subject or the tutor is, the ease with which the student is able to grasp what is taught, what the subject entails, the time of the day the subject is taught, among others. Previous studies have, however, shown that some attitudes of students towards certain subjects are as a result of some perceived ideas. These perceptions about the subject lead to the development of some attitudes towards its study. Mathematics is one of such subjects which have had variations of perceptions and attitudes towards its study.

2.5.1 Developed attitudes towards the study of mathematics.

Neale (1969) as cited in Mensah, Okyere, and Kuranchie (2013) defined attitude towards mathematics as an accumulated evaluation of a like or dislike for mathematics, a likelihood of getting oneself involved in or avoid activities related to the study or use of mathematics, a belief that one is good or bad at the subject, and a belief that mathematics is useful or not. Mensah, Okyere, and Kuranchie (2013) also cited Hart (1989) who from a multi-faceted viewpoint, describe one's attitude towards mathematics as an exceedingly difficult situation characterised

by the reactions the individual associates with mathematics, his/her beliefs about mathematics as well as his/her behaviour towards the subject.

Anthony (2000) in a discussion on the elements influencing success in mathematics emphasised the role played by motivation. Eshun (2000) believes that an attitude toward mathematics is inclined to an aspect of mathematics that the individual acquires through his or her beliefs and experiences. The various explanations given to attitudes towards mathematics all point to the role being played by one's beliefs, experiences, motivation, and so on, and they all seem to suggest that the attitude of people could change once they are made to believe differently or are open to new experiences. Kidd (2003) asserts that the feeling of dislike, frustration, and failure could influence the attitudes of people towards mathematics.

Attitude towards mathematics includes the tendency to be fearful of and anxious about mathematics. An attitude towards mathematics has cognitive, affective, and behavioural components, and like any other kind of attitude, it can be formed through any of the three processes described above. When an individual associate positive experiences with mathematics, he/she develops positive attitude towards the subject. Also, positive reinforcement fosters the development of individuals' positive attitude for mathematics.

2.5.2 The anxiety with the study of mathematics

Anxiety refers to the state of arousal triggered by one's wellbeing being threatened or intimidated (Abotowuro, 2015). This feeling of anxiousness influences the way one behaves towards what is triggering the anxiety or activities around the person. Abotowuro (2015) asserts that anxiety is common human experience although in some circumstances, it disorganises the mental functioning of some people. Even though, some anxieties can be encouraging, leading to

a positive outcome, extreme anxiety can lead to downshifting in which the brain's normal functioning mechanisms start to alter by diminishing discernments, preventing short term memory and behaving in more primitive reactions (McKee, 2002). The study of mathematics could also be impacted greatly by anxiety, and this could be positive or negative.

To Russell (2008), the anxiety with the study of mathematics is the fear of mathematics. It is the fear, defencelessness, paralysis, and intellectual disorganisation that arise among some people when they are required to solve mathematical problems. (Preis and Biggs as cited in Abotowuro 2015), described a cycle of mathematics avoidance which are as follows: the first is the individual experiencing unhelpful reactions to situations involving mathematics which may be due to past experiences with the subject. It then moves to the next phase where the individual chooses to escape from or excuse him or herself of all encounters with mathematics. Avoiding situations regarding mathematics then leads to phase three which has to do with poor preparations towards the subject, leading to poor performance (phase four). All of these generate negative experiences with the subject hence, leading to phase one, and the cycle continues.

Studies including Awanta (2004), Eshun (2000) and Nordin (2008) have shown that there is some form of correlation between the anxiousness of students about Mathematics and their performance in Mathematics. Nonetheless, like Beck (2012) wrote, anxiety could bring out the best in a person, but this is somewhat rare.

2.5.3 Confidence and its impact on mathematics Learning

Self-confidence is among the attitudinal variables identified to influence the participation of students and their performance in mathematics. Hannula, Maijala, and Pehkonen (2004) in their longitudinal study on self-confidence indicated that the learning of mathematics is influenced by

the beliefs of the student regarding Mathematics, especially self-confidence. Thus, they argued that mathematics learning is influenced by students who have confidence in their abilities in terms of being self-confident.

Bae, Choy, Geddes, Sable, and Snyder (2000) also argue that gaps in achievement appear more closely related to attitudes than to course-taking. Based on their analysis of data trends from the National Assessment of Educational Progress (NAEP), Bae et al. (2000) found out that females are less likely than males to think they were good at mathematics.

A study conducted by Cann (2009) revealed that in all the schools in Wales, girls were more likely than boys to report feelings of anxiety and a lack of confidence in mathematics. This is not so different from the situation in Ghana. Lack of confidence is obviously the reason why most people, especially girls, choose not to have anything related to Mathematics, thus they avoid Mathematics. Sometimes, students will have to be given a reason to be confident about the learning of mathematics.

Although self-confidence plays a major role in students' performance, other studies have revealed otherwise. Kunhertanti and Santosa (2018) investigated the influence of self confidence on mathematics learning. The results, contrary to what most researches find (that self confidence influence performance), showed an insignificant relationship between self-confidence and performance. Vancouver and Kendal (2006) assert that "self-confidence can reduce goal discrepancy perceptions, which in effect, lead to overconfidence; thus, when people perceive themselves as close to attaining their goal, their confidence may induce a degree of complacency about the task at hand". The negative results of self confidence and performane could therefore

be a result of complacency from the students, although they have confidence in the study of mathematics.

2.5.4 Students' perceptions of Myths, Beliefs and Mathematics Achievement

The perceptions and beliefs students have about the study of mathematics according to Aguilar, et al. (2012) come from past experiences made up of cognitive and affective dimensions. Their study asserts that “from a reasoning point of view, it relates to a person’s knowledge, beliefs, and other cognitive representations while from an affective domain, it refers to a person’s attitudes, feelings and emotions about mathematics”. There are claims suggesting that opinions and myths of mathematics are predominantly negative among students worldwide (Gadanidis,2012). Whereas some students have developed phobia for mathematics and feel defeated in the presence of mathematics ideas, many others see mathematics as hard, austere, abstract, and largely as masculine in many cultures. (Mutodi, 2014).

In Kimball and Smith (2013), there is a claim that seems to suggest that if you are not clever, mathematics is not for you. Therefore, teachers or instructors of the subject make attempts to explain this occurrence over the general dogmas or myths in mathematics that the study of mathematics is a question more of capability than of effort. Many students admittedly believe this poor mathematics achievement as a permanent state beyond their control. According to Aguilar et al. (2012), several adults miss professional and personal opportunities because of the fear they associate with the studying of mathematics and these negative experiences remain throughout their lives. A study by Farooq and Shah (2008) in Pakistan revealed that students’ attitudes towards the subject greatly influence their success in mathematics. In addition to that, the study found out that students’ beliefs and mythical opinions had the potential to either

facilitate or inhibit mathematics learning. This makes it a particularly important factor to consider in the assessment of the impact of perception and attitude on mathematics achievement in Ghana.

2.5.5 Challenges of Students in the Learning of Mathematics

The learning of mathematics is undoubtedly one of the most challenging subjects many people would agree have come across. According to Bawuah (2013), the difficulty associated with the teaching and learning of the subject is worse when the community where students are taught, do not consider school as a very important factor in their lives; a community where education is not valued; where parents and guardians prefer their wards farming or staying at home to going to school. In such a community, honestly, there is very little a teacher can do to help school children, as he or she may not be sure what the abilities of the student is, how knowledgeable the student is and what their capabilities are with regard to their education. Such people are not consistent in their behaviour towards their education making it difficult for them to follow through with what they are learning, especially when the subject being taught is one considered to be the most difficult and feared.

Many people within our societies are of the view that mathematics is a very difficult subject to treat and study, as compared to the many academic subject areas. In Mesler (2004), it was reported that students described mathematics as “difficult, dull, abstract, and disliked” in a survey that sought to ascertain the perception of students about the subject. It is also not surprising that many students describe the subject as difficult as many grown ups who are out of school, in recounting their experience in the classroom, associated mathematics with ‘fear and trembling’. This indicates how long mathematics has been considered as a difficult subject to

learn, hence, the challenge also faced by teachers in teaching the subject; because the student whose duty it is to learn the subject has already given up due to his/her perception that mathematics is difficult. Thus, the teacher is challenged because the student has no interest in the subject. Some students also argue that the subject is not taught to their understanding. Montague (2003) identified the peculiar areas of mathematics teaching and learning that makes it difficult and challenging for students and teachers to play their roles effectively. The challenges identified include the inability for some people to remember the formulas for solving some mathematics problems, especially when those formulas make no sense to them. Others, in preference, put pen or pencil on paper to pay attention to details in the classroom yet not able to see what those steps in the problem solving lead to. Yet, some others see what the big picture is and are insightful about the patterns involved in solving the question but are poor at computing and unable to remember the steps involved. Some understand the concepts being taught in the classroom but always give wrong answers to the questions. These are but a few of the problems encountered in the mathematics classroom. The individual experiencing these difficulties will therefore conclude that mathematics is difficult because they do not have any such challenges in their Literature or Social Studies class.

Inasmuch as this is a student's problem, the teacher is to blame as well for his or her inability to understand the problems of students so as to adopt the best of means to meet their needs. Some studies also suggest that the language of and the concept associated with mathematics also make the teaching and learning of the subject difficult. I will agree with those who argue that mathematics is difficult. I understand the challenges faced by students and teachers, however, the relevance of the subject to our academic system makes it impossible for it to be excluded from the education curriculum. It is therefore relevant that studies are conducted into the challenges

faced by students in order to ascertain the causes and subsequently provide solution to the problem identified.

2.5.6 Students' perception of teacher's competence

The perception held by a student over the competence of a teacher is a major influence in the student's attitude towards that teacher and his or her class. Evans (2009) asserts that enough evidence suggests that the learning of mathematics is tied closely to the competence of the teacher in the teaching of the subject (thus, being well-versed in the subject and adopting the best of tactics in teaching it). It is the duty of teachers of the mathematics subject to better understand the curriculum to be able to make use of diverse techniques that are concurrently multisensory, which make available clear instruction that is methodical, cumulative, problem-solving, and both synthetic and logical (Bawuah, 2013). In addition to all of these, the teacher is duty-bound to have knowledge of current research in the subject area.

Adediwura and Tayo (2007) examined the impact of students' perception of teachers' knowledge of a subject matter, attitude towards work and teaching skills on the academic performance of the students. With data gathered and analysed from a sample size of about 1600 senior secondary school students in the south western part of Nigeria, it was revealed that the perception of students about teachers' knowledge of a subject matter, as well as his or her attitude towards teaching significantly affect the performance of students. Similarly, Olaleye (2011) explored the perception of students on the characteristics of teachers to the academic performance of students in senior secondary schools in Osun State, Nigeria. With the sample size of about 1600, data was gathered from students in 16 rural and urban schools. The analysed data did not prove anything different as made known earlier; there existed a significant relationship between the characteristics of teachers and the academic performance of students.

Etuk, Afangideh and Uya (2013) examined how students perceived their teachers with regard to their knowledge of the mathematics content, their ability to communicate, their use of appropriate teaching strategies, the teachers' ability to manage the class, and how all of these influence the attitude of the student in learning mathematics. The study, with the data gathered and analysed revealed that some teachers were to blame for the poor performance of some students in mathematics, the reason being that these teachers are ineffective at work, leading to students' lack of interest in the subject. All of these tend to support the assertion that the moment students consider a teacher as incompetent, they take the instructions or teachings of that teacher for granted.

2.6 Teachers Teaching Practices and Students' Perception about Mathematics

Studies by Agyei (2013) and Agyei and Voogt (2015) revealed that there is a relationship between student-centred learning and students' attitudes towards the study of a subject. That is, innovative student-centred approach fosters deep learning and academic engagement among students. However, there have been some criticisms against this approach. Yara (2009), on the other hand, emphasised that the behaviour of teachers and how they interact with students are more paramount to what they teach. He argued that the teacher's attitude and his/her teaching styles and practices can greatly influence the students' attitude and performance on the subject. Ampadu (2012) investigated students' perceptions of their teachers' teaching of mathematics and how it impacts on their learning experiences. The study established that teachers' actions and inactions could impact positively or negatively on students' learning experiences as most of the respondents reported that their learning experiences are to a larger extent controlled by their teachers. Bawuah, Yakubu and Seyram (2014) examined the importance of Senior High School level mathematics to the development of a country. This research work made use of both

quantitative and qualitative methods. The findings were that majority of SHS mathematics teachers perceive the following professional activities to be influential to SHS students' mathematics development: "Assigning mathematics homework and reviewing the given homework, encouraging learners to work in groups, engaging the whole class in discussion, using additional mathematics textbooks as instructional tools, taking students' prior understanding into account when planning a lesson and motivating student to practice mathematics on their own". Thus, teachers' teaching practices are assumed to be one of the predominant factors influencing the formation of students' attitudes towards their learning of mathematics and that these practices can help to enhance the teaching and learning of mathematics.

Students' self-confidence towards the study of the subject depends on the attitude exhibited by teacher while teaching the subject. Mensah et al. (2013) examined the relationship between both teacher and student attitude toward mathematics. They concluded that positive attitude of teachers radiated confidence in students hence, made them develop a positive attitude towards the learning of mathematics. Ultimately, students' mathematics achievements are affected as well. In more detail, the teachers and their ways of teaching are critical factors that influence students to have desire to learn more and hence improve their achievement in mathematics.

2.7 The Influence of Demographic Factors on Mathematics Achievements

Studies already conducted on the factors that influence student performance in the study of mathematics and other subjects show that one's demographics have an impact also. Zaslavsky (1994), Levine (1995), Abotowuro (2015), among others, do assert that females especially do experience fear and anxiety in the study and dealing with mathematics. In this section of the

study is a review of how demographic factors do influence students perception and attitude towards mathematics.

2.7.1 Gender and Age of Students

Education is globally recognised to be building individuals and accelerating national development. Education for adolescent children increases the chances of giving them a brighter future, improved choices and opportunities. Early adolescence augurs well for the development of academic interest and attitudes of girls (Bayaga & Wadesango, 2014). Most females have the misconception that being bright is in sharp contrast with being well known (Abotowuro, 2015). High educational achievement can be in direct clash with social issues or aspects of adolescence concerning student and teacher interactions, learning opportunities, and performance in mathematics.

Moreover, Fannema and Franke (1992) suggest that studying habits that include working autonomously on significant levels may empower some adolescents to improve in mathematics and science. However, it is more evident and proven that males and females have distinct learning styles and that females exceed expectations when learning maths through guidelines and rules. They also make the assertion that adolescents mostly females are associated and trained to be more self-determining, and they get more help from parents or guardians and instructors than the males. Because of this reliance when children pursue academic training, females will in general be progressive subject to other people and will in general be increasingly independent. Females as youthful as grades 6 and 7 rate being popular and the favourite as more progressively significant as being seen as autonomous.

Young adolescent males, then again, are more prone to be linked as competent and independent. This is most likely to be the case in our parts of the world as gender has somewhat impacted the attitude students have towards Mathematics in Ghana. This study will prove more.

Josiah and Adejoke (2014) investigated the effects of gender, age and mathematics anxiety of college students on their achievement in Algebra. Ex-post-facto research design was adopted implying there was no manipulation of any variable. The participants of the study were mathematics teacher trainees in the Federal Colleges of Education in Lagos and Ogun states of Nigeria. In collecting data from respondents, the study made use of questionnaire which elicited information on gender and age of respondents, a mathematics anxiety scale ($r=0.82$) and participants' achievement score in an Algebra course coded MAT 111. The findings indicated that students' performance in Algebra course was average. Meanwhile, the differences in achievement across gender, age and mathematics anxiety groupings (low, medium and high) were all found to be non-significant. Participants had just begun the first semester and therefore it is presumed that may have affected the students' performance.

2.8. Review of Empirical Literature

The relevance of mathematics as a subject in schools, as already highlighted in this study, can never be misjudged. Many have identified that the perception and attitude of students towards the study of mathematics differs. Because the subject is a particularly important one and is linked to many other subjects in the school and the numerous concepts and sectors of life, it is relevant to look into the different perceptions and attitudes towards the subject, necessitating research works in this regard across the globe.

In Malaysia, Kanafiah and Jumadi (2013) examined the level of students' attitudes and their interest in Mathematics, what they perceived of their Mathematics teachers, and their perception

about the subject itself. The relationship between students' perception and their performance in Mathematics was ascertained in this study. After analysing data gathered from some 150 students, the study showed that the level of students' perception towards Mathematics were high and encouraging. However, the students attitude, interest and lecturers teaching were insignificant factors in contributing to low achievements in mathematics. Overall, though their study provides useful insights into the role of perception of students in mathematics achievements, the study failed to account for the factors which influence perception of students and the relative importance students attach to each factor influencing perceptions.

The role of attitudes towards the study of Mathematics was examined by Tanveer, Rizwan, Ali, Arif, Saleem, and Rizvi (2014) among some students of Islamia University of Bahawalpur, and their study revealed that students who achieved good grades in Mathematics have showed positive attitude and liking towards the subject. In addition, the study showed that the more students did well in Mathematics, the more positive attitude they develop towards the subject, hence, it is necessary that teachers see a need in ensuring that students get more interested in the subject by devising the best means of teaching it so as to help them achieve good grades and develop a positive attitude towards it. This study has limitations in the sense that it did not examine the factors that account for the formation of such attitudes towards mathematics. Again, the study did not examine how other demographic factors such as age, gender etc, influence such attitudes.

Mutai (2011) in Kenya assessed the attitude of students towards the study of Mathematics and how it influences their success in the subject. The study adopted a descriptive approach with structured questionnaires for data collection from teachers and students. Upon analysis of the gathered data, the study revealed that with regard to the attitude of students towards

Mathematics, there were some students who lacked self-confidence as well as interest in the subject, whereas a lot more agreed that “Mathematics is a problem”. Some still showed interest in the subject regardless of the challenges they faced. The study, therefore, recommended that measures ought to be taken to ensure a limit to the unpleasant attitudes that may be leading to the challenges identified (is it caused by the teachers, the students themselves, or factors that were external). This study similarly did not explore the factors which influence the attitude of students on mathematics.

Bayaga and Wadesango (2014), in South Africa, examined the attitude of students towards mathematical performance based on some structured factors: mathematical self-determination, parenting education, home history, education, climate at school, and attitudes. The study was purposed to determine which of these factors had some form of influence on the performance of students in the teaching and learning of mathematics. The analysis of data gathered after interviewing some 321 respondents randomly selected showed that the factors employed in the study, to some extent, had an impact on the learning of mathematics among South African students. A major strength of this study is that it uncovered a comprehensive assessment of various factors that account for student performance at the personal, school and structural levels. However, the study did not explore the factors which influence perception of students on mathematics.

In Chile, Ramirez (2005) showed that Chilean students enjoy mathematics but overestimated their skills in the subject. The study found out that in classes where students enjoyed the subject, the average performance was significantly lower. Ramirez (2005) attributes this to the demanding mathematics syllabus and the highest values of assessment employed in the classes that perform best. Like other studies, this study did not explore the factors which influence

perception formation towards mathematics and also did not assess the effect of demographic variables on students' mathematics performance.

With regard to the attitude of students and how it affects their achievement in mathematics, Michelli (2013) asserted that being a male or female played a significant role in determining the attitude and performance of students in mathematics. The study revealed that some specific traits including extraversion, awareness, self-control, and the intellectual ability of an individual determined how one performed in school. The study found out that males had a more positive attitude towards mathematics than females and however in terms of performance, that did not really count in assessment.

Studies in Ghana have also shown some correlation between the attitudes and perception of students and their performance in mathematics. Arthur, Asiedu-Addo, and Assuah (2017) assessed the perspective of students and how it impacts their interest in Mathematics. Using a multivariate statistical analysis, the study analysed responses gathered from a total of 1,263 students from ten high schools in the Ashanti region of Ghana and found more that half of the respondents agreeing that negative perceptions of mathematics at the basic level of education strongly affect the interest of students as they continue to the other levels of education. Scholars with interest in this subject have revealed that mathematics teachers have been notified of the bearing of the remarkable interest of students in mathematics, which could be unfavorable to their interests. Arthur, Asiedu-Addo, and Assuah (2017) therefore suggested that hands-on teaching approaches can sufficiently encourage students as well as help to lessen perception to enhance interest.

Churcher, Asiedu-Owuba and Adjabui (2015) also assessed the performance of high school students in mathematics education in Kassena-Nankana in Ghana. Their study showed that the performance of teachers, as well as the inadequacy of study materials like text books were the main cause of the poor performance of students in mathematics. The study also revealed that parental and extracurricular activities, probably activities at home were also a cause of the recorded poor student performance. The study, in finding out the performance of students in a specific subject in school, however pointed out that it is necessary to include in the assessment the physical presence of the student in the classroom, personal studies of the subject by the student, group study activities, among other activities seen to be very common among academically good students. Other studies including Abotowuro (2015) have also shown similar results like the above findings.

This current study seeks to add to the repository of literature in this subject by identifying specifically the various perceptions that Senior High Students have concerning mathematics, how these perceptions were formed, how they influence performance, and how factors such as gender and age influence students mathematics performance.

2.9 Theoretical Review

The attitudes of humans, largely, are expressed through behaviours and language (Kela, 2016). The attitudes we portray are developed mostly because of the perceptions we tend to have towards a concept, situation, or entity. Rikard and Banville (2006) are of the view that our attitudes are born from views which form our behaviours and determine how we get ourselves involved in happenings around us. It is therefore relevant that we come to an understanding of

the reasons why the factors and situations around us influence the attitudes we develop and why some others have little or no influence at all.

Theories are important when it comes to understanding certain concepts and issues. Varied theories in literature such as self-perception theory, disjunctive theory, direct perception theory and unconscious perception theory have been adopted to understand students' perception of maths and the impact on their mathematics achievement. To achieving the objectives of this study, the theory of planned behaviour as well as the constructivist theories will be explained briefly to understand how these theories define perception.

2.9.1. The theory of planned behaviour

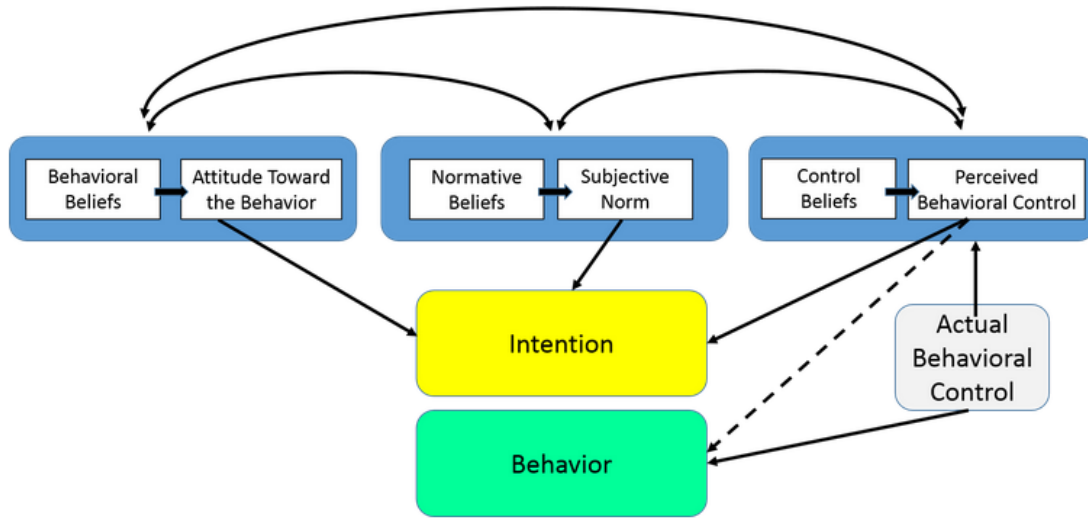
The Theory of Planned Behaviour (TPB) commenced as the Theory of Reasoned Action in 1980 and was mainly used for prediction of an individual's intention to behave in a particular way within specific time and place. The TPB was meant to explain all behaviours within the control of the individual. One main element to this model is that a person's intentions to behave in a particular way are motivated by the attitude and the probability that the act will have the anticipated results as well as the subjective assessment of the risks and benefits thereof. The TPB has been instrumental in the prediction and provision of explanation for a wide range of behaviours and intentions related to health such as breastfeeding, smoking, peoples' utilisation of health services, alcohol addiction, use of substance, academic achievements, among others. The TPB explains that behavioural achievement depends on both individuals' perceived motivation (intention) and ability (behavioural control) in engaging in the act. It consists of three main constructs' which are behavioural, normative, and control. Ajzen (2011) also proposed three main reasons for behavioural intention. These determinants are (1) attitudes (the overall positive or negative assessment toward an item), (2) subjective norm (the social pressures on the person

to carry out a behaviour), and (3) perceived behavioural control (the individual's perception of his/her ability to control the outcome of a behaviour).

Additionally, LaMorte (2019) asserts that the TPB is built out of six constructs that together constitute a person's real control over behaviour.

1. Attitudes – attitude has to do with the extent to which one has a favourable or unfavourable assessment of their actions of interest.
2. Behavioural intention - This concept focuses on factors that influence people to behave and act the way they do. Such that one is likely to demonstrate a certain kind of behaviour if they have a strong urge.
3. Subjective norms – this aspect centres on the perception of what people support or not as good or bad. With this people tend to focus on demonstrating behaviours that others expect of them.
4. Social norms - This refers to the normal codes of behaviour expected by team members or people from a larger cultural context.
5. Perceived power - This focuses on factors that may enable or hinder performance of a conduct.
6. Perceived behavioural control – this differs from one circumstance to the other. Thus depending on the circumstance, one may demonstrate varied behaviours.

Figure 1: Breakdown of constructs of the theory of planned behaviour



Source: LaMorte (2019)

In summary, the TPB indicates that the best predictors for forming behavioural intention that in turn leads to the person displaying the act or not include a person having a positive attitude towards an act or behaviour and being surrounded by favourable social norms and having a high level of perceived behavioural control. As in the case of this study, the researcher seeks to find out various perceptions that students have towards mathematics, how these affect their attitudes towards the study of mathematics and hence their influence on their mathematics achievements. The theory supports this work in that, it shows that perceived attitudes of people (in this case students), considering the subjective norms that surround the students as well as their perceived control over the maths or not, do go a long way to affect their decisions to do maths and subsequently influence their mathematics performance.

2.9.2. The theory of constructivism

Education has to do with the development of a child by using numerous methods, usually introduced by a teacher, who is directed by a syllabus. For education to be operative, teachers, pupil and the schools involved must participate actively (Behar, 2014). However, the current educational system emphasises on preparing students for examinations and do not promote effective learning. The central issue is that students are not studying as they should and are focusing more on routine learning and memorisation. In this modernised system, schools are encouraged to implement the constructivist approach which is moral and more focused on innovative activities and knowledge acquisition since the academic performance of the students of constructivist classrooms are better than outmoded classrooms (Dagar &Yadav, 2016). Constructivist theories assume that the process of perception is a highly active process of extracting sensory stimuli, their evaluation, interpretation and backward organisation of sensory stimulus. Perception is the end product of the interaction between stimulus and internal hypotheses, expectations and knowledge of the observer, while motivation and emotions play an important role in this process.

A wide range of individual factors influences perceptions which leads to an inadequate interpretation. (Eysenck & Keane, 2008).

Constructivist Learning Strategies

According to Dagar and Yadav (2016), the principles of social constructivism can be used to develop constructivist learning strategies to improve the social and emotional skills of the students', their academic achievement and high order thinking skills. The constructivist environment in a classroom can be created by adopting the following:

1. Provide experience with the knowledge construction process

Here the teacher is expected to present a topic to the students and guide them to explore the topic by investigating on it. Later with the aid of the teacher, the students are helped to answer questions through scaffolding.

2. Experience in and appreciation for multiple perspectives

All pupils are assumed to be different from one another especially the way they perceive issues. Thus, the pupils are encouraged to work in groups in order to share their views on the topic.

3. Provide social and emotional learning

The students must be taught social and emotional aspects of learning. There are five aspects of social and emotional learning. These are: self-awareness, managing feelings, motivation, empathy and social skills.

4. Use multiple modes of representation

The use of varied ways of representation help to improve learning and provides various ways for students to understand the topic understudy from numerous approaches.

In summary, the concepts in mathematics are generally thought of as difficult to understand. Constructivist however have belief that students will understand concepts better when they direct their own learning. The researcher therefore adopted this theory as it provides answers to how students can direct their own learning patterns to understand concepts better and thus do well in their achievements, the case of the study of mathematics being example.

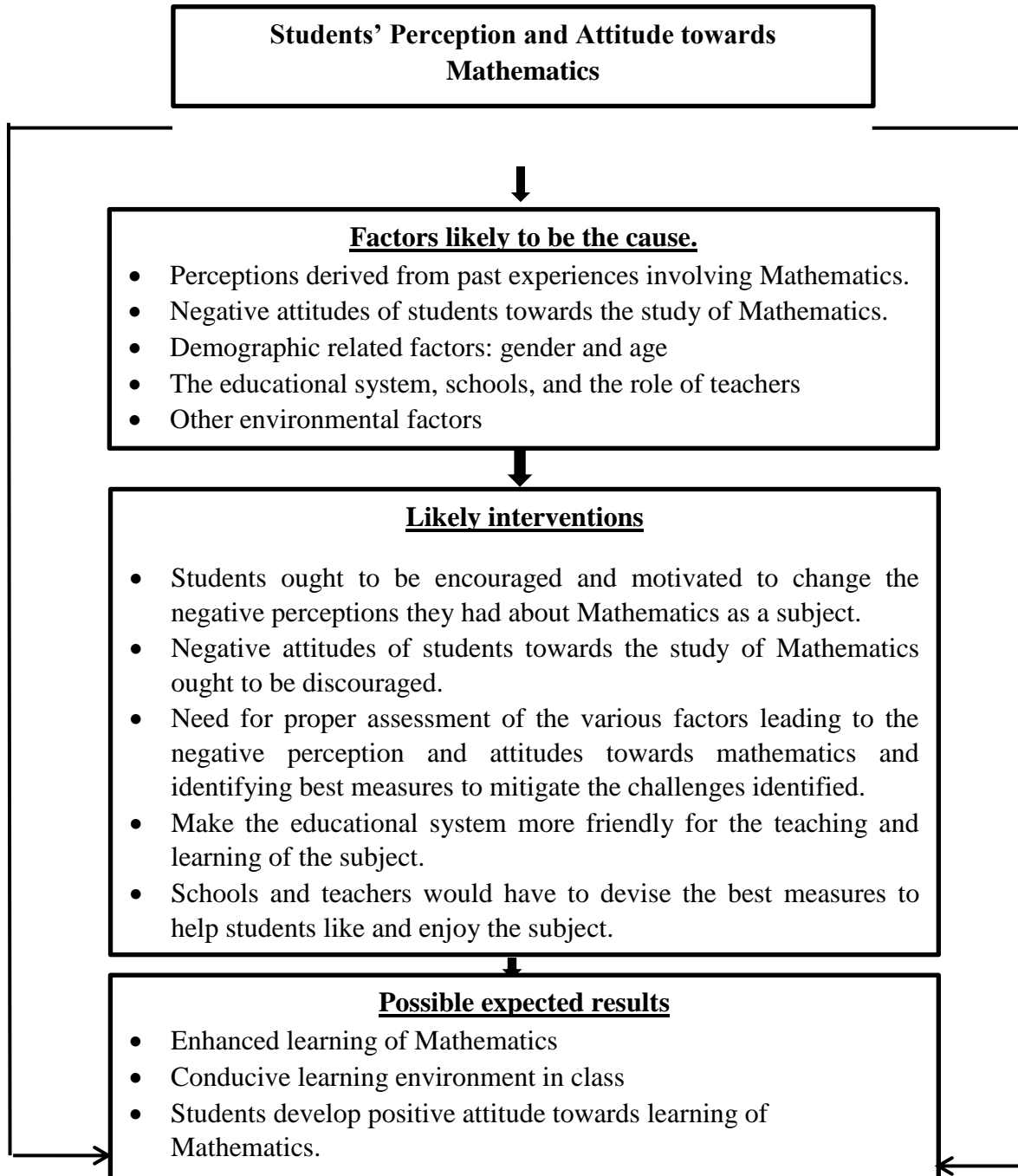
2.10. Conceptual Framework

The perceptions and attitude of students towards the study of Mathematics obviously have its causes; there are some factors that led to how students perceive the learning or teaching of Mathematics in school and its application in their real life, which may in turn influence the attitudes they develop towards the subject. Likewise, there may be some implications of these perceptions and attitudes, many of which may be negative, hence, the need for measures to help mitigate the challenges or problems identified. This is what this study generally sought to identify. The researcher has therefore developed a framework to explain all of these in a remarkably simple way captured in *Figure 2.2* below. The framework developed was adopted from Grouwns and Koechler (1988) in Poku (2019). The study identified the factors likely to lead to the perceptions and attitudes of students towards Mathematics to include perceptions derived from past experiences involving Mathematics; negative attitudes of students; demographic related factors like gender, family structure, and educational background of parents; the country's educational system, schools, and the role of teachers; as well as other environmental factors.

Upon recognising the factors likely to be the cause of the problem existing, the researcher, in the conceptual framework developed some mitigating measures. These are: students ought to be encouraged and motivated to change the negative perceptions they have about Mathematics; the negative attitude towards the teaching and learning of the subject ought to be discouraged; there is a need for proper assessment of the various factors leading to the negative perception and attitudes towards mathematics to ascertain how best to deal with the situation which seems to be popular across countries; as well as make the educational system more friendly for the teaching and learning of the subject. Schools and teachers would have to devise the best measures to help

students like and enjoy the subject. These when done is believed would lead to outcomes such as enhancement in the learning of Mathematics; the creation of a conducive learning environment in class; instilling in students a positive attitude towards the subject; ensuring a better performance in examination; and achieving their best as the apply what they learn in school outside the classroom.

Figure 2: Conceptual framework



Adapted from Grounwns and Koechler (1988 in Poku (2019)

2.11. Chapter Summary

This chapter reviewed the relevant studies already conducted regarding the teaching and learning of Mathematics, not just in Ghana but in other parts of the world. The chapter presented an overview of Ghana's educational system and the teaching and learning of the mathematics subject. It discussed the perception and attitudes of people towards the teaching, learning and application of mathematics. The various factors accounting for these perceptions and attitudes were also discussed, with theories that help to better explain the phenomenon studied. The chapter further reviewed the various studies undertaken in relation to the teaching and learning of Mathematics and the performance of students in the subject. Finally, there was a presentation of a conceptual framework that summarised the problem, the causes, interventions that could be developed, and the results expected.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter introduces us to the discussion on the methodology employed and used for the study. It involves the research approach and design, study population, sample size and sampling technique, sources of data, data collection instruments, data analysis methods and ethical considerations.

3.2 Research Approach

According to Yates (2004), there are three most dominant research approaches namely, the quantitative research approach, the qualitative research approach, and the mixed method research approach which entails a combination of both quantitative and qualitative research approaches. In general, the choice of any research approach depends on the nature of the research problem and the objectives that the research intends to achieve. This study made use of the quantitative approach. According to Creswell and Creswell (2017) quantitative research methods generally attempt to determine the relationship between two variables traditionally referred to as dependent and independent variable using statistical models and formula. Saunders, Lewis and Thornhill (2012) similarly opine that the quantitative research study is one that helps in ensuring accuracy, reliability as well as generalisations of research findings. It does so by developing testable hypothesis and theories which lend themselves to generalisation. Quantitative research methods are noted to generate greater objectivity in research findings. This is simply attributed to the fact that the researcher does not have any impact on research outcomes, unlike qualitative research approach. Data collected under quantitative research approach are external to the researcher and the researcher derives results based on statistical tools not on subjective interpretations

(Creswell, 2015). Synthesising these methodological approaches, the current study employed the quantitative research approach. The study primarily investigated whether there is a relationship between a dependent variable, in this context, students' achievements in mathematics and an independent variable, students' perceptions of mathematics. In sum, the quantitative research approach was most appropriate in determining the existence of significant relationship between the variables of the study, to be specific, perceptions of students on mathematics and their achievement scores.

3.3 Research Design

This study made use of descriptive survey design under quantitative research designs. This implies that the four research questions in this study would be analysed quantitatively. According to Saunders, Lewis and Thornhill (2012), a quantitative research design is one that helps in ensuring accuracy, reliability as well as generalizations of research findings. Quantitative research does so by developing hypothesis and theories that are testable which allows for generalization. This research technique, however, is normally employed to collect numerical data in order to demonstrate how the variables are related with the objective in mind (Ofori & Dampson, 2011). A further collection of data with this approach could either be obtained through questionnaires, surveys, personality test as well as the use of a standard research instrument (Creswell,2012). The quantitative research method also helps researchers collect information from individuals through their responses from carefully selected questions (Check & Schutt, 2012). One type of design under these quantitative designs is the descriptive survey design. According to (Kothari, as cited in in Wasike, Ndurumo and Kisilu,2013) descriptive survey designs offer efficient means of collecting descriptive data regarding the characteristics of populations, current practices and conditions or needs. By employing the use of samples, these

designs also help collect information from large cases hence cutting down on costs. The justification for the use of this research design is because it makes it possible for both numeric descriptions to be made easily with respect to the movements, attitudes, assertions, and the opinion of a certain population by making use of a sample from the population under consideration.

3.4 Research Strategy

There are two basic research strategies namely, deductive and inductive research strategies (Streefkerk,2019). Deductive research strategy aims to test an existing theory whereas inductive reasoning seeks to develop a theory, and most research scholars characterise it as theory emergent. Deductive reasoning involves the review of literature on a particular research phenomenon and then developing hypothesis for testing in a particular population setting (Streefkerk,2019). Deductive research is often employed when the body of research on a research problem is quite huge. From this backdrop, the current study adopted deductive research strategy given the vast level of research around students' perception of mathematics and performance. The appropriateness of the use of deductive research strategy in this study is that it provides a unique opportunity to explore whether theoretical sayings in particular on the relationships between various perception constructs and student's achievement scores hold true in the context of the studied population settings.

3.5 Population of the study

A research population refers to individuals or objects collectively. These well-defined collections of individuals and objects possess similar characteristics or binding traits. The target population for this study is senior high students in Ghana. However, the study focused on 3 senior high

schools. Specifically, the schools selected comprised two schools in the eastern region and one from the Greater Accra region of Ghana. The rationale for the focus on these schools was two-fold. First, the researcher, following a review of existing studies, found that studies about attitudes and perceptions of students have been mostly carried out on students in the greater Accra region and the central region, respectively. For this reason, the researcher finds it necessary to explore this research problem in different regions and different school contexts. Also, the researcher found these three schools most accessible which from a practical standpoint facilitated the conduct of the study especially regarding data collection. Specifically, the three schools comprised 1 mixed school (both males and females) (Adonteng SHS), 1 all - girls school (Aburi Girls SHS) and 1 all boys school (Presbyterian Boys SHS). The selection of these schools addressed a potential bias of selecting respondents in the study as may be the case of gender bias.

3.6 Sample size and sampling technique

Three hundred (300) students were sampled for this study. The study made use of purposive and simple random sampling techniques in the selection of the participants. Purposive sampling technique is one in which the researcher deliberately chooses a participant due to the qualities possessed by the participant. (Etikan, Musa & Alkassim, 2016). The use of this technique aided the researcher to identify and select proficient and well-informed students abreast with the phenomenon of interest. According to Gravetter and Forzano (2011), the straightest forward, popular and purest method for drawing a sample among a large population is the use of simple random sampling (also referred to as random sampling). Furthermore, they described it as a sampling strategy where there is equal chance of selection for each member of the population to be part of the sample, eliminating bias in the selection procedure, hence resulting in representative samples. Saunders, Lewis and Thornhill (2012) posit that a sample size of more

than few hundred is ideal for the appropriate application of the simple random sampling. They assert that although it seems easy to apply in theory, in practice, it is difficult. The researcher chose this because this method leads to a good representation of the sample group with less room for researcher bias compared to non-probability sampling of members. The sampling size also required for this method best suits this research work.

3.7. Research Data Collection Instrument

Research instruments are the tools or means by which researchers measure variables or items of interest in their data collection process (Salkind, 2010). Salkind (2010) posits that it is more than the creation of instruments as it also has to do with the researcher's consciousness in dealing with issues pertaining to a threat to internal validity in research. Thus, a researcher in designing any research instrument must ensure that it will not lead to biased results. For this quantitative study, the researcher designed a questionnaire as the main data collection instrument.

3.7.1. Development of the Questionnaire

According to Ahmad (2012), questionnaires are questions designed by a researcher to be answered by respondents. The reason for this instrument is the ease with which closed questions can be analysed. The assignment of numbers or values to each answer makes statistical interpretation easily assessable. As a result, a semi structured questionnaire was designed to capture the objectives of the study. Pursuant to achieving the objectives of the research, the views and opinions of the students were solicited. The questionnaire was adapted with respect to (Code et al's, 2016) questionnaire. The questionnaire was divided into two sections. The first part was on the demographic data of the students which included age, gender, level of students, and programme of study. The second part was on the research objectives. The items on the questionnaire were forty- five (45) altogether. For objective one, the perception constructs that

were used in this study were seven in all with thirty-two items making up the questions. Objective two which is about how these perceptions were formed also had six questions under it. The objective four had nine items in all and was also to find out how other factors such as age, language and gender influence the students' perceptions on mathematics. The statements on the Likert scale were expressed on a five-point scale pioneered by Rensis Likert in 1932, which asked respondents to indicate the extent of their agreement ranging from Strongly Disagree (SD), Disagree (D), Neutral ((N), Agree (A) and Strongly Agree (SA).

To improve the validity of the questionnaire, a pre-test of the research instrument was undertaken using 50 respondents. Generally, there is a broader consensus among research scholars that pre-test of a research instrument is an important technique of improving the validity of results (Malhotra, Kim & Patil, 2006). In the context of this study, the pre-test exercise was very critical as it gave the researcher a before-hand knowledge of the understanding of the study respondents on the questions contained in the questionnaire. Subsequently, the questionnaire was subjected to reliability. This signified the comprehensibility of respondents on the research subject matter and responses to the questions were more accurate. The validity of the questionnaire was also improved by the research supervisor through validation.

The Cronbach alpha of .777 indicated an acceptable level of the items on the questionnaire. Per this, the researcher is greatly confident the instrument that was used for the collection of the data was valid.

3.8. Sources of data collection

The study employed both primary and secondary data. The primary data was collected through the administration of questionnaires. The secondary data on the other hand was collected from

journal articles, from already published materials, chiefly comprising books, official websites and the internet. The research questions were answered by relying on the primary data collected. The secondary data helped the researcher to situate the study within the wider setting of academic scholarship.

3.9. Data analysis methods

The administered questionnaires were later collected from the students after filling, and it was examined properly to avoid any inconsistency. Data collected from the field was sorted out and those that were valid to be used for the study was subsequently coded and entered into excel spread sheet for onward analysis using Statistical Package for Social Sciences (SPSS). The research objectives were answered using both descriptive and inferential analyses. The descriptive and inferential analyses was appropriate because it gives a complete picture of data collected. Descriptive statistics were depicted using percentages for objective one, two and four. In analysing the three objectives which are identifying the various perception construct of students on mathematics, examining how these perception constructs of students concerning mathematics were formed and to examine whether other factors such as gender and age influence mathematics performance, a degree of consensus with a minimum of 51% was chosen to describe the degree of agreement or disagreement with a statement.

In achieving objective three which is on the relationship between the various perception constructs and maths performance, the regression model used by Mutodi and Ngirande (2014) was adopted and modified to suit the present study. Ordinary Least Square (OLS) regression estimation technique was used for the purpose of the regression. The regression model is presented as follows;

$$\text{Performance (Perf)} = \alpha + \beta_1\text{Selfconf} + \beta_2\text{Intsub} + \beta_3\text{TeachMot} + \beta_4\text{TeachComp} + \beta_5\text{MathsDiff} + \beta_6\text{MythofSub} + \beta_7\text{MathsUse} + \text{eit} \dots\dots\dots(\text{Eq. 1})$$

In measuring the performance of students, short but standard questions were set for the students to answer. The questions were marked over hundred percentages. In ensuring the reliability and the authenticity of the scores, the mathematics teachers from the various schools were tasked to indicate the performance of the students involved in the research on a rank of good (representing students whose performance are anywhere good, very good and excellent); average (indicating students who are generally average students) and poor (indicating students whose performance over time have been anything between poor and very poor) in their mathematics achievements. The students were not privy to what their mathematics teachers were tasked to do as the teachers merely indicated on their mathematics question papers the letters G (meaning good), A (meaning average) or P (meaning poor). It is stated authentically that the researcher herself supervised all these exercises together with the mathematics teachers in all the three senior high schools and can comfortably say that the students comported themselves by not seeking help from their counterparts. The researcher marked the papers and graded the students according to good (and score from 70% and above), average (any score from 50% to 69%) as well as poor (any score from 49% and below). Interestingly, the scores recorded during the marking of the papers tallied with the level of performance the teachers indicated on the sheet hence, bringing out a true reflection of the performance of the students. However, the researcher relied on the results from the test of the students as a reflection of their performance.

3.10. Ethical considerations

This section indicates the ethical considerations underpinning the research. The researcher took these ethics into consideration in the process of gathering data for the study. As required by the

university under whose supervision the researcher is conducting this research, an ethical clearance was given before the researcher could go to the field. This letter of consent was made available to the schools selected for the purpose of this study. Respect for the dignity of respondents was a priority for the researcher. Respondents who participated in this study were assured of the confidentiality of the information they provided by ensuring that their names and personal details are not included and revealed. The researcher also sought the voluntary participation of respondents with their full consent; no one was coerced into participating in the study. Respondents were also assured that the information gathered would be used purely for academic purposes.

CHAPTER FOUR

PRESENTATION OF FINDINGS, INTERPRETATION AND ANALYSIS

4.1 Introduction

This chapter presents data collected in the study and conducts analysis of the data presented. The chapter however presents the demographic background of respondents to get a clearer picture of the nature of the sample used in the study. The chapter subsequently presents the data collected in the study and thereafter analyses data with reference to the research questions set in the study.

4.2 Demographic Characteristics of Respondents

Out of the 300 questionnaires administered, 295 were subsequently retrieved thus, giving a response rate of 98.3% which is highly adequate for statistical analysis and inferences. The demographic data of respondents in the study were examined in these respective domains: gender, level at school, age, and programme of study and language. Results in this regard are captured in Table 4.1.

Table 3: Demographic profile of respondents

Characteristics	Response	Frequency	Percentage
Gender	Male	160	54
	Female	135	46
Level at school	SHS 1	120	41
	SHS 2	90	31
	SHS 3	85	28
	51-60		
Age	14-16 years	144	49
	17-19 years	151	51
Programme of study	General Arts	92	31
	Business	59	20
	Science	54	19
	Home Economics	45	15
	Visual Arts	45	15

Source: Field survey, 2020

From Table 3, it is evident that 160 respondents constituting 54% were males, whereas 135 respondents accounting for 46% of respondents were females. Regarding school level, Table 3 also shows that 120 respondents (41%) were in SHS 1 at the time of conducting the study, 90 (31%) were in SHS 2 and 85 (28%) were in SHS 3. Pertaining to ages of respondents, Table 4.1 depicts those 144 respondents (49%) were aged between 14-16 years and 151 respondents (51%) were aged 17-19 years. Lastly, on the programme of study, 92 (31%) of respondents offered General Arts, 59 (20%) offer Business, 54 (19%) offer Science, 45 (15%) offer Home Economics, and 45 (15) also offer Visual Arts.

4.3 What are the various perceptions of students on mathematics in senior high schools?

To answer this question, perception of students on mathematics were measured along five perception constructs. Results are captured in the ensuing Tables specifically, Tables 4, 5, 6, 7 and 8.

Table 4: Students Self-confidence and interest Perception of Mathematics

Self-confidence Constructs	SD	D	N	A	SA	Mean
No matter how I prepare, I am still not confident taking a maths test	23.4	31.2	18.6	19.7	7.1	2.54
I am always not confident answering mathematics questions in class	23.7	33.6	19.0	16.3	7.5	2.45
Even if the concepts in maths class are hard, I can learn them	9.9	9.5	21.0	40.7	19.0	3.45
I avoid solving maths problems when possible	37.3	32.5	15.9	10.5	3.7	2.03
Interest Constructs	SD	D	N	A	SA	Mean
My only interest in maths is getting a passing score	19.0	19.7	12.9	26.1	22.4	3.11
I like doing mathematics	7.5	9.8	25.4	32.5	24.7	3.54
I enjoy solving mathematics problems	6.8	11.2	26.8	33.9	21.4	3.49
My interest in attending maths class is high	5.5	7.5	24.4	33.9	29.2	3.74
I have high interest in maths calculations	9.1	9.5	23.7	34.2	23.4	3.49

My interest in maths makes me try other maths problems after the main class	10.8	12.9	24.7	31.2	20.3	3.35
I only learn maths when it is required	29.5	28.8	12.5	20.7	8.5	2.41

SD=Strongly Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strongly Agree

Source: Author's field data (2020)

From Table 4, it is shown that respondents generally agree to only one of the items measuring self-confidence perception of mathematics. This, from Table 4, is on the statement “Even if the concepts in mathematics are hard, I can learn them” as it records a percentage score of 59.7% representing agreement as specified on the Likert scale used in the study. Table 4 however evidence that respondents showed disagreement regarding the other items (1, 2 and 4), measuring perception constructs as they all report percentage scores of 54.6%, 57.3% and 69.8% respectively. The implication of this result is that students acknowledge their confidence in always learning mathematics whether the concepts are hard or easy. The results also indicate their preparedness to take a maths test or answer mathematics questions in class and readiness to solve mathematics problems whenever possible. This result in summary shows students do not necessarily lack confidence when it comes to learning of mathematics, something worth knowing.

Again, the table captures the perceptions of respondents on various items measuring interest in mathematics. It is generally confirmed from Table 4 that respondents agree to all the items apart from “I only learn maths when is required”, which recorded 58.3% of respondents showing disagreement. As it can be seen from Table 4 , the respective percentage scores of the items “my

interest in attending maths class is high”, “I enjoy solving mathematics problem”, “I have high interest in maths calculations, and “my interest in maths make me try other maths problems after class” given as 57.2%, 55.3%, 63.1%, 57.6% and 51.5% respectively all point to agreement. In practice, it might be said that students demonstrate high level of interest as they exhibit greater interest in attending maths class, enjoy doing mathematics, and solving problems. This attitude of students looks favourably. However, 48.5% agree that their only interest in maths is just making a passing score. For such respondents, maybe they only feel obliged to learn maths and pass since mathematics has become one of the subjects that requires a pass in order to gain admission to the tertiary or be assigned some courses in the tertiary level. They really have no interest in the study of maths.

Although students demonstrate high level of interest towards the study of mathematics, there is the need to have a further look at this as to whether, the student’s high interest is because they love the subject, understand its usefulness or whether all that matters to them is getting a passing score.

4.4. Perceived teacher motivation and teacher competence perceptions

Perceived teacher motivation and teacher competence perceptions are discussed under this subsection.

Table 5: Perceived teacher motivation and teacher competence perceptions

Teacher motivation Constructs	SD	D	N	A	SA	Mean
My maths teacher(s) makes me believe I can study maths and do well	5.0	5.4	9.8	29.5	50.2	4.14
My maths teacher(s) motivates the class in various ways to make us learn maths	7.8	5.8	8.8	28.8	48.8	4.02
Teacher competence Constructs	SD	D	N	A	SA	Mean
My maths teacher(s) have been unsuccessful with helping me learn maths	45.8	32.2	11.5	6.4	4.1	1.88
I like maths because my teacher is able to articulate maths contents very well	9.8	12.5	22.7	32.9	22.0	3.41
I do not like maths because my maths teacher is unable to articulate its content well	52.5	26.1	13.9	5.8	1.7	1.73

SD=Strongly Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strongly Agree

Source: Author's field data (2020)

Table 5, which depicts the responses about the perceived teacher motivation perceptions, showed that an overwhelming majority of 79.7% of students are in some degree of agreement with the statement “My maths teacher(s) makes me believe I can study maths and do well”; a breakdown of the response shows 50.2%, representing those who strongly agreed and 29.5% for those who just agreed. Only a few students disagreed with the statement, representing about 10.4% of respondents.

The students were again asked to indicate their level of agreement with the statement “My maths teacher(s) motivates the class in various ways to make us learn maths” and again, as seen in the response presented right above, an overwhelming majority of 77.6% do agree; 28.8% agree while 48.8 strongly agree. This is highly likely to go a long way in getting students more interested in mathematics, beyond just passing mathematics exams. This can be considered as a very important factor in ensuring that the other aspects of education and life, which make use of mathematics have students with already developed interest and willingness to contribute in that aspect too.

The same table which depicts responses about perceived teacher competence perceptions, showed an overwhelming majority of 78% of the students disagreeing to the statement “My maths teacher(s) have been unsuccessful with helping me learn maths” with only 10.5% concurring and 11.5% choosing to remain neutral.

The students were required to also indicate their level of agreement with the statement “I like maths because my teacher is able to articulate maths contents very well” and as seen in the responses gathered concerning the statement presented earlier, a majority of 54.9% agree while only a few students (22.3%) disagreed, with 22.7% remaining neutral.

The final item of the subject of perceived teacher competence perceptions which reads: “I do not like maths because my maths teacher is unable to articulate its content well” had most of the students in disagreement and less than 10% agreeing. While 78.6% of respondents either strongly disagreed or just disagreed with the statement, only 7.5% claimed otherwise. This could mean 2 things; it is either the students in disagreement with the statement do not see anything wrong with the way their teachers deliver in speech, or they just do not consider articulation as a factor here. However, the few who agree and strongly agree could have an issue with the articulation of teachers, and it would be good to check that for all and sundry to like maths if the problem for their dislike is how articulate the teacher is.

Table 6: Myths and beliefs perceptions

Constructs	SD	D	N	A	SA	Mean
Being good at maths requires natural (i.e., innate, inborn) intelligence in maths	33.2	25.8	14.9	18.0	8.1	2.40
For each person, there are maths concepts that would never be understood even if they tried	33.6	30.8	16.9	12.2	6.4	2.23
Maths is mainly about having a good memory	19.7	21.7	19.3	24.4	14.9	2.89
Only very intelligent students can understand maths	51.5	27.1	10.2	4.7	6.4	1.84
I believe I can get better at maths	5.4	1.0	3.1	20.3	70.2	4.46
Mathematics is for boys and not girls	76.9	11.2	5.1	3.4	3.4	1.43
Boys do better in maths than girls	50.8	11.9	17.3	13.9	6.1	2.08

Table 6 shows responses to the section about myths and beliefs perceptions, and the results indicate most students disagreeing to the statement that reads: “Being good at maths requires natural (i.e., innate, inborn) intelligence in maths”, while only a few students agreed. With a

majority of 59% responses showing disagreement, and with only 26.1% agreeing, it is evident that most of the students do not believe in the notion that people good at maths are born with it.

Also, the second statement realised similar responses as most students disagreed with the statement “For each person, there are maths concepts that would never be understood even if they tried” whereas only a few students agreed. Again, responses for the statement “Only very intelligent students can understand maths” showed that most students disagreed with the statements and only a few students agreed. Specifically, 78.6% disagreed with the statement, whereas only 11.1% students agreed. Additionally, regarding the statements of “I believe I can get better at maths”, an overwhelming majority of 90.5% students agreed, whereas only a few disagreed. This positive affirmation is a sign of hope for better achievement in maths than they already do. In the statement “Mathematics is for boys and not girls”, the responses showed that most students do not agree that mathematics is for boys and not girls. Only a few students agree with this statement. Regarding the statement “Boys do better in maths than girls”, most students do not agree with the statement and only a few agree. This is evidenced in the responses to the statement as 62.7% of respondents disagreed with the statement and only 20% agree. The responses on this do not make known the gender differences with this statement however the fact that some few concur that boys do better in maths could influence the effort some people make towards maths.

Table 7: Perceptions on difficulty in maths

Constructs	SD	D	N	A	SA	Mean
I often have difficulty organising my thoughts during a mathematics test	15.3	27.8	24.1	21.7	11.2	2.84
I have difficulty understanding certain topics in maths	10.8	13.9	19.0	38.6	17.6	3.36
I have difficulty understanding all topics in mathematics	42.4	33.2	11.5	8.5	4.4	1.98
After I study a topic in maths and feel I understand it, I have difficulty solving problems on the same topic	21.7	28.8	21.0	16.6	11.9	2.66
If I am stuck on a maths problem for more than ten minutes, I give up or get help from someone else	12.5	10.8	13.6	38.6	24.4	3.50

SD=Strongly Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strongly Agree

Source: Author's field data (2020)

Table 7 depicts the agreement of respondents on various items measuring perceptions on difficulty in mathematics. A reference to Table 7 indicates that students agree on the following: “If I am stuck on a maths problem for more than ten minutes, I give up or get help from someone else” (recording 63%) and “I have difficulty understanding certain topics in maths “(56.2% agreement). Although 63% agreed to giving up when faced with difficult maths problem, it is also encouraging to know that 37% try to work maths problems through to the end by themselves, something that is quite impressive. Regarding “I often have difficulty organising my thoughts during mathematics test”, it is evident that 43% of respondents disagreed, as against the 32.9% who agreed. However, 24% respondents were neutral. Although it looks like many disagreed, the response from those who agreed cannot be overlooked. Organising their thoughts during mathematics seems to be a problem for some students. Again, respondents disagree that they have difficulty understanding all topics in mathematics, given a percentage score of 75.6% respondents. More than half (50.5%) disagreed on item 4 under difficulty in learning maths construct. The results above show that students attest to the fact that they find it difficult understanding certain topics in maths but not all topics in mathematics.

Table 8: Perceptions on usefulness of maths

Constructs	SD	D	N	A	SA	Mean
Maths has no use outside of school	64.4	22.0	7.8	1.7	4.1	1.57
Maths has no relevance in my life	63.1	23.4	7.1	4.4	2.0	1.55
Doing well in maths can help me get a good job after school	5.4	6.4	14.9	31.9	41.4	3.95
I can use what I learn in maths class in other subjects	6.8	3.7	19.3	36.9	33.2	3.82

SD=Strongly Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strongly Agree. Source: Author’s field data (2020)

Table 8 summarises the perceptions of students on the usefulness of mathematics. Table 8 suggests that respondents acknowledge the usefulness or otherwise relevance of mathematics. This claim is supported by the percentage scores of 73.3% for “doing well in mathematics can help me get a good job” and 70.1% for “I can use what I learn in maths class in other subjects”. Respondents do not concede to the statements “maths has no use outside of school” and “maths has no relevance in my life”, given their corresponding percentage scores 86.4% for item 1 and 86.5% for item 2, which suggests disagreement. Generally, the results affirm that perceptions of students on the relevance of mathematics are positive. Intuitively, one would expect that this tacit acknowledgement of the relevance of maths by students should lead them demonstrating high confidence and interest level. Though the results from Table 8 suggest that students exhibit high

level of interest in maths, there were some findings of students interested in only getting a passing score, and the same table reveals students exhibiting low confidence in mathematics. This could be attributed to the fact that students recognise the value of mathematics, but it does not influence their interest and confidence level.

4.5. What factors affect students' perception of mathematics?

A variant research question of the study related to the determination of the variables that influence students' perception of mathematics. Table 4.7 reports the results regarding respondents' agreement to various variables identified.

Table 9: How perceptions were formed

Constructs	SD	D	N	A	SA	Mean
The experiences I went through at the early stages of my educational life made me form these perceptions about maths	11.9	13.2	22.0	34.6	18.3	3.30
I formed these perceptions about maths myself	20.0	11.2	18.0	30.2	20.7	3.08
My teachers make(de) me form these perceptions about maths	17.9	21.7	20.0	28.8	11.5	2.91
The society in general contributes greatly to the perceptions I have about maths	19.0	23.7	24.7	25.1	7.5	2.75
My parents contribute(d) to these perceptions I have about maths	23.4	24.7	20.0	20.3	11.5	2.69
My peer influence(d) me to form perceptions about maths	23.4	22.4	22.4	24.7	7.1	2.64

SD=Strongly Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strongly Agree

Source: Author's field data (2020)

Most students of about 52.9% agreed with the first statement that reads “The experiences I went through at the early stages of my educational life made me form these perceptions about maths”, and only a few students disagreed with the statement. Only a few remained neutral.

Again, most students agreed with the statement “I formed these perceptions about maths myself”, while only a few disagreed with the statement. That is, while about 50.9% of respondents either strongly agreed or agreed with the statement, only 31.2% disagreed. 18% remained neutral.

Regarding the other statements “My teachers make (de) me form these perceptions about maths; The society in general contributes greatly to the perceptions I have about maths; My parents contribute (d) to these perceptions I have about maths; My peer influence (d) me to form perceptions about maths”, the responses showed that none had most students agreeing or disagreeing to the statements. This is a clear indication that the students formed those perceptions at the early stages of their educational lives and by themselves, just a few concur that it was through the influence of some others, being it their teachers, society, their parents, or their peers.

4.6. What relationship exists between the identified perception constructs and student performance in mathematics?

Regression results on relationship between the identified perception constructs and student performance

Table 10: Model summary on the relationship between the perception and performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.331 ^a	.110	.088	1.346

- a. Predictors: (Constant), MathsUse, TeachMot, TeachComp, Selfconf, Intsub, MythofSubj, MathsDiff
- b. Dependent Variable: Mathematics performance

Source: Author's computation, 2020

Ordinary Least Square (OLS) regression estimation technique was therefore used on the perception variables to predict the magnitude and direction of the effects of these variables on performance. The intercept regression model was used in the analysis because some predictors have the possibility of being equal to zero (0) so much that the intercept would have a meaningful interpretation. Table 10 has in it the regression results on the relationship between the identified perception constructs and the performance of students in mathematics.

Table 11: Regression results on the relationship between the perception and performance

Model	Unstandardised Coefficients		Standardised Coefficients	T	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	3.203	.664		4.821	.000	1.896	4.511
Selfconf	-.041	.031	-.081	-1.300	.195	-.102	.021
Intsub	.033	.018	.111	1.832	.045***	-.002	.069
TeachMot	.022	.038	.035	.585	.559	-.052	.097
TeachComp	-.031	.044	-.042	-.704	.482	-.119	.056
MathsDiff	-.065	.021	-.201	-3.122	.002***	-.107	-.024
MythofSubj	-.008	.020	-.024	-.380	.704	-.046	.031
MathsUse	.085	.034	.147	2.503	.013***	.018	.152

Dependent Variable: Mathematics performance *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: Author's computation, 2020

The model indicates that 11.0% (R-Square=0.110) variation in student performance is explained by seven (7) of the predictor variables, which are self-confidence of students, interest of students in mathematics, motivation that is received from teachers in studying maths, competence of teachers in teaching maths, difficulties faced in studying the maths subject, students' perception on myths and beliefs concerning maths, and the perceived usefulness of studying maths.

Self-confidence construct represented by Selfconf is negative and insignificantly related to mathematics performance. The implication of this result is that self-confidence which forms part of perception constructs does not necessarily affect students' performance in mathematics. Interest in the mathematics subject as represented by Intsub is positive and significantly related to mathematics performance. The result suggests that interest in the subject improves performance of students in the subject. Essentially, what it means is that the more students like the subject and have interest in it, the better their performance. Teacher motivation which is one of the perception constructs is also positive but insignificantly related to mathematics performance. This suggests that motivation of teachers in mathematics does not necessarily improve mathematics performance of students. Also, perception relating to the competence of teachers represented by TeachComp had a negative but insignificant relationship on performance in mathematics. Again, the result implies that the competence of teachers does not influence students' performance in mathematics.

Again, difficulty in learning mathematics, another perception construct represented by MathsDiff is negative but significantly related to mathematics performance of students. This result indicates that when students face less difficulty in learning the mathematics subject, their performance tends to improve, while those students having challenges in learning mathematics tend to have decline in their performance.

Additionally, myths and beliefs associated with the study of mathematics, represented by MythofSubj, is negative and insignificantly related to performance, which indicates that these myths and beliefs of the mathematics subject do not influence mathematics performance of students. The last perception construct which is the usefulness of mathematics represented by MathsUse is positive and significantly related to mathematics performance of students. This result suggests that when students recognise mathematics as a very useful subject, they tend to perform better in it, while students who do not see the subject as very useful tend to have low performance in it.

4.7. What is the influence of gender, age and language as related to students on their perception and hence students' performance in mathematics?

The fourth research question was to find out how factors such as gender, age, and language influence how the students perceive maths.

Table 12: Other factors that influence perceptions.

Other factors that influence perceptions	SD	D	N	A	SA	Mean
Age plays a major role in how one perceives maths	37.6	26.1	13.6	14.9	7.8	2.24
When I was younger, my perceptions about maths were positive than now	19.7	21.7	17.6	21.0	20.0	2.94
When I was younger, my perceptions about maths were negative than now	35.2	28.5	11.9	15.9	8.5	2.29
My performance in maths was better when I was younger than now	15.9	20.7	11.5	26.4	25.4	3.22
Gender plays a role in how people perceive maths	37.0	29.8	16.3	10.5	6.4	2.16
Boys generally have positive perception towards maths than girls	32.5	19.0	20.7	18.3	9.5	2.49
Girls have positive perceptions towards maths than boys	34.9	30.5	27.5	4.1	3.1	2.06

SD=Strongly Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strongly Agree

Source: Author's field data (2020)

The researcher, in finding out other factors that may influence the performance of senior high school students in mathematics, presented them with some questions which required them to indicate their agreement or disagreement. The first statement presented to the respondents was

that “age plays a major role in how one perceives maths”. Out of the 295 responses gathered, more than half with a percentage of 63.7% disagreed with the statement. Just a few of about 22.7% agreed that age has a role to play in how one perceives maths. The rest remained neutral.

There was no obvious difference regarding the statement that reads “when I was younger, my perceptions about maths were positive than now” as 41.4% disagree, whereas 41.0% agree and 17.6% were neutral. Therefore, it cannot be concluded that being older could change how one perceives maths. Even though there were not many responses gathered for or against the perceptions about maths being positive when the respondents were younger, more than half of the 295 respondents, that is 63.7%, disagreed with the statement that when the respondent was younger, his/her perceptions about maths were negative than they are now. This shows that although a few were not certain about their perception being positive when they were younger, more were confident about it being negative. Only 24.4% agreed with the statement in varied degrees.

51.8% of the respondents claim their performance was better when they were younger than it is now, as some agreed and others strongly disagreed with the fourth statement presented to them.

Regarding gender and the role it plays on how people perceive maths, 66.8% of the responses gathered shows that gender does not play any role, as these persons disagreed with the statement that says gender does play a role.

51.5% of the 295 responses gathered, which is more than the total number of males, disagreed with the statement that “boys generally have positive perception towards maths than girls” which obviously shows that some females did agree with the statement. On the other hand, 65.4% which is over 10% more than the total number of females engaged in the study also disagreed

with the statement that “girls have positive perceptions towards maths than boys”. What this means is that both male and females completely agree that their gender differences do not influence their perception about mathematics.

4.7 Chapter Summary

This chapter of the study covered the analysis of data collected in the field. The findings as presented were done based on the purpose and objectives of the study; it was therefore done according to the research questions the study sought to answer. The study collected quantitative data. The researcher analysed the quantitative data statistically and presented the results using descriptive and statistical inferences.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the study, discussion of the findings made based on the results gathered, the conclusions drawn, and the recommendations suggested.

5.2 Summary of Findings

This study assessed the perceptions that affect students' performance in mathematics in senior high schools in Ghana. It did so with the objectives of identifying the various perceptions of students on mathematics in senior high schools, examining the factors that influence these perceptions, assessing the relationship between the identified perception constructs and student performance in mathematics, and examining whether other factors such as gender and age influence how they perceive mathematics. The findings of the study are below.

5.3 Discussion of Results

5.3.1 Research Question One

This question was to ascertain the various perceptions of students that do exist.

The perceived ideas that students' performance in mathematics is dependent on factors including self-confidence of students, their interest in the subject, motivation from the teacher, competence of the teacher, difficulty of the subject, myths and beliefs, as well as the perceived usefulness of subject do exist.

From the responses gathered from the data, students revealed that their level of confidence towards the learning of mathematics is high. Most students believe they can learn maths and do well in the subject area. This is a good perception they have towards the subject which should be able to translate into their performance.

Regarding the interest perceptions, students again responded in the affirmative. The responses revealed that they have a high interest in maths that pushes them to study the subject. However, for some of the students, their high interest in maths is just to make a passing score in the subject. Kan and Fabrigar's (2017) theory of planned behaviour comes to play here considering the fact that interest in making the passing score alone is enough to make students invest time and effort into preparing and taking part in maths activities.

The teachers' actions and inactions are considered as a particularly important factor in ensuring students' performance in mathematics. In table 4.3, the teacher's effort to instil in the students some hope makes them believe that they can do that which they have set their minds to do. Majority of the students essentially side with the fact that the motivation that the teachers provide on the study of the subject helps them in studying the subject. LaMorte (2019) examined Kan and Fabrigar's (2017) theory of planned behaviour, which he claims comprises 6 constructs; one of these constructs is perceived power. According to LaMorte (2019), perceived power has to do with the presence of factors that may facilitate or impede performance of a behaviour. Words are believed to have an effect and can be impactful and as such, if a teacher plays the role of a motivator to his or her student, the student is most likely to be encouraged and to believe in the possibility of doing better.

The competence of teachers is very much necessary in ensuring that those on the receiving end (students) are benefiting appropriately. The present study reveals students' acknowledgement of the competence of their teachers in helping them study maths. Majority of the students believe that their teachers are able to articulate maths contents. This suggests that the competence of teachers is essential in the study of the maths subject.

Generally, maths as a subject is perceived to be difficult to the extent that it creates fear among students and influence poor performance. From the finding as pertains to perceptions regarding difficulty of the subject, it is evident that the subject has posed to be difficult for majority of the students as majority of them agreed that when they are working on a maths problem and they encounter any problem, after some time, they give up. They also rely on friends for help with difficult problems. Again, most students revealed that they do not understand certain topics in maths. The relevance of the theory of constructivism is seen here. Teachers must device effective ways to make students be part of the learning process, enjoy the topics in maths and have clearer understanding in the topics in maths and use cooperative activities to help the student work with their peers, as many already fall on their peers for help.

Over the years, a lot of myths and beliefs have emerged regarding maths as a subject. Some students have heard untrue things about the subject, while some have also grown to imbibe some of these beliefs and myths relating to the subject. As far as the subject matter of myths and beliefs is concerned, majority of the students believe that they can get better at the maths subject. Essentially, what this implies is that students within them believe that if they study the subject, they can do well. Myths like boys do better than girls in maths (and vice versa), ability of one to do maths is innate and only those who are intelligent can do maths were strongly opposed.

Most students have questioned the usefulness of maths after school. They tend to have the mindset that majority of the concepts being treated in the maths subject have no bearing on their lives. For this reason, they have developed certain behaviour of seeing the study of maths as irrelevant hence, not making much effort to ensure better performance in the subject. This assertion is however not true as everyday life even involves calculations. The perception of students on the usefulness of maths per students' responses indicated majority of students refuting the assertion that maths is not useful. Majority of the students believe that the study of maths is very useful in real life as they clearly agreed that maths can help them get a good job. They therefore refute the assertion that maths has no bearing on their lives. The finding is in conformity with Ampadu (2009) who revealed that most students see mathematics as one of the most important subjects in the school curriculum.

5.3.2 Research Question Two

Research question two was geared towards finding out the factors that influence the perceptions identified in the study. Some possible ways by which these perceptions could be formed were presented to the respondents; they were to indicate their agreement or disagreement with the constructs believed to have influenced the formation of these perceptions about mathematics. The results of this present study showed that most students mainly formed the perceptions they have about mathematics and its achievement from past experiences of their early educational lives and not by the influence of parents, teachers, or their peers. The assertion made by Aguilar, et al. (2012) attest to this. They posited, that students form perceptions based on their past experiences in their early educational lives, comprising cognitive and affective dimensions. Their study asserts that from a reasoning point of view, these perceptions relate to a person's knowledge, beliefs, and other cognitive representations, while from an affective domain, they

refer to a person's attitudes, feelings and emotions about mathematics. When people gain a certain foundation on a particular issue or subject matter, it helps them in performing very well and vice versa.

5.3.3 Research Question Three

Under research question three, the relationship between perception constructs of students' and their performance in maths was ascertained. Among the perception constructs, students' perceptions of interest in maths, perceptions on maths difficulty as well as perceptions on usefulness of maths were found to be significantly related to their performance in mathematics as indicated in table 4.9 previously.

Students' interest in mathematics is both positively related and significant with their performance. This finding is consistent with the that of Quek (2006) who found a positive relationship between interest and performance in math which is attributed to the dedication and efforts of students in learning the subject. Thus, as students like the subject, they tend to study the subject very well and with other factors constant, lead to better performance in the subject.

Perceptions on difficulty encountered with the subject of maths were negatively related with performance though significant. This essentially implies that the more difficult the subject is, the poorer their performance and vice versa. This can be attributed to the reason that as students face difficulty in studying the maths subject, they give up with time (as some indicated earlier on). They no longer give the subject attention. With respect to difficulty in maths, Bawuah (2013) argues that when students have a challenge in learning maths, it negatively impacts their performance. The theory of constructivism plays a role here as well as reveals that teachers need

to find ways to make students understand concepts better which will in effect influence their performance positively.

Finally, perceptions relating to the usefulness of maths is positive and significantly related with performance in maths. The implication of this result is that as students perceive maths as a very useful subject, they tend to have improved performance, while a less perceived usefulness results in poor performance in the subject. This result can be ascribed to the reason that as students see maths as an especially useful subject, they take it very seriously hence study it to the best of their ability which eventually leads to improved performance. However, when students do not see the usefulness of the subject, less attention is paid to the subject and less attention, all things being equal, means that there will be poor performance in the subject. The finding is in conformity with Ampadu (2009) who revealed that most students see mathematics as one of the most important subjects in the school curriculum which will help them in their daily lives.

On the contrary, self confidence, teacher competence, teacher motivation, and myths and beliefs were insignificant to students performance as shown in table 4.9.

Regarding self-confidence as a perception construct, the results show a negative and insignificant relationship between self-confidence and performance. This suggests that although most students are confident about learning mathematics, it did not influence their performance. This finding is in conformity with Kunhertanti and Santosa (2018), who revealed an insignificant relationship between self-confidence and performance. The reason for this result also could be explained by Vancouver and Kendal's (2006) assertion that when people perceive themselves as close to attaining their goal, self-confidence may induce a degree of complacency about the task at hand. So, although students believe in their ability to do mathematics, there is a possibility of

complacency in the learning of mathematics as it should be learnt, hence affecting their performance negatively.

Teacher competence is insignificantly related to performance. This is as opposed to the finding by Adediwura and Tayo (2007) who indicated that the perception of students about a teacher's knowledge of a subject matter, as well as his or her attitude towards teaching it significantly affect the performance of student. Evans (2009) also holds the assertion that learning of mathematics is tied closely to the competence of the teacher. The results from this present study indicate that although the competence of the teacher is necessary, it really has no implication of the performance of the student.

Teacher motivation is positively related but insignificant in influencing students' performance per this present study. The study conducted by Pantziara and Philipou (2014) to investigate the relationship between motivation and other affective constructs and students' performance revealed the value of motivation in performance. Thus, motivation and performance are related and significant. However, this study posits that although teacher motivation is good, it is not enough to influence the performance of students, contrary to the study by Pantziara and Philipou (2014). The students will need to motivate themselves as well.

Myths and beliefs have negative and insignificant relation with performance. When myths and beliefs, especially negative ones, increasingly become a part of the students, they have the potential to influence their performance negatively. However, this study reveals that these myths and beliefs held by the students had no influence on their performance.

5.3.4 Research Question Four

The final research question of the study sought to find how factors such as gender and age influence perception of maths.

Majority of the respondents were also not in consensus that age really influences how they perceive maths. This suggests that age of the student would not make them form some perceptions on maths. Admittedly, being younger could not change how maths is perceived by these students, either positive or negative. Regarding gender of students and the role it plays on how students perceive maths; it was obvious that majority of the respondents were not in agreement with the statements. This implies that the gender of a student does not influence how maths is perceived. Then again it was revealed that being a male or female generally does not mean you would have a positive attitude towards maths. This finding is consistent with the finding of Mohamed and Waheed (2011), who asserted that the students' positive attitude is moderately significant towards the study of mathematics, and there is no gender difference in their attitudes.

5.4 Conclusion

This study was aimed at assessing students' perception of mathematics and the impact it has on its achievement in senior high schools in Ghana. The present study revealed that the perceived ideas that students' performance in mathematics is dependent on factors including self-confidence of students, their interest in the subject, motivation from the teacher, competence of the teacher, difficulty of the subject, myths and beliefs, as well as the usefulness of subject do exist.

Majority of the responses suggest that these perceptions were formed by themselves and from past experiences of their educational lives. The study also found a positive relationship between students' interest in the subject, motivation from the teacher and the perceived usefulness of the subject and mathematics performance. Motivation from the teacher, however, is insignificant in influencing students' performance. Perceived difficulty in learning maths, although negative, has a significant relationship with performance. Myths and beliefs, students' confidence, and teaching competence were found to be negative and insignificantly related to performance. Other factors like age and gender were also found to have no influence on how student perceive mathematics. The study therefore concludes that the perceptions formed by students about mathematics do exist and influence performance.

5.5 Recommendations

The results of the study have some implications for educational policy and practice. As a general recommendation, it will be useful to take these measures.

The study revealed that although students have high confidence towards the study of maths, it did not lead to high achievements in the subject. Teachers must ensure that students develop more confidence in mathematics. Where confidence is present among students, teachers must ensure students do not become complacent in their learning of the subject so that their confidence in the study of the subject truly leads to higher achievements in mathematics.

Teachers, school authorities and parents have the responsibility of helping students to overcome negative perceptions about mathematics from the incredibly early stages of their educational lives. As indicated in this study, most students revealed they formed negative perceptions

towards the subject at the early stages of their lives. If students develop positive attitude towards the subject at the early stages, it can help them overcome the fears that accompany the study of the subject and hence reflect in their performance in mathematics. Those already affected by these negative experiences, must be encouraged to do away with them.

Difficulty in the study of mathematics is among the perceptions that affects students' performance as this study posited. For this reason, teachers should adopt practical ways of involving students in the learning process such as the use of cooperative learning, teaching that elicit high order thinking rather than low order thinking etc. to make the learning process in mathematics more engaging and easier for students to grasp.

The study showed that, students' perceptions of usefulness of maths significantly affected their performance. Teachers, parents, society and government must work towards making students appreciate the relevance and application of mathematics as a subject. This will go a long way to enhance perception of students on the usefulness of mathematics and hence influence their performance positively.

5.6 Suggestions for Future Research

The current study, as usual with research studies, has its limitations. One of the limitations pertains to the degree of generalisability of findings. This is attributed to the fact that the research was limited to students in specific geographical regions. It is recommended that future research should focus on other regions to enhance the generalisability of research findings. Although the current study explored the perceptions of students on mathematics, no attempt was made to determine whether there are variations in students' perceptions of mathematics based on

gender. Future research should employ other statistical techniques to explore gender variations on perceptions of mathematics. Future research should also employ other methodological approaches to assess how perception contributes to building students' interest and performance. More so, future research should explore other teacher characteristics and teaching practices on students' achievement in mathematics.

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APPENDIX

Research questionnaire

(UNIVERSITY OF GHANA COLLEGE OF EDUCATION (MHPIL IN EDUCATION)

**TOPIC: STUDENTS' PERCEPTIONS AND THEIR IMPACT ON MATHEMATICS
ACHIEVEMENT AMONG SENIOR HIGH SCHOOLS IN GHANA.**

This study seeks to assess the influence of certain perceptions held by senior high students on their mathematics performance. The study is carried out as part of the requirements for an award of MPHIL in education. You are assured that all information provided will be treated with confidentiality and used for academic purposes only. Thank you for your cooperation.

SECTION A

SECTION A: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Gender Male Female

Level at school SHS 1 SHS 2 SHS 3

Age of student 11-13 14-16 17-19 Specify
if any other

School Type Government Private

School Location

Urban

Rural

Programme of Study

General Arts

Home Economics

Business Visual Arts

Science

Other ; Specify-----

SECTION B

A five point Likert format; “Strongly Disagree”, “Disagree”, “Neutral”, “Agree”, “Strongly Agree”. Please respond by choosing the one most appropriate for you. Thank you.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
SELF CONFIDENCE					
1. No matter how I prepare, I am still not confident taking a maths test.					
2. I am always not confident answering mathematics questions in class.					
3. Even if the concepts in maths class are hard, I can learn them.					
4. I avoid solving maths problems when					

possible.					
INTEREST					
5. My only interest in maths is getting a passing score					
6. I like doing mathematics					
7. I enjoy solving mathematics problems					
8. My interest in attending maths class is high					
9. I have high interest in maths calculations					
10. My interest in maths makes me try other maths problems after the main class					
11. I only learn maths when it is required					
PERCEIVED TEACHERS MOTIVATION					
12. My maths teacher(s) makes me believe I can study maths and do well.					
13. My maths teacher(s) motivates the class in various ways to make us learn maths.					
PERCEIVED TEACHER COMPETENCE/QUALITY					
14. My maths teacher(s) have been unsuccessful with helping me learn maths.					

15. I like maths because my teacher is able to articulate maths contents very well.					
16. I do not like maths because my maths teacher is unable to articulate its content well.					
DIFFICULTIES OR CHALLENGES IN LEARNING MATHEMATICS					
17. I often have difficulty organizing my thoughts during a mathematics test.					
18. I have difficulty understanding certain topics in maths					
19. I have difficulty understanding all topics in mathematics					

20. After I study a topic in maths and feel I understand it, I have difficulty solving problems on the same topic					
21. If I am stuck on a maths problem for more than ten minutes, I give up or get help from someone else.					
MYTHS AND BELIEFS					

22. Being good at maths requires natural(i.e. innate, inborn) intelligence in maths.					
23. For each person, there are maths concepts that would never be able to understand, even if they tried.					
24. Maths is mainly about having a good memory					
25. Only very intelligent students can understand maths.					
26. I believe I can get better at maths					
27. Mathematics is for boys and not girls.					
28. Boys do better in maths than girls.					
USEFULNESS OF MATHEMATICS					
29. Maths has no use outside of school.					
30. Maths has no relevance in my life.					
31. Doing well in maths can help me get a good job after school.					
32. I can use what I learn in maths class in other subjects.					
HOW THESE PERCEPTIONS WERE FORMED					

33. The experiences I went through at the early stages of my educational life made me form these perceptions about maths.					
34. My parents contribute(d) to these perceptions I have about maths.					
35. My teachers make(de) me form these perceptions about maths.					
36. The society in general contribute greatly to the perceptions I have about maths.					
37. My peers influence(d) me to form perceptions about maths.					
38. I formed these perceptions about maths myself.					
OTHER FACTORS THAT INFLUENCE THESE PERCEPTIONS					
39. Age plays a major role in how one perceive maths.					
40. When I was younger, my perceptions about maths were positive than now.					
41. When I was younger, my perceptions about maths were negative than now.					
42. My performance in maths was better when I was younger than now					

43. Gender plays a role in how people perceive maths.					
44. Boys generally have positive perception towards maths than girls					
45. Girls have positive perceptions towards maths than boys.					

PLEASE ANSWER THE QUESTIONS BELOW

$U = \{2,3,5,7\}$, $P = \{2,5\}$ and $Q = \{5,7\}$

Find a. $P \cap Q = \dots\dots\dots$ b. $P \cup Q = \dots\dots\dots$ c. $(P \cap Q)^c = \dots\dots\dots$

Simplify the following algebraic expressions.

$22x - 4xy - 7x + 3xy = \dots\dots\dots$

$\frac{30x^5y^3}{-5x^3y^2} = \dots\dots\dots$

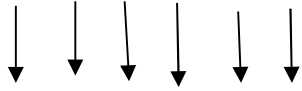
$\dots\dots\dots$

$\dots\dots\dots$

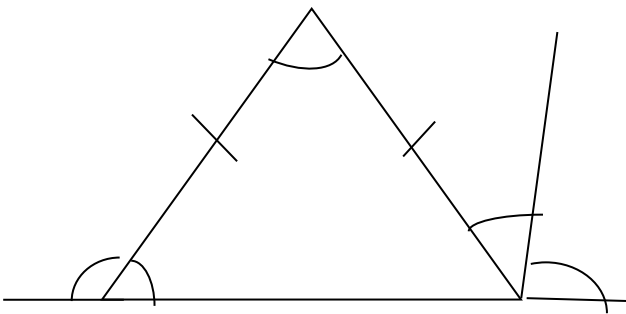
$\dots\dots\dots$

Find the rule of the mapping below

3 4 5 6 7



7 5 3 1 -1



4. In the diagram, find

a) the value of a, -----

the value of b -----

the value of c -----

5. Three people shared an amount of GH¢300,000 in the ratio 1:2:3. Find the highest amount received
