UNIVERSITY OF EDUCATION, WINNEBA

PRE-SERVICE TEACHERS' INCLUSIVE PRACTICES IN THE MATHEMATICS CLASSEOOM: THE CASE OF TUMU COLLEGE OF EDDUCATION

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MAY, 2023

DECLARATION

Student's Declaration

I, Amadu Sumani Zaato, declare that, this thesis with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

Signature.....

Date……

Supervisor's Declaration

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of thesis/dissertation as laid down by the University of Education, Winneba.

Name of Principal Supervisor:

Dr. Joseph I. Nyala

Signature.....

Date…….

DEDICATION

I dedicate this work to my late Parents, Mma Ajara Karimu and Salifu Kojo.

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I thank the Almighty God for His care, protection, and blessings for how far He has brought me and for the completion of this work.

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ABSTRACT

The Pre-service teachers' s have nowadays regardS inclusive classroom practices to be a struggle across the world. The purpose of this study was to investigate pre-service teachers' perceptions of inclusive classrooms and teaching mathematics during internships in Early grade and Upper-grade Schools in the Sissala East Municipality. A mixed method approach with a sequential explanatory design was used for data collection and analysis. A simple random sampling technique was used to select a sample size of 123 respondents. Purposive sampling technique was used to select 20 participants for the interview and observation sessions. The instruments used were questionnaires, interview guide, and observation checklist. Questionnaire data were analyzed using descriptive statistics (frequency, percentages). The qualitative data were analyzed thematically. The major findings revealed that experimental method, learner-centred method, expository teaching method, differentiation instruction and conventional method were the teaching methods used. Again, the challenges that pre-service teachers encountered included: inadequate teaching resources, lack of competency, inadequate training, large class sizes, inadequate funds to purchase instructional materials to meet all learners and difficulty in modelling geometric concepts. The study generally found that pre-service teachers in the internship schools were of the perception that inclusive classrooms meant bringing children with special educational needs on board and adjusting the environment for all. The study recommends that pre-service teachers use enquiry base with the materials in the environment to teach. In addition, Pre-service teachers need to encourage learners to form small discussion groups and the Ministry of Education should organize special orientation programme for the Gender, Equallity and Social Inclusion(GESI) commitees in Colleges of Education for them to function well. Finally, the study concluded that Pre-service teachers perceptions of inclusive classrooms on teaching mathematics was influenced by knowledge and experience, cultural values, personal attitudes, mode of communication, expectation, motivation, and large class size. Teacher preparation programs need to be organized for the pre-service teachers in the Colleges to give them the basic skills necessary for inclusive school teaching.

CHAPTER 1

INTRODUCTION

Overview

This chapter presents the background of the study, statement of the problem, the purpose of the study, research objectives, research questions, significance of the study, the delimitations of the study, limitations of the study, definition of terms, as well as the organisation of the study.

Background of the Study

In contemporary society, mathematics is regarded as a necessary prerequisite for success. Its importance in science, technology, business, economics, education, and even the humanities is almost equal to that of education as a whole (Tella, 2008). Mathematics plays a significant role in Ghana's elementary school, senior high school (SHS), and Colleges of Education (CoE) curricula, as it does in the majority of other countries. Every student must take mathematics at these levels; in essence, it serves as a barrier and crucial screening process for higher education in the nation. According to Fletcher (2007), One's prospects of moving forward in society are improved by having a greater capacity for mathematics. Pre-service teachers' performance in this vital topic has been poor nationwide despite its importance and extensive applicability (Examiners' report, 2021 University for Development Studies UDS; Enu, Agyeman & Nkum, 2015; Butakor, 2015; Bawuah, Yakubu & Seyram 2014; UNESCO, 2010; Ghana News Agency [GNA], 2012; Davis, 2008; Duedu, Atakpa, Dzinyela, Sokpe & Davis, 2005; Anamuah-Mensah & Mereku 2005).

The performance of pre-service teachers in colleges of education seems to be more concerning. The Chief examiner's report for the 2013/2014 academic year first-semester examination for Colleges of Education pointed out that the pre-service

teachers' performance was worst in mathematics (Enu, Agyeman & Nkum, 2015). The report indicates that 32.9% of the candidates who took the mathematics paper (i.e. BEN 108: Teaching, Learning, and Applying Geometry and Handlle data) had grades of D or D+ and 20.9% failed the paper. The future of the nation's science and technology sector is at risk due to these abysmal mathematics performance levels, which are of significant worry to those involved in education. It is crucial to look at the factors affecting students performance in order to investigate the causes of these low standards. These factors can be categorised as family considerations, socioeconomic issues, student personal characteristics, school-based factors, and peer or social aspects, according to Crosnoe. (Johnson & Elder, 2004). The concept of the subject plays a key role in shaping how individuals deal with various spheres of private, social, and civil life (Anthony & Walshaw, 2009). The Ghanaian government launched programmes to lessen citizen suffering and would also supply the necessary manpower to guide the nation into new technological and industrial development after realising the importance of mathematics and science in the implementation of many policies. This is demonstrated by the government's concerted attempt, through the ministry of Education and the Ghana Education Service, to enhance pre-tertiary school mathematics performance through the implementation of partner in education programmes. However, despite frantic efforts by the Government of Ghana and other partners in education to provide enough teachers, facilities, Continuous Professional Development (CPD) for tutors, and the provision of other necessary materials, the low performance in the subject has persisted, causing great concern among all stakeholders in education. Unfortunately, mathematics remains one of the most challenging courses in schools despite absorbing a vast amount of human and financial capital from society and government. Not just in Ghana, but in the majority of nations, there is a lack of enthusiasm in mathematical education. In this

regard, pre-service teachers exhibit greater challenges, lower levels of performance and achievement, and negative attitudes towards this subject generally. This suggests that there may be additional elements at work that require additional research. Given the significance attributed to the course, persistent performance issues will have a knock-on impact that will jeopardise the nation's future. Pre-service teachers' perceptions and beliefs about learning the subject are regarded by many researchers as a key factor to understand and explain the pre-service teachers' performance in mathematics, even though earlier research studies indicated that performance in mathematics is a function of many interrelated variables that can be grouped as pre-service teachers' factors, school factors, and home factors (Kogce et al, 2009). Pre-service teachers should therefore receive support not only on achievement or cognitive ability but also on emotional and behavioural aspects of learning mathematics, everyday lives. This still will concern itself with the effects of attitudes that the pre-service teacher will develop or bring into the lecture hall environment that may interfere with pre-service teachers' learning processes and, in turn, on their learning outcomes. It is an ongoing creative process that advances knowledge and comprehension. Pre-service teachers must support learning in mathematics classrooms in order to deliver high-quality mathematics instruction. This lays the groundwork for higher level studies in mathematics and coursesm related to mathematics, as well as for understanding the world around us. Encourage students to comprehend how mathematics may be used to study the causes and origins of things in our environment, anticipate how things will behave, and explain what is occurring (National Council for Curriculum and assessment, 2019).

Despite the relative importance of mathematics, students performance in the subject in the West African Examinations Council (WAEC) has remained consistently poor

(National Mathematics Center, 2009) argued that mathematics educators have made admirable and sincere efforts to identify the major issues pertaining to the teaching and learning of mathematics, such as a lack of mathematically qualified teachers, a lack of teacher incentives, and a lack of student interest. Additionally, it was determined that the students' impression of the topic's difficulty, the size of the classes, and their psychological anxiety of it were contributing factors to their low performance in the subject. Despite all of these admirable initiatives, the issue of low achievement in mathematics has persisted in the country's public examinations (Amazigo, 2000).

Studying various shapes or figures and their qualities is the focus of the mathematics discipline known as geometry (Fabiyi, 2017). Geometry might include a solid or plane shape and its characteristics. A plane shape is a geometrical entity that has length, breadth, or base, as well as height and altitude. Plane shapes, such as a square, circle, triangle, rectangle, and so forth, are referred to as 2-dimensional shapes or polygons. A solid shape can also be a Geometrical figure with length or base area and height. Solid shapes are also called 3-dimensional sh apes such as a cone, pyramid, sphere, cylinder, prism, cubes, and cuboid (Fabiyi, 2017). In Ghana and other nations, geometry is a big part of the maths curriculum for primary and secondary schools. It offers a wealth of graphic examples for comprehending mathematical, algebraic, and statistical ideas. In addition, geometry provides a complete appreciation of the world we live in (Fabiyi, 2017). Furthermore, geometry is used to develop learners' spatial awareness, intuition, visualizations and to solve practical problems, and so on. Sunzuma, Masocha, & Zezekwa (2012) contend that students "need to understand and be able to use mathematics in everyday life and in the work place"(p, 4). This discovery highlights the necessity of giving all pupils more attention to reasoning, problem-solving, critical thinking, and mathematical communication. The NCTM All students should have

access to excellent, interesting mathematics, according to the principles and criteria for educational mathematics.

Despite the organization's desire for more thinking and problem-solving in school mathematics, it has become crucial to hear the complaints of pre-service teachers in order to enhance practise and promote morale. The agency for educational change, pre-service teachers, play a crucial part in ensuring that learners learn effectively in the classroom. One of the crucial components of good teaching is having students have a solid understanding of the subject matter (Tutak, 2009). Preparing to teach means that many of them will instruct in the same manner. From their experiences as learners, they start learning how to teach (Tutak, 2009). As they begin their profession in classrooms, they are shaped by their experiences in the classrooms (Tutak, 2009). Pre-service teachers are required to teach geometry even though it is likely that they haven't done much of it since they were in Senior High school, if at all (Jones, 2000). In order to effectively teach and learn, it is crucial to comprehend pre-service teachers' perspectives. Even though teaching itself can be difficult, it becomes burdensome and overwhelming for pre-service teachers of all levels of experience without support, a favourable attitude, hands-on training, best practices, and the prevention of potential barriers to service delivery. As a result, support is crucial (Polidore, Edmonson, & Slate,2010).

A person's or a group of people's perceptions are their opinions based on how they conceptualised a scenario (Mulinge, 2016). Pre-service teachers' attitude of instructions towards inclusion has been argued by (Avramidis, Bayliss, and Burden, 2000) that offering training may not always have an impact on education. Instead, pre-service teachers need a chance to think deeply about reform ideas that affect them personally. It is terrible to subject instructors to a variety of changes without taking their opinions

into consideration (Mulinge,2016). Mwangi and Arodho (2014) in their study of Kenyan pre-service teachers' perceptions found that pre-service teacher preparedness posed a threat to inclusive classrooms. The survey found that the majority of pre-service teachers agreed that their unwillingness to care for learners with special educational needs prevented them from managing an inclusive classroom. Increasing engagement in learning, cultures, and communities while minimizing exclusion from and within education constitutes the process of addressing and reacting to the diversity of needs of all learners (Education Insights,2012). This definition encapsulates the two main aspects of inclusive classrooms: first, the barriers that prevent children from attending school, accessing the educational process, and participating fully; and second, the restrictions that prevent children from participating fully in their classroom's educational process once they are there.

A common vision that includes all children of the appropriate age range and a conviction that it is the duty of the regular system to educate all children are all necessary components of inclusive classrooms, according to Education Insight (2012). Inclusive classrooms also involves changes and modifications in content, approaches, structures, and strategies. Ntombela (2010) makes the case that inclusive classrooms responds to students and maximizes their involvement in the school's culture and curriculum. In spite of the needs and support each student receives inclusive instruction attempts to foster a sense of community and equality among all students.

Additionally, for inclusive classrooms to be successful, pre-service teachers need to have the knowledge and ability to deal with students of different abilities (Njoka et al., 2012). Other elements, such as the number of classes, are believed to compound pre-service teachers' difficulties. According to Njoka et al. (2012), inclusive classrooms in Kenyan public elementary schools was severely hampered by a high pupil-teacher ratio

of more than 45:1. It appeared that service instructors were already overworked by large classes and bad attitudes due to the added workload associated with inclusion. According to Avramidis et al. (2000), pre-service teachers' opinions are influenced by the sorts of learners' educational needs and the level of their involvement in the process. They described how pre-service teachers in inclusive settings tended to reject students who displayed severe disabilities because mainstream pre-service teachers favoured children who had features that did not require additional instructional and managerial skills.

Additionally, in order to promote inclusion, there needs to be a focus on awareness and understanding of special educational requirements and how they affect both the kid and the rest of the class. Gyimah et al. (2009) noted that 67% of pre-service teachers had the necessary knowledge and understanding to teach in an inclusive school, which helped foster a positive perception of inclusion. However, other factors made it less likely that children would be accepted into inclusive classrooms.

We live and teach in a time where more learners with special needs are integrated into general education classes and held to the same standards as their general education peers than ever before, claim Cole and Leah (2010). Cole and Lead went on to say that the majority of people are aware that many students still have difficulty with mathematics, hence it is crucial to improve mathematics instruction. Direct instruction and inquiry-based teaching, they claimed, are two opposing approaches to organising mathematics instruction and classrooms. Cole and Lead claimed that direct instruction is typically regarded as falling under the general education umbrella. According to them, pre-service teachers should work to maximise the learning of all students and close the gap caused by divergent views on how to teach and study mathematics. According to Humphreys (2009), the use of inclusive classroomsal practises has

sparked debate about how to provide more equal educational opportunities for everyone on a global scale. Humphrey continues by stating that pre-service instructors have been forced to switch from teacher-led instruction to l-centered learning. Humphreys (2009) asserts that inclusion is more about a person's mindset than it is about any particular educational setting; he claims that both **the** method and the content of what students learn are significant. Hunphreys examined the pre-service teacher's role as a change agent in more detail. Pre-service teachers must be sufficiently prepared, which is one criterion for the implementation of inclusive classrooms (Ethel, 2015). This can be accomplished by providing experiences, which provide prospective educational opportunities.

Because not all children receive an education that allows them to reach their full potential as pre-service teachers with the capacity to build original problem-solving methods and abilities, inclusive classrooms is one of the most delicate current concerns. Since they are essential to educational transformation and school improvement, pre-service teachers are expected to examine problems from a variety of angles. They also construct, define, and interpret the curriculum in addition to practising it in the classroom (Ethel, 2015). The type of learning that pre-service teachers' students receive is ultimately shaped by what they think, believe, and do in the classroom. Therefore, it is crucial to comprehend how basic school pre-service teachers view inclusive classrooms and how it affects how mathematics is taught.

Statement of the Problem

While educational systems work to become more inclusive, one of the biggest issues in today's world is inclusive education (Sag, Sinfield & Burns 2017). More inclusive instructional practices are not established for pre-service teachers. Additionally, pre-service teachers' active participation and their concerns about the transition are

necessary for the transformation of the educational system (Mdikana et al., 2007, p. 126). However, pre-service teachers, who are also the policy's main focus, are frequently unprepared to cater for the demands of learners with special needs in the classrooms. International organisations and a large portion of the developed world now support education as a fundamental human right (Waddington & Toepeke, 2014). Despite the widespread support, pre-service teachers still don't fully understand what it means to include learners with special needs because there are different definitions and interpretations across the globe (Ainscow, Dyson, & Weiner 2014). Therefore, pre-service teachers from colleges and universities who are interested in education must address this in the theory and practice that they present in pre-service teaching courses. As seen in China with End discrimination, Exclusion of children with disabilities, pre-service teachers' perceptions of inclusive education continue to be a global fight. Guidelines permit institutions of higher education to restrict or reject entrance to candidates with specific special needs (Human Rights Watch, 2013). Additionally, they stated that 28% of kids with special needs aren't getting the education they should be. According to research by Jearez (2002), who surveyed girls with special needs, the median level of finished schooling was eighth grade, discrimination against individuals is also evident in Mexico. Fullan (1999) states, that there is a tendency to keep people that are different from us at a distance. Diverse groups of students, including some with disabilities, are now part of every teacher's mathematics classroom. The discomfort that teachers may have with students who are different must be addressed to create a mathematics instructional environment that will not interfere with student learning. Teacher preparation plays a key role in looking at this issue. Fullan states that quality teacher preparation involves "developing and applying knowledge of curriculum, instruction, principles of learning, and evaluation needed to implement and monitor

effective and evolving programs for all learners" (p.115). He believes that teacher education means working with all students in an effective way that respects differences. These values are particularly pertinent today with the move toward a more inclusive classroom. There have been difficulties in implementing inclusive cluassrooms in a number of nations, including Ghana. According to Eenyega & Deku (2011), problems with pre-service teachers' lack of professionalism and attitude have led to what appears to be the segregation of learners with special needs. Pre-service teachers in inclusive schools are currently expected to rise to the challenge of a classroom that is becoming more diverse, adapt their teaching methods to account for different learning styles, and be psychologically and practically prepared to take on the dynamic role of the inclusive educator (Subban & Sharman, 2006). In their study on how Ghanaian pre-service teachers saw the implementation of inclusive classroom, (Nketsia, Saloviita, and Gyima, 2016) discovered that the majority of pre-service teachers believed Ghana had not been effectively prepared for the implementation of inclusive education.

The increasing diversity in classrooms necessitates that teachers are well-prepared to implement inclusive classroom practices, ensuring all learners, regardless of their abilities or backgrounds, have equitable access to learning opportunities. This is particularly challenging in subjects such as mathematics, where abstract concepts can pose significant barriers to learning. Mathematics, with its reliance on spatial reasoning and logical proofs, is one such area where inclusive teaching strategies are critically needed.

Despite the importance of inclusive classroom, there is limited research on pre-service teachers' perceptions and preparedness to teach mathematics inclusively especially in the Sisaala East Municipality. This gap is concerning because teachers' attitudes and confidence levels significantly impact their effectiveness in the classroom and their

ability to accommodate all learners (Avramidis, Bayliss, & Burden, 2000; Sharma, Loreman, & Forlin, 2012).

Purpose of the Study

The purpose of the study is to investigate pre-service teachers' perceptions of inclusive classrooms and teaching of mathematics at internship in Sissala East Municipality a case in the Tumu College of Education.

Objectives of the Study

The objectives that guided the study are to:

1. Explore pre-service teachers' perceptions of inclusive classrooms in Tumu College of Education.
2. Assess pre-service teachers' teaching methods in teaching mathematics in Tumu College of Education.
3. Examine how pre-service teachers' perception of inclusive classrooms influences their teaching of mathematics in their practicing schools..
4. Identify the perceived challenges pre-service teachers' encounter in teaching mathematics in Tumu College of Education.

Research Questions

The following research questions were set to guide the study:

1. What are pre-service teachers' perceptions of inclusive classrooms in the Tumu College of Education?
2. What are pre-service teachers' teaching methods in teaching mathematics in Tumu College of Education?
3. How do pre-service teachers perceptions of inclusive classrooms influence their teaching of mathematics in Tumu College of Education?

4. What perceived challenges do pre-service teachers' encounter in teaching mathematics in Tumu College of Education?

Significance of the Study

The study's conclusions would show how pre-service teachers feel about the effectiveness of special education in preparing them for inclusive classrooms. This would give curriculum developers at colleges of education the ability to assess if the current programme they are using is suitable for preparing future teachers for inclusive classrooms in Ghana.

Also, the study would assist future educators in understanding inclusive classrooms and the most effective methods for integrating all students into maths instruction. The research would improve inclusive classrooms so that special needs students may receive a high-quality education. The study's findings will once more make clear to the Ghanaian government what has to be done to equip Ghana's colleges of education to improve the instruction of students with special needs.

The results of this study would also inform curriculum designers and the Ministry of Education about how pre-service teachers perceive how to teach mathematics. It aids in their comprehension of the difficulties pre-service teachers encounter in comprehending mathematical ideas that have an impact on their instruction in inclusive classrooms. Additionally, it would assist them in producing resources that would support geometric thinking as well as teaching methods that will improve students' grasp of geometry ideas. The results of this study will advance our understanding of study practices that improve comprehension of geometric concepts.

Finally, the study would be of significance to policy makers at Tumu college of education because the data obtained from the study would provide valuable

information for enhancing policy guidelines and procedures on good pedagogy for teaching mathematics topics such as mathematics in inclusive classes in the college. It will help plan future interventions for students with special needs in the mainstream classes in the Tumu college of education, in terms of instructional methods pre-service teachers need to use in teaching mathematics in the mainstream colleges.

Delimitations of the Study nn

Several factors influence learning and performance in mathematics ranging from economic, cultural, social, etc. But this study is going to focus on pre-service teachers' factors and specifically on their perception of inclusive classrooms and teaching of mathematics. In addition, only 2023 level 400 pre-service teachers in the Tumu College education were used for the study but not the entire students in the college. Moreover, there are many topics pre-service teachers teach in mathematics but the study was limited to only mathematics.

Limitations of the Study

One major problem faced initially in this study was the difficulty in having access to the pre-service teachers in responding to the instrument since they were busy always with their academic work. This extended the time projected for the completion of the study. Moreover, the availability of time on my part to go to several classes, perhaps three times, before administering the instrument since no pre-service teacher was willing to receive it on behalf of their colleagues. The challenges outlined above unduly delayed the completion of the study. Nevertheless, it could not have any significant effect on the data collected for the study. However, this did not have any significant effects on the findings of the study.

Organization of the Study

There were five chapters in the study. The study's background, statement of the problem, research objectives, purpose, research questions, significance, definition of terminology, delimitation, and limitations are all included in Chapter 1 and provide context for the investigation. Chapter 2 included a review of the relevant literature is based on the subheadings connected to the study and discusses the theoretical framework as well as a review of pertinent literature. Chapter 3 presented the research technique and design. Both qualitative and quantitative analyses are performed on the data collected. In order to assess pre-service teachers' perceptions of inclusive classrooms and the teaching of mathematics in mathematics, three different types of instruments were used. The first was a set of achievement (pre and post) test items, the second was a closed-ended questionnaire, and the third was an interview guide that asked respondents about their perceptions of inclusive classrooms. Results and discussion of data were presented in Chapter 4. Chapter 5 constituted the summary of findings, discussions, recommendations, and suggestions for further studies into the problem, based on the findings of this study.

Operational Definition of Terms

In order to provide common understanding across the study, the following terms will feature in the study:

Perception: In this study, perception refers to the way Pre-service teachers' understand inclusive classrooms and how that understanding drives their teaching of mathematics.

Inclusive classrooms: This refers to the kind of education whereby handicapped and no handicapped students are learning in one class at different levels of education.

An inclusive school: In this study, an inclusive school refers to a school which accept all learners regardless of their condition and provide equal access to all the facilities or resources in the school.

Geometry: In this study, Geometry as the branch of Mathematics concerned with the properties and relations of point, lines, surface and solid or the shape and relative arrangement of the parts of something and also involves the study of position of objects, movement of objects and the space around the objects improve learners? Spatial imagination.

Mathematics: Mathematics is the science that deals with logic of shape, quantity and arrangement. In this study, Mathematics is define as an important subject of which learners must acquire all the skills, knowledge and understanding that will help them in the real world and as an abstract science of numbers, quantity, space, change and other properties.

Learning: In this study, learning refers to the process where Pre-service teachers present geometry concepts in a systematic way for learners to understand.

Teaching: Teaching in this study refers to the strategies Pre-service teachers use to guide, coach, counsel, and support learners in the learning of mathematics.

Mathematics: in this study, mathematics refers to shapes or figures in a two-dimensional plane.

Chapter Summary

The rationale for the study, the purpose statement, the research questions, the theoretical framework, the definition of words, and the importance of the findings are all discussed

in this chapter. To help the reader navigate the study, what follows is an outline of the remaining chapters.

CHAPTER 2

LITERATURE REVIEW

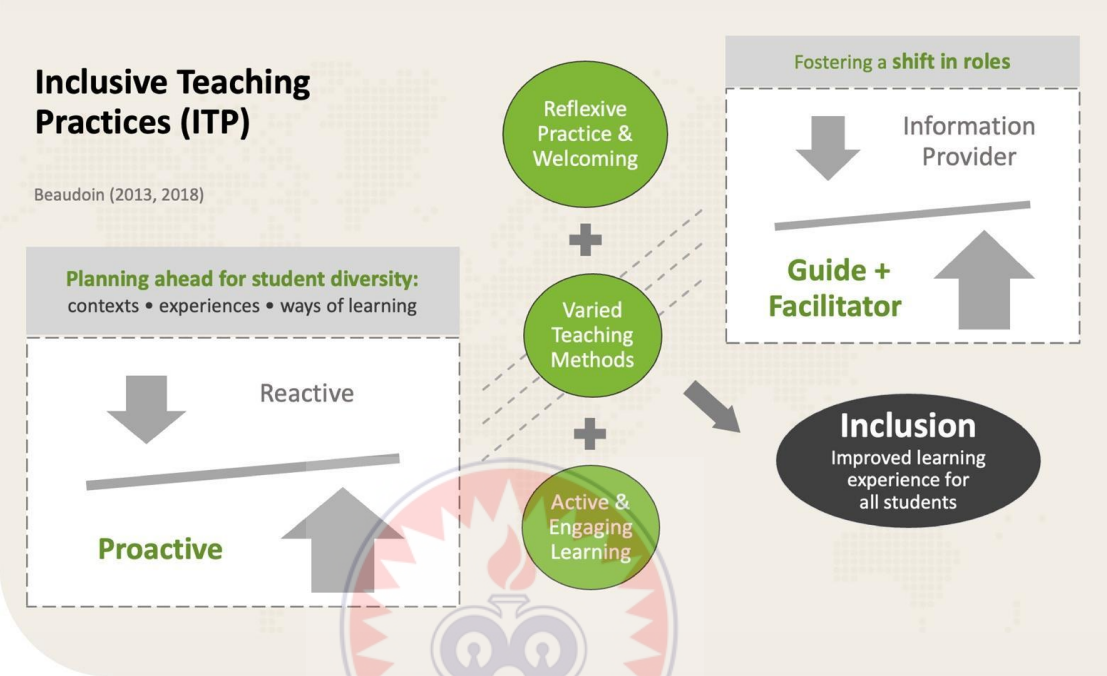
Introduction

How can your current efforts affect the future if you don't know what happened in the past? When describing a discipline's historical perspective and current circumstances, William Pinar (2007) used the terms "verticality" and "horizontality" (pp. xiii-xiv). "One marker of 'disciplinarily' is acknowledging the discipline-specific historical context in which one's topic becomes understandable" (Pinar, 2007, p. xi). Therefore, I intend that one will discover both the verticality and horizontality of teaching and achievement of mathematics by the pre-service teachers as you turn the pages that trace the time from the late 1950s to the present day. The purpose of this part of the research was to review what other researchers have also said and written about the research area which is the pre-service teachers' perception in inclusive classrooms and the teaching of mathematics in mathematics. The review explored varied research findings and views relating to pre-service teachers' perception in inclusive classrooms and the teaching of mathematics. The complexity of connected elements that have been discovered to affect per-service teachers' perceptions of inclusive classrooms and the instruction of planar geometry in mathematics were made clear by this. When striving to comprehend and explain the heterogeneity in student accomplishment, several academics have viewed perceptions as an important element to be taken into consideration (Dika, 2002).

The researcher considered the following thematic areas when discussing the review of relevant literature: the theoretical framework of the study, pre-service teachers' perceptions of inclusive classrooms, teaching methods used in teaching mathematics, pre-service teachers' perceptions of inclusive classrooms influence on teaching

mathematics, challenges pre-service teachers encounter in teaching mathematics, and summary.

Conceptual Framework



Theoretical Framework of the Study

Merriam (2001) describes the theoretical framework as the structure, the scaffolding and the frame of your study. A theory is an idea or a set of ideas to explain something. Socio-Cultural Theory (Vygotsky, 1978). Multiple Intelligences Theory (Gardner, 1983) and Intergroup Contact Theory (Allport, 1954) underpin this study.

Socio-cultural theory

Vygotsky and his associates initially systematized and implemented socio-cultural ideas in Russia in the 1920s and 1930s (Bruce & Hughes, 2013). Other theorists have advanced socio-cultural theories, including Lave (1988), Lemke (1990), Rogoff (1990; 2003), and Wertsch (1991). Lev Vygotsky, who expounded on issues with learning and mental development (Woolfof & Margretts, 2007; Limberg & Alexandersson, 2010),

was the principal proponent of the socio-cultural theory. According to socio-cultural theories, learning and development take place as a learner interacts with other people, things, and events in a collaborative setting. (Vygotsky, cited in Bruce & Hughes, 2013) Learning and development are described as being embedded inside social events. Socio-cultural theory states that human cognition is developed through engagement in social activities, as an individual interacts with other people, objects, and events. Therefore, human cognitive development cannot be separated from the social, cultural, and historical contexts from which such development emerges (Johnson, 2009). This social and cultural engagement is mediated by culturally constructed tools such as language, materials, signs, and symbols that create uniquely human forms of higher-level thinking. In his well-known genetic law of development, Vygotsky emphasized the primacy of social interaction in human cognitive development in which human mental abilities emerge twice: "first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the learner (intrapsychological)" (Vygotsky cited in Bruce & Hughes, 2013; p.298). From this perspective, learning and development occur on two planes: first on the social plane (interactions with others) and then on the psychological plane (within the learner or researcher). This describes a process of human cognitive development which is situated in, but not limited to, social interaction (Bruce & Hughes, 2013). Vygotsky's Socio-cultural theory has been discussed in relation to four aspects of human cognitive development, namely mind, tools, Zone of Proximal Development (ZPD) and community of practice (Mantero, 2002; Bruce & Hughes, 2013), First. Mind extends beyond a person and people. Mind, according to Vygotsky, is socially distributed. Thus, our mental habits and functioning are dependent upon our interaction and communication with others, which are also affected by our environment, context, and

history (Mantero, 2002). Bruce & Hughes (2013) claim that "learning, thinking and knowing are relations among people engaged in activity in, with, and arising from, the socially and culturally structured world" (p.298). The Socio-cultural perspective assumes that human cognition is formed through engagement in social activities (Mantero, 2002). The second aspect of cognitive development, tools, assists the developing communicative and cognitive functions in moving from the social plane to the psychological plane. Such tools include language; various systems of counting; algebraic symbol systems; works of art; writing, diagrams, maps and mechanical drawings and so on (Bruce & Hughes, 2013). The third aspect of cognitive development, ZPD (the Zone of Proximal Development), was defined by Vygotsky as:

"the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through prob solving under adult guidance or in collaboration with more capable peers" (1978, p.48).

The actual and potential levels of growth must be distinguished, according to Vygotsky, if we are to comprehend the connection between learning and development. The accomplishments a student can show off or carry out on their own are considered to be at the actual level. Community of practice is the fourth component of development, where learning a subject area is seen as a process of joining a community of practice (Mason, 2007). A group of persons who are acknowledged as having a unique expertise in an important cultural practice is referred to as a community of practice (Bruce & Hughes, 2013). Every research strategy has benefits and drawbacks. Additionally, the sociocultural has its limitations. For instance, it depends on the social construction of knowledge in a practise community. As a result, the experiences of the community members are crucial in creating and producing new knowledge. Different members in

various communities may produce various new insights and understandings of the same problem. Selecting participants who will best serve the goals of the research or course design is therefore crucial when using this strategy.

Application of the Socio-Cultural Theory to the Study

According to Vygotsky (1978), who was quoted by Bruce and Hughes (2013), learning takes place as a result of interactions between a learner and other people, things, and events in the environment. According to socio-cultural theories, social interaction encourages students to talk about what they are learning while also bringing into play the affective and subjective parts of learning because students are required to express their opinions and pay attention to those of their peers (Stacey, 2005). This method is student-centered and concentrates on what the students have learned. By choosing sociocultural theory, the researcher will be better able to understand how pre-service teachers create instructional activities that allow learners to learn mathematics in a collaborative setting. Learners interacted with their friends and with their pre-service teachers. They learned by doing and by discussing questions and finding solutions.

The socio-cultural theory was chosen in part because the researcher and study participants created the data that was gathered for the study. Vygotsky, referenced in Bruce and Hughes (2013), asserts that participation in social activities shapes human intellect. During the data co-construction process, the researcher and participants work together to exchange ideas and create new information. For instance, both participants and the researcher engaged in discourse and discussed their perspectives on inclusive classrooms, the techniques employed, and the difficulties encountered when teaching mathematics during the data collection for this study. The social cultural theory enables educators to identify the ZPD the "zone" in which a student may perform successfully with sufficient support and to comprehend how a student can comprehend new

relationships that they had not previously understood by engaging in them with a partner. Since the socio-cultural theory also considers how peers affect learners and how social situations affect their capacity to learn, it is important to note that. As such, the choice of the Socio-cultural theory will help educators to become aware of how learners may directly impact one another, as well as how cultural "norms" can influence learner's learning behaviour. In addition, it helps the researcher understand how pre-service teachers' at basic school use social interactions to promote learners' understanding in mathematics.

Multiple intelligences theory

Multiple intelligence (MI) was developed by Gardner, Harvard Graduate Professor in the School of Education, in 1983. Gardner's theory maintains that each person possesses several intelligences that are used to carry out specific tasks. Gardner's theory debuted in his first book entitled Frames of Mind, where he defined eight intelligences. Those first eight intelligences are: Interpersonal (appreciates group work), Intrapersonal (prefers working alone). Kinesthetic (needs movement), Linguistic/Verbal (understanding through speaking), Logical/Mathematical (uses numbers), Musical (Learns through rhythm and music), and Spatial (visual understanding) (Concept to Classroom, 2004). Naturalistic intelligence was added to the theory by Gardner (1999) in his book entitled Intelligence Reframed This intelligence was added in 1999 because it met the criteria that Gardner uses for his intelligences.

Gardner criteria are as follows: "Is there a particular representation in the brain for the ability?" "Are there populations that are especially good or specially impaired in an intelligence? And, can evolutionary history of the intelligence be seen in animals other than humans?" (Guignon, 2004).

Currently, there is some debate as to whether the ninth intelligence of Existentialism has been added to the theory or not. This debate is occurring because this intelligence does not meet all the criteria Gardner uses in adding intelligences. As Gardner puts it, "I shall continue for the time being to speak of $8\frac{1}{2}$ intelligences." (Gardner, 2006, p.21). In all individuals, he suggested, all eight intelligences are unevenly distributed, and can change over time, and each person has a different intellectual composition similar to our finger prints. Each intelligence is located in a different part of the brain and can either work independently to complete a task, or several intelligences can work together to complete something. These intelligences may define the human species and how we differ from other species represented here on earth. In order to better understand one-self and strengths there first must be understanding of what each intelligence means (Viadero, 2003; Concept to classroom, 2004). Gardner broadly defined intelligence as

> *"a bio psychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture... intelligences are not things that can be seen or counted. Instead, they are potentials-presumably, neural ones that will or will not be activated, depending upon the values of a particular culture, the opportunities available in that culture, and the personal decisions made by individuals and/or their families, school teachers, and others" (Gardner, 2004, p.33).(*

From educational perspective, the Multiple Intelligences theory states that students will benefit more from a broader vision of education, would drive pre-service teachers to use different methodologies, exercises and activities to reach all students, not just those who excel at linguistic and logical intelligence and challenge them to discover "ways that will work for this student learning this topic". According to Gardner's theory, students have different types of dominant intelligence and they reached can be more effectively by using a wider array of approaches. Student engagement is a multi-faceted

construct that includes affective, behavioural and cognitive dimensions (Fredricks, Blumenfeld & Paris, 2004).

While the pre-service teacher can choose the approach used for presenting a certain notion or task, it's important also that the student learn to understand and value their own approach to successful Mathematics learning, to understand the conditions under which they learn best and to broaden their approach to learning. At the same time, this will help them learn to value their peers. Pre-service teachers' can encourage students to reflect on how they grasp mathematical ideas the best, as well as understand that although students learn in different ways, they can still be equally effective as learners and can learn the same ideas. Figure 2.1 shows the 8 types of different intelligences.

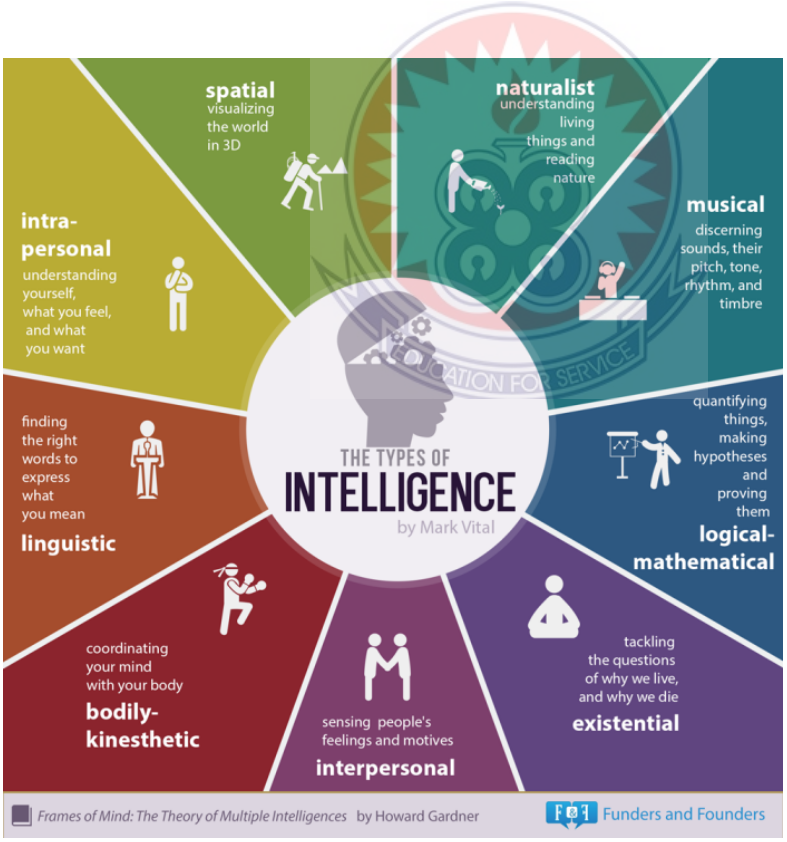


Figure -1: Types of different intelligences.

Source: www.iraparenting.com

Interpersonal intelligence enables one to comprehend and cooperate with others. It is typically found in persons who can effectively communicate both verbally and nonverbally, who can distinguish one person from another, and who can consider a variety of viewpoints. Students who prefer working in groups, participate in several extracurricular activities, and love thinking about important issues like poverty and war frequently identify with this intelligence. Highly interpersonal individuals are leaders among their peers, skilled communicators, and appear to comprehend the thoughts and motivations of others. Teachers, therapists, salespeople, and politicians are among those who typically have high interpersonal intelligence (Shepard, 2004; Gardner, 2006).

Intrapersonal intelligence is defined as, "Knowledge of a person's internal aspects: access to one's own feeling life, one's range of emotions, the ability to distinguish between these emotions and eventually to label them and to draw on them as a way to understand and guide one's own behaviour."p.17; Gardner, 2006). People with a high Intrapersonal intelligence would rather work alone then be forced to work in a group, and are often labelled shy. They are very aware of their own feelings, and are self-motivated. Intrapersonal intelligence deals more with the individual self. It is the ability to know oneself and to understand one's own inner workings. "Students who prefer working alone, enjoy helping others, and believe everyone should be treated fairly tend to have a dominant Intrapersonal intelligence. In a classroom it is often difficult for a student with intrapersonal intelligence to express themselves. This can be aided with imagination exercises, music, language pieces, or similar tasks where students are expressing themselves" (Gardner, 2006, p. 228).

Linguistic/Verbal intelligence is defined as everything having to do with language, speech, reading, and writing, It is said to be the most widely shared human competence. Poets, journalists, and novelists tend to have the highest level of understanding to this

intelligence. Students who have a high Linguistic intelligence enjoy writing, reading, telling stories or doing crossword puzzles. They are often great storytellers and joke tellers. They are also able to express themselves rhetorically and poetically. Language helps make memorization easy for these students. These students often remember subjects better if they take notes; they love to read and journal, and enjoy public speaking (Shepard, 2004; Fogarty, 2005; Gardner, 2006;York, 2008).

Spatial intelligence is the ability to appropriately comprehend the visual world by transforming, altering, and recreating elements of one's own personal real environment. This is commonly referred to as visual intelligence. People who are blind can also acquire spatial intelligence. The components of spatial intelligence include mental images, spatial reasoning, visual skills, and imagination. The ability to think spatially and with a focus on the physical environment is referred to as spatial intelligence. It takes a lot of spatial intelligence to solve spatial problems, which are used in navigation and map use (Nolen, 2003; Gardner, 2006; Scherer, 2006). Students with extreme levels of this intelligence may be caught doing mazes, puzzles, or just drawing and daydreaming. Spatial students enjoy rearranging their desk, watching music videos, and creating art. Graphic organizers such as a Venn diagram help these students learn because all the information is organized in a specific way (York, 2008). **Logical/Mathematical intelligence** is calculating, creating hypotheses, and completing mathematical operations. It can be defined as manipulation of objects and problem solving, and is dominant in the fields of science and Mathematics, Any physicist, chemist, and mathematician are assumed to have a prominent Logical/Mathematical intelligence, but it can also be found in detectives. Albert Einstein and Marie Curie are well known for their high level of Logical/Mathematical intelligence. Students with this intelligence are often working on patterns, math

problems, strategy games or brain teasers and experiments. These students are often very organized, appreciate schedules and structure, and are quick to ask for assistance when they do not understand a task. It is said that individuals with high Logical/Mathematical intelligence often show an interest in music (Shepard, 2004: Gardner, 2006).

Musical intelligence entails thinking in terms of sound and having an understanding of pitch, rhythm, and tone. A component of musical intelligence is the ability to alter and blend musical elements. Many persons who possess musical intelligence are frequently able to recognise and hear tones that others might miss. The musical intelligence of musicians, singers, composers, and conductors is very good. Students with a high level of musical intelligence frequently make rhymes to help them remember knowledge, are adept at seeing patterns, and get easily distracted when a radio or television is playing while they are trying to concentrate. Singers such as Whitney Houston and the Beatles are thought to have high musical intelligence (Shepard, 2004; Gardner, 2006; York, 2008). For these people and others with high musical intelligence they not only remember music, they cannot get it out of their minds. Gardner presents this example as a counter, "autistic children who play a musical instrument beautifully but who cannot otherwise communicate, underscore the independence of musical intelligence (Gardner, 2006, p. 9). This provides evidence for Musical intelligence

Bodily/Kinesthetic intelligence is the ability to think in movement, using the ability to manipulate objects and several physical skills. This involves a sense of timing and perfection of skills through mind-body unison, which goes further than eye-hand coordination. Careers in this field include athletes, dancers, surgeons, actors, mimes, technician, typists, programmers, and jugglers. Mikhail Baryshnikov and Michnel Jordan are both considered to have high Bodily/Kinesthetic intelligence. Students who

have an excessive Bodily/Kinesthetic intelligence are often not able to sit still for long periods of time, learn better by doing rather than watching, and are usually involved in outdoor games or sports (Shepard, 2004).

Naturalist intelligence is displayed in a person who is, "keenly aware of how to distinguish the diverse plants, animals, mountains, or cloud configurations in their ecological niche"(Gardner, 2006, p.19).

Gardner suggests that one's entire consumer culture is based on the Naturalist intelligence because it includes the capacities we use when we are drawn to one item rather than another. People with advanced Naturalistic intelligence have an appreciation for the natural world. They are very concerned with the present, and the future of the world and preserving our planet for future generations. They often show an expertise in recognition and classification of plants and animals. Charles Darwin, the founder of evolution theory, is a prime example of the Naturalist theory. Careers such as a botanist or a chef would p ossess high levels of the Naturalist intelligence. Students who enjoy spending time outdoors, love to group items together, and always want to recycle are said to have high naturalist intelligence (Armstrong, 2000; Nolen, 2003; Shepard, 2004; Gavcrdner, 2006).

The Existential intelligence involves deep questions about human existence, such as the meaning of life, why people die, and how the human race ended up on planet Earth. Gardner seems hesitant about adding this intelligence because it is too close to a moral boundary that he does not want to cross. Gardner reveals, "he may well be persuaded that there are additional intelligences to be added to the list and perhaps sufficient evidence will accrue to deem Existential intelligences as a separate frame of mind" (Gardner, 2004, p.216).

A classroom designed according to a Multiple Intelligences (MI) 1983 framework classroom supports the approach of choice by allowing children to experience repetition when deemed appropriate. They are given the freedom to practice skills until they are satisfied with their mastery of it. They are given choices and can work at their own speed. When the MI Theory is used correctly, children thrive, become confident, explore, feel safe to try new things, and believe in themselves (Austin, 2016).

Linda Campbell, author of Teaching & Learning through Multiple Intelligences describes the following five approaches to adding Multiple Intelligences into the classroom.

1. **Lesson design**. Some schools focus on lesson design. This might involve team teaching (pre-pre-service teachers focusing on their own intelligence strengths), using all or several of the intelligences in their lessons, or asking student opinions about the best way to teach and learn certain topics.

2. Interdisciplinary units. Basic schools often include interdisciplinary units on certain topics.

3. Student projects. Students can learn to initiate and manage complex projects when they are creating student projects.

4. Assessments. Assessments are devised which allow students to show what they have learned. Sometimes this takes the form of allowing each student to devise the way he or she will be assessed, while meeting the teacher's criterin for quality.

5. Apprenticeships. Apprenticeships can allow students to "gain mastery of a valued skill gradually, with effort and discipline over time. Gardner feels

thatapprenticeships...should take up about one-third of a student's schooling experience (Guignon, 2004),

In using these five ideas, students may decide to express his or her knowledge of that content in one of many different ways (ie., puppetry, model making, classroom demonstrations, songs, and plays). Gardner (2008) indicated there are three fundamental components of a school that incorporates the spirit of MI theory:

1. Students are provided the opportunity to engage in experiences across a range of intelligences or domains.

2. Educators know their students well, specifically their strengths and interests.

3. Students have a hand in defining the curriculum (Gardner, 2008).

Application of Multiple Intelligences Theory to the Study

The purpose of education should be to assist people develop their intelligences and achieve career goals that are suited to their specific spectrum of intelligences, according to Gardner (2004), the creator of the Multiple Intelligence hypothesis. He thinks that those who receive assistance in doing so feel more involved and capable and are consequently more likely to contribute to society. Everyone has distinct types of intelligence, according to Gardnehr, and can thus learn, remember, perform, and understand in various ways. His theories hold that language, logical-mathematical analysis, spatial representation, musical thinking, the use of the body to solve issues or create things, an understanding of other people, and an understanding of ourselves are all ways that we can all gain knowledge of the world. The choice of this theory lies to the fact that, it will help educators in the classroom to know the role in the child's educational experiences. Although some educators see themselves as the giver of

knowledge, the Theory of Multiple Intelligences makes educators to be more careful and see themselves as guides or facilitators.

Additional reason for opting for Gardner's (1983) theory of multiple intelligences is that, it helps better to understand the learners in the classroom, understand and appreciate their strengths, and identify real-world activities that will stimulate more learning. This can allow students to safely explore and learn in many ways, and helps students direct their own learning. The researcher feels that using the multiple intelligences theory helps educators prepare students for an environment conducive to learning by offering an orderly, prepared space.

The Multiple Intelligence theory recognizes that teachers are there to help children discover resources and support their curiosity in productive ways. Creating a conducive environment will make children feel safe, calm, and cared for they are able to concentrate on learning, exploring, and growing. Like Gardner, the researcher believes some students may manifest some degrees of learning deficiencies, but instead of blaming the learner we should ensure that the delivery of instruction is accomplished in a meaningful way. With his research, Gardner has provided educators with new hope in attempting reaching all learners in their classroom.

Theory of intergroup contact

This notion was advanced by Allport in 1954. Initially, the theory was created to assist explain how groups with various traits can cooperate to lessen prejudice and intergroup conflict. According to Allport's thesis, interpersonal contact is one of the most efficient ways to lessen prejudice among members of majority and minority groups under the right circumstances. People who have the chance to connect with others are better equipped to comprehend and value various points of view regarding their way of life.

Prejudice ought to lessen as a result of increasing appreciation and knowledge. Issues of stereotyping, prejudice, and discrimination are commonly occurring issues between rival groups. Allport's proposal was that properly managed contact between the groups should reduce these problems and lead to better interactions. Contact fails to cure conflict when contact situations create anxiety for those who take part. Contact situations need to be long enough to allow this anxiety to decrease and for the members of the conflicting groups to feel comfortable with one another. Additionally, if the members of the two groups use this contact situation to trade insults, argue with each other, resort to physical violence, and discriminate against each other, then contact should not be expected to reduce conflict between groups. To obtain beneficial effects, the situation must include positive contact. Some of the criteria are as follows**:**

Equal status**:** The relationship requires equal participation from both parties. The group's members ought to share a common history, personality, and traits. If differences in academic standing, income, talent, or experience will affect how people perceive status and position within the group, then these differences should be kept to a minimum.

Common goals: An issue or task that both groups must work on and share as a common goal is known as a superordinate aim and can only be achieved when the members of two or more groups collaborate by combining their efforts and resources.

Intergroup cooperation: Both groups must work together for their common goals without competition. Groups need to work together in the pursuit of common goals.

Support of authorities, law, or customs: Both groups must acknowledge some authority that supports the contact and interactions between the groups. The contact

should encourage friendly, helpful, egalitarian attitudes and condemn in group-out group comparisons.

Personal interaction: The contact situation needs to involve informal, personal interaction without group members. Members of the conflicting groups need to mingle with one another. Without this criterion they learn very little about each other and cross-group friendships do not occur.

According to Allport (1954), the factors that have a positive influence on the intergroup contacts are cooperation, equal status within the situation, common goals and authority support. It posits that bringing individuals from contradicting bunches together under conditions including cooperation, equal status, personal acquaintance with authority support can improve attitudes and enhance dispositions toward the out- gathering and encourage intergroup amicability (Pettigrew, 2011). These conditions are met, to a large extent, through structured intergroup encounters that emphasize commonalities between the groups or through contact that occurs between friends (Turner, Hewstone & Vocí, 2007). As stated by Allport (1954), not all types of contact between diverse groups could lead to acceptance of each disagreement with the common belief that merely assembling diverse groups of people together facilitates acceptance of each other, Allport (1954) concluded that there is no formula to establish successful contact. It was however echoed that, "prejudice may be reduced by equal status contact between majority and minority groups in the pursuit of a common goal. He also believed the effect is greatly enhanced if this contact is sanctioned by institutional supports" (Allport, 1954: p. 281).

Supporting Allport's (1954) argument regarding the theory of intergroup contact, Ami, Sharan and Ben-Ari cited in Pettigrew (2011), stress that albeit coordinate contact

between various gatherings might be basic for positive collaborations, it is not adequate without anyone else. They likewise trust that all controlled contact between children from various ethnic gatherings in school can affect social collaborations among gatherings. Contact circumstances that support rapprochement between the distinctive gatherings are that personal contact allows the revelation of novel parts of one's partner in the other gathering. Accordingly, individuals identify with each other not assemble delegate but rather as people. At long last, a social climate or standards that support relational and intergroup contact can encourage rapprochement and more prominent comprehension between individuals from various ethnic gatherings; cultivating associations (Pettigrew, 2011). In the field of inclusive classrooms, this theory is without doubt of great importance. Thus, in the light of the Intergroup Contact Theory, this study explored basic school teacher's perceptions of inclusive classrooms and teaching mathematics.

Application of Theory of Intergroup Contact to the Study

Considering the fact that, the theory of intergroup contact helps to explain how groups of different characteristics can work together thereby helping reduce the occurrence of prejudice and intergroup conflicts, the theory fits in this study. The choice of this theory lies with the fact that, it helps to explain how children with special needs can mingle, study and learn with other children without any form of disability, without any form of prejudice or conflict between them. Furthermore, the theory helps to bring out and establish the factors that can promote positive influence and relationship between children with special needs and children without special needs through intergroup cooperation, equal status within the situation, common goals as well as authority support.

Another reason underlying the choice of this theory is that, it helps to establish the fact that, when children with special needs are made to mingle and form some level of relationship with children without special needs. It could lead to children without disabilities accepting children with multiple disabilities as their equals and treat them fairly without any form of biasness or prejudice. Additionally, the theory establishes the fact that, this kind of relationship can only be achieve if it is sanctioned by institutional supports. Clearly, this is true for this especially since the inclusive classrooms is sanctioned by the government and supported by all stakeholders in the educational industry.

Pre-Service Teachers' Perception of Inclusive classrooms

Over the years, national policies as well as local and international regulations have influenced how the world views the provision of education for children with special needs. According to Abu-heran et al. (2014), 42% of the participants thought inclusive classrooms would not be successful in the Bethlehem school district, even though one-third of the participants acknowledged that there is a lack of resources and support for pre-service teachers. According to Shari and Vranda (2016), pre-service instructors had a high level of reluctance to include students with impairments in their classrooms. Shari and Vranda revealed that due to the absence of necessary components, inclusion will remain an unachievable idea. The display of negative tendencies toward children with special needs integrated in general education classrooms has encouraged researchers to examine the reasons spurring the negativity (Shari & Vranda, 2016). Shari and Vranda concluded that when every member in the school environment (teachers, students and parents) are involved in school activities, the value and acceptance of diversity in the school culture increases. Several other countries (L.e., Jordan, South Africa, and Kenya) have taken steps to include children with disabilities

in the mainstream educational program (Odongo & Davidson, 2016; Shari & Vranda, 2016).

According to some research, instructors in elementary and secondary schools have comparable views on inclusive classrooms, both good and negative (Rimploa, 2011). The classroom environment and high school teachers' opinions of inclusiveness were found to be significantly correlated by Wiggins (2012). This study concluded that instructors who had experience working in inclusive classrooms had more positive attitudes toward inclusive classrooms than those who had not. Recent studies have shown that much has not changed over the past decade regarding high school teachers' perceptions of inclusive classrooms; in a study, which investigated the perceptions of general education in basic schools. Akomeah (2015) revealed that, overall teachers expressed more positive attitudes toward mainstreaming than inclusion. In addition, training in special education appeared to lessen pre-service teacher's concerns regarding inclusive classrooms. Similarly, Rimpola (2015) revealed that teachers who reported having undertaken training in special education were found to hold more positive perceptions about implementing inclusive classrooms. Loreman, Forlin and Sharma (2007) reported similar findings which showed that teachers' perceptions of inclusive classrooms were negatively impacted by their training, or lack thereof, in special/inclusive classrooms. In contrast, as cited in Akomeah (2015) found that in general, teachers held positive attitudes towards inclusive classrooms. According to the results of the study, the teachers agreed that inclusive classrooms enhanced social interaction and inclusion among the students and thus minimized negative stereotypes of special needs students. Tumbo (2011) conducted a study on Teachers' attitudes and support toward teaching pupils with intellectual impairment in Tanzania schools in Dare-Es-Salaam. The purpose of the study was to investigate and identify the attitudes

of teachers toward pupils with intellectual impairment. In addition, to investigate the types of support they need in teaching pupils with intellectual impairment. The researcher's findings was that teachers had positive attitude toward children with intellectual disabilities, Also the children were learning communication skills, daily leaving skills, physical education and vocational skills. Again limited academics, teachers were delayed in supporting and interventions, and last inadequate teachers financing, instructional resources and motivation to teachers. The researcher had suggestions on this but mainly was that, teachers should be supportive and help the children with disabilities.

Research has shown that the Perceptions of teachers on inclusive classrooms seem to be the same. Although teachers understand what inclusive classrooms is, and may respond positively about it, they may not practice it (Evans, 2010). Beyond these findings, our investigation focused on the difficulties teachers encounter when implementing inclusive classrooms. The research mentioned above on teachers' perspectives of inclusive classrooms demonstrate that teachers' perceptions of inclusive classrooms vary. Thus, the current study intends to explore Pre-service teachers' perception of inclusive classrooms at Tumu College of Education, Tumu.

Teaching Methods Used in Teaching Mathematics

The numerous ways you might teach a topic in a classroom are covered by teaching methods, which are composed of concepts that teachers utilise for instruction (Johnsen, 2001). These methods can be group discussion, lecture, demonstration, problem and puzzles, question, and answers, oral and written testing, games or play, participatory, and so forth (The Math's Teacher's Handbook, 2007). Additionally, Dalen, mentioned in Tulia (2013), describes three types of instruction: group instruction, whole-class instruction, and individual instruction. The Association claims that while the Euclidean

method of teaching geometry acknowledged different levels of subject matter, it employed the same teaching strategy across the entire course. The Association phased the teaching of geometry into five stages and provided recommendations on how learners might be taught at the various stages (Atebe, 2008). The stages are:

Stage A: The Experimental Stage. Real-world issues are the main focus of this phase. The study of common geometrical concepts and shapes should place a strong emphasis on the use of geometrical tools. It was suggested that information about angles, lines, and triangles be presented orally. Deductions are to be made simple. The ideal age for the treatment of concepts at this stage is $12\frac{1}{2}$ years (Mathematical Association, 1923 cited in Atebe, 2008).

Stage B: The Deductive Stage. In this stage, students learn theorems, solve riders, and write out proofs in geometry. The subject matter of this stage was "the whole of elementary mathematics with occasional inroads upon the easier parts of solid geometry" (Mathematical Association, 1923, p.15 cited in Atebe, 2008). A practical approach that encourages the use of the deductive method, as well as intuitive knowledge, was recommended. *Learners* at this stage are yet to fully develop Euclid's systematizing process. This stage was recommended for students aged between 12-15 years old.

Stage C: The Systematizing Stage. Theorems covered in Stage B are ordered logically in this stage using the fewest possible axioms. Rationality is the goal of reasoning. Not all secondary school pupils are expected to finish at this level before they graduate. It was advised that older students proceed to this stage.

Stage D: Modern Geometry. At this point, projective geometry, systems of circles, geometrical conics, and formal solid geometry are all explored. This level is intended

for students who are applying for scholarships, according to the Association. Few pupils ever progress to this level.

Stage E: The Philosophy of Geometry. At this point, geometry works with more advanced abstract formulations and analyses of theorems from various axiomatic systems. Geometries that are not Euclidean can be investigated. This level is thought to be more suitable for university education as opposed to schooling for a select group of gifted professionals. Although the Mathematical Association's model received a lot of support, it was criticised on two counts: Due to the extremely broad topic matter and approach divides, only a small number of students were able to advance to Stage B. This was due to two factors: first, the categories were too broad to be very effective. As a consequence, it was felt that an approach was needed that better reflects, in more detail, the growth in geometric understanding exhibited by students (Atebe, 2008).

Hamisu (2017) asserts that as we refocus on students and meaningful learning across a wide range of intellectual fields, teaching techniques are evolving. Teachers' current concern for pupils is how they might learn and develop ideas while we also have higher or other objectives in mind for them. According to Hamisu (2017), teaching abilities are directly tied to content and instructional approaches and will necessarily result in effective learning. It is the capacity to combine tactics and content to get the best results. Therefore, for an efficient teaching-learning process to occur, a skilled instructor should have both the subject matter and methodology with actual objects being rehearsed. Using a practical approach to teaching mathematics such as the experimental method, laboratory method, and model method will help the students to understand the mathematics concepts.

Experimental Method of Teaching: We can get a generalisation by exploratory instruction, just like in discovery learning. The approach taken is truly one of discovery learning, however on sometimes students will need to conduct experiments in order to make their own findings. As one of the most famous mathematicians of all time, Polya is highlighted in Hamisu (2017) and stresses the value of experimentation, research, and discovery in the development of new mathematics. There have been some changes in the curriculum of Primary School Mathematics Education applied in 2005-2006 educational year. It is, in principle, adopted in the new program that activity-based learning methods are used in Mathematics education to make students more active in learning. First and most important of all, since students find the theories and rules that are discovered by using Mathematics knowledge at a high level on their own through a trial and error process, it makes learning more enjoyable, easier, and increases their success. Second, because students produce knowledge by themselves, they become more involved in lessons that create continuous activity and liveliness. Finally, this utilized method can be in teaching of not only volume of pyramid, cone and sphere but also in teaching of other geometry concepts.

Laboratory Method of Teaching: According to Rabiu (2008), a laboratory is typically thought of as a distinct area where scientific research are conducted and students engage in laboratory activities to generate their own original ideas. Therefore, it is imperative that mathematics laboratories be added to our schools, running concurrently with those for biology, chemistry, physics, and home economics.

Igbokwe (2000) defined a mathematics lab as a setting where students can learn and explore various mathematical concepts and use a variety of activities and materials to validate various mathematical facts and theories. A mathematics laboratory is a particularly furnished space in a building where mathematics lessons or activities are

regularly held, or it could be a table-filled area of a conventional classroom. Odili (2006) posited that Mathematics is a subject that has to be learned by doing rather than by reading. The doing of Mathematics gives rise to the need for a suitable method and suitable place. The correct responses to it are the laboratory approach and the mathematical laboratory. It fosters and sustains the pupils' interest in mathematics. It invites pupils to experiment with and manipulate maths. It helps the students understand the practical applications of mathematics while keeping them engaged and thinking. It can demonstrate fundamental mathematical ideas, laws, or rules as well as how such ideas, laws, or rules came to be. It gives pupils the chance to practise using tools like cutters, turners, drill bits, mathematical sets, paint, brushes, solid model kits and other types of lab equipment in the mathematics lab.

Learner-Centred Approach: The education commissions report of Gachathi and Mackay cited in Kakai (2011), suggested that teaching should be learner-centred so that learning becomes more relevant to the learner. Gachathi further recommends that schools should teach basic computational skills for problem solving. This emphasizes need for the learners" active participation in the classroom activities. This also implies that the teachers role is to offer opportunities that will lead to student-centred activities in class, which could enhance performance in Mathematics. Such opportunities could be realized if teachers used teaching methods that encourage students' participation in class. This study sought to establish the teaching methods used by teachers in an attempt to enhance performance by making students adaptable to Mathematics learning.

Expository Methods: In expository approaches, the instructor is in charge of transferring knowledge and so stays engaged throughout the teaching and learning processes, while the students simply listen. Heuristic techniques, on the other hand, rely more on the students' own research, collection, acquisition, or creation of new materials

to help them understand the concepts being taught. According to Hamisu (2017), it would be hard to adapt to expository or heuristic procedures in their most severe forms. This is due to the fact that extremes are either learner- or teacher-centered, necessitating a balance between the two approaches. The degree to which students participate in the teaching and learning processes rises as we go from expository to heuristic methods. Consequently, this creates opportunities for learners to adapt to Mathematics learning with varied content. The current study intended to establish the extent to which teachers dominate the lesson since this could be a possible challenge to students' adaptation to Mathematics learning in Colleges of Education

Mathematics Teaching Model (Kits): The act of connecting mathematics to practical issues is known as mathematical modelling. In the past, mathematical models were utilised to eradicate smallpox. The idea of mathematical modelling is typically the idea of mathematicalization; it is a method for applying mathematics to real-world issues. Teachers need to build up students' perception in the twilight zone between Mathematics and the real world to get the students to 'see' underlying patterns in the jagged outlines of experience, and also to get them to 'see' the meaning of mathematical solutions when these are translated back into physical terms. Relying on this, the National Mathematical Centre embarked on a project on Mathematics Kits (model) for Primary and Secondary Schools. For the fact that the kits were provided with the shapes ready made, this study tried to fill or bridge the gap by activity method, where students use cardboard papers to cut the shapes themselves, also the teacher's guide through improvisation, which resulted in good learning out-come (Hamisu, 2017).

A model is a physical replica of a concept. For instance, for common solids, the name of some objects representing mathematical concepts listed are below:

Table: 1 Error! No text of specified style in document. 1: Common Solids.

Name of Objects	Concept
Cube of Sugar	Cube
Tin of Nido	Cylinder
Packet of Omo	Cuboids
Ball	Sphere
Roof of Circular Building	Cone

Quite often, teachers tell students that Mathematics exists, useful and purposive without really showing how. In mathematical modelling, these things are what they will be seeing and doing as will be exemplified in the different model methods of teaching various Mathematics concepts.

Various Model Methods

Model Method of Teaching some Solid Shapes

Explore the characteristics of these shapes in Figure 2.2, given that

Number of vertices (V)

Number of edges (E)

Number of faces (F)

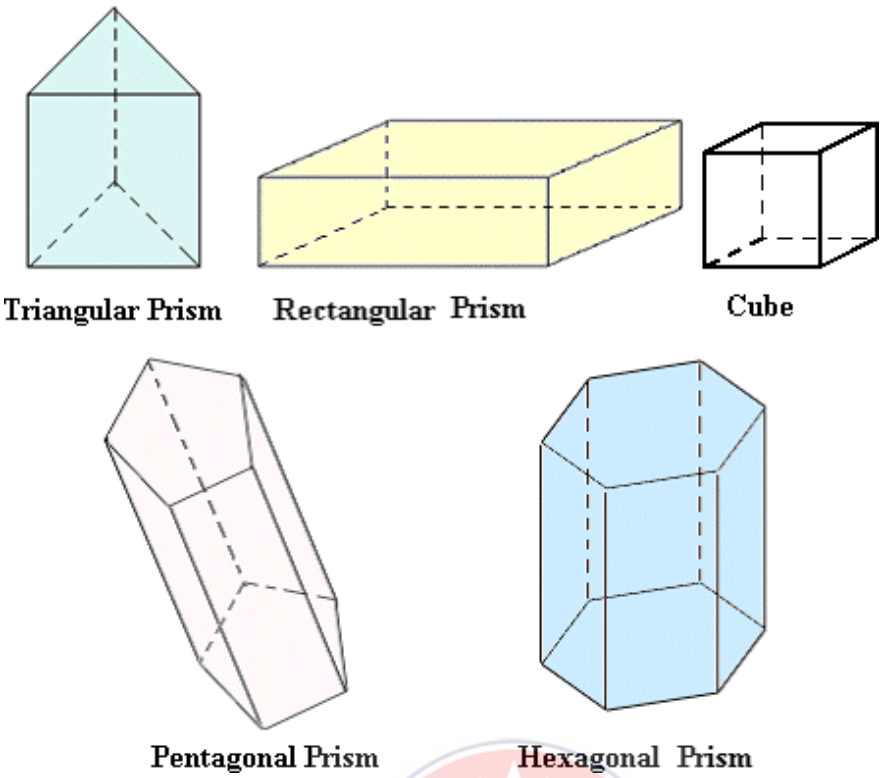


Figure 1: Error! No text of specified style in document. 2: shapes

To help students discover the relationship between the shapes in figure 2.2. The formula F+V-E =2 is used to discover the relationship. Let us consider the triangular prism

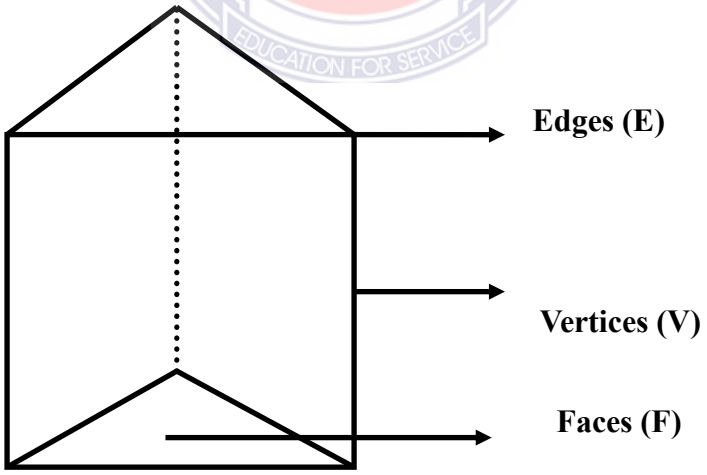


Figure 2: Error! No text of specified style in document. 3: Triangular Prism

Supposing we want to know the relationship between the edges, vertices, faces, and we haveV=4 and E=6. Find F. We use the formula F+V-E =2

Therefore, F= 2 – V + E. F = 2 – 4 + 6 . F = 4

Hence, triangular prism has 4 faces

The rest of the shapes calculated using the formula are presented in Table 2.1

Table 2 : Error! No text of specified style in document. 2: Depicts the Relationship between the Shapes using the Formula F+ V – E = 2

Name	V	F	E	V+F-E
Triangular Pyramid	4	4	6	2
Square pyramid	5	5	8	2
Pentagonal Pyramid	6	6	10	2
Regular Octahedron	6	8	12	2
Triangular Prism	6	5	9	2
Hexagonal Prism	12	8	18	2

Hexagonal Prism

However, cardboard modeled can be to know some shapes and its symmetry.

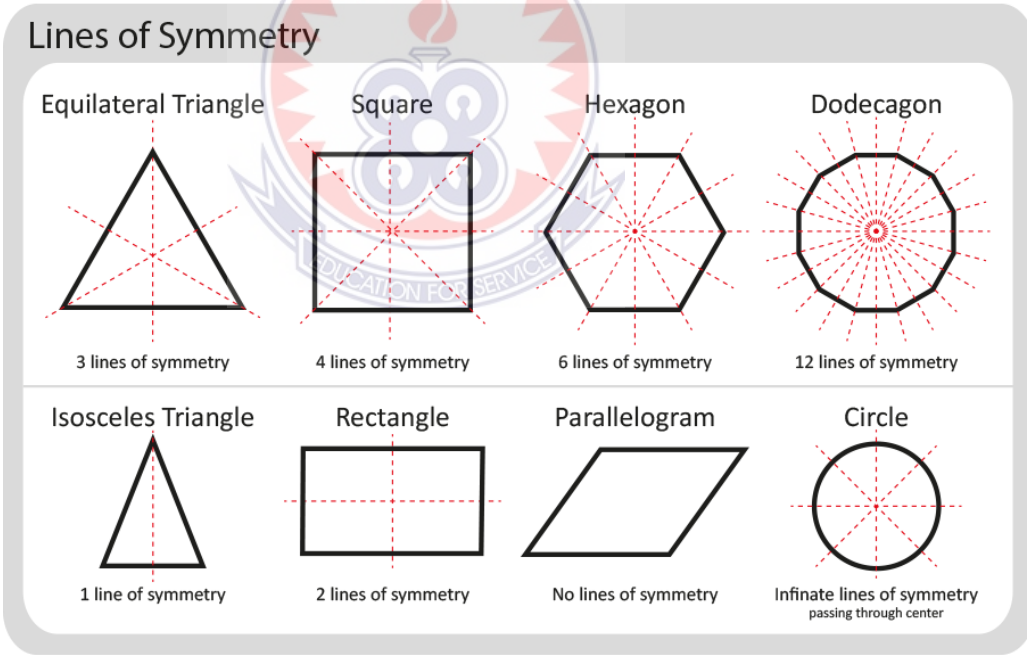


Figure 3: Shows cardboard used to model shapes and its symmetry

Figure Error! No text of specified style in document.**-2: Model shape and its symmetry.**

Roles of model

The roles of models in the teaching and learning of Mathematics include:

1. To provide a setting for discovery of concept.
2. To provide a means for making an independent investigation
3. To generate interest in a new topic
4. To provide retention

Differentiation Instruction:

Differentiation In mainstream contexts, instruction offers numerous chances to benefit different students. To support students with and without impairments, teachers must be able to recognize their students' strengths and needs and have a toolkit of solutions at their disposal (Gartin, Murdick, Imbeau & Perner, 2002). Differentiation is the use of different teaching techniques and strategies to teach pupils concepts. UNESCO (2004) argues that, giving different learning tasks to pupils with different proximal learning possibilities, varying in study content, learning task, length of study content and length of time for solving a task are traditional ways of differentiating. Differentiation aims to meet the diversity of pupils' educational needs by applying a variety of instructions (Westwood 2004).

According to Tomlinson (2004), differentiated instruction is not individualized instruction, losing control of student behaviour, or just another method of creating homogeneous groups. It also does not involve assigning the same exercises or tasks to the majority of students and alternative ones to those who have shown difficulty. Differentiated instruction is one strategy that pre-service teachers might use to solve this problem while upholding the intention of inclusion, according to Salend (2001). Pre-service teachers can adjust the delivery method or assessment for classroom learners while still developing lesson plans based on educational objectives for the

entire class. By providing instruction in this forum, classroom learners recognize that they are all learning the same material; however, its presentation is in the way that meets their unique needs.

Conventional Approach Teaching Method: The traditional approach is more teacher- and group-centered and centers on the teacher. In primary and junior high schools, teaching methods for geometry are essentially the same. The Conventional Approach, which is still the most often utilized teaching style, forbids more than one person from speaking at once. As a result, shy or slow-learner students may always be reluctant to talk at all. The method promotes rote memorizing of mathematical concepts, which facilitates learning by making the concepts understandable (Uyoata, 2006). In my view as a Mathematics tutor teaching mathematics, the instruction is been divided into four progressive stages. Step 1 is engagement stage, where the teacher creates an enabling environment to engage learners in activities that generate curiosity and interest in the planned topic of the day. Usually, an inquiry question presented is to the learners at this stage. The second stage is exploration, where learners explore the question(s) raised at the engage stage and generate answers. At this stage, the learners are placed in groups, and the tutot acts as a facilitator and usually asks further questions to guide learners' explorations, and provides hints about how to proceed, without showing learners exactly how to go about solving the problem (Stein, Smith, Henningsen & Silver 2000). Usually, this stage characterized is by a series of questions and introductory activities that are similar to the topic presented in their worksheets. Then the third stage explanation, where opportunities provided are for learner groups to present solutions or answers to the inquiry question(s), giving justifications and explanations for their claims. Then comes the last stage, extend, where learners extend their concepts and skills to other situations by applying what they have learned in the explain stage.

Usually, and particularly so in Mathematics, further tasks in which these skills exhibited can be are provided for the learners. It could be in groups, pairs, or individually. At each of these stages, and indeed at the end, evaluation of the process would go on simultaneously. It is important to note that activities at all of these stages are interlinked, and will bring about learners' active participation. This emphasis represents an important merger between Mathematics as an investigation and Mathematics as a body of know-ledge, where learners acquire "knowledge through investigation and experimentation in order to facilitate verbalizing, understanding and applying principles in the real world" (Luera, Killu & O'Hagan, 2003; p. 195). Hence, the study examines the teaching methods pre-service teachers use in teaching mathematics in College practicing schools.

Pre-vice Teachers' Perception of Inclusive classrooms Influence on Teaching Mathematics

Perception was described by Amissah and Agbeke (2015) as a process of expanding on our vague and unfinished sensory impressions. Any act or process of knowing things, including facts and truths, whether by the senses, personal experience, or thought, is referred to as perception. Perceptions are the beliefs or judgements that a person holds as a result of their experiences and the influences of the outside world. A person's perception is a more comprehensive examination of the construct of beliefs, which includes concepts, meanings, preferences, and mental representations (Philipp, 2007). Our experiences, beliefs, and expectations all affect how we perceive the world. To interpret teachers' knowledge, attitudes, and practises, researchers frequently use lenses developed by teachers (Kuzle, 2012). Pre-service teachers' individual perceptions, beliefs about the sense and nature of Mathematics education and preparation are becoming increasingly recognized as fundamental contributors influencing the way

they teach and in which innovative teaching concepts implemented are into day-to-day mathematical lessons (Philipp. 2007; Kuzle, 2012). Bruner and his contemporaries cited in Twum (2016) found that perception influenced could be by a variety of factors. These are cultural values, personal attitudes, expectation, and motivational states.

Cultural Values: Perspective-based drawing perception is a particular cultural ability that must be studied rather than automatically acquired. People from many cultural backgrounds appear to favour drawings that display both sides of an object simultaneously rather than using perspective (Deregowsk cited in Twum, 2016). According to the research by Deregowski and Mundy-Castle that Twum (2016) highlighted, culture has a significant impact on how people perceive other people and things.

Personal Attitudes: Twum (2016) described a study that demonstrated the impact prejudice can have on perception. A stereoscope was employed in the experiment, which is a tool for simultaneously showing a different image to each eye. One member of each couple from each mixed-race pair was displayed to each research participant's eye. In general, people were clearest when classifying members of other ethnic groups. However, Afrikaners distinguished between the races far more clearly than other people, who were famous for their racial prejudices. They perceived subcategories or uncertainties in classifying people. Twum construed this as showing how the racist views held by these people had affected their perceptions.

Expectation: In a study by Bugelski and Alampay, cited in Twum (2016), participants were either a group of animal images or a group of irrelevant items, such as furniture or automobiles. People who had previously seen animal images were substantially more likely to see a rat than a man when they were presented an unclear "rat man" depiction.

Simply seeing those figures created an anticipation that what would come next would be more of the same, and that expectation guided how they interpreted the stimuli. Bruner and Minturn (2000) showed how strongly expectation could influence perception. They began by showing people letters or numbers, one at a time, and then showed them an ambiguous figure that could be either as a **P** or **14**. According to Bruner and Minturn, the research participants who had seen numbers unequivocally judged the figures- to be a **14**, while those who had seen letters previously saw it as a **P**. Moreover, when they were asked to reproduce what they had seen, their drawings showed no ambiguities: the gap in the figure was enlarged by those who believed it to be a **14**, but those who believed it to be a **P** did not include any gap. From the two studies, it concluded that expectation influences perception largely. This suggests that once an impression created concerns an object or about something or somebody at the back of the mind, it makes an ineradicable mark. The impression created affects an individual's perception of an object or someone either positively or negatively.

Motivation: Gilchrist and Nesberg, reported in Twum (2016), asked participants to rate various images for brightness. They found that, despite ratings for other images remaining unchanged, participants perceived food images as brighter the longer they had gone without meals. Participants in the study were starved of food for up to four hours by Standford (as cited in Twum, 2016), after which they were shown confusing images. Standford found that the longer the participants had been food-deprived, the more likely they were to interpret pictures as having something to do with food. These studies, and others of the same kind, implied that internal motivational states, in this case, starvation, could directly affect perception. Other factors that influence the perception of this study include:

Values and Perceptual Defense: Sexual or other taboo words have greater recognition thresholds than regular words, according to Postman, Bruner, and McGinnies (as reported in Twum, 2016). When those terms were swiftly presented to the research participants, the taboo words took them longer to recognise than the neutral ones did. The scientists utilised a tool called a tachistoscope, which displays stimuli over incredibly brief yet quantifiable intervals. Postman, Bruner, and McGinnies (as cited in Twum, 2016) argued that their findings were evidence for perceptual defense - the idea that our perceptual system tries to protect us against threatening or disturbing stimuli, by making them more difficult to identify. However, Bitterman and Kniffin (as cited in Twum, 2016) found that the time difference in recognition disappeared if people were allowed to write down their responses instead of saying them aloud.

In a study reported in Twum (2016), Carpenter, Wiener, and Carpenter challenged participants to finish phrases on touchy subjects like sex, hospitality, and emotions of inadequacy. This led to the study's subjects being classified as either "sensitive" or "repressed" in those areas. Researchers found that participants' responses to stimuli varied depending on their sensitivity: "Sensitive people perceived taboo or disturbing words more easily than normal ones; while "repressed people perceived such terms less readily. This study also reveals that perception can be greatly influenced by individual differences in values and attitudes.

According to Loreman, Forlin, and Sharma's (2007) research, pre-service teachers' perceptions were significantly impacted by elements like close contact with a person with a special need, teaching experience, policy and legal understanding, and confidence levels. Research regarding pre-service teachers' perceptions of inclusive classrooms has provided varied results. Some studies suggest perceptions toward inclusive classrooms were strongly influenced by the nature of disabilities (Avramidis

and Norwich, 2010), while other studies have indicated that pre-service teachers were more positive about including only those children whose characteristics were not likely to require extra instructional or management skills on the part of the teacher (Hwang & Evans, 2011).

According to Mambo (2011), training, knowledge and experiences, large class size and workload influence pre-service teachers' perception of teaching children with disabilities in school. The quality of knowledge about children with disabilities and inclusion that pre-service teachers gain through pre- and in-service teacher training is paramount because this can improve their perception (Forlin, 2008). Authors as Kitchen (2007) and Forlin (2008) also assert that pre-service teachers' perception shaped are certainly in part during initial training. Therefore, Jimenez and Graf (2008) recommended that appropriate training and support would increase the confidence of pre-service teachers in their ability to teach students of all abilities and would ensure positive perception.

Research also shows that a pre-service teacher's experiences of teaching a child with special needs or having a family member with a disability also influenced their attitudes. According to Kitchen (2007), people who experience high levels of interaction with individuals who have disabilities hold more positive perception of people with disabilities. For instance, the Mapea (2006) study noted variables like having a family member with a disability influenced pre-service teachers to seek further training in specific areas of inclusion (example, sign language) to help in their relative's learning. Parasuram (2006) study also noticed that some pre-service teachers who had previous experiences of teaching pupis with disabilities did not want to take any more pupils with disabilities into their class. They expressed that having a pupil with a disability in their class sometimes created problems such as slowing the pace at which

they covered lessons. Teaching pupils with special needs in a regular classroom requires a lot of commitment, preparation and planning. According to studies, the pressure of a heavy workload is the main concern for the majority of pre-service teachers at all levels of schooling. Researchers (example, Mclaughlin et al., 1998; Sharma, 2001) have reported that large class sizes are challenges to the implementation of inclusive classrooms. It is noted that there was a decline in academic gain for pupils when class sizes increased and gain when class sizes were reduced (Schmidt & Harriman, 1998). Large class size can impede some of the useful strategies used to assist children's Individualized Education Programs (IEPs). A study (Irma cited in Jemenez & Graf, 2008) conducted in South Africa found that teachers were not giving attention to slow learners. The teachers expressed concern that they had a higher number (40/50) of pupils to teach in the inclusive classroom. Furthermore, some researchers have pointed out that having children with special needs in a regular classroom meant additional work for the teachers, which added to their existing workload (Forlin & Lian, 2008). This is because pre-service teachers are also required to do other professional and administrative tasks as well as extracurricular activities in addition to teaching. However, researchers also stated that other ways of overcoming pressures of and large class sizes that influences teachers' perception. Some of the possible ways that used could be to minimize such pressure would be through "cooperative teaching" (Farrell, 2005; Forlin & Lian, 2008) or "collaboration" with co-teachers and other support personnel to share responsibilities. When responsibilities shared are with other pre-service teachers or support personnel, the pressure is also shared. According to UNESCO survey (2000), pre-service teachers who favour the education of all children in ordinary classes were from the countries have laws requiring this (UNESCO 2000). Pre-service ,.teachers' positive attitudes towards inclusion depended strongly on their

teacher's education, experience with students having special educational needs, class size, workload, and the availability of support (Opdal et al.2001, UNESCO 2000, Avramidis et al. 2000). On the contrary, opponents are the one concerned with the lack of training, personnel and administrative support and the uncertainty of academic and social gains through adopting such models (Whitaker 2004). However, this study explores Pre-service teachers' perceptions of inclusive classrooms influence on teaching mathematics in basic school.

Challenges Pre-service Teachers' Encounter in Teaching Mathematics

The process of teaching geometry to students presents a variety of difficulties for pre-service instructors. The difficulties, however, can vary from one class or one pre-service mathematics instructor to another.

Language: Unquestionably, language is a crucial tool for communication, and geometry may place the greatest emphasis on language use of any Mathematics course (Ashfield & Prestage, 2006). Given that a lack of language proficiency impedes the development of geometric knowledge, Feza and Webb (2005) argue that geometric terminology is essential for the communication of geometric ideas both inside and outside of the classroom. De Villiers (as cited in Feza & Webb, 2005, p.45) stresses the point that "success in geometry [indeed] involves acquisition of the technical terminology" (p.45). Hamisu (2017) asserts that the most basic type of knowledge in any particular field is its terminology. However, all too often, pupils lack the appropriate vocabulary to express the distinguishing properties of a figure or compare shapes in an orderly manner. Atebe (2008) explain that lack of exposure to proper vocabulary is one of the reasons for students' misconceptions in geometry. Therefore, Ngirishi (2015) suggests that precise terminology "may be thrust on students" early in their geometry course in order to remediate students' imprecise use of geometric terminology.

Instructional/Pedagogical Factor: One of the most significant educational hubs, the classroom is where curricular intentions are translated into possible learning experiences. In fact, the majority of school learning experiences are framed by a pre-service teacher who chooses, organises, and delivers a wide variety of instructional activities for the students (Atebe, 2008). The teachers in the classroom are the most crucial members of any educational institution, according to (Evans, cited in Atebe, 2008). Stoker (2003, p.11), too, believes that "learning is strongly and necessarily linked to teaching". This means that the amount of learning that takes place in the classroom depends for the most part on pre-service teachers' own knowledge of the subject matter learnt. In fact, research seems to indicate that pre-service teachers' classroom behaviour is often "influenced by their knowledge" of the subject and subject matter specific pedagogy. Clearly, a pre-service teacher with good content knowledge of geometry coupled with a good teaching strategy in the subject would make learning much easier for the pupils (Atebe, 2008).

A pre-service teacher needs have a variety of knowledge categories in order to effectively teach, according to Nickerson (2014). These include curriculum knowledge, which refers to the materials and programmes used to carry out instruction and assessment, pedagogical content knowledge, which refers to specific strategies for imparting a particular subject matter, and content knowledge, which refers to knowledge of the subject matter to be taught. Because it highlights the particular bodies of information for instruction, pedagogical content knowledge may be the most crucial (Atebe, 2008). There is a whole body of research indicating that much of the difficulty that pupils experience with Mathematics generally and with geometry specifically is due to pre-service teachers' lack of appropriate pedagogical content knowledge in these subjects. It has been observed, that "Children's knowledge and pre-service teachers'

understanding of that knowledge are central to instructional decision making" (Atebe, 2008, p.59). Dreyer (2017) asserts that the inability of many pre-service teachers to match instruction with their pupils' level of understanding in geometry more than anything else accounts for their failure to promote pupils' conceptual understanding in the subject.

Textual Factor: Typically, textbooks used in class and for homework expose students to the curriculum's content. This is so that textbooks can accurately reflect curricular requirements for the body of knowledge and abilities that students should be able to master. Thus because of their content and the way in which it is organized, different geometry textbooks will tend to orient learners along different lines of competency in geometry problem solving (Atebe, 2008). Even when the textbooks cover geometric concepts, pre-service teachers are sometimes reluctant to teach the specifics because they lack the knowledge of how to teach them properly. They tend to steer the focus towards algebraic methods (Nickerson, 2014).

In a comparative study of the U.K. and Japan, for example, Fujita and Jones (2002, p.82) state that in the U.K. the textbooks analyzed were "designed around a set of exercises with mathematical theorems merely stated rather than developed or proved". Fujita and Jones (2002), claim that consequently, in the U.K., "even 14-15-year-olds show a consistent pattern of poor performance in constructing proofs", even when they excel in tasks that involve numerical calculations in geometry. By contrast, in Japan, "textbooks attempt to develop students' deductive reasoning through 'proof using various approaches" (ibid.). Consequently, "most 14-15-year-old students (Japanese secondary 3rd grade) can write down a [geometry] proof" even though "around 70% [of the students] cannot understand why proofs are needed" (Fujita & Jones, 2002, p.81; Jones, Fujita & Ding, 2006). It has observed that pre-service teachers generally "depend

very heavily on the textbook; follow the text very closely for content and sequencing; and hold as a major objective the completion of the exercises at the end of each section". What this seems to imply is that pre-service teachers should select very carefully those geometry textbooks whose contents reflect the curricular objectives if learners are to have learning experiences consonant with the expectations of the geometry curriculum.

According to Atebe (2008, p.63) an ideal geometry textbook is one in which "the subject matter is repeated many times, and each time it is dealt with from the very beginning". A textbook organized in this manner, satisfies what he calls "telescoped re-teaching". This seems to call for the implementation of a spiral curriculum through the organization of the subject matter in textbooks. However, it is my experiential conviction, however, that pre-service teachers can redress this situation through their instructional practices.

Pre-service Teacher Approach and Representation of Materials:

No matter how much geometry a pre-service teacher knows, the way they teach geometry in the classroom can have a big impact on how well their pupils learn. Open-ended activities, according to Begg and Cavagna (2009), can be a powerful tool for revealing students' thinking and learning. They developed a project whereby their students studied 3-dimensional shapes and scaling using isometric drawings. When given creative freedom to choose what to draw for their tasks, they discovered that the pupils were more motivated and inventive. Many children created drawings that were more intricate than the ones the pre-service instructor would have chosen.

Begg and Cavagna feel the use of open-ended activities is an opportune way to assess the students in their geometric understanding and performance. Not using rote straightforward questions is also a way to retain the students' interest in learning

geometry. Since geometry requires visualization to understand definitions and theorems, they found that students are more successful when problems presented are both textually and visually. This method improves the existing knowledge and broadens it with new facts. Furthermore, the authors advise that multimedia representations of geometric problems provide a more interesting view for students and make the problems easier to make sense. Their research indicates that the use of multimedia learning achieves higher test scores. Their specific research investigated the software use of and Geometer's Sketchpad (Nickerson, 2014). How to represent geometry concept for student to understand is a major problem for most pre-service teachers. Hence, pre-service teachers can use interactive activities. Interactive experiences add variety to the lessons and engage the students, while enabling them to gain insights into mathematical concepts.

Larger Class Sizes: In terms of teaching and learning planar geometry, large class sizes have an impact on pre-service teachers' classroom procedures, particularly when it comes to allocating more time to deal with students who exhibit unique educational needs. In courses with 35 or more students, many professors handle them, according to Hayford (2013). The practical effects of this issue include task overload and challenging marking. Additionally, larger classes are typically noisier and more challenging to manage. The negative impact of larger classes on instructors' classroom practises and student learning has been discussed by local observers on educational reforms (Angbing, 2001). In terms of pupil participation, Asamoah (2002) suggests that larger classes prevent teachers from developing close relationships with pupils thus progress is hindered, as they are unable to assist pupils who need more attention. This affects the number of objectives stated by teachers as well as the variety of tasks teachers give to

pupils in the classroom, because teachers consider the time for supervising while pupils work, marking, processing and filling of records of pupils.

The teaching and learning process, in the opinion of teachers, is hampered by larger classes (Asamoah, 2002). Larger classes were also noisier and offered difficult problems to mainstream teachers, according to Hayford and Avoke (2011). Pollard et al. (2005) highlighted in writing that the number of students inherently limits the amount of time teachers can spend teaching, particularly students with mild and moderate disabilities in mainstream classrooms. Thus, larger classes make it impossible for pre-service teachers to work with all pupils including disabilities in the classrooms and confirm what UNESCO (2019) said, larger classes show that the teaching staff has become overstretched and makes most teachers methods ineffective in class.

In-Service Training: According to Hayford (2013), teachers' professional development may have an impact on traditional classroom procedures with regard to students actively participating in the teaching and learning process. Pre-service instructors are not taught how to support and improve students in traditional schools who struggle with learning mathematics. This research is crucial because it highlights a significant deficiency in Ghana's teacher professional development programmes. Hamisu (2017) argues that there is no systematic training for pre-service service teachers such that it may be difficult to be aware of what one is expected to do, reflecting that at times the pre-service teachers may not be aware of the role that they are supposed to play in the process of teaching. Pre-service teachers may not be aware because they are not trained or inducted on teaching. He adds another dimension when he says that teaching will not be due to lack of knowledge on the part of the pre-service teachers this may affect the performance of learners. Hamisu (2017) points out that not all those selected to be pre-service teachers have interpersonal skills; hence, this can

lead to conflict and unhappiness. Once there are conflicts, unhappiness between the pre-service teacher and the learner, standards are likely to be compromised, and the purpose of teaching may be defeated.

Teaching and learning Materials in Mainstream Schools: Inadequate teaching and learning material is another challenge in teaching the mathematics. The cost of buying teaching and learning materials is high. For example, Braille machines and textbooks are costly; hence, it becomes a problem in teaching pupils' disabilities in mainstream schools. Mmbaga (2002;p.175)

argues that, "schools are not making necessary purchases of teaching and learning materials, equipment for making teaching aids and materials for building and completing the required number of classrooms and furniture to avoid overcrowding and having pupils sit on the floor". Therefore, this makes it difficult for mainstream schools to plan effectively for their development and hence, pre-service teachers face problems in teaching pupils in mainstream schools. She emphasizes that teachers should make sure that each pupil benefits from the teaching regardless of his or her learning difficulties. Furthermore, Mmbaga (2002) mentions that most of mainstream teachers are not aware that they can use their local environment in teaching mathematics to pupils with disabilities. She gave an example that teachers were not keen to use real objects in the environment that were available free of charge and most of the teachers teach without appropriate teaching aids. She again indicated that, at the mainstream school where she did her research, she observed that, in the classroom a textbook shared by nine pupils. Pupils with low vision or partially sighted had no writing equipment such as Perkins Braille, and hand frames and styluses were not available for all pupils needing them.

Summary of Review of Related Literature

Pre-service teachers work with a variety of learners in the inclusive classroom who may not have a medical diagnosis for a disability but are having trouble following instructions or completing a job. Therefore, pre-service instructors should always be looking for the type of instruction that is best for each particular learner because students' poor performance in learning geometry is typically caused by their lack of grasp of planar geometry concepts. In this chapter, topics pertaining to both inclusive classrooms and mathematics were examined.

Sociocultural theory, multiple intelligence theory, and the theory of intergroup contact made up the theoretical framework used. The pre-service teachers' knowledge will be clear in how they put into practise instructional techniques that support inclusive classrooms. To that end, literature on pre-service teachers' perspectives on inclusive classrooms, teaching strategies for teaching mathematics, pre-service teachers' perspectives on inclusive classrooms and their impact on mathematics, and difficulties pre-service teachers face when teaching mathematics were reviewed. The current study aimed at bridging the gap and establishing further knowledge on pre-service teachers' perceptions of inclusive classrooms on teaching mathematics in Tumu College of Education, Tumu.

CHAPTER 3

METHODOLOGY

Introduction

This chapter discusses the general approach and specific techniques that were used to carry out the study. This includes the philosophical underpinning, research approach, research design, study area and population of the study, the sampling procedure and sample, instrumentations (research instruments, pilot study, validity and reliability of the research instrument, and data collection procedure), data analysis procedure, and ethical considerations.

Research Approach

The researcher used a mixed-methods technique for this investigation. Even while it was commonly known that mixed methods research was a relatively recent development in the field of research inquiry, its roots may be traced back to the 1960s. Due to the 'paradigm wars' of the 1970s and 1980s, where social scientists fervently rejected the positivist paradigm of quantitative research and argued in favour of constructivism as a workable substitute, mixed method research is frequently associated with this phenomenon (Reichardt & Rallis, 1994). It, then, arises from this disagreement by research purists over usage of two mutually exclusive research methods as a new third research movement to "make use of pragmatic method and system of philosophy" (Johnson & Onwuegbuzie, 2004; pg. 17). Johnson and Onwuegbhuzie (2004), stated that:

> *"Mixed methods research is formally defined here as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or languages into a single study. Mixed methods research is an attempt to legitimate the use of multiple approaches in answering research questions, lrather than restricting or constraining researchers' choices (that is, it*

> *rejects dogmatism)...it I,klms inclusive, pluralistic and complementary, and it suggests that researchers take an eclectic approach to method selection and thinking and conduct of research" (p. 17-18).*

There are three possible ways of carrying mixed methods study: (1) doing both research methodologies simultaneously, that is, using both at once (Creswell & Plano Clark, 2011); (2) utilising separate qualitative and quantitative research methods for different stages of a study (Leech & Onwuegbuzie, 2009); and (3) carrying out both researches sequentially i.e. data from quantitative understanding research will be collected first before the next qualitative method (Johnson & Onwuegbuzie, 2004). The primary purposes of mixed method research, according to Caracelli and Greene (1997), cited in Adrian-Yap (2017), enhanced conceptual of the social phenomenon. They had already recognised three uses: (1) to verify the findings obtained from different measurement instruments; (2) to draw the result of one method and apply it for the next method; (3) to demonstrate how the results from a particular method could influence the next method. The researcher can concentrate on his research questions rather than the various methodologies being used thanks to this new pragmatic notion. In order to appropriately answer the research questions, Johnson and Onwuegbuzi (2004) suggested that the methodologies usedz should be determined by the research questions. Despite the popularity of mixed methods research, there are still misunderstandings regarding how to apply some components of it to this research, such as when it is appropriate to combine both research methodologies i.e. during data collection, or data analysis (Tashakkori, 2009). In some cases, some purists attacked the mixed methods research as either research methodology could be secondary to the other one i.e. qualitative research method could be considered as secondary or inferior to quantitative rather than being on an equal footing with each other (Yin, 2006).

In order to find more thorough responses to the research questions, a mixed strategy was used in this study. Mixed techniques are used for this purpose because they are complementary, using the findings from one research approach to further explain and support those from another (Greene, 2007). The quantitative research allowed me to disseminate the questionnaires to pre-service instructors of larger disciplines, including mathematics, and based on the sample results, these results were generalised to the population results. The researcher next applied qualitative research techniques to the quantitative data to determine "WHY" this reason has already arisen and "HOW" this factor might impact the other components. These two key reasons are found to be consistent with the reason that explains the complementarity of mixed methods to support certain quantitative findings with in-depth qualitative answers. Therefore, the importance of qualitative study in this mixed method provide better understanding of "wholeness" of particular class within its context (De Vaus 2002).

As a summary, the current study employed a mixed-methods approach to explore the perceptions of inclusive classrooms held by basic school pre-service teachers through a questionnaire and examined how these perceptions affected their teaching of mathematics in the internship classrooms in Sissala East Municipality and Sissala West District through observation and interview methods. The questionnaire merely measures the pre-service elementary school teachers' level of positive or negative opinions regarding the inclusion of students with special needs. When teaching mathematics in the classroom, an interview and observation provide justification for their actions towards learners with special needs.

Research Design

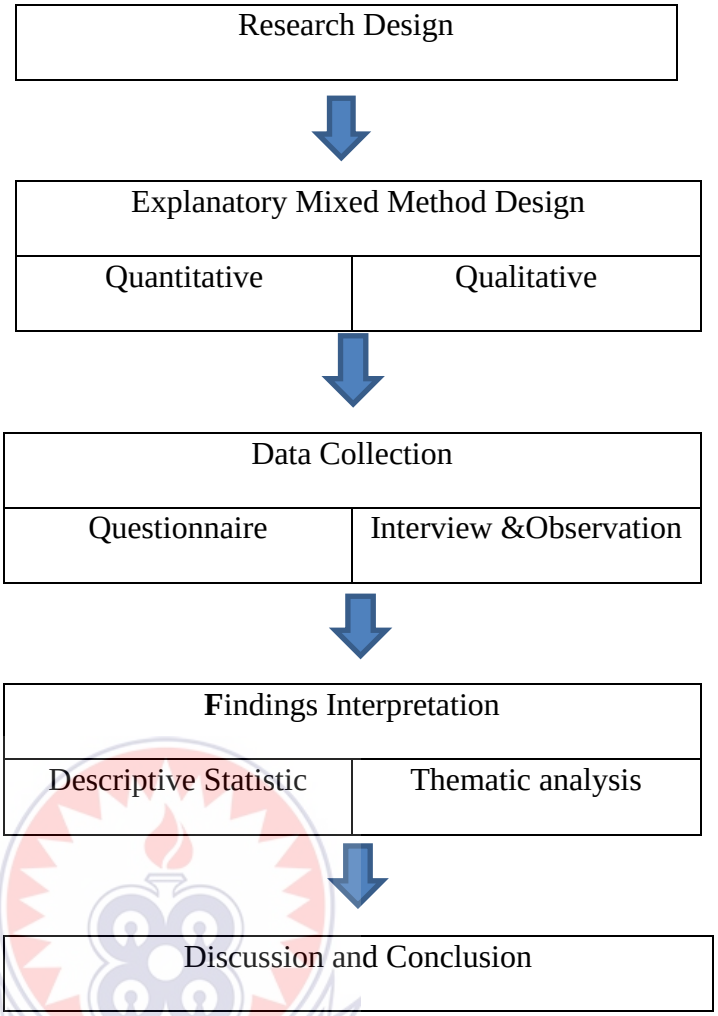
According to Creswell (2012), a research design is a set of rules and tools to use when solving the problem under study. According to Teddlie and Tashakkori (2009), there are

four types of mixed-method research designs: 1) triangulation, 2) embedded, 3) explanatory, and 4) exploratory. This study employed the explanatory mixed research design. The explanatory design is a two-phase mixed methods design also referred to as the explanatory sequential design. Quantitative data are first gathered and analysed in this design. The next step is the gathering and analysis of qualitative data after the initial phase. The study's second qualitative phase is structured to build on (or relate to) the findings of the first quantitative ph/ase. This design's overarching goal is to use qualitative data to expand upon or explain early quantitative findings (Creswell & Plano Clark, 2011).

The explanatory approach, which collects quantitative data first and then qualitative data, was most suitably used in this study. Using this approach, the quantitative data were used to paint a clearer image, and the qualitative data were used to better comprehend and explain the relevant study. The researcher recognizes specific quantitative findings in the explanatory design that require more explanation. The researcher next acquired qualitative information from participants who may help explain these findings in order to be able to fully investigate the quantitative data (Teddlie & Tashakkori, 2009; Creswell & Plano- Clark, 2011).

The explanatory design is recognized as the easiest and most straightforward of the mixed-method designs (Creswell & Plano Clark, 2011). The advantages of the explanatory research approach were further clarified by Creswell and Plano-Clark as follows: 1. Because the researcher uses the two approaches separately and only collects one type of data at a time, the two-stage structure makes it simple to carry out. 2. The final report can be broken down into two sections, which makes it simple for the reader to understand the conclusions. As a result, using both approaches can result in the interpretation of data that is extensive and thorough. The participants' perceptions

served as the basis for the current study, which is one of many perception studies to use an explanatory mixed-methods design. Guillot (2003), for instance, employed the explanatory mixed method design to gauge how teachers and students felt about the use of online instruction in higher education. Ismail et al. (2010) used qualitative and quantitative methodologies to investigate how teachers of Arabic and English language courses in United Arab Emirates schools felt about using technology in their lessons. Almekhlafi and Almeqdadi (2010) utilized an explanatory mixed-method design to investigate how instructors in the United Arab Emirates perceived the usage of technology in the classroom. These techniques were utilized to get accurate information, thorough outcomes, and trustworthy data. Hence, the current study used an explanatory mixed methods design to investigate pre-service teachers' perception of inclusive classrooms and their influence on their teaching of mathematics in basic schools in Sissala East Municipality and Sissala West District. In particular, the details of the research design for the current study is illustrated in Figure 3.1.



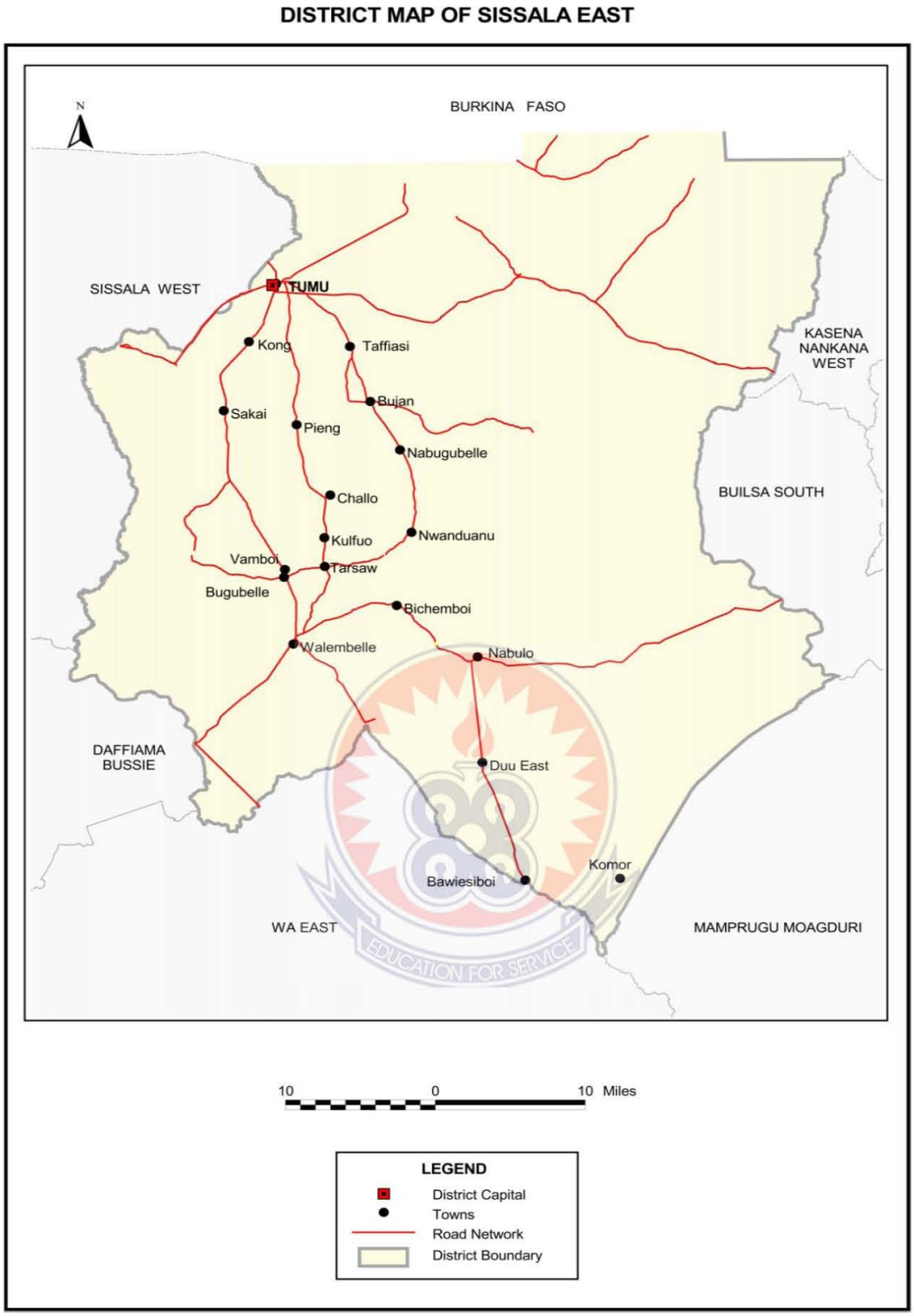
Figu 3.1: Research Design.

Figure 3.1 shows the research design for this study. The explanatory mixed-method design was used by administrating a questionnaire and structured interview and observation checklist as research instruments to collect quantitative and qualitative data, respectively. The data from the questionnaire were analyzed using descriptive statistics, and the interview and observation findings were coded and analyzed to support the findings of the questionnaire.

Study Area

The study was conducted in Tumu College of Education in Sissala East Municipality in the Upper West Region of Ghana to explore pre-service teachers' perceptions of inclusive classrooms and teaching mathematics in the basic schools. The Sissala East

Municipality Assembly is one of the 216 administrative districts in Ghana and one of the 11 administrative districts in the Upper West region of Ghana (Lamptey & Donwazum, 2014). Originally it was formally part of the then-larger Sissala District in 1988 until the Western part of the District was later split off to create Sissala West District in July 2004, thus remaining part has been renamed as Sissale East District, which was later elevated to municipal assembly status on 15 march 2018 to become Sissala East Municipal Assembly. The municipality is located in the northeast/eastern part of the Upper West Region and has Tumu as its capital town. it is situated between latitudes 10°35' 49.398" and 20.18" N and longitudes 1°51.0303W of the Eastern part of the Upper West region. Tumu is the administrative capital of the Municipality; a town renowned for several specialized institutions of higher learning. There are nine administration circuit centers in the Municipality namely: 1. Tumu East Circuit 2. Tumu West Circuit, 3. Bujan Circuit, 4. Tarsor/Kulfuo Circuit, 5. Nabulo Circuit, 6. Fachoboi Circuit, 7. Wallembelle Circuit, 8. Sakai Circuit, 9. Kunchogu Circuit.



Figur 3.2: Map of Research area (Sissala East Municipality).

Source: Ghana Statistical Service, GSS (2014)

Population of the Study

According to Kusi (2012), a population is a collection of individuals, people, or objects that share certain traits and are of interest to the researcher. The target population was defined by Cohen, Manion, and Morrison (2011) as a collection of elements whether people, things, or events that meet certain criteria and to,whom the researcher intended to generalize the study. The target population for this study were all 237 level 100 Upper Grade pre-service teachers of 2023 year group in Tumu College of Education in the Sissala East Municipality. The accessible population for this study was the one hundred and twenty-three (123) level 100 pre-service teachers, in the College of Education lin the Sissala East Municipality.

Sample and Sampling Procedures

A sample is a collection of people, things, or events chosen from a population for a study, preferably in a way that makes them a representative sample of the broader group from which they were chosen, according to Gay, Mills, and Airasian (2009). The number of objects that must be chosen from the entire universe to form a sample is known as the sample size (Kothari, 2004). In the case of the present study, the sample included a selection of one hundred and twenty-three (123), 2023 batch of Level 400 mathematics students which offers Upper Grade Course in the College in Sissala East Municipality since all students are practicing inclusivity. The sample size for the study was one hundred and twenty-three (123) participants. Vanderstoep and Johnston (2009) assert that sampling is important because, in almost all cases, it is not practical to study all the members of a population.

For the quantitative sampling procedure, the researcher used a simple random procedure to select the respondents. To select this sample, the researcher employed the hat and draw method to select pre-service teachers from Tumu College of Education,

Tumu in the Sissala East Municipality. One hundred and twenty-three pieces of paper with "Yes" and the rest pieces of paper with "No" inscriptions were folded and placed in a box. Pre-service teachers' were given equal opportunity to pick a paper from the box. All pre-service teachers who picked the "Yes" inscriptions were used for the study. This was done for all the classes the researcher visited. At the end of the hat and draw process, the researcher had one hundred and twenty-three (123) Pre-service teachers representing the selected students in the College in the Sissala East Municipality. The random sampling procedure was used because it gave each Mathematics pre-service teacher an equal chance of being selected and it was also to do away with any form of bias. In addition, it helped the researcher to ensure that each element within the accessible population has an equal and independent chance of being selected.

For the qualitative sampling procedure, the researcher used a purposive sampling technique to select 20 participants for the interviews and observations. According to Creswell (2012), the sample size for qualitative research should range from five (5) to twenty-five (25) participants to reach saturation. Saturation is reached when a researcher collects data from participants to a point where participants have nothing new to add to the data (Marshall et al., 2013). Twenty (20) participants from the classes were purposefully selected from the one hundred and twenty-three (123) Upper Grade Mathematics pre-service teachers since the pre-service teachers have mentors to assist the pre-service teachers in managing learners with special needs. Ritchie, Lewis, Nicholls, and Ormston (2013) added that purposeful sampling entails choosing participants who exhibit essential traits or aspects that have the ability to produce the relevant data for the study.

Research Instruments

The selection of the instrument to be used for data collection is an essential component of research project planning. Structured questionnaires, an observation checklist, and an interview guide were the tools used for the study.

Questionnaire

In this study, the researcher used the structured questionnaire to collect numeric data on pre-service teachers' perceptions of inclusive classrooms and teaching of mathematics in Tumu College of Education in the Sissala East Municipality. The respondents were limited to a list of five options from which they were to choose one as a response to an item. The questionnaire consisted of 24 statements with a Five (5) point Likert scale consisting of the following possible responses: strongly agree (SA), agree (A), uncertain (U), strongly disagree (SD), and disagree (D). The first aspect of the questionnaire items elicited information on the demographic background (Section A). The demographic component of the questionnaire was essentially designed to elicit information on variables like gender, individual entry requirement, teaching Mathematics in basic schools and teaching experience before enrolment into the programme, because some might have done community teaching before coming into the College system. This was in tune with the research since these variables helped the researcher to make deductions from the views of respondents.

The second part of the questionnaire consisted of four sections namely B, C, D, and E. Section B elicited responses on pre-service basic school teachers' perceptions of inclusive classrooms in basic schools in both Sissala East Municipality and Sissala West District. Items numbering from 1 to 6 were provided for respondents; given a five (5) point-Likert scale: (SA) =Strongly Agree, (A) =Agree, (U)=Uncertain, (SD) = Strongly disagree and (D) = Disagree. In section C, a five (5) point-Likert scale was given: SA

= strongly agree, A = agree, U= Uncertain, SD= strongly disagree and D= disagree to elicit responses on teaching methods used in teaching mathematics in basic schools in these two Districts. Section D elicited responses on pre-service teachers' perceptions of inclusive classrooms and their influence on teaching mathematics in their practicing basic schools in the Sissala East Municipality and Sissala West District. Items numbering from 13 to 18 were provided for respondents; given a five (5) point- Likert scale: SA = strongly agree, A = agree, U= Uncertain, SD = strongly disagree, and disagree. Section E elicited responses on the challenges Mathematics pre-service teachers encounter in teaching mathematics in their practicing schools in Sissala East Municipality. These items numbering from 19 to 24 were provided for respondents; given a five (5) point-Likert scale: SA= strongly agree, A = agree, Un= Uncertain, SD = strongly disagree and D=disagree.

Interview guide

The researcher employed interviews to provide efficient means of acquiring such in-depth and sincere qualitative information from specific participants because it was necessary for more detailed data to corroborate those collected in the questionnaires (Thomas, 2003). Because it focuses on the descriptive character of data and process rather than output and inductive interpretation of data, structured interviews were employed in this study. This has given the researcher and interviewee subjects considerable flexibility. A thoughtfully designed interview guide was created to help build a good relationship with the interview subjects and to make sure the interview session stayed on topic and ran according to schedule in order to collect high-quality data (Ahsan, Sharma, & Deppeler, 2011). Questions were asked and the researcher had a greater degree of flexibility and freedom to modify interviewing approach depending on the demands of the interview circumstances as recommended by Cohen, Manion,

and Morrison (2007). The interview questions in the interview guide were based on my assessment of the problems that were specific to perspectives of inclusive classrooms and their impact on learning about teaching mathematics from the respondents. According to Adrian Yap's (2017) citation of Brenner's (1981) interview standards, researchers must follow a precise order of properly written questions with pre-planned prompt questions. Making similarities between these questions and tailoring their comments in response to them assisted the interviewers. Prompt questions, for example, "what do you by this? Sorry, I am not clear about what you have shared with me and can you provide additional details about it?" prompts, was asked from time to time to obtain further clarification and to affirm the informants' understanding of questions.

The interview questions were centered on the following themes: pre-service teachers" perceptions of inclusive classrooms and how the perceptions of inclusive classrooms influence their teaching, challenges basic school teachers to encounter in teaching mathematics. The interview was conducted on a one-on-one basis in the school setting. This enabled the participants to express their views and concerns freely and explicitly.

Observation checklist

An observation is described as "a way of obtaining data whereby a researcher watches the participants understand the natural environment lived by participants, without altering or manipulating it" by Gay (2011) on page 381. In this study, the researcher employed non-participant observation, which Gay (2011) defined as the method in which the observer concentrates more on observing and recording behaviour without interacting with anyone while the event is being watched. to evaluate the educational strategies used by future instructors. The researcher was able to precisely understand what was occurring in the classes due to the observation checklist. The observation checklist gave the researcher the chance to investigate the questionnaire's findings and

learn more about what goes on in the classroom. The observation checklist was organised into a type. It started by searching for background data on the lessons. In terms of classroom layout, supplies, space, and management of the class, it also included four different classroom scenarios. Also five modes of lesson delivery as expository. Dramatization, experimental, learner-centered, and lecture demonstration. The mode of lesson delivery activities was rated on a four-point Likert scale; (1= not at all, 2-some evidence, 3= clear evidence, and 4- to a greater extent). These rating keys help the researcher to describe such of the lessons observed.

Pilot Testing

The instrument was pilot-tested in the public schools in the Sissala East Municipality in the Upper West Region of Ghana. The researcher selected those public schools because the selected population for the work has comparable characteristics as those of the Pre-service teachers in Tumu College of Education in the Sissala East Municipality. Also, the school environment in terms of infrastructure, teaching, and learning materials was similar to those selected for the main study. Hundred (100) teachers were sampled for the pilot testing. Regarding the instrument's design, testing was required to evaluate the validity and reliability of the questionnaire. The purpose of the pilot test was to determine whether the instructions were clear and sufficient without any ambiguities or excessive verbiage to allow responders to complete the instrument accurately. According to Cohen, Manion, and Morrison (2007), piloting is a good way to check for items, instruction, and overall instrument layout clarity. Obtaining input from the respondents was one of the key factors that may help in the creation of an effective questionnaire.

Additionally, piloting also encourages the eradication of ambiguities or linguistic challenges. The purpose of the pilot test was to see if the survey sample would be able

to understand the questionnaires. For instance, certain questions on the survey were reworded to have a clearer meaning because some respondents wanted clarification on them before responding.

Validity and Reliability of Research Instruments

It was required to evaluate the validity and reliability of the research tools as well as the credibility of the researcher in order to establish and improve the trustworthiness of the results gained from this study (Merriam, 2009). According to the researcher's questions and objectives, the instrument's validity simply relates to how effectively it can measure what it is intended to measure. The degree to which a research tool is able to deliver reliable results is referred to as reliability. According to Groth-Marnat (2009), a research tool is considered dependable if it consistently yields the same results under various conditions.

Quantitative phase

The following validation test was conducted to determine the validity of the questionnaire: Validity of Face and Content; Iacobucci and Churchill (2010) defined face validity as the correspondence (similarity/correlation) between the researcher's explanation of the ideas and his/her description of the categories measured. After developing the questionnaire, some colleague graduate students from the University of Education, Winneba, and other College Tutors in the Tumu College of Education, Tumu were requested to carefully and systematically scrutinize and assess the instrument for its relevance and face validity. The feedback from the graduate students and the Tutors was factored into the final preparation of the instrument. Issues such as the length of the items and the general format of the questionnaire were some of the concerns pointed out to the researcher during the pilot stage.

Content Validity: The degree to which an instrument's content matches the ideas it is intended to test is what's known as content validity (Titty, 2015). According to their opinion, the typical procedure for determining content validity is to look at the instrument's aims and compare them to its substance. The authors' Cooper and Schindler (2008) proposed two methods for judging content validity. First, the designer might decide on it by carefully defining the subject of interest, the objects to be scaled, and the scale to be applied. Second, an expert may determine how well the instrument complies with the requirement. Based on this knowledge, suggestions from my supervisor and other lecturers who are experts in Assessment, Measurement, and Evaluation, were sought to content validated the questionnaire.

The coefficient of correlation was more than 0.70. The researcher made contact with more seasoned experts in the sector. The supervisor was crucial in Malhotra's (2004) presentation of the split-half, internal consistency, test-retest, and equivalent-form reliability assessment techniques. On the same sample of participants, the researcher used a test-retest procedure. Two weeks passed between the first and second times the questionnaires were administered. The researcher assessed the mean scores of the two tests and discovered the correlation coefficient after completing the exercise of distributing the instrument questionnaires to the pilot centers twice. Pearson's coefficient of correlation (r)

$$r = \frac{\mathrm{N}\sum xy - (\sum x)\,(\sum y)}{\sqrt{[(N\sum x^2 - (\sum x^2))][(N\sum y^2 - (\sum y^2))]}}$$

Where N = *Number of respondents* m

x = *Scores from the test*

y = *Scores from the scond test*

The value of r lies between ±1, the closer the value will be to + 1 the stronger the congruence. The Pearson coefficient value (r) obtained was 0.88. The instrument was, therefore, accepted since the reliability ensured that the consistency of the results was enhanced. The instrument was also pilot tested.

Qualitative phase

Six techniques for evaluating internal validity were given by Merriam (1998), as referenced in Zohrabi (2013). These include triangulation, member checks, ongoing site monitoring, peer review, collaborative or participatory research methods, and researcher bias. Member checks were employed in this study to validate the qualitative instruments.

The member checks approach was used to return the results and interpretations to the participants for confirmation and validation. To validate the accuracy of what was said during the interview and what the researcher observed, the results and interpretations of the interviews and observations were given to the interviewers and the observer. The reasonableness and veracity of the information can be recognized and supported in this manner. According to Zohrabi (2013), Lincoln and Guba (1985) and Merriam (1998), who were both referenced, the investigator's position, triangulation, and audit trial were three procedures that were used to guarantee the reliability of the results. The study also employed the investigator's role in producing the same outcomes as qualitative tools. The researcher explicitly described the various procedures and stages of the investigation using the investigator's position. Every detail of the study was commented upon by the researcher. She gave a thorough explanation of the study's justification, defined and described the data's structures and premises, which made replication easier and, as a result, increased dependability.

Data Collection Procedure

Creswell (2012) asserts that respecting the location of the research and obtaining permission before approaching a site are of utmost importance. A letter explaining the study's objectives and requirements for participants' agreement and cooperation was acquired from the Department of Mathematics Education. The letter was sent to the Management of Tumu College of Education to formally gain access to the Pre-service teachers, participants, and other documents that would facilitate the study. The College Directorate subsequently permitted the researcher to have access to the participants. A copy of the permission letter was given to the Heads of the STS Coordinator, where the research was carried out to have access to the Mathematics pre-service teachers. The data collection process started on 20th April 2023 until 20th of June, 2023 (9 weeks). At every school, all the participants were briefed on the topic of the study as well as the purpose of the study. The researcher spent two days at each practicing school doing observations and interviewing as well as explaining questions that participants find difficult to understand in the questionnaire.

Quantitative data collection procedure

The researcher personally administered the questionnaires to the respondents for data collection on an agreed date (three days later). The researcher used two weeks to administer the questionnaire to the selected 123 pre-service teachers from the College practicing schools in Sissala East Municipality and Sissala West District. Arrangements made was with the Head Teachers in charge of each practicing school to see to the collection of the completed questionnaire for subsequent collection by the researcher. The collection of the questionnaire also took five (5) days. A total of one hundred and twenty-three (123) pre-service teachers received questionnaire for the study. However,

a total of 119 consented pre-service teachers' completed and returned their questionnaire. This gave a response and return rate of 96.75%.

Qualitative data collection procedure

Informants were assured of their secrecy and advised that they had the option to decline to answer any questions they believed were not necessary before the interview even started. It highlighted the significance of open lines of communication between interviewers and subjects in order to enable candid discussion and expression of the subjects' opinions about inclusive classrooms practices taking place in their classrooms, as well as to help them step back and re-evaluate their understanding of their roles and responsibilities based on their remembered actual classroom experiences. The researcher used a structured interview guide to gain an in-depth understanding of pre-service teachers' perceptions of inclusive classrooms, how the perceptions influence their teaching of mathematics, and the perceived challenges pre-service teachers encounter in teaching mathematics: The proceeding of the interview was audiotaped and transcribed subsequently.

In contrast, observational research was done to assess the kinds of strategies pre-service teachers employ in their classes to address the issue of inclusion when instructing mathematics. Field notes were taken throughout the observation process, which involved the constant use of an observation checklist. The results from the questionnaire may not have been sufficient, thus observation was done to supplement them. To collect observational data, the researcher saw two lessons from a school's Early Grade (EGE) and upper elementary classes while visiting 10 different schools and classrooms where the mentees were enrolled. A maximum of 45 minutes lesson was observed and the observational checklist was ticked based on classroom context, mode of lesson delivery, and mode of lesson delivery activities (see appendix C). Notes were also taken based

on the classroom context, mode of lesson, and mode of delivery activities. On the same day that the session was observed, a verbatim transcription of each videotape recording of the lesson was made. Since some of the witnessed occurrences and other pertinent topics would still be fresh in people's minds, doing this helped to ensure the authenticity and correctness of the transcribing.

Data Analysis Procedure

In mixed-method research, both quantitative and qualitative data are analysed while analysing data (Creswell & Plano Clark, 2007). Each data set was evaluated using the proper methodology, with both qualitative and quantitative analyses being performed on both quantitative and qualitative data. Although there are similarities in the steps involved in data preparation, exploration, analysis, representation, and validation, Creswell and Plano Clark (2007) hypothesised that in mixed method research, the analysis is based on the study's design.

Data Analysis

The statistical methods used in analysing the data were descriptive statistics such as simple percentages, charts, and frequency distribution tables. Frequency tables and charts were used to analyse the bio-data of the respondents. Percentages and frequency distribution tables were used to calculate the various items or statements that answered the research questions. In order to facilitate scoring and analysis of the data, the completed copies of the questionnaire serially numbered were coded and tabulated with the aid of SPSS version 26.0. The following values given were to the responses: 1 = "strongly agreed"- (SA), 2="Agreed"- (A), 3 = "uncertain" 4 = "Disagreed"- (D), and 5 = "Strongly Disagreed?"- (SD). During the analysis, 1 and 2 representing strongly agree and agree respectively were merged and 4 and 5 representing disagreed and strongly

disagreed respectively were also merged. All, the negatively worded items scored were re-coded. Tables of frequency and percentages were used to organise the data, properly calculated and analysed to respond to the research questions.

Qualitative data analysis

The voice-recorded information was stored on a PC and a backup pen drive. To achieve more accuracy throughout analysis, the voices were verbatim recorded and transcribed. The transcripts were then segmented, carefully reviewed, and compared using a theme framework to look for similarities and contrasts. A matrix-based analytical technique for organizing and synthesizing data is the thematic framework analysis (Ritchie, Spencer, & O'Connor, 2003). It is helpful for categorising and arranging data into categories for analysis based on themes, concepts, and emerging categories. The five steps for managing and interpreting data are outlined in the Analytical Framework. The researcher first read over the bulk data multiple times to become familiar with it. The development of concepts came next. This was accomplished by referring to recurrent problems and themes that showed up in the data. The next stage involved applying the produced initial themes to the complete data set. Next was the sorting of data according to the themes created and finally, the researcher summarized the data by reducing the bulk data based on the set objectives. For easy analysis, the interview responses and observation comments were grouped into four, namely: Pre-service teachers A, B, C and D. Each group contains five participants.

Ethical Considerations

Research ethics are crucial, especially when it involves human subjects. According to Bassey (2010), ethical behaviour should be viewed through the lenses of respect for democracy, respect for the truth, and respect for people. Similar to this, Cohen, Manion,

and Morrison (2011) suggest two things to look out for when it comes to ethical considerations: first, how the research has been conducted in relation to the research subject (aspects like informed consent, confidentiality, and people involved), and second, acknowledging the contributions of all those who have been involved in the research as well as outright recognizing those whose research influenced this particular study. After all, permissions were granted, the data collection began. The first visit at the school was to meet with the Mathematics pre-service teachers and resource persons (Mentors) to discuss the research project in general. These included discussions about the purpose, participants' roles, ethical issues, and methods of data collection. The ethical issues the researcher considered were;

Informed consent: Prior to starting the research, the researcher informed the participants about its goals, procedures for collecting data, and scope. Additionally, the researcher described to them their regular roles; this was crucial because the technique was very different from the conventional face-to-face approaches. In accordance with this, the researcher got their written and recorded informed consent.

Harm and risk: In this study, the researcher made sure that no volunteers were placed in an environment where their involvement may endanger them physically or psychologically.

Honesty and trust: Strict adherence to all ethical principles acts as a benchmark for the integrity and dependability of the data gathered and the related data analysis.

Confidentiality: Participants received assurances that all information they supplied would be kept private and wouldn't be used for any other purpose than this study. All data collected will be stored in a secure place and destroyed after the study is completed.

Anonymity: Here, it was difficult to protect the participants' identities because they were well-known to the rest of the school community. However, every effort was made to prevent their real names from being used and to prevent their identities from being made public.

Voluntary Participation: Despite all the safety measures described, it was made plain to the participants that the study was being done for academic purposes and that their participation was wholly voluntary. Nobody was compelled to take part. The option to leave the study before the third week of data collection was disclosed to participants.

Professional ethics

According to Creswell (2012), "Professional ethics refers to the moral commitment that scientists are expected to make to obtain unbiased and accurate data about real phenomena." Based on the above, this research was conducted ethically for the following reasons:

1. The researcher was been objective in reviewing the literature and obtaining data.

2. The researcher refrained from falsification and/or fabrication of data.

3. The researcher in all cases had described the methodology used to obtain the data.

Accountability: The research was carried out in an open and transparent manner, and participants may check the findings.

Publishing ethics: According to Auriacombe and Mouton (2007), one of the fundamental ethical rules for publishing social research is that sources must be acknowledged. This research was done in compliance with the following:

1. Works of all authors used in this document have been properly acknowledged, in a list of references.

2. All other written work was free of plagiarism

Relationship with subjects: Participants always have the right to secrecy, anonymity, and privacy. The right of an individual to choose when, where, to whom, and to what extent his or her attitudes, ideas, and actions will be revealed is how Schumacher and McMillan (2010) defined privacy and anonymity. The following measures were adopted in this study:

1. All subjects had the right to express their viewpoints

2. No harm was done to any of the participants, be it physical or emotional

3. A summary of the rationale of the research project was explained to participants at the beginning of the interviews as well as in the cover letter.

Publication of results: According to De Vos (2005), a study's findings should be presented in writing, should be valuable, and should be regarded as research. This investigation's report is clear to ensure that whoever uses it may rely on it.

Chapter Summary

This chapter discussed the methodological procedure that was followed in the study. Issues relating to population, sampling procedure, instrumentation, data collection, and analysis as well as the ethical principles were discussed. Descriptive statistics, as well as content and thematic analysis help, answered the research questions. The next chapter presents the analysis of data collected and the discussion of findings.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents data collected from the pre-service teachers' perceptions of inclusive classrooms and their influence of teaching mathematics in the Sissala East Municipality and Sissala West District of Ghana where pre-service teachers' were sent for internship. The data collected were structured into four (4) sections, the first section presents a section focused on the background information of the respondents, the second section deals with the presentation and analysis of data based on the research design, third section presents a discussion on the findings and fourth section focused on the summary of findings.

Research Questions

The following research questions were set to guide the study:

1. What are the pre-service teachers' perceptions of inclusive classrooms in the Sissala East Municipality Sissala West District?
2. What are the pre-service teachers' teaching methods in teaching mathematics in in the Sissala East Municipality Sissala West District?
3. How do pre-service teachers' perceptions of inclusive classrooms influence their teaching of mathematics in those practicing schools in the Sissala East Municipality?
4. What perceived challenges do pre-service teachers' encounter in teaching mathematics in the Sissala East Municipality.

Background Information of the Respondent

The background information of the respondents centred on their gender, age, entry qualification, number of years they had been undergoing Mathematics training, the class level they were teaching as at the time of the study and training received on inclusive classrooms. Frequency tables, percentages and charts were used to present the background information of the respondents.

Gender distribution of pre-service teachers (Mentees).

Data set on gender distribution of the respondents (as shown in Figure 4.1)

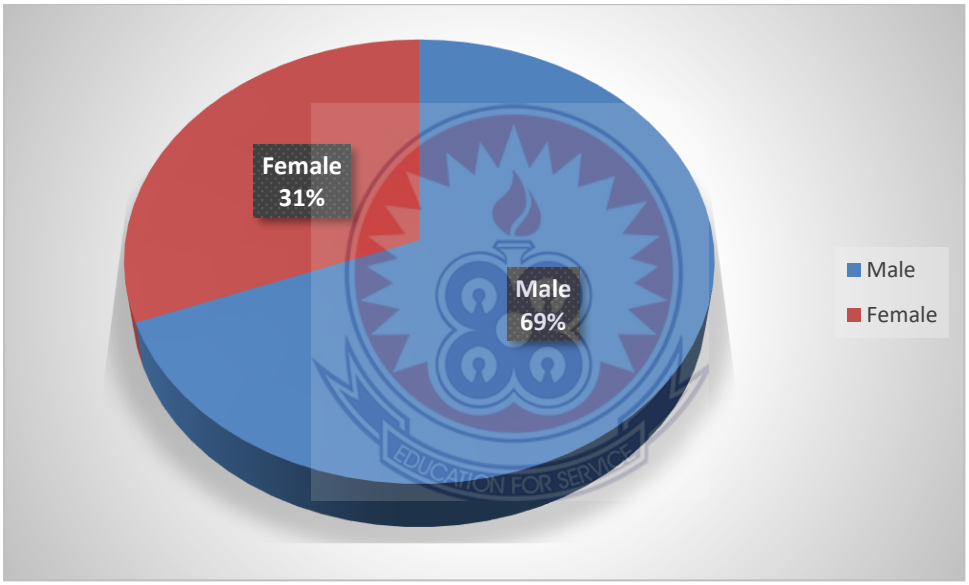


Figure 4.1: Gender Distribution of Pre-Service Mathematics Teachers.

Figure 4.1 shows that out of One Hundred and Twenty-Three (123) respondents, Eighty-five (85) respondents representing 69% were male whereas Thirty-Eight (38) representing 31% were female. The result as shown in Figure 4.1 indicates that male pre-service teachers were the majority of the respondents in the study.

Age distribution of pre-service teachers

The pre-service teachers were requested to indicate their age range as applied to them (see Figure 4.2).

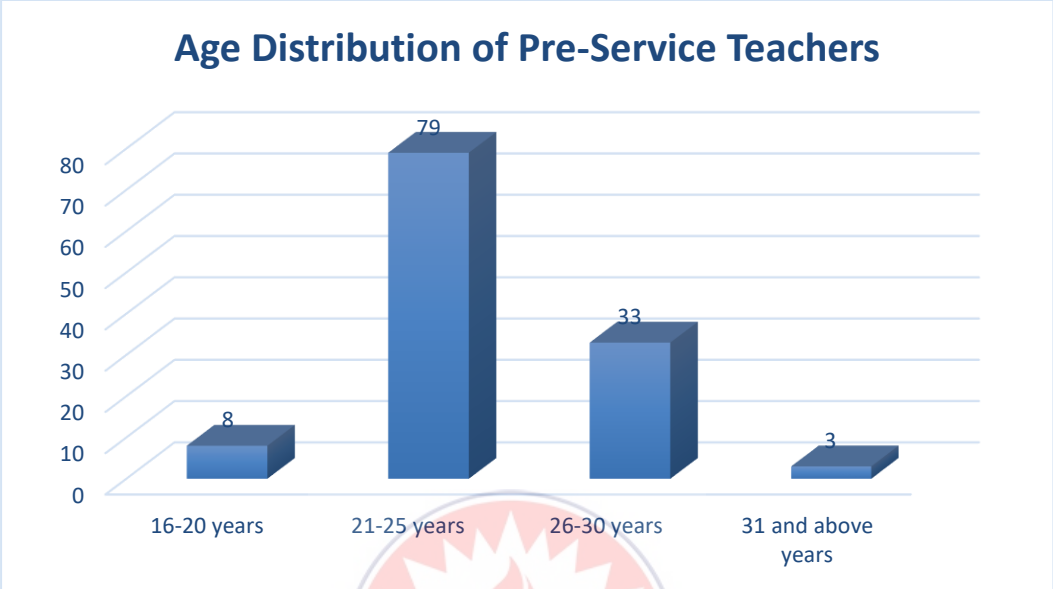


Figure 4.2: Age Distribution of Pre-Service Mathematics Teachers

In figure 4.2 Eight of the respondents representing 6.80% indicated that they fell within the age range of 16-20 years, Seventy-nine (79) of the respondents representing 63.95% indicated that they were within the age range of 21-25 years, Thirty-Three (33) of the respondents representing 27.21% were within the age range of 26-30 years and finally, 2.04% representing 3 respondents were within the 31 and above years age brackets.

Academic Entry Requirement of Pre-service Teachers

The pre-service teachers were asked to provide information on their senior high school background by simply indicating their West Africa Examination Council (WAEC) performance obtained from their various Senior High School Level.

Table 4.1: Performance of WASSCE Core Mathematics by pre-service mathematics teachers'

Grades	Frequency (F)	Percentages (%)
A	42	34
B2	9	7.5
B3	58	46.9
C4	5	4.1
C5	9	7.5
Total	**123**	**100**

Source: Field Data – Questionnaire (2023)

Majority of the respondents (58 representing 46.9%) indicated that they had Grade "B3" in WASSCE Examination, 34.0% representing 42 respondents indicated that they had Grade "A" , 7.5% representing 9 of the respondents indicated they had Grade "B2" , 7.5% representing 11 of the respondents indicated that also had Grade "C5" and finally, 5 respondents representing 4.1% also indicated that they had Grade "C4". This indicates that majority of the respondents in the study

Data collected indicates that 67 of the respondents representing 54.5 % had no mathematics teaching experience before gaining admission into the Tumu College of Education, 30 of the respondents representing 24.4% indicated that, they had taught Mathematics as untrained teachers for only three (3) years before coming into the College, 19 of the respondents representing 15.5% have had mathematics teaching experience for two years before coming into the College and 7 of the respondents indicated that, they had one year mathematics teaching experience before gaining

admission into Tumu College of Education. Figure 4.3 is a diagrammatical representation of number of years of teaching Mathematics of the respondents.

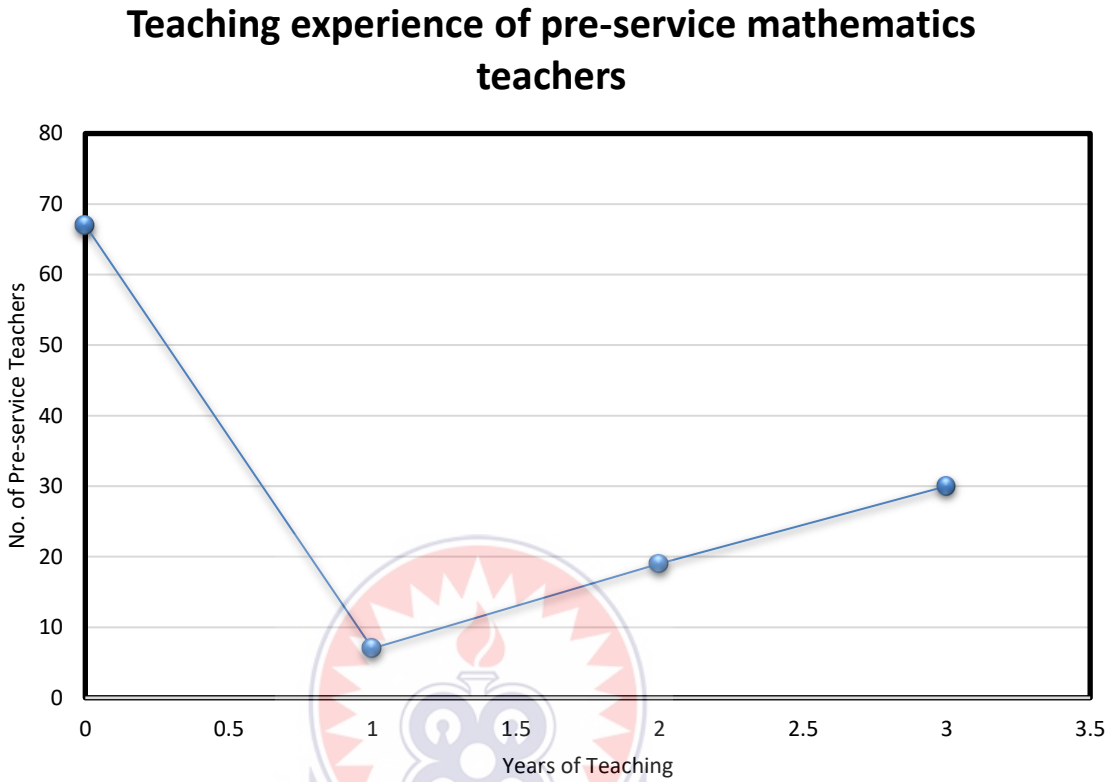


Figure 4.3: Number of years of teaching mathematics against number of teachers

Class Level of Basic School Teachers

The respondents were further required to indicate the class level they teach Mathematics.

Table 4.2: Class level of pre-service mathematics teachers

Class Level	Frequency (F)	Percentage (%)
Early Grade	57	46.3
Upper Grade	66	53.7
Total	**123**	**100**

Source: Field Data – Questionnaire (2023)

The results shows that, 66 of the respondents representing 53.7% do practicing teaching at Upper Primary. and 57 of the respondents representing 46.3% do practicing teaching at the Early Grade. This indicates that majority of the respondents in the study teach at Upper primary. A summary of respondents and their academic qualifications before gaining admission into the Tumu College of Education is presented in Table 4.1.

Training received on inclusive classrooms

Item six on the bio data sought to find out whether the respondents had received any sort of training on inclusive classrooms.

Table 4.3: Training received on inclusive classrooms by the Respondance.

Training	Frequency (F)	Percentages (%)
Yes	97	78.9
No	26	21.1
Total	**123**	**100**

Source: Field Data - Questionnaire (2023)

Respondents who had training in inclusive classrooms were higher, 97 of the respondents representing 78.9% and those respondents who missed the training were without training in inclusive classrooms were the less, 26 (21.1%). The result clearly points to the fact that the respondents in the selected basic schools had been prepared

to practise inclusive classrooms. Although few 26 (21.1%) of the respondents did not receive any form of inclusive classrooms, it may not derail the preparedness of the former. The few respondents could be trained while on the practise by those who had the Table 4.3 presents the results relating to inclusive classrooms training for the respondents.

Presentation and Analysis of Data

This section presents data gathered from the field in an attempt to answer the stated research questions. The analysis was done according to the stated research objectives of the study.

Research Question 1: What are the pre-service teachers' perceptions of inclusive classrooms in Tumu College of Education?

Research Question 1 indicated that the first objective of the study sought to explore pre-service teachers' perceptions of inclusive classrooms in Tumu College of Education. In view of five (5) point Likert scale used, frequency table and percentages were used. The results are presented in Table 4.4.

Table 4.4: Mathematics Pre-service Teachers' Perception of Inclusive classrooms

Statement	SA		A		UN		SD		D	
	F	%	F	%	F	%	F	%	F	%
The integration of students with special needs will necessitate extensive retention of general classroom teachers.	80	65	33	27	5	4	4	3	1	1
The integration may have emotional effect on learners with special needs.	33	27	72	59	9	7	4	3	5	4
It is more difficult to maintain order in general Classroom that contains pupils with special needs than in one that does not contain pupils with special needs.	37	30	65	53	15	12	2	2	4	3
Create conducive learning environment that Meets the needs of all learners.	23	19	77	63	16	13	3	2	4	3
Slow down the process of addressing and Responding to the diversity of needs of all Children in the learning environment.	33	27	62	50	17	14	4	3	7	6
Enhancing social interaction and inclusion Among pupils and teachers.	28	23	76	62	15	12	1	1	4	3

Source: **Field Data – Questionnaire (2023)** **N = 123**

Key: Strongly agree = SA, Agree = A, UN = Uncertain, D = Disagree, SD = Strongly disagree, % = Percentage, F = Frequency, N = Total number of respondents.

Results in Table 4.4 show a description of the responses of the respondents in relation to pre-service teachers' perceptions of inclusive classrooms. Table that majority of the respondents (113, 92%) agreed to the statement that the integration of learners with special needs will necessitate extensive retention of general classroom teachers. In addition, many of the respondents (105, 86%) agreed to the notion that integration will likely have emotional effect on learners with special needs.

One hundred and two (102) respondents (83%) agreed that it is more difficult to maintain order in a general classroom that contains pupils with special needs than in one that does not contain pupils with special needs. One hundred of the respondents

(100, 82%) agreed that they create conducive learning environment that meets the needs of all learners.

Ninety-five of the respondents, representing (77%) agreed that there is slow down the process of addressing and responding to the diversity of needs of all children in the learning environment. Finally, concerning enhancing social interaction and inclusion among learners and teachers, one hundred and four (104) representing 85% agreed to this statement.

From Table 4.4, it was found that the integration of students with special needs will necessitate extensive retention of general classroom teachers was the highest responses (92%) and slows down the process of addressing and responding to the diversity of needs of all children in the learning environment was the lowest responses (77%). This indicates that, the highest Mathematics perceptions of inclusive classrooms was the integration of learners with special needs will necessitate extensive retaining of general classroom teachers.

Interview Guide Result on Pre-service Teachers Perceptions of Inclusive classrooms

Twenty pre-service teachers interviewed were to capture research question one, research question three and research question four. Twenty pre-service teachers selected were from the one- hundred and twenty-three (123) Pre-service teachers who responded to the questionnaire. The transcripts were then broken down into discrete parts, then examined closely and analyzed for similarities and differences using thematic framework.

Researcher's Question 1: In your opinion what is the meaning of inclusive classrooms?

Pre-service teachers' knowledge and understanding of inclusive classrooms investigated were to see how they perceived inclusive classrooms. It was important for the researcher to know how they understood inclusive classrooms because their understanding determined the nurturing of inclusive classrooms practices in their classrooms.

The following are some of their responses:

Pre-service teachers A and B answered by saying that:

> *Inclusion is a good thing because all learnerts learn together from the lower level of education and are taught to love one another and cooperate with all the pupis regardless of individual condition* ***(Interview Data, 2023).***

Similarly, Pre-service teachers C and D also said that:

> *Inclusion should be for all pupilss with disabilities except those with mental disorders because this group has a very special type of disability that cannot be mixed with other pupils in the same classroom and the inclusion should be in school. This will give the teacher a room to teach children with more or less capacities to learn* ***(Interview Data, 2023).***

Such response show those pre-service teachers perceive inclusive classrooms selectively, including only the pupils with certain disabilities and excluding others (those with mental retardation). This response is in line with Kapinga (2010) who found that some pre-service teachers had negative perception on inclusive due to the fact that mental retarded children have a tendency to salivate. Likewise, Moyi (2012) study on Access to education for pupils with disabilities in Uganda, where he found about 71%

of children with visual problems attending school compared to about 36% of children who had difficulty with self-care.

Question: How is inclusive classrooms relate to your regular practice of teaching mathematics?

The following are some of the responses:

> *Pre-service teacher A had the following explanation: Yes, it create a conducive learning thus helps us to make some changes to the environment to accommodate the special needs children to the mainstream classes.* ***(Interview Data, 2023)***

Pre-service teachers B and C commented that:

Through creating conducive learning environment we are able to admit children with disability to regular school and adjust the school environment so that they can share and learn with the others.

(Interview Data, 2023)

Finally, Pre-service teacher D said that:

> *This helps us make reasonable adjustments in the school to accommodate children with special educational needs.* ***(Interview Data, 2023).***

This interview response affirms the questionnaire responses in Table 4.4 that 82% of the respondents agreed that inclusive classrooms create conducive learning environment that meets the needs of all learners.

Question: Does integration of pupilsm with special needs necessitate extensive retention of general classroom teachers? The following are some responses:

Pre-service teachers A and B had the following explanation:

> *Yes, it is too boring especially when the special child is not getting the concept been taught. We sometimes get confuse whether we did not teach the concept well so we have extra time with that special child in the classroom.*

Similarly, Pre-service teachers C and D said that:

> *The extensive retention of us in the classroom is not helping us especially we the subject pre-service teachers. You can bear me witness during the lesson observation, when my period was over how I was struggling to stay in order for the special pupils to understand the lesson. In fact, the integration of pupils with special needs necessitate extensive retention of us in the classroom* ***(Interview Data, 2023).***

Discussion of Result of Research Question I

This research question sought to explore pre-service teachers' perceptions of inclusive classrooms in basic schools in the Sissala East Municipality and Sissala West District where pre-service teachers in Tumu College of Education were posted.

Table 4.4 shows that 113 of the respondents representing 92% agreed to the statement that the integration of students with special needs will necessitate extensive retention of general classroom pre-service teachers, 5 of the respondents representing 4% were uncertain and 4 of the respondents representing 3% disagreed. According to Polidore, Edmonson, and Slate (2010) teaching in itself can be a challenge and extensive retention of pre-service teachers in the classroom is a problem. However, without support, a positive attitude, hands-on training, utilizing best practices, and forestalling barriers that may impede service delivery, educating pupils becomes burdensome and overwhelming for pre-service teachers at all levels of experience; thus, support is imperative.

In addition, 105 of the respondents representing 86% agreed to the notion that integration may have emotional effect on pupils with special needs, 9 of the respondents

representing 7% were uncertain and 9 of the respondents representing 7% disagreed. According to research by Pavri and Monda-Amaya (2001), Wylde (2007) and Shongwe (2005) inclusive classrooms do not have emotional effect on students with special needs rather it leads to a sense of belonging and membership and it impacts positively on the social wellbeing of students with barriers to learning.

One hundred and two (102) of the respondents representing 83% agreed that it is more difficult to maintain order in a general classroom that contains pupils with special needs than in one that does not contain pupils with special needs, 15 of the respondents representing 12% were uncertain and 6 of the respondents representing 5% disagreed. This finding is against the findings of Mentis et al., (2005) who concluded that teachers are able to maintain order in a general classroom with special needs pupils as a result of pre-service teachers' positive attitudes about inclusive classrooms. Similarly, Tilton (2000) also states that a teacher in an inclusive classroom needs a positive attitude in order to move beyond initial fear and incomprehension to discover the benefits of the inclusive classroom.

One hundred (100) of the respondents representing 82% agreed that they create conducive learning environment that meets the needs of all learners, 16 of the respondents representing 13% were uncertain and 7 of the respondents representing 5% disagreed. According to Barton and Armstrong (2007) inclusive classrooms helps make the school environment responsive to all learning needs through restructuring programs and environment to provide equal opportunities for all. However, 95 of the respondents representing 77% agreed that there is slow down the process of addressing and responding to the diversity of needs of all children in the learning 17 of the respondents representing 14% were uncertain and 11 of the respondents' representing 8% disagreed.

Finally, concerning enhancing social interaction and inclusion among students and teachers, 104 of the respondents representing 85% agreed to this statement, 15 of the respondents representing 12% were uncertain and 5 of the respondents representing 4%. This is in line with the findings of Akomeah (2015) who found that in general, pre-service teachers held positive attitudes towards inclusive classrooms. According to the results of the study, the pre-service teachers agreed that inclusive classrooms enhanced social interaction and inclusion among the pupils and thus minimizing negative stereotypes on special needs pupils.

However, for inclusive classrooms to succeed, the right knowledge and skills need to be transferred to teachers' especially teachers so as to handle learners with diverse abilities (Njoka, et al., 2012). Hence, the urgent need to change training and leadership programs that are currently disjointed to incorporate special needs studies has been highlighted in many forums

Research Question 2: What teaching methods do pre-service teachers' use to teach mathematics in their practicing basic schools in Sissala East Municipality?

The second objective of the study sought to assess the teaching methods pre-service teachers used in teaching mathematics in basic schools in the Sissala East Municipality. The researcher wanted to determine the kind of teaching methods pre-service leachers' used in teaching mathematics. In view of five (5) point Likert scale used, frequency table and percentages were used. The result is presented in Table 4.5.

Table 4.5: Teaching Methods Pre-Service Teachers' Use in Teaching Mathematics.

Statement	SA		A		UN		SD		D	
	F	%	F	%	F	%	F	%	F	%
Experimental method of Teaching.	71	58	43	35	4	3	2	2	3	2
Learner's-centred method.	42	34	76	62	1	1	1	1	3	2
Expository teaching method.	28	23	82	67	4	3	6	5	3	2
Differentiation instruction.	27	22	70	57	12	10	11	9	1	1
Conventional teaching method.	17	14	64	52	32	26	1	1	9	7
Mathematics teaching model.	36	29	50	41	33	27	1	1	4	3

Source: **Field Data – Questionnaire (2023)**

Key: SA=Strongly agree, A=Agree, UN=Uncertain, D=Disagree, SD=Strongly disagree, %= Percentage, F= Frequency, and N=Total number of respondents.

Results in Table 4.5 show a description of the responses of the respondents in relation to the teaching methods pre-service teachers used in teaching mathematics. Table 4.5 reveals that majority of the reapondents (114, 93%) agreed to the statement that they used experimental method of teaching. When respondents were asked whether they used learner-centred method of teaching, majority of the respondents (118, 96%) agreed to the question.

Also, many of the respondents (110, 90%) agreed to the question that they used expository teaching method. Concerning using differentiation instruction, most of the respondents (97, 80%) agreed to this assertion. Many of the respondents (81, 66%) agreed that they used conventional teaching method. Finally, many of the respondents (86, 70%) agreed that they used Mathematics teaching model.

From Table 4.5, it was clearly observed that, the highest positive responses (96%) were from respondents who used learner-centred method in teaching mathematics while the lowest positive responses (66%) were from respondents who used conventional teaching method. This indicates that, learner-centred method was the teaching method most pre-service teachers learned in Tumu College of Education used in teaching mathematics in basic schools in the Sissala East Municipality and Sissala West District.

Observation checklist Results

After using the questionnaire to determine the kind of teaching methods pre-service teachers used in teaching mathematics, the researcher again used observation checklist to assess the teaching methods pre-service teachers used in teaching mathematics. The researcher first observed classroom setting or context and mode of lesson delivery activities. Finally, the researcher observed the teaching methods used by the Mathematics pre-service teachers. The result is presented in Table 4.6.

Classroom Context: Classroom setting is one of the factors that contribute to the determinants of teaching methods which the pre-service teacher uses to facilitate learning. Most of the classrooms investigated were found to be poorly suited for teaching and learning of mathematics. For instance, during lesson observation of Pre-service teacher A, B and C, their classrooms lacked display of teaching/learning materials on the wall such as the flip charts showing different formulas, multiplication table, mathematical set instruments, geometrical photos, and some mathematical figures. In the case of sitting arrangement, most of the pupils were interested to sit with the same sex and one desk was shared by two pupils. Pupils with low mathematical skills preferred to sit at the back in the class. Inadequate chairs and tables were available for the pre-service teacher in the classrooms; pre-service teachers used a desk as multipurpose furniture. Arrangement of desks or routine in the classroom discourages

interaction and class was averagely controlled making the class noisy while lesson was in progress as at the time of the research. Also, in Pre-service teacher D classroom it was observed that, the classroom was spacious, fully equipped with teaching and learning resources. The arrangement of desks and the routine in the classroom encourage interaction and class was impressively controlled enhancing pupils' active participation in the teaching and learning process.

Mode of Lesson Delivery Activities: In this study, the mode of lesson delivery activities helped the researcher to determine the kind of teaching methods Mathematics used and how successful it was. During the lesson, it was observed that, Pre-service teacher A, B and C motivated and awaked pupils' interest in solving geometry problems, encouraged pupils to share ideas and interact with each other in the classroom, guided pupils to do their class activities with ease through modelling the activities, exposed pupils to hands-on activities that increase their understanding of the topic and partly dramatize lesson through play as well as questions and answers.

Table 4.6: Matrix for Assessing the Teaching Methods Pre-Service Teachers' Used in Teaching Mathematics

Teaching Methods		T.A	T.B	T.C	T.D
Expository	Always			√	√
	Sometimes		√		
	Not at all	√			
Teacher-centred/Conventional teaching method	Always				
	Sometimes				√
	Not at all	√	√	√	
Experimental n	Always		√	√	√
	Sometimes	√			
	Not at all				
Learner-centred	Always		√	√	√
	Sometimes	√			
	Not at all				
Differentiated Instruction	Always				√
	Sometimes	√	√		
	Not at all			√	

Source: Field Data-Observation checklist (2023)

Note: T.A, T.B, T.C, and T.D = Teacher A,B,C, and D.

Table 4.6 shows the rating of all the participants teaching methods during the lesson observation. Table 4.6 reveals that Pre-service teachers C and D always use expository teaching method in teaching mathematics in the classroom. Sometimes Pre-service teacher B also uses the expository method of teaching but Pre-service teacher A does not use the expository method of teaching.

In addition, it was observed that Pre-service teacher D sometimes uses conventional method in teaching mathematics in the classroom. Pre-service teacher A, B and C do not use the conventional method in teaching mathematics in the classroom. Also, it was observed that Pre-service teachers B, C and D always use experimental method in

teaching mathematics in the classroom while sometimes Pre-service teacher A also use experimental method in teaching mathematics in the classroom.

Moreover, it was observed that Pre-service teachers B, C and D always use the learner-centred method in teaching mathematics while Pre-service teacher A sometimes use the learner- centred method in teaching mathematics in the classroom. Finally, it was observed that Pre-service teacher D always uses the differentiated instruction in teaching mathematics, sometimes Pre-service teacher A and B also use the differentiated instruction in teaching mathematics but Pre-service teacher C do not use the differentiated instruction in teaching mathematics in the classroom.

From Table 4.6, it was observed that during lesson observation, many of the pre-service teachers (Teacher B, C and D) always use the learner-centred method in mathematics in the classroom while many of the pre-service teachers (Teachers A, B and C) do not use the conventional method in teaching mathematics in the classroom. The observation 5results confirms the responses in Table 4..5 Which showed that the highest positive responses (96%) were from respondents who used learner-centred method in teaching mathematics while the lowest positive responses (66%) were from respondents who used conventional teaching method..

Table 4.7: Frequency Distribution Table of Matrix for Assessing the Teaching Methods Pre-Service Teachers' Used in Teaching Mathematics

Teaching Method	Frequency	T. A	T. B	T.C	T. D
Expository	Always	1	0	0	0
	Sometimes	0	1	1	1
	Not at all	0	0	0	0
Teacher-centered	Always	1	0	0	0
	Sometimes	0	1	1	0
	Not at all	0	0	0	1
Experimental	Always	0	0	0	0
	Sometimes	1	1	1	0
	Not at all	0	0	0	1
Learner-centered	Always	0	0	0	0
	Sometimes	1	1	1	1
	Not at all	0	0	0	0
Differentiated Instruction	Always	0	1	1	0
	Sometimes	1	0	0	1
	Not at all	0	0	0	0

Source: Field Data Observation Checklist (2023)

Note: T.A, T.B, T.C, and TD = Teacher A, B, C, and D.

Discussion of Result of Research Question 2

This section discusses findings realised from the data analysis from the field after obtaining answers to the stated were merged into "Agree": while Strongly Disagree and Disagree: were merged into research question. The five-point Likert scale employed in the instrument: Strongly Agree and Agree "Disagree" for the purposes of discussion.

This research question sought to assess the teaching methods pre-service teachers use in teaching mathematics in basic schools in the Sissala East Municipality.

Result in Table 4.5 reveals that 114 of the respondents representing 93% agreed to the statement that they use experimental method of teaching. 4 of the respondents representing 3% were uncertain and 5 of the respondents representing 4% disagreed to

the statement. This confirms the findings of Durdcu (2010) on comparing experimental teaching method (ETM) with the teacher centred traditional teaching method based on students' success.

In addition, when respondents were asked whether they use learner-centred method, 118 of the respondents representing 96% agreed, 1 of the respondents representing 1% were uncertain and 4 of the representing 3% disagreed. According to Fosnot (2005) and Hiebert (1997) student-centred instructional practices lay a strong enough mathematical foundation in instructed concepts that students' ability to perform procedural tasks would also be strengthened despite the decrease in procedural learning methods. Similarly, Froyd and Simpson (2010) emphasised that in pupil/learner-centred method, knowledge of learners' influence future learning, and this can be in Mathematics or other courses where calculation and application of concepts are needed. Also, 110 of the respondents representing 90% agreed to the notion that they use expository teaching method, 4 of the respondents representing 3% were uncertain and 9 of the respondents representing 7% disagreed. Bruner (1960) cited in Nannen (2000) claims that expository teaching produces bench-bound learners whose motivation for learning is likely to be extrinsic to the task at hand pleasing the teacher, getting into college or artificially maintaining self-esteem. Also, Maheshwari (2013) concluded that teachers who use expository teaching present information to their students in a purposeful way that allows students to easily make connections from one concept to the next.

Concerning differentiation instruction, 97 of the respondents representing 79% agreed to this assertion, 12 of the respondents representing 10% were uncertain and 12 of the respondents representing 10% disagreed. Konstantinou-Katzi, et al. (2013) studies on differentiation of teaching and learning Mathematics: an action research study in

tertiary education point out that differentiated instruction has a positive effect on student engagement and motivation and improves students' understanding of difficult calculus concepts. According to Tomlinson (2001) differentiation allows the teacher to plan and carry out varied approaches to content (what student learns); process (how the student learns and how you teach); and product (how the student what they have learned) in anticipation of and in response to pupils differences in readiness (prior mastery of knowledge, understandings, and skills); interest (the student's curiosity and passion); and learning profile (how the student learns best).

Moreover, 81 of the respondents representing 66% agreed that they use conventional teaching method, 32 of the respondents representing 26% were uncertain and 10 of the respondents representing 8% disagreed. According to Uyoata (2006) conventional teaching approach encourages rote memorization of Mathematics concepts which leads to easy for getting the concepts learnt. Finally, 86 of the respondents representing 70% agreed that they use Mathematics teaching model, 33 of the respondents representing 27% were uncertain and 5 of the respondents representing 4% disagreed. A study conducted by Ozdemir and Uszel (2011) on Teacher

Instructional Practices in Mathematical Modelling reveals that mathematical modelling makes an important contribution in terms of developing problem solving skills of pupils. Also, modelling emphasizes mathematical relations and ensures for pupils to develop their learning styles and understanding of Mathematics.

The findings in Table 4.5 and Table 4.6 indicates that majority of the pre-service teachers used experimental method and learner-centred method as a teaching method in teaching mathematics in the basic schools in Sissala East Municipality and Sissala West Distrct. According to Hamisu (2017) experimental method and learner-centred

method of teaching helps students more active in the learning process. Also helps pupils find the theories and rules that are discovered by using Mathematics knowledge in high level on their own by trial and improve process, it makes learning more enjoyable, easier and increases their

As by Centre for Curriculum Studies in Africa (1987) cited in Kakai (2011), no particular teaching-learning strategy gives optimum learning conditions to all students. This implies that pre-service teachers need to combine more than one teaching method to enhance pre-vice teachers must bear in mind that in teaching mathematics, pupils level of understanding varies hence the teaching instruction must link students own abilities and interest which will help achieve the stated teaching objectives.

Result of Research Question 3: How do pre-service teachers perceptions of inclusive classrooms influence the teaching of Mathematics in Tumu College of Education?

The third objective of the study sought to examine how pre-service teachers perceptions of inclusive classrooms influence their teaching of mathematics pre-service teachers' in the Tumu College of Education in basic schools in the Sissala East Municipality. In view of five (5) point Likert scale used. Frequency table and percentages were used. The result is presented in Table 4.8

Table 4.8: Influence of pre-service teachers' perceptions on teaching mathematics

Statement	SA		A		UN		SD		D	
	F	%	F	%	F	%	F	%	F	%
Knowledge and experience	33	27	78	63	5	4	1	1	6	5
Cultural values	42	34	74	60	2	2	1	1	4	3
Personal attitudes	33	27	71	58	10	8	4	3	5	4
Mode of communication	35	29	58	47	25	20	1	1	4	3
Expectation	33	27	66	54	19	15	1	1	4	3
Motivation and class size	38	31	57	46	22	18	2	2	4	3

Source: Field Data - Questionnaire (2023) **N = 123**

Key: strongly agree SA, agree A, Un = Uncertain, D =disagree, SD =strongly disagree , % =percentage, F = frequency and N = Total number of respondents.

Results in Table 4.8 show a description of the responses of the respondents in relation to basic school teachers' perceptions of inclusive classrooms influence on teaching mathematics. Table 4.8 reveals that majority of the respondents (111, 90%) agreed to the statement that knowledge and experience influence their teaching of mathematics. When respondents were asked whether cultural values influence their teaching of mathematics, majority of the respondents (116, 94%) agreed. Concerning personal attitudes, most of the respondents (104, 85%) agreed to this assertion. Many of the respondents (93,76%) agreed that mode of communication influence their teaching of mathematics. With regard to expectation, most of the respondents (99, 81%) agreed to the statement. Finally, majority of the respondents (95, 77%) agreed that motivation and large class size influence their teaching of mathematics.

From Table 4.8 result, it was found that, cultural values influences their teaching of mathematics was the highest positive response (94%) and mode of communication influence their teaching of mathematics was the lowest responses (76%). This indicates that, the highest influence of pre-service teachers' perceptions of inclusive classrooms of teaching mathematics was cultural values.

Interview Guide Result on Pre-service Teachers Perceptions of Inclusive classrooms and their Influence on Teaching Mathematics

Again, the researcher wanted to use the interview guide to establish how the pre-service teachers' understanding of inclusive classrooms influences their teaching of mathematics. Is their understanding being translated into a certain teaching approach that the teachers have adopted as a result of inclusive classrooms? Teachers were now asked questions that meant to probe about teaching strategies, whether they have changed or not.

Question: The first question was; has your perception of inclusive classrooms helped you in any way in your teaching of mathematics?

Responses: The interviewees replied that their perception of inclusive classrooms has helped them in their teaching of mathematics during their teaching practice period in the basic schools,

For instance, Pre-service teachers A and B said that;

Yes, this has helped me prepare Individualized Education Plan (IEP) for monitoring the progress of students with disabilities in my classroom while teaching mathematics concept.

(Interview Data, 2023)

Similarly, Pre-service teachers C and D also commented that:

> *Yes, it has really helped me to be responsible to all pupils in my class. There is a saying that; A change in teacher beliefs on disability is a change in teacher practice; thus it has help me to be inclusive in the way I teach mathematics and always find ways to connect with my pupils. Effective teaching encompasses engagement, time management skills, scaffolding, encouraging, and supporting success. Thus, my perception of inclusive classrooms helps me to fuse what effective teaching encompasses in order to be aware and sensitive to all learners and adjusting teaching to factor in each pupil's prior experiences while teaching mathematics in class.* ***(Interview Data, 2023)***

Question: Does your cultural values influence your teaching of mathematics?

The following are some responses:

Pre-service teachers A and B answered this question by pointing out that cultural values differ from one teacher to another depending on the tribe.

> *Our culture values really influence how we perceive children with or without special needs children in our classroom when teaching mathematics. Since, we are from the same tribe; our culture does not permit us to associate ourselves with disabled children or person Definitely, it will make us exclude those children in the teaching and learning process or activities.* ***(Interview Data, 2023)***

Similarly, Pre-service teachers C and D also commented that:

> *Our cultural values have great influence on our teaching of mathematics in the classrooms. For instance, one of our greatest cultural values is respect. Therefore, when I am in class and pupils are disrespecting my orders in the class. definitely, this will affect the way am going to behave or explain the lesson to pupils.* ***(interview Data,2023)***

This interview response confirms the questionnaire responses in Table 4.8 that 94% of the respondents agreed that cultural values influence their teaching of mathematics.

Question: Has your mode of communication influenced your teaching of mathematics?

The following are some responses:

Pre-service teachers B and D commented that:

> *Our mode of communication also influence the way we teach mathematics in our classroom. Just imagine, me from the Northern region been posted to teach in the Fante land school (Winneba). I find it very difficult to explain certain geometric terms to the students. Even explaining the mathematics concept in the official language is a problem to some to understand. Sometimes I get frustrated in the teaching process due to language barrier* ***(Interview Data, 2023).***

Similarly, Pre-service teacher A and C also commented that:

> *Yes, mode of communication influences our teaching of mathematics in the classroom. For students to understand mathematics concept in the classroom, we must be able to communicate geometric ideas to students.* ***(Interview Data, 2023)***

This interview response confirms the questionnaire responses in Table 4.8 that 76% of the respondents agreed that mode of communication influence their teaching of mathematics,

Question: Does your knowledge and experience influence your teaching of mathematics?

Response:

All the interviewees were of the same responses that their knowledge and experience have great impact on their teaching of mathematics.

Pre-service teachers were of the views that:

> *Knowledge and experience are very important in teaching all manner of pupils in the classroom. These two (knowledge and experience) must move and work together. For instance, we may be well versed with the concept of inclusive classrooms but if we lack the experience we cannot give equal learning opportunities for those special needs pupils in the class.*

This interview response confirms the questionnaire responses in Table 4.8 that 90% of the respondents agreed that knowledge and experience influence their teaching of mathematics.

Discussion of Result of Research Questions 3

How does pre-service teachers' perceptions of inclusive classrooms influence their teaching of mathematics in basic schools in Sissala East Municipality?

This research question sought to examine how pre-service teachers' perceptions of inclusive classrooms influence their teaching of mathematics in pre-service teachers' in teaching attachment the Sissala East Municipality.

Result from Table 4.8 reveals that 111 of the respondents representing 90% agreed knowledge and experience influence their teaching of mathematics, 5 of the respondents representing 4% were uncertain and 7 of the respondents representing 6% disagreed. Webster, Villora, and Harvey (2012) surveyed physical education teachers concerning content relevance and found that experience is not a sufficient factor to distinguish expert from non-expert teaching performance. Yssel et al. (2007) also indicate that experienced teachers might be less inclined to adapt their classrooms and practices to meet In addition, 116 of the respondents representing 94% agreed to the notion that cultural values influence their teaching of mathematics, 2 of the respondents representing 2% were uncertain and 5 of the respondents representing 4% disagreed. Twum (2016) proposed that culture plays an important role in the perception of an individual or about something. Concerning personal attitudes, 104 of the respondents representing 85% agreed to this assertion, 10 of the respondents representing 8% were uncertain and 9 of the respondents representing 7% disagreed.

the needs of learners/s with more severe disabilities.

Moreover, 93 of the respondents representing 76% agreed that mode of communication influence their style of teaching mathematics, 25 of the respondents representing 20% were uncertain and 5 of the respondents representing 4% disagreed. With regard to expectation, 99 of the respondents representing 81% agreed that expectation influence their teaching of mathematics, 19 of the respondents representing 15% were uncertain and 5 of the respondents representing 4% disagreed. Bruner and Minturn (2000) showed that expectation could influence perception. Their studies concluded that expectation influences perception to a large extent. This suggests that once an impression is created concerning an object or about something or somebody at the back of the mind, it makes an ineradicable mark. The impression created affects an individual's perception about an object or someone either positively or negatively.

Finally, concerning motivation and large class size, 95 of the respondents representing 77% agreed to this statement, 22 of the respondents representing 18% were uncertain and 6 of the respondents representing 5% disagreed. According to Hayford (2013) many pre-service teachers manage classes with 35 or more pupils. In practice, the direct consequence of this phenomenon is work overload and difficulty in marking. Also, Asamoah-Gyimah (2002) and Angbing (2001) reported that teachers felt larger classes impinged/effect on teaching and learning process

Research Questions 4: What challenges do pre-service teachers encounter in teaching mathematics in Tumu College of Education.

Result of Research Question 4: What Perceived challenges do pre-service teachers encounter in teaching mathematics in Tumu College of Education?

The fourth objective of the study was to identify the challenges pre-service teachers encounter in teaching mathematics in basic schools in the Sissala East Municipality. In view of five (5) - point Likert scale used, frequency table and percentages were used. The result is presented in Table 4.8

Table 4.9: Challenges pre-service teachers encounter in teaching mathematics

Statement	S.A		A.		UN		SD		D	
	F	%	F	%	F	%	F	%	F	%
Inadequate teaching resources	17	14	54	44	19	15	18	15	15	12
Lack of competency in managing pupils with special needs as it makes me feel stressed and less confident.	21	17	54	44	14	11	18	15	16	13
Inadequate orientation.	26	21	50	41	17	14	10	8	20	16
Larger class size.	15	12	50	41	21	17	31	25	6	5
Inadequate funds to purchase instruction materials to meet all learners.	21	17	64	52	16	13	7	6	15	12
Difficulty in modelling geometric concept to special needs pupils in the class.	27	22	42	34	20	16	22	18	12	10

Source: Field Data - Questionnaire (2023)

Key: strongly agree = S A, agree A, Un Uncertain***, disagree D, strongly disagree = SD, % =percentage, F = frequency and N = total number of respondents.***

Results in Table 4.9 show a description of the responses of the respondents in relation to challenges pre-service teachers encounter in teaching mathematics. Table 4.8 reveals that many of the respondents (71, 58%) agreed to the notion that there are inadequate teaching resources. When they were asked whether their lack of competency in managing learners with special needs as it makes them feel stressed and less confident, majority of them (77, 61%) responded in the affirmative.

Concerning inadequate orientation training, most of the respondents (76, 62%) agreed to this assertion. With regards to larger class size, majority of the respondents (65, 53%) agreed to the statement. Eighty-five of the respondents, representing (69%) agreed that there are inadequate funds to purchase instructional materials to meet all learners. Finally, concerning difficulty in modelling geometric concept to special needs students in the class, 69 of the respondents representing 56% agreed to this statement.

From Table 4.9, it was found that, inadequate funds to purchase instructional materials to meet all learners was the highest positive responses (69%) and difficulty in modelling geometric concept was the lowest responses (56%). This indicates that, the greatest challenge pre-service teachers in the Sissala East Municipality and Sissala West District face in teaching mathematics was inadequate funds to purchase instruction materials to meet all learner.

Interview Guide Results on Challenges Pre-service teachers Encounter in Teaching Mathematics

Pre-service teachers encountered different challenges during the process of imparting knowledge to students in geometry class. However, the challenge differs from one pre-service teacher to the other or from one class to the other.

Question: Does the large size of the class hinder your progress in teaching mathematics in the classroom?

The following are some responses:

Pre-service teacher A and B said that:

> *Larger class size is one of the paramount challenges we encounter in teaching mathematics in basic schools in the Sissala East Municipality especially in the public schools. The more pupils in the class, the less time given is to all the other pupils. However, the larger classes prevent us from developing close relationship with pupils thus progress hindered is, as we are unable to assist pupils who need more attention. This affect the number of objectives stated by us as well as the variety of tasks we give to pupils in the classroom*
>
> ***(Interview Data, 2023).***

Similarly, Pre-service teacher C and D also commented that:

> *Larger classes impinge our teaching and learning process in the classroom especially when teaching technical topics like mathematics. Due to this, we struggle with too many pupils as discipline and behaviour issues become more of a problem* ***(Interview Data, 2023).***

The interview responses on larger class size confirms the questionnaire responses in Table 4.9 that 53% of the respondents agreed that larger class size is a challenges they encounter in teaching mathematics in the basic schools in the Sissala Easr Municipality. The whole problem of large class teaching is summed up in the quotation. Quality teaching and assessment actually suffer in large classes and this is an indictment on the quality of higher education in Ghana and the other developing countries. This is supported by the fact that lecturers "reported that developing appropriate teaching and learning styles in large classes with diverse needs is challenging in itself" (Amua-Sekyi, 2010, p. 145).

Question: Do you encounter any challenge with the teaching resources used in teaching mathematics in the classroom?

Response:

Pre-service teacher B bemoaned the sorry state of some of the teaching materials;

> *The teaching materials we have in store are now out-dated, Changes are happening fast; the computers we have are old and not even adapted for children with or without special needs.*

(Interview Data, 2023).

Looking at what Pre-service teacher B said teaching resources ought to be updated so as to provide an opportunity for active participation and reduce barriers to learning by stituting experiences. Thus, a good resource ought to be simple, relevant and motivating. However, it is good that the participants in this study acknowledge use of teaching resources to help children acquire knowledge and skills.

Similarly, Pre-service teachers A and D commented that:

> *,,Yes, we encounter many challenges. The teaching resources in our classrooms are inadequate due to its cost and lack of maintenance. There are no funds made available for us to purchase these instructional materials to meet all pupils in the classroom. Pupils need to have good and big pictures, books, audio and video teaching aids, and much variety of toys to manipulate. The local made teaching materials are sometimes less attractive to pupils even though we still use them a lot. Since we have a low budget from the Government, we use only locally made teaching materials. We cannot provide good teaching materials such as computers, video and audio systems. When we use the locally made teaching materials, some of the children do not show any interest in learning of the mathematics* ***(Interview Data, 2023).***

In addition, Pre-service teacher C said that:

Inadequate teaching materials impede our teaching progress in mathematics. You can bear me witness, when you were observing my lesson on Measuring of Angles.
(Interview Data, 2023).

Looking at the interview responses on teaching resources confirms the questionnaire responses in Table 4.9 that inadequate teaching resources, inadequate funds to purchase instructional materials to meet all learners and difficulty in modelling geometric

concept to special needs pupils in the class were the challenges they encounter in teaching mathematics in the classroom. A good Mathematics classroom supported should be by educational resources that make learning practical for children with or without special educational needs. These materials should help to reduce barriers and create a least restrictive environment for learning. Provision of educational resources should thus take into consideration the individual learning needs (Hiuhu, 2002).

Discussion of Result of Research Question 4

This research question sought to identify the challenges pre-service teachers' encounter in teaching mathematics in basic schools in the Sissala East Municipality and Sissala West District.

Result in Table 4.9 shows that 71 of the respondents representing 58% agreed to the notion that there are inadequate teaching resources, 19 of the respondents representing 15% were uncertain and 33 of the respondents representing 27% disagreed to the notion. According to the Organization for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA) shows that resource shortages hinder instruction and lower student performance (OECD cited in Atieno, 2014). In addition, inequalities in pupil's educational performance often reflect disparities in the resources invested in schools (Atieno, 2014).

When respondents were asked whether the lack of competency in managing pupils with special needs as it makes them feel stressed and less confident, 77 of the respondents representing 61% agreed, 14 of the respondents representing 11% were uncertain, and 34 of the respondents representing 28% disagreed to the statement. Ainscow and Goldrick (2010) expresses some key competencies that were needed for instruction of children with special needs to benefit from education in regular classrooms. Such

competencies include the knowledge and skills of teaching strategies and approaches that meet the needs of all children in regular classrooms. These skills enable pre-service teachers to plan flexible instruction and to recognize the reality of differences between and in children, while yet being able to adapt learning goals, content, and the environment to the needs of individuals and the whole class (Ainscow & Goldrick, 2010).

Concerning inadequate in-service training, 76 of the respondents representing 62% agreed to this assertion, 17 of the respondents representing 14% were uncertain and 3 of the respondents representing 24% disagreed to this assertion. Tuncel and Çobanoğlus (2018) studies revealed that in-service training did not make any contribution to some novice teachers. Similarly, Huhtala and Vesalainen (2017) found that teachers need and request more training, and most of the in-service training organized in Sweden is irrelevant from the teachers' need. The possible explanation for the views that the process did not make any contribution is lack of a careful need analysis while planning the training.

With regard to larger class size, 65 of the respondents representing 53% agreed the statement, 21 of the respondents representing 17% were uncertain and 37 of the respondents representing 30% disagreed to the statement. According Westerlund (2008) increases in size of Mathematics classes leads to significantly lower student course evaluations there, as well. In addition, Monks and Schmidt (2010) findings reveal that large classes and heavy student loads appear to prompt faculty to alter their courses in ways deleterious to students.

Furthermore, 86 of the respondents representing 69% agreed that there is inadequate funds to purchase instruction materials to meet all learners, 16 of the respondents

representing 13% were uncertain and 22 of the respondents representing 18% disagreed. According to Atieno (2014) when instructional materials are inadequate education is compromised and this inevitably is reflected in low academic achievement, high dropout rates, problem behaviours, poor teacher motivation and unmet educational goals.

Finally, concerning difficulty in modelling geometric concept, 69 of the respondents representing 56% agreed to this statement, 20 of the respondents representing 16% were uncertain and 34 of the respondents representing 28% disagreed. According to Lyons (2012) to model geometric concept there must be enough instructional materials in the teaching learning process to facilitates learning of abstract concepts and ideas, discourage rote learning, and helps to stimulate and motivate learners.

Commenting on lack of competency in managing pupils with special needs as it makes pre-service teachers feel stressed and less confident has been a great concern of government and other stakeholders to help solve the situation. Also, Davis and Florian (2004) assertion, that teachers have much of the knowledge and many of the skills required to teach all pupils, but they may not have the confidence to put this knowledge into action in helping pupils who are experiencing difficulties in learning.

Pre-service teachers' lack of competency in managing their mainstream classrooms is a serious problem which affects pupil's participation, hence makes the pre-service teachers feel stressed and less confident when teaching in class (Landsberg, 2011), Florian (2007) also suggested that teachers need knowledge about pupils with special needs in the mainstream and that they need to be skilled in using specific instructional methods in teaching them for their easy participation and understanding of lessons.

Summary of Research Findings

Findings on pre-service teachers in Tumu College of Education perceptions of inclusive classrooms in their practicing schools in Sissala East Municipality and Sissala West District reveals that, majority of the respondents agreed that integration of pupils with special needs will necessitate extensive retaining of general classroom teachers. The integration will likely have emotional effect on pupils with special needs, since it is difficult to maintain order in a general classroom that contains pupils with special needs than in that does not contain students, creates a conducive learning environment that meets the needs of all learner. Also it slow down the process of addressing and responding to the diversity of needs of all children in the learning environment and enhancing social interaction and inclusion among students and teacher, were the pre-service teachers perceptions of inclusive classrooms in Tumu College of Education in Sissala East Municipality. Again, pre-service teachers in the basic schools in Sissala East Municipality are of the perception that inclusive classrooms means bringing children with special educational needs on board and adjusting the environment for all manner of children to participate actively in the mainstream activities.

Findings on the teaching methods pre-service teachers use in teaching mathematics in basic schools in Sissala East Municipality reveals that majority of the respondents agreed that they use experimental method (93%); learner-centred method (96%), expository teaching method (90%), differentiation instruction (80%), conventional method (66%) and Mathematics teaching model (70%). Again, majority of the pre-service teachers (Pre-service teachers B, C and D) always use experimental and learner-centred method as a teaching methods and this process motivate and awake pupils' interest in solving geometry problems. Encourage pupils to share ideas and interact with each other in the classroom, guide pupils to do their class activities with ease through

modelling the activities, expose pupils to hands-on activities that increase their understanding of the topic and dramatize lesson through play as well as questions and answers.

Findings on how pre-service teachers' perceptions of inclusive classrooms influence their teaching of mathematics in Sissala East Municipality reveals that majority of the respondents agreed that knowledge and experience, cultural values, personal attitudes, mode of communication, expectation, motivation and large class size all serves as a source of influence on their teaching of mathematics. Again, nature of pupils, cultural values or norms, personal attitudes, knowledge and experience are the pre-service teachers' perceptions of inclusive classrooms that influence their teaching of mathematics which helped them to plan effective lesson to recognise and provide appropriate learning environment for all pupils in the mainstreams.

Finally, findings on the challenges pre-service teachers encounter in teaching mathematics reveals that majority of the respondents agreed that, inadequate teaching resources, lack of competency, inadequate course training, larger class size. In addition, inadequate funds to purchase instruction materials to meet all learner and difficulty in modelling geometric concept were the challenges pre-service teachers encounter in teaching mathematics in basic schools where they do their practice in Sissala East Municipality. Again, majority of the participants also encounter imprecise geometric terminology, inadequate teaching materials, and inadequate funds to purchase instruction materials to meet all pupils in the classroom and frequently changes in the basic school Mathematics curriculum as a challenge in the course of teaching mathematics in basic schools in Sissala East Municipality.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Overview

This chapter presents summary of the study, summary of main findings and draw conclusions from the findings. The chapter also presents recommendations and suggestions for further research.

Summary of the Study

The perceptions that pre-service teachers hold today regarding inclusive classrooms continues to be a struggle across the world. The purpose of the study was to investigate pre-service teachers' perceptions of inclusive classrooms and their influence on teaching mathematics in their practicing school in Sissala East Municipality. In order to achieve this purpose, the following questions were set to guide the study:

1. What are the pre-service teachers' perceptions of inclusive classrooms in the Tumu College of Education?
2. What are the pre-service teachers' teaching methods in teaching mathematics at their practicing schools in the Sissala East Municipality
3. How do pre-service teachers' perceptions of inclusive classrooms influence their teaching of mathematics in the Sissala East Municipality?
4. What perceived challenges do pre-service teachers' encounter in teaching mathematics in the Sissala East Municipality?

The findings from the study may reveal pre-service teachers' views about the adequacy of special education in preparing pre-service teachers towards inclusive classrooms. This would enable curriculum planners for Colleges of Education to know whether or not the current curriculum used in the Colleges of Education is appropriate to prepare

pre-service teachers for inclusive classrooms in Ghana. From the review of related literature, it was found that in the inclusive classroom teachers interact with different types of learners who have not necessarily been diagnosed medically as having a problem, but are struggling with understanding a learning instruction or task. Thus, teachers should always be searching for a kind of instruction that is optimal for every individual leaner because the lack of understanding of mathematics concepts may often discourage students and thus it leads them to poor performance in learning geometry.

The study philosophical framework was the pragmatist philosophy with a mixed method approach. However, the explanatory design was used for data collection and analysis. This design was used in order to obtain a clearer picture from the quantitative data, and then to use the qualitative data to provide better understanding and explanation of the study in question.

The study carried out was within three months in the pre-service teachers' who were doing their internship in Sissala East Municipality and Sissala Wset District. Simple random procedure was used to select a sample size of 123 respondents. Out of the 237 respondents, purposively sampling procedure was used to select 20 participants for the interview and observation session. The instruments used for the study were questionnaire, interview guide and observation checklist. The statistical methods used in analysing the data were descriptive statistics such as simple percentage, chart and frequencies,

Summary of Main Findings

Pre-service teachers' perceptions of inclusive classrooms in tumu College of Education in Sissala East Municipality

Table 4.7 revealed that, 113 of the respondents(92%) agreed that integration of pupils with special needs will necessitate extensive retaining of general classroom teachers, the integration will likely have emotional effect on pupils with special needs, it is more difficult to maintain order in a general classroom that contains pupils with special needs than in one that does not contain learners, creates a conducive learning environment that meets the needs of all learner, slow down the process of addressing and responding to the diversity of needs of all children in the learning environment and enhancing social interaction and inclusion among pupils and teacher, were the pre-service teachers perceptions of inclusive classrooms in East Municipality. Again, the interview responses shows that pre-service teachers in the basic schools in Sissala East Municipality are of the perception that inclusive classrooms means bringing children with special educational needs on board and adjusting the environment for all manner of children to participate actively in the mainstream activities.

Teaching methods pre-service teachers use in teaching mathematics during internship in basic schools in Sissala East Municipality and Sissala West District.

Table 4.4 reveal that 93% of the respondents agreed that they use experimental method, followed by 96% of the respondents agreed that they use learner-centred method, 90% of the respondents agreed that they use expository teaching method, 80% of the respondents agreed that they use differentiated instruction, 66% of the respondents agreed that they use conventional method and 70% of the respondents agreed that they use Mathematics teaching model. Again, Table 4.5 reveals that Pre-service teacher B, C and D always use experimental and learner-centred method as a mode of lesson

delivery and this mode of lesson delivery motivate and awake pupils interest in solving geometry problems, encourage pupils to share ideas and interact with each other in the classroom, guide pupils to do their class activities with ease through modelling the activities, expose pupils to hands-on activities that increase their understanding of the topic and dramatize lesson through play as well as questions and answers.

Influence of pre-service teachers' perceptions on teaching mathematics in Tumu College of Education in the Sissala East Municipality and Sissala West District.

Table 4.8 reveal that majority of the respondents agreed that knowledge and experience, cultural values, personal attitudes, mode of communication, expectation, motivation and large class size serves as a source of influence on their teaching of mathematics. Again, the interview guide responses shows that nature of pupils, cultural values or norms, personal attitudes, knowledge and experience are the pre-service teachers' perceptions of inclusive classrooms that influence their teaching of mathematics which helped them to plan effective to recognise and provide appropriate learning environment for all pupils in the mainstreams.

Challenges pre-service teachers encounter in teaching mathematics in Mentees classrooms in Sissala East Municipality

Table 4.6 reveal that majority of the respondents agreed that, inadequate teaching resources, lack of competency, inadequate orientation programmes, larger class size, inadequate funds to purchase instructional materials to meet all learners and difficulty in modelling geometric concept were the challenges pre-service teachers encounter in teaching mathematics in basic schools in Sissala East Municipality and Sissala West District. Again, interview guide responses shows that, majority of the participants also encounter imprecise geometric terminology, inadequate teaching materials, and

inadequate funds to purchase instructional materials to meet all pupils in the classroom and time pre-service teachers' spends in their internship programmes as a challenge in the course of teaching mathematics in basic schools in Sissala East Municipality.

Conclusion

Based on the findings of the study, the following conclusions were drawn: The study concluded that, integration of pupils with special needs will necessitate extensive retaining of general classroom. Integration will likely have emotional effect on pupils with special needs, it is more difficult to maintain order in a general classroom that contains learners with special needs than in one that does not contain pupils, creates a conducive learning environment that meets the needs of all learner, slow down the process of addressing and responding to the diversity of needs of all children in the learning environment and enhancing social interaction and inclusion among pupils and pre-service teacher, were the pre-service teachers perceptions of inclusive classrooms in Sissala East Municipality. Again, from the interview guide response, the study concluded that pre-service teachers in the basic schools in Sissala East Municipality are of the perception that inclusive classrooms means bringing children with special educational needs on board and adjusting the environment for all manner of children to participate actively in the mainstream activities.

On the findings of teaching methods pre-service teachers' use in teaching mathematics in basic schools in Sissala East Municipality. The study concluded from Table 4.4 that, experimental method, learner-centred method, expository teaching method, differentiation instruction, conventional method and Mathematics teaching model were the teaching methods pre-service teachers use in teaching mathematics. However, during classroom lesson observation the study concluded that, majority of the pre-service teachers (Pre-service teacher B, C and D) classroom encourages interaction and

always use experimental and learner-centred method as a mode of lesson delivery. Also, the study concluded that pre-service basic school teachers' perceptions of inclusive classrooms on teaching mathematics in Sissala East Municipality was influence by; knowledge and experience, cultural values, personal attitudes, mode of communication, expectation, motivation and large class size. The study also concluded from the interview guide responses that nature of students, cultural values of norms, personal attitudes, knowledge and experience are the pre-service teachers perceptions of inclusive classrooms that influence their teaching of mathematics which helped them to plan effective to recognise and provide appropriate learning environment for all students in the mainstreams.

Finally, the study concluded on the fourth findings that, challenges pre-service teachers encounter in teaching mathematics in basic schools in Sissala East Municipality include; inadequate teaching resources, lack of competency, inadequate in-service training, larger class size, inadequate funds to purchase instruction materials to meet all learner and difficulty in modelling geometric concept. The study concluded from the interview guide that, participants were of the opinions that; inadequate teaching materials, inadequate funds to purchase instruction materials to meet all pupils in the classroom and frequently changes in the b school Mathematics curriculum were the changes they encounter in the course of teaching mathematics in basic schools in Sissala East Municipality.

Recommendations

Based on the findings and conclusions drawn, the following recommendations were Suggested:

1. Understanding the diverse viewpoints of pre-service teachers in Tumu College of Education in Sissala East Municipality and how these perceptions might help in shaping

the inclusion discourse in Ghana and can perhaps be seen as the beginning of the implementation of a successful inclusion program in the country. Thus, the study recommends that the Ministry of Education and education policy makers should consider the viewpoint of pre-service teachers in revisiting and reviewing the current inclusion policy and its implementation agenda in the schools in Ghana.

2. The study recommends that Pre-service Mathematics teachers in Tumu College of Education in Sissala East Municipality be encouraged to use enquiry based method of teaching mathematics. In addition, pre-service teachers need to encourage pupils to form small discussion groups so that each individual child can have a platform to express their ideas and learn from each other. This will encourage consultations among pupils and with the pre-service teachers and eventually boost mastery of the geometry concepts.

3. In line with the third findings, the study recommends that the Tertiary Institutions and Training Colleges should ensure that pre-service teachers are equipped with knowledge and skills to handle and teach in inclusive classrooms. Also, the Ministry of Education should ensure that schools are environmentally friendly to all pupils including those with various special needs to ensure inclusive classrooms.

4. Based on fourth findings, the study recommends that the Ministry of Education through the relevant departments should carry out regular inspections to schools and Colleges, and organize refresher courses for pre-service teachers in order to alleviate some of the probable causes of poor achievement of mathematics content. Also, pre-service teachers and Mentors should avail the necessary material used for learning geometry.

Area for Further Studies

The findings showed that further studies could be done to bring to knowledge what must be known about inclusive classrooms. Since it is a topical issue in Ghana, it is suggested that further research in the following areas;

- A Comparative study of inclusive classrooms among Colleges of Education and Universities in the Country.
- Challenges affecting inclusive classrooms in the northern and southern part of Ghana.

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APPENDICES

APPENDIX A

UNIVERSITY OF EDUCATION, WINNEBA
DEPARTMENT OF MATHEMATICS EDUCATION SELF-ADMINISTERS QUESTIONNAIRE:
PRE-SERVICE TEACHERS' PERCEPTIONS OF INCLUSIVE CLASSROOMS AND TEACHING OF MATHEMATICS A CASE OFTUMU CPLLEGE OF EDUCATION.

The researcher is an M.Phil. Student in the Department of Mathematics Education, University of Education, Winneba. This questionnaire is not meant to assess you. Instead, it seeks to elicit information from pre-service teachers' in their practice schools in perceptions of inclusive classrooms and their influence on their teaching of mathematics in Sissala East Municipality and Sissala West District. The study is for academic purpose. Your candid response to this research would help find answer(s) to the problem under investigation. During this study, high ethical standards will be maintained to ensure that no harm is caused to you as a person or the information you will freely give. Therefore do well to provide an honest response to each of the following items.

Your confidentiality and anonymity would be protected.

Thank you for your time, patience and participation.

SECTION A

Background Information

Instruction: Please tick [] for the response, which corresponds with your background information. If you want to change an item you have already ticked, put a cross [x] over the selected item and tick the new item.

1. Gender: **]]**

a Male [ ]

b. Female [ ]

2. Age: **[ ]**

a. 15 - 20 [ ]

b. 21 – 25 [ ]

c. 26 – 30 [ ]

d. 31 and above [ ]

3. Entry Requirement

a. A [ ]

b. B2 [ ]

c. B3 [ ]

d. C4 [ ]

e. C5 [ ]

4. How long have you taught before gaining admission?

a. 0 year [ ]

b. 1 year [ ]

c. 2 years [ ]

d. 3 years [ ]

5. What class do you teach Mathematics?

a. Early Grade Education [ ]

b. Upper primary . [ ]

6. Do you have any orientation of inclusive classrooms?

Yes [ ] No [ ]

SECTION B

PRE-SERVICE TEACHERS' PERCEPTIONS OF INCLUSIVE CLASSROOMS

Directions: For each statement below use the following key to indicate how you respond to the statement regarding how you perceive inclusive classrooms. Please tick in the appropriate box. If you want to change an item you have already ticked. put a cross [x] over the selected item and tick the new item. **Note:** Strongly Agree SA, Agree A,

Uncertain= **UN**, Strongly Disagree - **SD** and Disagree = **D**

No	Statement	SA	A	UN	SD	D
1	The integration of learners with special needs will necessitate extensive training of classroom teachers					
2	The integration will likely have motional effect of learners with special needs.					
3	It is move difficult to maintain order in a general classroom that contains learners with special needs than in one that does not contain learners with special needs.					
4	Create a conducive learning environment that meet the needs of the learners.					
5	Show down the process of addressing and responding to the diversity of needs of all learners in the learning environment.					
6	Enhance social interaction and inclusion among learners and pre-service teachers'					

SECTION C

TEACHING METHODS PRE-SERVICE TEACHERS USE IN TEACHING MATHEMATICS

Directions: For each statement below use the following key to indicate how you respond to the statement regarding the teaching methods you use in teaching mathematics. Please tick

in the appropriate box. If you want to change an item you have already ticked, put a cross over the selected item and tick the new item. **Note:** Strongly disagree =SA, Agree-A, Uncertain **UN,** strongly disagree = **SD**. and Disagree-**D**

No	Statement	SA	A	UN	SD	D
7	Experimental method of teaching					
8	Learner-centred method					
9	Expository teaching method					
10	Differentiation instruction					
11	Conventional teaching method					
12	Mathematics teaching model					

SECTION D

PRE-SERVICE TEACHERS' PERCEPTIONS OF INCLUSIVE EDUCATION AND THEIR INFLUENCE ON TEACHING PLANE GEOMETRY

Complete this statement on how pre-service teachers' perceptions of inclusive classrooms and teaching of mathematics. Tick (√) in the appropriate column for your response to the following statement. Note that: Strongly Agree **SA**, Agree=**A.** Uncertain-**UN**, Strongly Disagree = **SD** and Disagree – **D**

No	Statement	SA	A	UN	SD	D
13	Knowledge and experience					
14	Cultural values and expectation					
15	Personal attitudes					
16	Mode of communication					
17	Personal attitudes towards geometry lesson.					
18	Motivation and large class size					

SECTION E

CHALLENGES PRE-SERVICE TEACHERS ENCOUNTER IN TEACHING MATHEMATICS

Directions: For each statement below use the following key to indicate how you respond to the statement regarding the challenges you encounter in teaching mathematics. Please tick "V' in the appropriate box.. If you want to change an item you have already ticked, put a cross [x] over the selected item and tick the new item. Note: Strongly Agree-**SA,** Agree - **A**, Uncertain= UN, Strongly Disagree - **SD** and Disagree = **D**

No	Statement	SA	A	UN	SD	D
19	Inadequate knowledge and skills required to teach mathematics in class.					
20	Lack of competency in managing learners with special needs as it makes me feel stressed and less confident.					
21	Lack of commitment as a result of low incentives.					
22	Inadequate teaching and learning materials in the classroom.					
23	Incorrect pedagogy to support and enhance pupils participation in mainstream schools that experience difficulties in learning mathematics.					
26	Difficulty in modelling geometric concept to special needs learners in the class.					

APPENDIX B

PART A

STRUCTURED INTERVIEW GUIDE QUESTIONS ON

Pre-service Teachers' Perceptions of Inclusive classrooms Sub-questions

1) What do you know about inclusive classrooms? How do you come to know about it?

2) How is inclusive classrooms related to or different from your regular practice? Could you give any example?

3) Do you consider those pupils who are very shy or often absent should be included in an inclusive classroom? What is your view towards children with special needs?

PART B

STRUCTURED INTERVIEW GUIDE QUESTIONS ON

Pre-service Teachers Perceptions of Inclusive classrooms and Their Influence on Teaching Mathematics.

Sub-questions

1. What influence your teaching of mathematics? Let's discuss

2. What factors of inclusion education influence your teaching of mathematics? Why these factors? Let's discuss.

PART C

INTERVIEW GUIDE QUESTIONS

CHALLENGES PRE-SERVICE TEACHERS ENCOUNTER IN TEACHING MATHEMATICS.

Sub-questions

1. What challenges do you encounter in the course of teaching mathematics?
2. Can we discuss these challenges?

APPENDIX C

OBSERVATION CHECKLIST

Observation Checklist: Assessing the Teaching Methods Basic School Teachers' Use in Teaching Mathematics.

Name of School: .....

Teachers' Gender :……..

Date and Day: .....

Class Observed :.....

Time of Observation: Start.....End……...

Number on Roll: Boys……..Girls……

A. Classroom Context

1, Classroom space	1	2	3
	Crowded	**Little space**	**Adequate space**
Comment			

2,Classroom resources	1	3	3
	Fully resourced	**Partially resourced**	**Not resourced**
Comments:			

3..Classroom arrangement	1	2	3
	Encourage interaction	**Impede interactiom**	**Discourage interaction**
Comment:			

4, Class control	**1**	2	3
	Impressive	**Satisfactory**	**Averagely**
Comment:			

B. Mode of lessons delivery

5. Expository	1	2	3
	Always	**Sometimes**	**Not at all**
Comment:			

6. Dramatization	1	2	3
	Always	**Sometimes**	**Not at all**
Comment:			

7. Experimental	1	2	3
	Always	**Sometimes**	**Not at all**
Comment:			

8. Learner-centred	1	2	3
	Always	**Sometimes**	**Not at all**
Comment:			

9.Lecture and demonstration	1	2	3
	Always	**Sometimes**	**Not at all**
Comment:			

C. Mode of lesson delivery activities

Rating scale: Not at all = 1, Some evidence = 2, Clear evidence = 3, To greater extent = 4

No	**Mode of lesson delivery activities observed**	**1**	**2**	**3**	**4**	**Comments**
1	Motivate and awake learners' interest on solving geometry problems.					
2	Encourage learners to share ideas and interact with each others in the classroom.					
3	Guide learners to do their class activities with ease through modelling the activities.					
4	Expose learners to hands on activities that increase their understanding of the concept.					
5	Lessons are dramatized through play as well as questions and answers.					

APPENDIX D

TRANSCRIBED DATA FROM THE INTERVIEW

Twenty (20) participants were purposively selected for the interview and observation. For easy analysis, the interview responses and observation comments were grouped into four, namely: pre-service teachers A, B, C and D. Each group contains five participants. The interview guide and observation checklist were used to collect data to support the responses from the questionnaires you can also get an in-depth understanding of the current situation in the classroom.

Twenty (20) pre-service teachers were interviewed to capture research question one, research question two, research question three and research question four. Twenty pre-service teachers

selected were from the one hundred and twenty-three (123) pre-service teachers who responded to the questionnaire. The transcripts were then broken down into discrete parts, then examined closely and analyzed for similarities and differences using thematic framework.

As a follow up on Research Question 1(What are the pre-service teachers' perceptions of inclusive classrooms in practice in the Sissala East Municipality and Sissala West District?)

Researcher's Question: In your opinion what is the meaning of inclusive classrooms? Pre-service teachers' knowledge and understanding of inclusive classrooms were to see how they perceived inclusive classrooms. It was important for the researcher to know how they understood inclusive classrooms because their understanding determined the nurturing of inclusive classrooms practices in their class.

The following are some of their responses:

Pre-service teachers A and B answered by saying that:

Inclusion is a good thing because all learners together from the lower grade of education and upper grade are taught to love one another and cooperate with one another regardless of individual condition ***(Interview Data, 2023).***

Similarly, Pre-service teachers C and D also said that:

Inclusion should be for all learners with disabilities except those with mental disorders because this group has a very special type of disability that cannot be mixed with other learners in the same classroom and the inclusion should be in school. This will give the teacher a room to teach pupils with more or less capacities to learn ***(Interview Data, 2023).***

Question: How is inclusive classrooms relate to your regular practice of teaching mathematics?

The following are some of the responses;

Pre-service teacher A had the following explanation:

Yes, it create a conducive learning thus helps us to make some changes to the environment to accommodate the special needs children to the mainstream classes. Pre-service teachers B and C commented that:

*Through creating conducive learning environment, we are able to admit learners with disability to regular school and adjust the school environment so that they can share and learn with the others. (****interview Data, 2023).***

Finally, Pre-service teacher D said that:

This helps us make reasonable adjustments in the school to accommodate learners with special educational needs. **(Interview Data, 2023).**

Question: Does integration of learners with special needs necessitate extensive retention of general classroom teachers?

The following are some responses:

Pre-service teachers A and B had the following explanation.

Yes, it is too boring especially when the special child is not getting the concept been taught. We sometimes get confuse whether we did not teach the concept well so we have extra time with that special child in the classroom, ***(interview Data, 2023).***

Similarly, Pre-service teachers C and D said that:

The extensive retention of teachers in the classroom is not helping the teachers especially we the subject teachers. You can bear me witness during the lesson observation. When my period was over how I was struggling to stay in order for the special needs learners to understand the lesson. In fact, the integration of pupils with special needs necessitate extensive retention of teachers in the classroom **(Interview Data, 2023).**

Research Question 3 (Examine how pre-service teachers' perceptions of inclusive classrooms influence their teaching of mathematics in internship in the Sissala East Municipality and Sissala West District?)

Question: The first question was, has your perception of inclusive classrooms helped you in any way in your teaching of mathematics?

Responses: The respondents replied that their perception of inclusive classrooms has helped them in their teaching of mathematics in the pre-service teachers A and B said that;

Yes, this has helped me prepare Individualized Education Plan (IEP) for monitoring the progress of learners with disabilities in my classroom while teaching mathematics concept.

(interview Data, 2023).

Similarly, Pre-service teachers C and D also commented that:

Yes, it has really helped me to be responsible to all learners in my class. There is a saying that; A change in teacher beliefs on disability is a change in teacher practice, thus it has help me to be inclusive in the way I teach mathematics and always find ways to connect with my students, ***(Interview Data, 2023).***

Question: Does your cultural values influence your teaching of mathematics?

The following are some responses:

Pre-service teachers A and B answered this question by pointing out that cultural values differ from one teacher to another depending on the tribe.

Our culture values really influence how we perceive learners with or without special needs pupils in our classroom when teaching mathematics. Since we are from the same tribe; our culture does not permit us to associate ourselves with disabled children or person. Definitely, it will make us exclude those children in the teaching and learning process or activities ***(interview Data, 2023)***

Similarly, Pre-service teachers C and D also commented that:

Our cultural values have great influence on our teaching of mathematics in the classrooms. For instance, one of our greatest cultural values is respect.

Question: Has your mode of communication influenced your teaching of mathematics? The following are some responses:

Pre-service teachers B and D commented that:

Our mode of communication also influence the way we teach mathematics in our classroom. Just imagine, someone from the Volta Region been posted to teach in the Wala land school (Wa).

He will find it very difficult to explain certain geometric terms to the learners. Even explaining the mathematics concept in the official language is a problem someone to understand. Sometimes I get frustrated in the teaching process due to language barrier ***(Interview Data, 2023).***

Similarly, Pre-service teachers A and C also commented that:
Yes, mode of communication influences our teaching of mathematics in the classroom. For students to understand mathematics concept in the classroom, we must be able to communicate geometric ideas to learners.

Question: Does your knowledge and experience influence your teaching of mathematics?

Response:

All the interviewees were of the same responses that their knowledge and experience have great impact on their teaching of mathematics.

Pre-service teachers were of the views that:

Knowledge and experience are very important in teaching all manner of learners in the classroom. These two, knowledge and experience must move and work together For instance, we may be well versed with the concept of inclusive classrooms but if we lack the experience, we cannot give equal learning opportunities for those special needs learners in the classroom.

Research Question 4 (What perceived challenges do pre-service- teachers' encounter in teaching mathematics in practice schools in the Sissala East Municipality and Siaasla West District?)

Question: Does the large class size hinder your progress in teaching mathematics in the classroom?

The following are some responses:

Pre-service teachers A and B said that:

Larger class size is one of the paramount challenges we encounter in teaching mathematics in our practice schools in Sissala East Municipality especially in the public schools. The more pupils in the class, the less time given is to all the other pupils. However, the larger classes prevent us from developing close relationship with pupils thus progress hindered is, as we are unable to assist pupils who need more attention. This affect the number of objectives stated by us as well as the variety of tasks we give to learners in the classroom ***(Interview Data, 2023)***

Similarly. Pre-service teachers C and D also commented that:

Larger classes impinge our teaching and learning process in the classroom especially when teaching technical topics like mathematics. Due to this, we struggle with too many

students as the discipline and behaviour issues become more of a problem ***(Interview Data, 2023)***

Question: Do you encounter any challenge with the teaching resources used in teaching mathematics in the classroom?

Responses:

Pre-service teacher B decries the sorry state of some of the teaching materials:

The teaching materials we have in store are now outdated Changes are happening fast; there not enough computers in the system and the few that are with the regular classroom teachers not even adapted for learners with or without special needs **(Interview Data, 2023)**

Similarly, Pre-service teachers A and D commented that:

Yes, we encounter many challenges. The teaching resources in the classrooms are inadequate due to it expensiveness and lack of maintenance. There are no funds made available for us to purchase these instruction materials to meet all learners in the classroom.Learners need to have good and big pictures, books, audio and video teaching aids, and much variety of toys to manipulate The local made teaching materials are sometimes less attractive to learners even though we still use them a lot. Since schools don't have budget from the Government, we use only local made teaching materials. Pre-service teachers' cannot provide good teaching materials such as computers, video and audio systems. When we use the locally made teaching materials, some of the learners do not show any interest in learning of the mathematics ***(Interview Data, 2023).***

In addition. Pre-service teacher C said that

Inadequate teaching materials impede their teaching progress in mathematics You can bear me witness, when you were observing my lesson on measuring of angles ***(Interview Data, 2023).***