

The Impact of Teacher Development and Student Preparation in Mathematics Education in  
Senior Secondary Schools in Delta State, Nigeria: A Collective Case Study.

By

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## **Abstract**

This study critically analyzes teacher development and student preparation in Mathematics education. A purposeful sample of three schools in Delta State, Nigeria was used while a total of twenty-eight teachers and students were interviewed and observed. The data acquired were presented and critically analyzed. It was found out that Mathematics is compulsory for all students. The study explored the conditions of classrooms that are conducive for effective teaching and learning of Mathematics, and the availability of vital instructional materials and aids and facilities. The study also probed the motivation of teachers, as well as their motivation and interest in the teaching of Mathematics. Furthermore, the study investigated the place of gender, IQ, determination, and attention in knowledge of Mathematics. In addition to this the study examined teacher-student relationships. One of the significant findings of the study concerned the qualifications of teachers who teach Mathematics as well as the foundation students have in Mathematics. The study explored the time teachers had to instruct in Mathematics as well as the students' study habits and class attendance. This study offers findings, conclusions, and recommendations on the effective teaching and learning of Mathematics in Delta State, Nigeria.

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## Table of Contents

<b>Abstract</b>	<b>ii</b>
<b>Acknowledgements</b>	<b>iii</b>
<b>Table of Contents</b>	<b>v</b>
<b>Chapter 1: Introduction to the Study</b>	<b>1</b>
<i>1.1 Background to the Study</i>	1
<i>1.2 Statement of the Problem</i>	4
<i>1.3 Significance of the Problem</i>	4
<i>1.4 Purpose of the Research</i>	5
<i>1.5 Research Questions</i>	5
<i>1.6 Limitations of the Study</i>	6
<i>1.7 Summary</i>	6
<b>Chapter 2: Theoretical Foundation/Literature Review</b>	<b>7</b>
<i>2.1 Introduction</i>	7
<i>2.2 Meaning and Philosophy of Mathematics Education</i>	8

2.3 Trends of Science, Technology, Engineering, and Mathematics (STEM) with Mathematics Education as a Beacon	11
2.4 Problems and Prospects of Mathematics Education	16
<b>Chapter 3: Research Methodology</b>	<b>24</b>
3.1 Introduction	24
3.2 Qualitative Research	24
3.3 Research Design	26
3.4 Population and Sampling Procedure	28
3.5 Description of Research Instruments	29
3.6 Sources of Data	31
3.7 Data Analysis Technique	31
3.8 Primary Questions	32
3.9 Summary	32
<b>Chapter 4: Presentation of the Data</b>	<b>33</b>
4.1 Introduction	33
4.2 Teachers' Views	34
4.2.1 Teacher Mindset	34
4.2.2 Qualifications	36
4.2.3 Classroom Conditions	37
4.2.4 Teacher View of Students	41
4.2.5 Demands of Mathematics (Both Teachers and Students)	44

<i>4.3 Students' Views</i>	46
<i>4.3.1 Classroom Conditions</i>	46
<i>4.3.2 Learning</i>	49
<i>4.3.3 Student Mindset</i>	51
<i>4.3.4 Retention and Individual Differences</i>	53
<i>4.3.5 Demands of Mathematics</i>	55
<i>4.3.6 Teaching</i>	56
<i>5 Summary</i>	57
<b>Chapter 5: Analysis of Data and Conclusions</b>	<b>58</b>
<i>5.1 Introduction</i>	58
<i>5.2 Analysis</i>	58
<i>5.2.1 Classroom Conditions</i>	58
<i>5.2.2 Teacher Mindset</i>	60
<i>5.2.3 Student Mindset</i>	62
<i>5.2.4 Qualifications</i>	64
<i>5.2.5 Teacher View of Students</i>	66
<i>5.2.6 Demands of Mathematics (Both Teachers and Students)</i>	68
<i>5.2.7 Learning</i>	70
<i>5.2.8 Retention and Individual Differences</i>	71
<i>5.2.9 Teaching</i>	72
<i>5.3 Conclusions</i>	73

<i>5.3.1 Classrooms Conditions</i>	73
<i>5.3.2 Teacher Mindset</i>	73
<i>5.3.3 Student Mindset</i>	74
<i>5.3.4 Qualifications</i>	74
<i>5.3.5 Teacher View of Students</i>	74
<i>5.3.6 Demands of Mathematics (Both Teachers and Students)</i>	74
<i>5.3.7 Learning</i>	75
<i>5.3.8 Retention and Individual Differences</i>	75
<i>5.3.9 Teaching</i>	75
<i>5.4 Recommendations</i>	75
<b>References</b>	<b>78</b>
<b>Appendix A</b>	<b>88</b>
<b>Appendix B</b>	<b>95</b>
<b>Appendix C</b>	<b>103</b>



## **Chapter 1: Introduction to the Study**

### **1.1 Background to the Study**

The place of Mathematics in the life of any nation cannot be overemphasized due to the fact that it is linked with the development of that nation. According to Adolphus (2011), Mathematics is one of the core subjects to be offered to all students to complete the tertiary level of education. This compulsory nature of Mathematics carries with it the assumption that knowledge of the subject is essential for all members of the society. Mathematical competence is a critical determinant of post-secondary education and career options availability for young people. Adolphus (2011) further argues that, "Science, Technology, and Mathematics Education (STME) have been widely acclaimed to be the index of measuring any nation's socio economic and geo-political development" (p. 147). Adolphus (2011) also says that there must be an effort to make Mathematics a compulsory subject at the primary and secondary levels, if scientists, technologists and engineers are to be produced. It is not enough just to study Mathematics; high quality Mathematics must be produced that will pave the way for the much needed pursuit of Science and Technology at a higher level. Also Obod (2000) laments that, "the poor state of Mathematics instruction in Nigeria and the consistently poor performance of the students in both external and internal examinations are disappointing" (p. 8).

It has been noted that Nigeria has trailed behind other West African countries for nine consecutive years in Science, Technology, and Mathematics (STM) academic performance (Chukwuneke and Nwachukwu, 2005). Students not only perform poorly at the cognitive level, they also perform badly at the affective and psychomotor domains respectively (Okebukola, 2007). Furthermore, it is difficult to have a sufficient number of candidates with enough credits to secure admission at higher levels of STM disciplines. Mathematics achievement has never been adequate, and has adversely affected subjects like Physics, Further Mathematics, and Chemistry. This is further corroborated by the 2006

West Africa Examination report, which claims that the marks lost by Physics students are a result of poor Mathematical knowledge and accounts for fifty percent of the marks lost.

The Federal Government of Nigeria has taken a number of measures in previous years to improve and promote the study of Science, Technology and Mathematics in the country. This is evident in its effort in establishing more special Science secondary schools to facilitate the teaching and learning of Sciences (Jebson, 2012). One of the policy statements of the National Policy on Education is that "A great proportion of education expenditure will be devoted to Science, Technology and Mathematics" (NPE revised, 1998 in Jebson, 2012, p. 1). If this policy was properly implemented, there should be enough availability of learning resources for the teaching and learning of Science subjects in most, if not all, of the secondary schools in the country (Jebson, 2012). Uche, Agu and Olibie (2010) state that, "A report from the Operation Reach all Secondary Schools (ORASS, 2006) survey in Nigeria indicated that inadequate resources (teachers, facilities, materials and funds) characterize most secondary schools in Nigeria. In the absence of adequate resources, quality education for the attainment of the Millennium Development Goals (MDGs) cannot be realized" (p. 152).

The concern about quality education can be seen as a wider phenomenon. Osafrehinti (1986) noted earlier that the problems involving the curriculum changes in Mathematics have occurred in several countries for one reason or another. There is also a desire to improve school Mathematics teaching to meet the ever-changing needs of society in terms of Science and Technology. In Nigeria, the context for this study, curriculum changes have occurred for a long time, and the tendency has been to adopt, unquestioningly, syllabi from advanced countries based on the universality of the subject. Such an approach loses sight of some problems usually raised by curriculum change, notably those having to do with context.

Osafrehinti (1986) outlined some such problems with curriculum changes in Nigeria. First, there was the failure to relate Mathematics to the child's environment and thus the child could not see the importance and immediate application of Mathematics (in particular, Geometry) in his or her day-to-day living. Secondly, each new curriculum has always taken the teachers by surprise because they have never been involved in its

development. Also, the Nigerian Educational system has been constituted in such a way that teachers' training, curriculum development and classroom practice are three separate activities. Therefore, curriculum changes have taken place without due consideration for the training of teachers who will use the newly developed curriculum both at the pre-service and in-service operational and training levels. Lastly, there is the problem of the non-availability of instructional materials such as text books, workbooks, computer and internet to meet the pedagogical demands of the new curriculum imposed on teachers.

However, it is pertinent to note that performance in the Sciences (Mathematics related subjects) are a function of the knowledge of Mathematics (Osafrehinti, 1986). In another claim, Azuka (2000) describes "Mathematics as the queen or servant of the Sciences and to that extent, the poor performance in this subject has negatively influenced the learning of Science, Technology, and Mathematics Education (STME) in schools in Nigeria" (p. 133). There is the need in Nigeria to prepare students for occupations in a highly scientific and technological environment. Moreover, according to Ajeyelemi (2006), the world summit for sustainable development recommended that people should be empowered through education to achieve three goals: empowerment generation, poverty eradication, and value orientation. Such goals are very dependent on students' high achievement in STM Education. Ajeyelemi (2006) further avers that "It is sad to note that Nigerian students do not achieve as high as expected in STM to meet challenges of the nation in this era driven by the relentless necessity for scientific and technological advancement" (p. 5). As noted, statistics also reveals that Nigerian students do not perform well in STM-related subjects such as Physics, Chemistry, Further Mathematics, and Mathematics in internal and external examinations (Ajagun, 2006). Azuka (2000) also notes that with the importance of Mathematics to Sciences, the poor performance in this subject has negatively influenced the learning of Science, Technology and Mathematics Education (STME) in schools in Nigeria. Uche, Agu, and Olibie (2010) collaborate that "An area in which Nigerian government has persistently emphasized the need for the provision of high quality education is in Science, Technology, and Mathematics Education (STME) ... a strong background in STME is crucial for many careers and job opportunities in today's

increasingly technological society. STME is expected to contribute immensely to the attainment of the Millennium Development Goals (MDGs)” (p. 152).

It is further claimed by Ajagun (2006) that schools cannot provide students and teachers with access to instructional Technology, including appropriate calculators, computers with mathematical software, Internet connectivity, and handheld data-collection devices. If this is the case, it follows that curricula and courses of study should incorporate instructional Technology in learning outcomes, lesson plans, and assessments of students’ progress.

## **1.2 Statement of the Problem**

As noted above, the performance of students in STME has been a concern of educators, parents and governments in Nigeria. For instance, the Chief Examiner’s annual reports in Science, Technology, and Mathematics, especially Mathematics in the Senior Secondary School Certificate Examination (SSCE) conducted by the West African Examination council (WAEC) and National Examination council (NECO), offer strong evidence of the state of teaching and learning in those subject areas. It is the intent of this study **to explore the Impact of Teacher Development and Student Preparation in Mathematics Education in Senior Secondary Schools in Delta State**, Nigeria. It should be noted that educators in Delta State, Nigeria, have intensely tried in their own way through their collective efforts to identify the major issues confronting Mathematics Education. It is the intent of this study to contribute, in a systematic way, to such efforts.

## **1.3 Significance of the Problem**

By exploring and identifying The Impact of Teacher Development and Student Preparation in Mathematics Education in Senior Secondary Schools in Delta State, Nigeria, this study is expected to lay the foundation for improving such teaching and learning. It is crucial to understand the problems and challenges facing Mathematics Education and to suggest appropriate remedies for improved student performances.

In time it can be expected that the government will use the findings from the study to more effectively put in place the conditions and resources to affect the teaching and learning of Mathematics.

The study will also serve as a foundation for other researchers on issues related to student performance in Mathematics Education at Senior Secondary Schools in Nigeria.

#### **1.4 Purpose of the Research**

Considering the vital role of Mathematics Education to the economic growth, and the overwhelming influence of globalization, I explored, in this study, those factors that most thoroughly impact Mathematics Education. The purpose of this collective case study is to investigate and describe the factors contributing to performance in Mathematics Education in Delta State, Nigeria. Specifically, I investigated and described the major factors affecting teacher development and student preparation in Mathematics Education in Delta State, Nigeria.

#### **1.5 Research Questions**

In order to achieve the basic objectives, this study is framed by the following primary research questions:

- ✚ From the point of view of teachers and students, what are the dominant factors that influence teaching and learning of Mathematics Education in Senior Secondary Schools?
- ✚ Do teachers consider themselves to be qualified and adequately prepared to teach Mathematics?
- ✚ What are students' attitudes and perceptions towards Mathematics?

## **1.6 Limitations of the Study**

As noted, the issues related to performance in Mathematics Education in Senior Secondary Schools are ubiquitous in the secondary schools of Nigeria. For the purpose of this study, I focused on three senior secondary schools, one each from Delta North, Delta South and Delta Central. This collective case study was carried out in such a way that the necessary data required for the study were obtained within the limitations and scope stated, in order to make meaningful recommendations for those jurisdictions.

## **1.7 Summary**

In this chapter of the study, I introduced the subject and precisely stated the problems addressed. This chapter further paved way for proper understanding of the purpose of the study and the research questions. Furthermore, the chapter showed the significance and limitations of the study. In the next chapter, I set up a theoretical foundation for the study.

In this chapter, the research topic was introduced and the study framed. The chapter further paved the way for an elaboration of the study by presenting the purpose of the study, its significance, primary research questions, and limitations. In the following chapter the conceptual base for the study is presented.

## **Chapter 2: Theoretical Foundation/Literature Review**

### **2.1 Introduction**

Since Nigeria achieved independence in 1960, Mathematics education has received and continues to receive special emphasis and attention. This is perhaps, in recognition of the indispensable role of Mathematics in realizing the nation's dream of rapid scientific and technological development (Daso, 2012). The importance of Mathematics education in the development of manpower for a nation's economy cannot be over-emphasized in any nation of the world and the federal government of Nigeria has clearly demonstrated this by making Mathematics a core and compulsory subject at both the junior and senior levels of secondary school.

In the universities and other tertiary educational institutions, a credit or ordinary pass in Mathematics constitutes a major admission requirement for preparation in the professions. The government of Nigeria has demonstrated commitment to the teaching and learning of Mathematics by investing financially and materially in education generally and particularly in the promotion and popularization of the study of Mathematics... at all levels of education (Federal Republic of Nigeria, 2004, p. 10).

Categorically, the Federal Government of Nigeria has for a long time been aware of the pivotal position of Mathematics to individual fulfillment and national developmental goals with particular reference to scientific and technological emancipation and breakthrough. This understanding has consequently led educational policy makers to position Mathematics as compulsory and one of the core subjects in primary and secondary levels of education (Federal Republic of Nigeria, 2004).

Mathematics is also a requirement for pupils to proceed from upper basic to senior secondary level as well as for almost all courses in the tertiary level. Despite the high position offered to Mathematics in Nigerian education system it is highly

disheartening that approaches and strategies for teaching and learning of this subject at both primary and secondary levels are not probably being put to use effectively that could promote learners' activity and provide learners' guided practice enabling them to retain concepts taught and solve problems. Generally students fear and hate or dislike Mathematics because they see it as abstract. This has resulted to their lack of interest and low retention rate, which leads to poor performance in Mathematics examinations, both internally and externally (Kurumeh, Onah and Mohammed, 2012, p. 55).

In spite of the orchestrated claims for the importance of Mathematics and the laudable and substantial investment in the study of it by the Nigerian government, students' performance in the subject has not been impressive over the years. Many of the Science and Mathematics related academic programmes in the tertiary educational institutions have not been filling their admission quotas largely because of poor performance of Nigerian candidates at the end-of-school external qualifying examinations (Federal Republic of Nigeria, 2004). Many factors have been highlighted as explanations for the poor performance of students in Mathematics, but the role of the teachers cannot be underestimated or explained away. In any educational system, the academic achievement and performance of the learners largely depend on the quality of the teachers, among other variables (Okpala, 1999). Onoshakpokaiye concurs that "the teachers have various roles to play in the process of teaching/learning most especially in teaching of Mathematics. They need to be competent in their own area of specialization and also be able to apply different methods of teaching and strategy and understand the learning processes of students" (2011, p. 1).

## **2.2 Meaning and Philosophy of Mathematics Education**

Odili (2006) defines Mathematics as a body of knowledge, a collection of techniques and methods, and the product of human activity for solving problems. Hornby (2001) defines Mathematics as the Science of size and numbers (of which arithmetic, algebra, trigonometry and geometry are branches). Sentera, Kajubi and Taiwa (1974) describe Mathematics as the Science of structure, order and relation that has evolved from elementary practices of counting, measuring and describing the shapes of objects.



Furthermore, Sentera, Kajubi and Taiwa (1974) attest that Mathematics is a major aspect of our educational system since its application cuts across all areas of human endeavor. For instance from social or economics perspectives Mathematics is a key element in our day-to-day living that every human being practices in one form or the other. Mathematics is quite rich in concepts that directly translate to proper life skills.

The importance of Mathematics to everyday living cannot be over emphasized. Kolawole and Oluwatayo (2004) reinforce the motion that Mathematics curriculum in Nigerian secondary schools is developed and structured around four major concepts: Number and Numeration, Algebraic Processes, Geometry, and Mensuration and Everyday Statistics and that these concepts have direct bearing on people's way of life. Oyedeji, 2000 describes Mathematics as a creative language, a tool and a process. According to Onoshakpokaiye (2011), "Mathematics is an expression or graphical representation of what resides in the sub-conscious and also a mental activity ... Mathematics is a branch of Science that deals with shapes and numbers" (p. 16). Mathematics is the branch of knowledge that seeks to improve human perception and the immediate environment by using clear, logical precise and exact thinking processes. Furthermore, Mathematics is an autonomous Science that springs up on a defined basis and developed in any direction based on the unfolding of knowledge (Ezenweani 2006). Onoshakpokaiye (2011) opines that, "Mathematics involves thinking, modeling, conjecturing and describing all aspects of reasoning about situations and organizing ones expression" (p. 16).

...The following epistemological and cognitive assumptions about Mathematics, take into account some recent tendencies in the philosophy of Mathematics (Tymoczko, 1986, Ernest, 1991): Mathematics is a human activity involving the solution of problematic situations. In finding the responses or solutions to these external and internal problems, mathematical objects progressively emerge and evolve.

According to Piagetian constructivist theories, people's acts must be considered the genetic source of mathematical conceptualization; mathematical problems and their solutions are shared in specific institutions or collectives involved in studying such problems. Thus, mathematical objects are socially shared cultural entities; Mathematics is a symbolic language in which problem-situations and the solutions found are expressed. The systems of mathematical symbols have a communicative

function and an instrumental role; and Mathematics is a logically organized conceptual system. Once a mathematical object has been accepted as a part of this system, it can also be considered as a textual reality and a component of the global structure. It may be handled as a whole to create new mathematical objects, widening the range of mathematical tools and, at the same time, introducing new restrictions in mathematical work and language (Godino, 2000, pp. 418 – 419).

Furthermore, Mathematics is quite rich in concepts which directly translate to proper life skills and the importance of Mathematics to everyday living cannot be over emphasized (Tali, Mbwas and Abe, 2012). According to Kolawole and Oluwatayo (2004), the Mathematics curriculum in Nigerian secondary schools is developed and structured around four major concepts; Number and Numeration, Algebraic processes, Geometry, and Mensuration and everyday statistics and these concepts have direct bearing on people's way of life. Amoo and Disu (2012) unveil that the origin of Mathematics as a core subject in secondary school system may have been an attempt by the policy makers to solve certain quantitative problems of human's daily life.

Today, the importance of Mathematics permeates all aspects of human endeavor. Mathematics as the queen of Science cannot be completely separated from Sciences because of its applications to physical Sciences. Increasingly, applicants for the best employment opportunities will need a good grasp of Science, Mathematics, and Computer Technology. However, the societal values and views about its (Mathematics') importance among the school subjects have not been fully explored. Why this is so, and what can be done to increase their achievement, are important educational concerns now. Successful attempts to teach Mathematics effectively have been made recently, and a range of educational policies and programmes, school effectiveness and methods for effective instruction have been identified (Amoo and Disu, 2012, p. 2).

Ernest (2009) asserts that Mathematics education is the practice of teaching and learning Mathematics, and that Mathematics education is both a set of practices, encompassing Mathematics teaching, teacher education, curriculum development, researching and research training, as well as a field of knowledge with its own terms, concepts, problems, theories, subspecialisms, papers, journals and books. More so, the

success of any teaching of any learning process depends largely on the instructional procedures and for a given instructional procedure to achieved desire objectives it must be properly harnessed through adequate and proper use of instructional facilities (Gistarea, 2013).

In our Universities, the teaching and learning of Mathematics (Mathematics education) should be taken very seriously. The quality of Mathematics that will pave the way for the much needed pursuit in Science and Technology at the higher level is a matter of concern. Quality has to do with the attainment of standards and standards ensure accountability; ...the problem of quality of Mathematics instruction and learning are from diverse sources. The teacher has been said to be responsible for the low quality of student performance in our secondary schools. Despite the relative importance of Mathematics, it is very disappointing to note that the student's performance in the subject in both internal and external examinations has remained consistently poor. Mathematics educators have put up noble and spirited efforts aimed at identifying the major problems associated with the teaching and learning of Mathematics in the nation's schools. Despite all these noble efforts, the problem of poor achievement in Mathematics has continued to rear its head in the nation's public examinations (Adolphus, 2011, pp. 144).

### **2.3 Trends of Science, Technology, Engineering, and Mathematics (STEM) with Mathematics Education as a Beacon**

Mathematics, it is claimed, remains the most functional subject in all disciplines and fields of human work and it has become an indispensable tool in the study of humanities, Sciences, Technology and engineering. Mathematics has entered into many areas of human activities and every individual needs some measure of Mathematics for his or her day to day activities (Kurumeh, Onah and Mohammed, 2012). "Usefulness of Mathematics in human activities cannot be underestimated because it is the precursor of scientific discoveries and inventions, of which any nation that overlooks the study of Mathematics and does not take interest in it would remain underdeveloped" (Kurumeh, Onah and Mohammed, 2012, p. 54).

In contemporary Nigeria, greater emphasis is being placed on Industrial and Technological development. As a result students are being encouraged to take up Science related subjects. Conversely, one subject that cuts across all the Sciences is Mathematics (Adedeji, 2007). "Today, mathematical methods pervade literally every field of human endeavor and play a fundamental role in economic development of a country. In our march towards scientific and technological advancement, we need nothing short of good performance in Mathematics at all levels of schooling. Unfortunately, performance of students in Mathematics at the end of secondary education has not improved in the past decade" (Adedeji, 2007, p. 149).

The importance of Mathematics to the modern culture of Science and Technology has been well recognized and generally accepted worldwide. Oguntuase, Awe and Ajayi (2013) reveal that, "Mathematics is the pillar of Science and Technology and its functional roles in the development of Science and Technology are multi-dimensional that no area of Science, Technology and business enterprise escapes its application (Okereke, 2006, Okigbo and Osuafor, 2008)" (p. 1). Oguntuase, Awe and Ajayi (2013) stress that Mathematics is the backbone of civilization in all the centuries of meticulous calculation, and the most basic discipline for any person who would be truly educated in any Science and in many other endeavors.

Science, Technology and Mathematics Education (STME) have been widely acclaimed to be the index of measuring any nation's socio economic and geopolitical development. Among Science and Technology courses, according to the National Policy on Education, Mathematics is one of the core subjects to be offered by all students up to the tertiary levels of education. This compulsory nature of Mathematics carries with it the assumption that the knowledge of the subject is essential for all members of our society. Mathematics competence is a critical determinant of the Post-Secondary educational and career options available to young people (Adolphus, 2011, pp. 143 – 144).

According to Daso (2012), the increasing importance, attention and position given to Mathematics stem from the fact that without Mathematics there is no Science, without Science there is no modern Technology and without modern Technology there is no modern society; simply put, "Mathematics is the precursor and the queen of Science and

Technology and indispensable single element in modern societal development. This suggests that there could be no real development technologically without a corresponding development in Mathematics both as conceived and practiced” (Daso, 2012, p. 74). Barrow and Woods (1987) emphasize the need to make Mathematics a compulsory subject at the primary and secondary levels if scientists, technologists and engineers are to be produced. Oguntuase, Awe and Ajayi collaborate that,

Mathematics is a universal language of Science and central intellectual discipline of the technological societies (Kalejaye, 1985; Odeyemi, 1995). A student needs fundamental knowledge of Mathematics like ‘Change of Subjects’ to understand density which appears under major topics like Ecology in Biology, Diffusion in Chemistry and Floatation in Physics (2013, p. 2).

Bajah (2000) echoes that no nation can make any meaningful progress in this information Technology age, particularly in economic development, without a foundation in Mathematics. Furthermore, Mathematics is one of the important subjects taught in all schools throughout the world due to its relevance to other subjects, most especially in the development of Science and Technology. It is an integral part of life because it is needed by everyone for successful living (Onoshakpokaiye, 2011). “The fabric of society has become more and more underpinned by mathematical ideas. As a result, a major development in Mathematics education in this millennium has been the increased amount of Mathematics that all citizens are expected to know.

STEM is not a separate reform movement; rather, it is an emphasis on a multidisciplinary approach for better preparation of all students in STEM subjects and in growing the number of postsecondary graduates who are prepared for STEM occupations. The motivation behind this new emphasis on STEM is simple. Increasing the number of students versed in STEM and growing the number of graduates pursuing STEM careers or advanced studies which are critical to the economic prosperity of every state and the nation (Thomasian, 2011). UNESCO (2003) opines that “providing a sound basis in Physics, Mathematics and Chemistry enables the youth to pursue their goals, regardless of their background. A socially responsible future generation will need to have these qualities instilled at an early level, to be able to apply all the standards and models that today’s scientists are working on, whether environmental or societal” (p. 2). “Mathematics, is

crucial to meaningful technological development, it has become imperative for Lagos state to support any move geared towards improving the teaching and learning of the subject” (Eleweke, 2009, p. 1). “The urgent need for STEM workers presents enormous challenges to our nation's future productivity and to its educational systems” (Tyson, Lee, Borman, and Hanson, 2007, p. 247). Black and Atkin (2005) emphasize that “the terms and circumstances of human existence can be expected to change radically during the next human life span. Science, Mathematics and Technology will be at the centre of the change – causing it, shaping it, responding to it. Scientific literacy is essential to educate today’s children for tomorrow’s world” (p. 15). Thomasian (2011) corroborates that “a labor force without a rich supply of STEM-skilled individuals will face stagnant or even declining wealth by failing to compete in the global economy, where discovery, innovation, and rapid adaption are necessary elements for success” (p. 11).

Wherever a person belongs in a society, he utilizes knowledge of Mathematics in one form or the other. A president of a nation, an engineer a businessman, an industrialist, a banker and a financier or a finance minister; a planner or a boss in a parastatal, even a labourer has to calculate his wages, make purchases from the market and adjust the expenditure to his income. Whosoever earns and spends uses Mathematics. Counting, notation, addition, subtraction, multiplication, division, weighing, measuring, selling, buying and many more are simple and fundamental processes of Mathematics which require immense practice. The knowledge and skills in these processes can be provided in an effective and systematic manner only by teaching Mathematics in schools (Kulbir, 2006)” (Tali, Mbwas and Abe, 2012, p. 2).

Chen (2009) asserts that, “the percentage of men entering STEM fields was higher than that of women (33 percent vs. 14 percent), especially in the fields of Mathematics .... Nearly half of Asian/Pacific Islander students (47 percent) entered STEM fields, compared to 19–23 percent of students in each of the other racial/ethnic groups. No measurable differences were found among White, Black, and Hispanic students” (p. 7). Tyson, Lee, Borman, and Hanson (2007) note that “Science and Mathematics course-taking is a key component on the pathway toward STEM careers. This STEM pathway can be understood as the set of educational and occupational pathways that lead to STEM careers” (p. 244).

Various academic indicators are associated with STEM entrance as well. For example, the percentage of students entering STEM fields was higher among students who took trigonometry, precalculus, or calculus in high school; earned a grade point average (GPA) of B or higher; had college entrance exam scores in the highest quarter; and expected to attain a graduate degree in the future than among students without those characteristics. Students entering most STEM fields had similar demographic and academic characteristics, but those entering computer/information Sciences were somewhat different. For example, a higher percentage of students age 30 or older, from families with income in the bottom 25 percent, and with an average high school GPA of below B entered the computer/information Science fields than did students age 19 or younger, from families with income in the top 25 percent, and with an average high school GPA of B or higher (Chen, 2009, p. 7).

Increasingly, Science, Technology and Mathematics (STM) have become an essential part of basic education. The link between the number of STM related research personnel and the affluence of a nation is well established. Nations are keen to invest in STM education, but their capacities to do so remain widely disparate creating a major gap between them (UNESCO - United Nations Educational, Scientific, and Cultural Organization, 2003). Tali, Mbwas and Abe argue that “to develop scientifically, technologically, economically, politically depends on the manpower the country has acquired. This manpower includes Mathematics teachers, engineers, medical doctors, technologist and others. In order to produce future scientists and technologists in quality and quantity that are self-reliant, the knowledge of Mathematics is paramount” (2012, pp. 1 – 2). Makinde (2012) confirms that,

Research reports have offered several reasons for the students’ poor performance in Mathematics. The reasons include: lack of qualified Mathematics teachers (Adewumi, 1981; Ali, 1985); student’s lack of interest and as well as negative attitude towards Mathematics (Ale, 1989); teachers own negative attitude and incompetence in certain concepts (Badmus, 1989); poor methods of teaching applied by the teacher in the classroom; and teachers’ non-use of relevant

instructional materials in the teaching of Mathematics concepts (Agwagah, 2001) (p. 53).

Makinde (2012) emphasizes that, “if all the reasons above can be greatly taken care of positively, there will be effective teaching and learning of Mathematics and for the hearing impaired this will go a long way to increase their high level of man power [sic] in the teaching of Mathematics” (p. 54). Mathematics is an indispensable tool in the study of Sciences, humanities and Technology. Its usefulness to human activities cannot be overemphasized. People use Mathematics directly or indirectly in everyday life or activities. It is a human invention to solve human problems (Kolawole and Oluwatayo, 2005).

Most importantly, in order for Nigeria to take her rightful position among the committee of nations there is an urgent need to have an indigenous critical mass of trained scientists and engineers. Invariably, such critical mass can only be acquired by well-organized Mathematics programmes at all levels of schooling (Daso, 2012).

#### **2.4 Problems and Prospects of Mathematics Education**

Daso (2012) laments the alarming poor state of Mathematics education in our schools, as revealed by the students’ dismal performance in public examinations such as SSCE and JAMB, called for an urgent need to constantly seek ways of improving the teaching and learning of the subject. Such efforts could be geared towards evolving new strategies and total transformation of the Mathematics education programmes. In spite of the effort of the government on the development of Mathematics teaching and provision of opportunities for the improvement of teaching, there are still problems of Mathematics teaching and learning (Tali, Mbwas and Abe, 2012). Some of these problems are as follows:

Lack of curriculum integration; shortage of Mathematics teachers; lack of instructional materials; poor government policy; poor classroom organization by teachers; lack of equipped Mathematics laboratory for practical; over population of students which may impede effective demonstration during practical; teachers impatience and un-preparedness; and poor remuneration of teachers (Odili, 2006, p. 8).

Furthermore,



Despite the importance of Mathematics, many problems seem to beset Mathematics education in Nigeria. This has resulted in the consistent poor performance in senior school certificate examination (SSCE) in the subject (NERDC, 1992; Salau, 2002). Prominent among these problems, according to STAN (2002) are: acute shortage of qualified professional Mathematics teachers; exhibition of poor knowledge of Mathematics content by many Mathematics teachers; overcrowded Mathematics classrooms; adherence to odd teaching methods in spite of exposure to more viable alternatives; students' negative attitude towards Mathematics; undue emphasis on the coverage of Mathematics syllabuses at the expense of meaningful learning of Mathematics concepts; inadequate facilities and Mathematics laboratories in our schools, to mention but a few (Daso, 2012, p. 75).

According to Salau (2002), the road to better Mathematics education is tortuous and difficult and in order for Science and Technology to take its firm root in our society, the poor state of Mathematics education must be remedied. This could be achieved by demystifying the subject in the Nigerian classroom and incorporating the enhanced strategies for this laudable goal (Daso, 2012).

Through international cooperation and partnerships, UNESCO organizes activities, especially in developing countries, to promote capacity-building for research and advanced training in Mathematics and Mathematics education, and in general, to enhance public understanding and appreciation of the importance of Mathematics in society and daily life (UNESCO, 2003). "Within the framework of the Basic Sciences Programme, the International Centre for Pure and Applied Mathematics (ICPAM), based in Nice, France, has been the consistent partner of UNESCO in capacity-building initiatives to promote research and advanced training in Mathematics" (UNESCO, 2005, p. 1). Moreover, UNESCO supports initiatives that address the lack of interest by students in Mathematics, and those that upgrade teachers on their knowledge of new developments in Mathematics and their significance to society and daily life. Within this context, partnerships are being strengthened with the International Commission for Mathematical Instruction (ICMI-IMU), regional mathematical societies, universities, and research institutes (UNESCO, 2005).

UNESCO International Mathematics Exhibition: Experiencing Mathematics continues to travel around the world since July 2004. The exhibition was conceptualized

and designed to promote public appreciation of the importance of Mathematics and to show that Mathematics is indispensable for daily living, from basic economic activities to the operation of train stations and airports, as well as to demonstrate that Mathematics is fun and interesting. Experiencing Mathematics features posters, manipulative models and interactive devices. The exhibition is now under the care of Centre-Science, France. This Mathematics Exhibition is a dynamic, hands-on educational tool based on active learning methodology. Each of the experiments was designed to be used by teachers in their classrooms (UNESCO, 2012). "Since 2005, the Mathematics exhibition has already been presented successfully in more than 90 cities of 32 different countries in Southern and West Africa, China and East Asia, Latin America, Russia and Western Europe. It has attracted approximately 1,200,000 visitors, of whom about 70% were under 18 and over 20,000 teachers" (UNESCO, 2012, p. 2).

The problem of poor performance in Mathematics as a subject is global and it is a serious concern to parents and education stakeholders (Valverde and Schmidt 1997; Mudulia, 2012). This problem is made worse in developing countries by the existing digital divide, poverty and other problems unique to the third world especially Nigeria. Mathematics is a compulsory subject up to pre-university level especially in social Science and Science oriented subjects. Despite the importance placed on Mathematics, researchers (Odili, 1986; Salau, 1995; Amazigo, 2000; Agwagah, 2001; Betiku, 2001; Obioma, 2005; Maduabum and Odili, 2006; Okereke, 2006 Okigbo and Osuafor, 2008) had observed that students lack interest in the subject and perform poorly in it. During the past few years, performances in Mathematics in National examinations such as General Certificate Examination, WASC, NECO, NBTE and UTME) have dropped significantly and this has been a major concern for the society. Ale (2012), submits that there is a lack of interest in Mathematics and mass failure in Mathematics at school certificate level; and the country (Nigeria) could not achieve its transformation agenda without promoting the study of Sciences through Mathematics (Oguntuase, Awe and Ajayi, 2013, pp. 1 - 2).

UNESCO's main activities in Mathematics education puts emphasis on raising public awareness and interest, especially that of young people, in mathematical concepts and applications to daily life; on attracting youth into Mathematics-related studies and careers;

and showing that current curricula can be improved by insertion of hands-on Mathematics experiments which develop scientific thinking as well as practical capabilities in Mathematics and related Sciences (UNESCO, 2012). Furthermore, “UNESCO promotes Mathematics education globally and especially in developing countries, through international cooperation and partnerships with specialized organizations and unions among these the International Mathematics Union (IMU) and its commission for education (ICMI), the African Mathematical Union (AMU) and the [UNESCO/UNITWIN network of chairs in Mathematics](#)” (UNESCO, 2012, p. 3).

Tali, Mbwas and Abe (2012) claim that there have been numerous achievements recorded in Mathematics education in Nigeria in the 21st century. However, there are more challenges ahead. Makinde (2012) realizes that though Mathematics is vital to students’ future and national development, the teaching and learning of Mathematics has been ineffective in meeting the demands of national development in Nigeria. Students’ performance in Mathematics examinations, both internal and external, from year to year has never been encouraging as revealed when he considered the West Africa Secondary Certificate Examination (WASCE) results in Mathematics between 1989 and 1998, whereby the result shows the high level of poor performance of students in Mathematics. According to Daso (2012), the current effort of the Federal Government in this direction is noteworthy (Federal Republic of Nigeria, 2000), however, despite the government’s effort at both state and federal levels to promote Mathematics, much of the teaching and learning of the subject in our secondary schools today is far from being satisfactory. The alarmingly poor state of Mathematics education in our schools, “as revealed by the students’ dismal performance in public examinations such as SSCE and JAMB, calls for an urgent need to constantly seek ways of improving the teaching and learning of the subject; such efforts could be geared towards evolving new strategies and total transformation of the Mathematics education programmes” (Daso, 2012, pp. 75 – 76). However, statistics have revealed that there are difficulties in the teaching and learning of Mathematics, Geometry in particular; and this has resulted in mass failure in examinations. Furthermore, the mass failure in Mathematics examinations is real and the trend of student’s performance has been on the decline (Adolphus, 2011).

A cluster of variables has been implicated as responsible for the dismal performance of students. These include, government related variables, curriculum related variables, examination body related, teacher, student, home and text-book related variables. Apart from these variables, Amazigbo (2000) has identified poor primary school background in Mathematics, lack of incentives for teachers, unqualified teachers in the system, lack of learner's interest, perception that Mathematics is difficult, large classes and psychological fear of the subject as factors responsible for the dismal performance of students in the subject (Adolphus, 2011, p. 144).

If a student feels a personal connection to a teacher, experiences frequent communication with a teacher, and receives more guidance and praise than criticism from the teacher, then the student is likely to become more trustful of that teacher, show more engagement in the academic content presented, display better classroom behavior, and achieve at higher levels academically. Positive teacher-student relationships draw students into the process of learning and promote their desire to learn (Rimm-Kaufman, 2013).

For the teachers to discharge their duty effectively, government also has a significant role to play. Also, the government needs to employ more qualified Mathematics teachers so that the teacher student ratio will be in equilibrium. Incentive should also be given to the best Mathematics teacher of the year and the best Mathematics students of the year; this will enable the teacher to give their best [effort] to make their class students oriented and the students will then work harder in order to achieve good performance in Mathematics (Makinde, 2012, p. 55).

According to Nyesom (2013), the Federal Government of Nigeria plans to employ more than 1,000 English language and Mathematics teachers for the 104 unity colleges in the country, and the Federal Government's concerns over the poor performance of students of these Federal Government colleges in public examinations cannot be over emphasized.

Let me at this juncture inform all participants that the Federal Government has given approval for the employment of 1000 teachers in English language and Mathematics to bridge the gaps in these two important subjects. This is because despite their acknowledged degree of relevance, students across the country have consistently demonstrated poor knowledge of these subjects and under performed

in public examinations. From the statistics, the national average credit pass in the two subjects has quite unfortunately vacillated between 30 per cent and 37 per cent in the last five years. This is a bad omen that is undermining the country's quest for producing well rounded students and leaders who can creatively and independently contribute to national development (Nyesom, 2013, p. 1).

The decision to appoint new Mathematics teachers followed a Mathematics development needs assessment which showed that the ratio of Mathematics teachers to students was 1:350. Challenges facing basic education in terms of teaching and learning of Mathematics, English language and Science subjects are already being addressed (Nyesom, 2013).

Adedeji (2007) ascertains that various factors have been adduced for poor performance of students in Mathematics. Reporting to the National Council on Education (NCE) on students' performance in the May/June senior secondary school certificate Examinations (SSCE), the West African Examinations Council (WAEC, 2006), expressed worries over the low achievement due to poor retention rate and interest in Mathematics by Nigerian candidates (Kurumeh, Onah and Mohammed, 2012, p. 55). Kurumeh (2007) reveals that the inappropriate, inadequate, elitist and euro-centric teaching techniques and methods used by Mathematics teachers are instrumental in learners' inability to understand and retain the basic mathematical principles, computations or logical facts involved. The underlying process that gave rise to these mathematical realities resulted in learning by rote memorization, which led to poor retention, low performance and loss of interest in Mathematics.

Man is endowed with limited capacity for memorization. Thus the ability to memorize difficult subjects by rote learning calls for exercising the minds and the muscles of the mind and brain. However, Mathematics is not a subject that can be learned by rote memorization but for one to remember and recall information demands passing through one's experience. This means that the task before a teacher is how to help learners improve in their ability to assimilate information towards effective recalling/retrieving when the need arises. Resourcefulness in Mathematics teaching demands that the Mathematics teacher should focus attention on methods of teaching that stimulates learner's zeal, interest and higher retention rate, taking into cognizance of individual differences of learners. This then suggest

that Mathematics educators should be able to develop new teaching techniques/methods to take care of the individual abilities of learners in the classroom (Kurumeh, Onah and Mohammed, 2012, p. 55).

Mari (2002) argues that teaching strategies is a variable that can easily be manipulated by teachers to increase students' retention rate and performance as well as reduce or eliminate sex-related differences in Science and Mathematics performance.

The interest of students in Mathematics have been related to the volume of work completed, students' task orientation and skill acquisition, students' personality and self-concept (More, 1973), feeling of inadequacy (Callahan, 1971), motivation and self-confidence (Aiken, 1976), anxiety (Aiken, 1970), shortage of qualified Mathematics teachers, (Ohuche, 1978; Ale, 1989), poor facilities, equipment and instructional materials for effective teaching (Oshibodu, 1984; Akpan, 1987; Odogwu, 1994), use of traditional chalk and talk methods, (Oshibodu, 1988; Edwards and Knight, 1994), large pupils to teacher ratio (Alele-Williams, 1988) Mathematics fright/phobia (Georgewill, 1990) and so on. Wentzel (1998) states that interest in activities tends to increase the likelihood that individuals formulate goals relating to that activity and invest time and effort to achieve them (Adedeji, 2007, pp. 149 - 150).

Moreover, individual characteristics such as intelligence, cognitive styles, and personality play an imperative role in learning and instruction as does the context of learning. Nevertheless, other research findings have shown that individual students' characteristics and variables such as motivational orientations, self-esteem and learning approaches are important factors influencing academic achievements (Adedeji, 2007). Osafrehinti (1986) contends that curriculum changes in Mathematics have occurred in several countries for one reason or the other, but more importantly because of the desire to improve school Mathematics teaching to meet the ever changing needs of society, Science and Technology. Adolphus (2011) agrees that in Nigeria, curriculum changes have occurred and for a long time, the tendency has been to transfer unquestioningly, syllabi from the advanced countries based on the universality of the subject. Such undertakings lose sight of some problems usually raised by curriculum change. Osafrehinti (1986) outlines the following problems in curriculum changes in Nigeria: failure of Mathematics to relate to the child's

environment and thus the child cannot see the importance and immediate application of Mathematics, in particular Geometry in his or her day to day living; each new curriculum implementation has always taken the teachers by surprise, because they had never been involved in the development of the curriculum; the Nigerian Educational System has been constituted in such a way that teachers' training, curriculum development and classroom practice are three separate activities. Therefore, curriculum changes have taken place without due consideration for the training of teachers who will use them both at the pre-service and in-service operational and training levels. In addition to that, there is a non-availability of instructional materials such as textbooks, workbooks, slides, film strips, and other technologies to meet the pedagogical demands of the new curriculum imposed on teachers.

## **Chapter 3: Research Methodology**

### **3.1 Introduction**

To achieve the purpose of this study, a qualitative research approach was chosen. The purpose of this chapter is to describe the research design and theoretical framework chosen for this investigation. As stated in Chapter One, the intent of this study is to explore the Impact of Teacher Development and Student Preparation in Mathematics Education in Senior Secondary Schools in Delta State, Nigeria. Following this and based on the professional knowledge landscape of the researcher (Wilson, Ed. 2013) and the context of this study, a collective case study methodology was selected as the underlying research design for this investigation. In this chapter I highlighted the research methodology used. It consists of the research design, population and sampling procedure, description of research instruments and sources of data. This helped in directing the study towards achieving its set goals.

### **3.2 Qualitative Research**

Qualitative research is a generic term for investigative methodologies described as ethnographic, naturalistic, anthropological, field, or participant observer research. It emphasizes the importance of looking at variables in the natural setting in which they are found. However, interaction between variables is important and detailed data is gathered through open ended questions that provide direct quotations whereby the interviewer is an integral part of the investigation (Key, 1997). "Qualitative researchers are inclined to 'paint a portrait' or describe teaching as orchestration...; Qualitative research is largely inductive, with reasoning moving from descriptions of specific detailed observations to more general principles" (Suter, 2012, p. 55). Research is qualitative when there "is a need to collect, interpret and make judgements about data that cannot be measured - such as what people say and do, and why" (O'Toole and Beckett, 2010, p. 28). Qualitative research



is a philosophy of knowing achieved through a number of approaches to collecting and analyzing information. “Qualitative research focuses on understanding from the perspective of whoever and whatever is being studied ... [and is] based on the assumption that reality is subjective and dependent on context” (McMillan and Wergin, 2002, p. 119). Taylor and Bogdan (1998) believe that qualitative approach, in its broadest sense, is research that produces descriptive data: people’s own written or spoken words and observable behaviour.

Interpretivist or qualitative researchers argue that “important dimensions of social life and human experience cannot be measured in numeric or quantitative terms.” Such researchers are interested “in exploring processes and attempt to add depth and complexity to our understandings” (Curtis and Pettigrew, 2010, p. 58). Qualitative researchers typically begin with an exploratory research question about what people think and how they act, and why, in some educational setting (Check and Schutt, 2012). So, in qualitative research we try to make sense of the world through the pre-understandings of the people researched. “ Given, then, that the field of study is the meaningful actions of individuals and the social construction of reality, the social Sciences must be distinct from natural Sciences, with different methods, different ways of explaining and different criteria about what constitutes valid knowledge” (Scott and Usher, 2011, p. 29). Furthermore, Scott and Usher (2011) claim qualitative research is a popular approach for educators, because in emphasising the social actor and his or her situation, it seems to offer a more fruitful and human way of doing research.

Eisner (1998) notes that qualitative research tends to be field focused, and in education studies this means that researchers go out into schools and district offices, visit classrooms, watch children play, and observe teaching and learning. This type of educational research can include the study of school architecture, textbooks, or classroom design. Anything that holds importance for education is of research value.

Qualitative inquirers triangulate among different data sources to enhance the accuracy of a study. Triangulation is the process of corroborating evidence from different individuals (e.g., a principal and a student), type of data (e.g., observational

fieldnotes and interviews), or methods of data collection (e.g., documents and interviews) in descriptions and themes in qualitative research... This ensures that the study will be accurate because the information draws on multiple sources of information, individuals, or processes. In this way, it encourages the researcher to develop a report that is both accurate and credible (Creswell, 2012, p. 259).

By drawing on different types and sources of data, one can gain a deeper and clearer understanding of the people and places being studied. This means that along with fieldnotes and interviews, one might also examine documents relevant to the study. In this way, the study will end up with what is often called a “thick description” of work (Check and Schutt, 2012, p. 190).

### **3.3 Research Design**

Creswell (2012) claims that “research designs are the specific procedures involved in the research process: data collection, data analysis, and report writing” (p. 20). “A qualitative research design is the ‘logic that links data to be collected (and the conclusions be drawn) to the initial questions of the study’” (Suter, 2012, p. 365).

It is pertinent to note that different research designs exist and no one method is the best, as either one can suitably be adopted in carrying out a research study (Ahiauzu, 2002). However, “many description-oriented research questions in education can be answered by intensive study of a single person, single group, or similar unit, such as a classroom or school district. Case study design is an approach to qualitative research that focuses on the study of a single person or entity using an extensive variety of data” (Suter, 2012, p. 366).

Case studies are detailed investigations of individuals, groups, institutions or other social units. The researcher conducting a case study attempts to analyze the variables relevant to the subject under study (Polit and Hungler, 1983). The principle difference between case studies and other research studies is that the focus of attention is the individual case and not the whole population of cases. Most

studies search for what is common and pervasive. However, in the case study, the focus may not be on generalization but on understanding the particulars of that case in its complexity. A case study focuses on a bounded system, usually under natural conditions, so that the system can be understood in its own habitat (Stake, 1988) (Key, 1997, p. 2).

In doing this qualitative research I have chosen a collective case study (Creswell, 2012, p.465). In general, case studies are usually done for one of the following three reasons: first, to provide vivid descriptions – it is often helpful to obtain vividly descriptive pictures of a particular person or instance; secondly, to provide explanations – at times descriptions, however vivid, are not sufficient in themselves, the “why” of the situation is needed; thirdly, to provide evaluations – it is to evaluate programs, individuals, and settings. Such study will probably identify program strengths and shortcomings, and will lead to suggested modifications (Mertler and Charles, 2005). A case study can test theory or build theory, incorporate random or purposive sampling, and include quantitative and qualitative data. “The case study may choose a particular person, group of people, or teaching context in order to investigate a phenomenon that was noticed” (O’Toole and Beckett, 2010, p. 6). In addition, McMillan and Wergin (2002) talk about case study as “an in-depth analysis of one or more events, settings, programs, social groups, communities, individuals, and other bounded systems” (p. 120). Furthermore, Yin (2003) claims that case study; because it is naturalistic, it is especially suited to overcome the challenges presented by fragmentation and its associated obstacles to our understanding of research situations, including the delivery of curriculum which is neither simple nor fragmented and needs to be treated as a whole. Authentic insights reached through case study have the capacity to work reflexively to change the situation studied. And the action possibilities created by case study are grounded in the situation itself, not imposed from outside it. A particular case study can be a thorough examination of a variety of specific phenomena, including an event, institution, person, process, program or social group. Regardless of the subject chosen for the investigation, it is vital the researcher clearly define the boundaries of the case as a unit of analysis (Hatch, 2002; Merriam, 1998). “Case studies may also include multiple cases, in which multiple cases are described and compared to provide insight into

an issue ...” (Creswell, 2012, p.465). Moreover, a collective case study is a case study that consists of several different cases. A collective case study may be conducted at one site (e.g., a school, hospital, or university) by examining a number of different departments or other units at that one site. Each unit is studied as part of a collection, regardless of whether the units themselves are located at single or multiple sites (Creswell, 1998). This seemed a logical approach for this particular study.

Following on the above and given that case studies are descriptive, interpretive, enlightening and activating, and are well suited to the goals of this investigation, I decided to use a collective case study as the methodology since it offers me the opportunity of exploring and identifying the factors impacting the teaching and learning of Mathematics in three Senior Secondary Schools.

### **3.4 Population and Sampling Procedure**

The population of a study can be likened to an entire universe of the subject in which a researcher is interested. Creswell (2012) perceives that “a population is a group of individuals who have the same characteristic” (p. 142). “A population contains all the individuals within certain descriptive parameters, such as those of location, age, or sex” (Mertler and Charles, 2005, p. 43). The population of this study therefore is the Senior Secondary Schools in Delta State, Nigeria.

It was through a purposeful sampling exercise I obtained the sample for this study. “In purposeful sampling, researchers intentionally select individuals and sites to learn or understand the central phenomenon... In any given qualitative study, you may decide to study a site (e.g., one college campus), several sites (three small liberal arts campuses), individuals or groups (freshman students), or some combination (two liberal arts campuses and several freshman students on those campuses). Purposeful sampling thus applies to both individuals and sites” (Creswell, 2012, p. 206).

### 3.5 Description of Research Instruments

As noted above, qualitative inquirers triangulate among different data sources to enhance the accuracy of a study. Triangulation is the process of corroborating evidence from different individuals (e.g., a principal and a student), types of data (e.g., observational fieldnotes and interviews), or methods of data collection (e.g., documents, and interviews) in descriptions and themes in qualitative research” (Creswell, 2012, p. 259). To achieve triangulation in this study, interviews with teachers and students along with observation of fieldnotes based on the primary research questions were used.

For this study the primary form of data collection was through interview. Interviews were an integral part of the data collection. At the root of in-depth interviews is “an interest in understanding the experience of the other people and the meaning they make of that experience” (Seidman, 1998, p. 3). Through interviews it was possible for me to probe the thoughts, values, prejudices, perceptions, views, feelings and perspectives of an interviewee (Wellington, 2000). Patton (2002) avers that, “the purpose of interviewing... is to allow us to enter into the other person’s perspective” (p. 341). Taylor and Bogdan (1998) claim that it is helpful to recall that in interviews people are subject to the same fabrications, deceptions, exaggerations and distortions that characterise talk between any persons. Every one of us perceives the world through our own experiences and mindsets. However, this is where triangulation and thick descriptions help the study. According to Creswell (2012), “a qualitative interview occurs when researchers ask one or more participants general, open-ended questions and record their answers. The researcher then transcribes and types the data into a computer file for analysis. In qualitative research, one asks questions so that the participants can best voice their experiences unconstrained by any perspectives of the researcher or past research findings. An open-ended response to a question allows the participant to create the options of responding.” (pp. 217 - 218). There are a number of approaches to interviewing, which interview approach to use will ultimately depend on the accessibility of individuals, the cost, and the amount of time available (Creswell, 2012). In this study, I made use of one-on-one interviews and observational fieldnotes. The one-on-one interview is a data collection process in which the

researcher asks questions to and records answers from only one participant in the study at a time (Creswell, 2012).

I found that in doing the study on the Impact of Teacher Development and Student Preparation in Mathematics Education in Senior Secondary Schools in Delta State, Nigeria, a valuable source of information in qualitative research can be fieldnotes (Creswell, 2012). “The data recorded during an observation are called fieldnotes. Fieldnotes are text (words) recorded by the researcher during an observation in qualitative study” (Creswell, 2012, p. 216). Suter (2012) emphasizes that, “fieldnotes may take many forms, including detailed observations and general interpretations, reflections, and summaries of recorded interviews” (p. 368).

Fieldnotes are contemporaneous notes on observations or conversation taken during the conduct of qualitative research. Depending on the circumstances, the notes taken can be full (e.g. verbatim transcripts of conversations taken by hand or recorded by a tape recorder) or brief notations that can be elaborated on later. Bryman and Bell (2003) identify three classifications of fieldnotes based on suggestions by Lofland and Lofland (1995) and Sanjek (1990). These are: mental notes when it may be inappropriate to take notes; jotted or scratch notes, taken at the time of observation [non-participant observation; participant observation] or discussion and consisting of highlights that can be remembered for later development; and full fieldnotes written up as promptly and as fully as possible. Keeping good systematic fieldnotes is an essential part of undertaking qualitative research as observations and interviews are only useful to the extent that they can be remembered ... (Thorpe and Holt, 2008, p. 1).

Cohen and Crabtree (2006) note that when observing a culture, setting, or social situation, fieldnotes are created by the researcher to remember and record the behaviors, activities, events and other features of the setting being observed. Fieldnotes are prepared - jottings are translated into fieldnotes. The jottings are used to facilitate the observer's memory of the session in the field. In preparing his or her fieldnotes, the researcher provides a detailed, coherent description of what he or she observed. Fieldnotes are meant to be read

by the researcher to produce meaning and an understanding of the culture, social situation or phenomenon being studied.

### **3.6 Sources of Data**

Mertler and Charles claim that “the information researchers obtain about people, settings, objects, and procedures is called data, which can be recorded in verbal or numerical form. Data are obtained from two broad sources of information, called primary sources and secondary sources. Information from those sources is correspondingly called primary data and secondary data” (2005, p. 35).

The data for this study were obtained from primary sources. The primary sources of data are those generated through the interviews and observational fieldnotes. Primary data sources are highly valued because the firsthand information they supply tends to be more accurate than information obtained from secondary sources (Mertler and Charles, 2005).

### **3.7 Data Analysis Technique**

The goal of qualitative data analysis is to uncover emerging themes, patterns, concepts, insights, and understandings (Patton, 2002). Qualitative studies often use an analytic framework – a network of linked concepts and classifications – to understand an underlying process; that is, a sequence of events or constructs and how they relate” (Suter, 2012, p. 344).

Check and Schutt (2012) assert that, “most approaches to qualitative data analysis use five steps: Documentation of the data and the process of data collection, Organisation/categorization of the data into concepts, Examining relationships to show how one concept may influence another, Authenticating conclusions by evaluating alternative explanations, disconfirming evidence, and Reflexivity” (p. 303).

In translating the raw data into standard form, all interview tapes were transcribed and the data were analyzed in terms of the evolving themes or relationships. I analyzed

themes already existing in their context and examined them according to the institutions and the ideologies of the participants.

### **3.8 Primary Questions**

The interviews schedule/questions are functions of the following primary questions:

- From the point of view of teachers and students, what are the dominant factors that influence teaching and learning of Mathematics Education in Senior Secondary Schools?
- Do teachers consider themselves to be qualified and adequately prepared to teach Mathematics?
- What are students' attitudes and perceptions towards Mathematics?

### **3.9 Summary**

This chapter of the study provided the methodology employed in conducting this study. We now proceed to presenting the data collected from interviews and observational fieldnotes in the next chapter.



## Chapter 4: Presentation of the Data

### 4.1 Introduction

This chapter is concerned with the presentation of the primary data collected from the field for this research, *The Impact of Teacher Development and Student Preparation in Mathematics Education in Senior Secondary Schools in Delta State, Nigeria: A Collective Case Study*. The data gathered from interviews and observational fieldnotes were organized into structural themes, categories or “abstractions derived from the data” (Merriam, 1998, p. 181), as a means to provide the best representation of the results in order to answer the primary research questions (Merriam, 1998). These questions, as noted above, are:

- ✚ From the point of view of teachers and students, what are the dominant factors that influence the teaching and learning of Mathematics Education in Senior Secondary Schools?
- ✚ Do teachers consider themselves to be qualified and adequately prepared to teach Mathematics?
- ✚ What are students’ attitudes and perceptions towards Mathematics?

In order to obtain clarification and consistency in the presentation and analysis of the data, each of the schools and interview participants has been purposefully assigned a symbolic name (X, Y, Z, X<sub>T1</sub>, Y<sub>T1</sub>, Z<sub>T1</sub>, X<sub>S1</sub>, Y<sub>S1</sub>, Z<sub>S1</sub>, ...). These symbolic names are used when the schools and individual voices are referenced throughout the chapter (See Appendix C for a general title/key and role of each of these schools and participants).

By way of explanation, the National Youth Service Corps (NYSC) is an organisation set up by the Nigerian government to involve the country's graduates in the development of the country. There is no military conscription in Nigeria, but since 1973 graduates of Universities and later Polytechnics have been required to take part in the National Youth

Service Corps (NYSC) program for one year. This is known as national service year. "Corp" members, commonly or popularly called/known as Coppers are posted to cities far from their city of origin. They are expected to mix with people of other tribes, get to know social and family backgrounds, to learn the culture of the indigenes in the place they are posted. This action is aimed to bring about unity in the country and to help youths appreciate other ethnic groups (Marenin, 2009).

It should be noted that I present the interviews done with teachers and students verbatim. No attempt has been made to modify these voices or present them in *Standard English*.

## **4.2 Teachers' Views**

The views of the teachers are presented under the following themes: Teacher Mindset, Qualifications, Classroom Conditions, Teacher View of Students and Demands of Mathematics (both Teachers and Students).

### **4.2.1 Teacher Mindset**

In education we are often drawn to issues and concerns around, what I am calling in a general sense, Teachers' Mindset. This theme includes, for my purpose here, Teacher Interest in teaching Mathematics, Teacher Motivation, and Professional Development, as well as Relationships with Students.

The teachers interviewed expressed their interest in teaching Mathematics. These claims ranged from, "I am very interested in the teaching of Mathematics", and "It is my field. That is the subject I enjoy teaching and I'm definitely interested in Mathematics." One teacher said, "If you are the person who understands the students you will be able to let them know what the subject stands for and you will be able to generate their interest in the subject." However, these claims were tempered by statements like, "I do not enjoy teaching Mathematics."

It follows that these claims, pros and cons, are linked to motivation. One said, "I'm not motivated; there is no motivation." Another elaborated by stating, "Mathematics is a subject I never expected/wanted to teach because I read mechanical engineering ... but here I am in the classrooms teaching Mathematics; and nothing here is motivating me." Another teacher said, "I'm not happy teaching in the classrooms and I cannot wait to stop it." Others who believed in the value of the work opposed such claims: "What motivates me in Mathematics is that it is a practical subject and the knowledge from there is applicable to all fields of learning."

Concerns were expressed about the place and availability of professional development. The teachers interviewed were unanimous in claiming that they were not receiving the professional development that they believed they needed. The statements ranged from, "Well ever since I started teaching I have never been to any staff development programmes" to "At times you stay for like five, six, seven years there is nothing like staff development." Even the expectation for professional development for some teachers is lacking: "I have not been there (staff development programmes) before; like I have told you, I'm a youth copper." Finally, there is the universal claim that, "I have never attended any (staff development programmes)."

One of the more positive aspects of this exploration of teacher mindset was the expressed relationship with students. The claims made by teachers ranged from, "There is a good teacher/students relationship" to "They see me as their teacher, uncle, parent in school; and they see me also as their friend." These statements were discredited by what I observed in the classroom. Thus, "... The students are somehow scared of their Mathematics teacher, there appears to be a gap in the teacher/student relationship with the Mathematics teacher" (X<sub>OF</sub>, 2013, July 4). However, teachers are realistic when it comes to student motivation. As Z<sub>T1</sub> said, "In terms of motivation, there are some that are very, very motivated ... however, among these students there are others who are not motivated; nothing moves them especially when it comes to the subject Mathematics."

Adding to the complex area of teacher mindset is the issue of continuity. As Y<sub>T2</sub> noted, "In no distant time, say, about six months' time I will be leaving the school for my

career; because I'm not happy teaching in the classrooms and I cannot wait to stop it." This reality will be taken up when presenting data on teachers' qualifications.

#### 4.2.2 Qualifications

An important aspect that has an impact on the teaching and teachers of Mathematics, and indeed education are the qualifications of the teachers. This theme includes: Teachers' Certificates, Staff Strength and Corps Members (Coppers).

A Teaching Qualification is one of a number of academic and professional degrees that enables a person to become a registered teacher. Depending on country, such qualifications may for example include the Postgraduate Certificate in Education (PGCE), the Professional Graduate Diploma in Education (PGDE) and the Bachelor of Education (Reid, 2013). The teachers interviewed described the types of degrees they hold. These descriptions stretched from, "I have a B. Sc. (Industrial Mathematics) and PGDE (Post Graduate Diploma in Education)," to "I read B. Sc. Ed. Mathematics" and "I'm the only Mathematics teacher, with a qualification in Mathematics in the school." Z<sub>T1</sub> pointed out that "They just brought in some coppers here in this school but they do not have a degree related to Mathematics." A teacher agreed that, "I told you that I am an engineer and I am in the classroom teaching Mathematics ...." In the same vein X<sub>T3</sub> said "My degree is Higher National Diploma (HND) in Computer Science; and I did not read education (that is, I did not go to school to be a teacher)". Z<sub>T2</sub> responded that, "I have National Certificate of Education (NCE) in Business Education and Accounting". Moreover, when I met the teachers in the office, I observed that, "A copper that read computer Science (without Education/Mathematics qualification) is being used as a substitute for Mathematics teacher due to insufficient Mathematics teachers (low man power)" (X<sub>OF</sub>, 2013, July 1).

It would appear that teachers' certificates may be linked with staff strength. Throughout the interview sessions and discussions held with the teachers of this study, there was the recurring issue of the competence and number of staff/employees who are teaching Mathematics. One teacher said "I'm the only Mathematics teacher in this school; and this is affecting the teaching/learning of Mathematics here." Y<sub>T1</sub> claimed that, "It is,

very, very demanding. You can see that I'm the only Mathematics teacher in this school; so based on that I teach Mathematics every day in the school." Another teacher declared, "We have two Mathematics teachers," and "If it would be possible, it would be good that we have more hands or more staff employed in teaching the subject Mathematics in the school." Furthermore, X<sub>T3</sub> said, "The authority of education in Nigeria, Delta State in particular should do well at employing Mathematics teachers," because "We do not have enough manpower in the subject (Mathematics)." I observed in the school that, "The school has just two permanent Mathematics teachers. It was formerly three Mathematics teachers; unfortunately, one just retired without replacements" (X<sub>OF</sub>, 2013, July 1).

The purpose of corps members (Coppers) was to augment the staff strength for teaching Mathematics. The claims made by teachers ranged from, "I teach Mathematics because it is a kind of mandatory programme of the federal government, and as a copper I was deployed to this state to teach" to "They just brought in some coppers here in this school and they do not have degrees related to Mathematics." X<sub>T3</sub> concurred that, "As a mandatory programme by the federal government, I do not have any other option than to abide and accept teaching." However, Y<sub>T1</sub> explained, "... Coppers are graduates of higher institutions that are deployed to different States of Nigeria to serve the society after staying for a couple of weeks in an orientation camp. Moreover, most of them who have qualifications that are related to Mathematics, like engineering, are posted to secondary schools to teach Mathematics."

#### **4.2.3 Classroom Conditions**

Reid noted that not every student is learning in the classroom. Numerous distractions stand between the teacher's message and the student's ears. According to The Wallace Foundation (2013, p. 1), "Student learning is influenced most directly by classroom conditions which are a result of state, district and school conditions, as well as individual teacher preferences, capacities and motivations." From this, it is pertinent to note that classrooms are an integral part for the teaching and learning of Mathematics. This theme

encompasses: Overcrowding, Time Constraints, Teaching Aids/Instructional Materials, Facilities/Learning Materials, Library and Textbooks.

The teachers interviewed expressed their views from the same perspective in regards to the population of their classrooms. Y<sub>T1</sub> cited that, "Presently most of the students are crowded together in some of the chairs; and to me this situation affects the students' study/learning of the subject Mathematics." Furthermore, X<sub>T1</sub> explained that,

We have up to one hundred students in a class; but the commissioner that came recently said there should be forty students in a class. However, despite that they are still admitting more than forty, say, fifty students and above but not more than one hundred students in a class.

Y<sub>T1</sub> stressed that, "We do not have enough classrooms because some of the classrooms are crowded." When we went to the classrooms, I observed that, "The classrooms are overpopulated with about 62 students in a class. However, the classrooms are of different sections; these ranged from Senior Secondary School One A, Senior Secondary School One B, ... to Senior Secondary School One H (SSS 1A – SSS 1H); likewise, Senior Secondary School Two A, Senior Secondary School Two B and Senior Secondary School Two C (SSS 2A – SSS 2C) as well as Senior Secondary School Three A and Senior Secondary School Three B (SSS 3A & SSS 3B)" (X<sub>OF</sub>, 2013, July 1).

Time is a vital factor in classroom teaching and learning. According to the data collected in this study, insufficient instructional time was considered a significant issue. The comments on this issue ranged from "The time is not enough for the lessons because each period is forty minutes," to "No, no, no, the time we use is too short because there are some problems that may nearly consume the whole time and the time to explain to the students is not there," and "Before you know it the next teacher will come in." One teacher said, "I am not really okay with the forty minutes per lesson," furthermore, that teacher made the extraordinary claim that, "Most of the students' IQs are very, very low; so I have to come down very low for them to understand what I'm teaching and the time is not enough for that." Z<sub>T1</sub> reported that,

There was a time when I attended a workshop at Bayelsa State, and that was the complaint I made. That they will tell us after teaching and giving examples to the students we must/have to give classwork which must be marked also. I asked where is the time, and for how many minutes? Whereas at times only one problem could take the whole forty minutes of the lesson; due to the fact that, for instance, a problem may be segmented into a, b and c. At the end of it all, you will find out that you would end up attending to a and b alone; then c would still be hanging, automatically, this will be treated in the next Mathematics lesson, you understand me; the time is too short. A student should be properly guided in Mathematics, because parents are not helping matters. If you give students assignments and they refuse to do the assignments, maybe they forgot or they were occupied with one thing or the other; at the end they may fail to do the assignments. And for students not to do assignments there is no way you will know whether the students are really performing/doing well or not. It is like maybe, after you have treated a topic, you give a class work; if students do not respond you won't know whether they understand it or not. The students do not respond to assignments. They do not [respond] because they are always occupied with handsets, films, videos here and there. Before they notice that they were given assignments it is already the following morning when it is already time for them to go to the school; some of them (students) will just hurry up and begin to copy the assignments from their classmates who were able to do theirs.

In the same vein, Z<sub>T2</sub> added that,

“Another thing is that the time for marking the classwork and other assignments would not be there; that is why I said the time per lesson/period is very short,” and “the periods’ length (time) are not enough. You will be teaching before you know it another teacher will be waiting to come in to teach.”

The success of any learning process depends largely on the instructional procedures; and for a given instructional procedure to achieved desire objectives, it must be properly harnessed through adequate and proper use of instructional facilities

(Gistarea, 2013). Concerns were expressed about the availability of instructional materials and teaching aids. The teachers interviewed agreed that they did not have adequate instructional materials and teaching aids to be effective. The proclamations ranged from, “It is demanding in the sense that teaching aids are not there” to “There are some sophisticated instructional materials which are difficult to improvise.” Z<sub>T1</sub> noted that “... challenge faced mostly is the area of instructional materials for teaching and learning of Mathematics; we do not have them at all.” On the other hand, when I met a teacher I observed that,

There are no offices; teachers are using the corridor as an office and there is no library in the school. There is a lack of most of the vital instructional materials (such as meter rule, pair of compass, protractor, charts, dice, coins, ...) and no current textbooks on Mathematics (X<sub>OF</sub>, 2013, June 25).

In addition to the concerns about classrooms there is the issue of Library. A library serves as the center and coordinating agency for all material used in the school. The goal of the school library is to ensure that all members of the school community have equitable access to books, information, and information Technology. Researchers have demonstrated that school libraries have a positive impact on student achievement (Smith, 2002). As Z<sub>T1</sub> noted, “We have a library but it is not equipped with current textbooks because the textbooks are outdated,” and “The aspects of textbooks for students ... students do not have textbooks and they do not even buy.” Z<sub>T1</sub> echoed that,

The books are not current at all; current textbooks simplify Mathematics more than the old textbooks. Although, some of the topics are in the old textbooks (in the library), but, there are also some new topics that are fixed into the Mathematics curriculum that you will not find at all in those old textbooks in the school library.

Y<sub>T2</sub> added that, “They have a library but not well equipped and the books are not current. The text books are very, very old (books of 80s and 90s).” In collaboration with these claims, when I went round the school with a teacher, I observed that, “There is a mini library in the school but with very few Mathematics text books. Those that are there, from the 1970’s and 1980’s, are not current” (Y<sub>OF</sub>, 2013, July 8). Z<sub>T2</sub> concurred, “We have a



library but the books are as old as the school (founded in 1960s)." However, X<sub>T3</sub> cited that, "There is no library. The school is not even secure, left alone, to have a library," and Y<sub>T1</sub> conceded thus, "No, no, no, they do not have a Library." Finally on this, X<sub>T3</sub> called for assistance, saying, "I want to plead with the government and school principal to try and bring good/recent text books and even computer to school for the students to use/learn."

Lastly, in terms of Classroom Conditions, one of the vital aspects of the investigation was the Facilities/Learning Materials. On this point Y<sub>T1</sub> proclaimed that

Government can as well come to the aid of the school to provide more structures, provide more facilities because now we do not have a functional laboratory for Mathematics, so we need a functional laboratory in the school and we need Mathematics materials and equipment, we need current text books.

Another teacher indicated that, "The students do not have materials to learn; like mathematical sets and other materials required in carrying out operations in Mathematics." X<sub>T3</sub> asked that, "... If there is anything anybody can do about this present situation/problem they should please do. Moreover, they should please provide the students with current text books."

#### **4.2.4 Teacher View of Students**

In education, the issues and concerns about Teacher View of Students on learning is of paramount concern. This theme explores Poor Foundation, Gender Issues, Attendance, Attention (Concentration) and Performance.

The teachers interviewed expressed their views on the Poor Foundation (in Mathematics) of the students. These extended from, "What I'm seeing is that the background of the students is very low," to "Presently, the problem we have in Mathematics is from the foundational level," and "The foundation of students should be taken very, very seriously." Y<sub>T2</sub> highlighted that, "... The problems we are having now in SSS are from the foundation level." X<sub>T1</sub> emphatically concurred by elaborating that,

The foundational level in terms of Mathematics, where they are starting: from primary one to six and from JSS 1 to 3 is a problem because if they (students) have good teachers there and they are teaching them well to the extent that the students know what they are doing there; because Mathematics is a continuous process. Whatever we are teaching them (students) here in Senior Secondary School One (SSS 1), the students are supposed to learn/know the foundational aspect of it there, Junior Secondary School One (JSS 1). Like now they say Mathematics is from simple to complex; so I believe that in JSS 1 to 3, that simple part of Mathematics is supposed to be part of them (students) so that you as a teacher teaching them here in SSS 1, whenever you ask a question they (the students) should be able to respond positively,... because you may not go back to their syllabus in JSS 3. It is worthy of note here that the topics are always related. When you are teaching you will have to take them back or reflect on their JSS 3 that they have been taught such/like topic in JSS 3 before; and that topic they have been taught, they should apply/use that idea of what they have there to this new topic. You will see that following that process they will catch up easily; but with the foundational level and the way they are taught, there is no flow/link. It is not worth it at all. More so, some of the students cannot read nor write; we have them here.

Moreover, during the interviews with the students, I observed that, “Most students confirmed that they had good scores in Mathematics examinations. However, the same students admitted to having difficulties in most foundational topics they should have been taught/learnt in the past at lower grade levels” (Z<sub>OF</sub>, 2013, July 30).

There were concerns expressed about Genders Issues. In this regard, teachers interviewed revealed that, “The knowledge of Mathematics is not a function of sex.” Therefore, “When you talk about Mathematics you do not look at sex.” Y<sub>T2</sub> cited that, “When it comes to Mathematics it (gender) does not count; it has nothing to do with Mathematics. It has to do with your seriousness and hard work.” According to Z<sub>T1</sub>, “If a student is female or male and he/she is really determined to learn Mathematics, Mathematics would become easy for him/her and the student will have a good knowledge of it. Simply put, the knowledge of Mathematics depends on personal determination.” Thus, “... Mathematics has

nothing to do with gender.” On the contrary, X<sub>T1</sub> spotted out that, “The girls are better in Mathematics than the boys; for instance, the class I do handle, the girls are more brilliant/good in Mathematics than the boys.” Furthermore, “I would say few years back the girls were better in Mathematics than the boys,” and “Presently, in my rating, the girls are still better in Mathematics than the boys.” As a final point, “We have seen a situation whereby a girl becomes even more outstanding in Mathematics than the boys in a mixed school.”

Adding to the complex area of Teacher View of Students is the issue of Attendance. The teachers interviewed asserted that the students do not attend Mathematics classes on a regular basis. The claims ranged from, “The students are not regular ...” to “The students are not regular to school thereby making them absent from the Mathematics class.” Y<sub>T2</sub> echoed that,

During morning periods you will see most of them in the classrooms; but after break periods during the afternoon periods you will find out that almost half of the population from the morning period have gone home to support their parents. Simply put, the students do not take the afternoon periods serious.

Another intricate area of Teacher View of Students is the issue of the students being attentive, paying Attention or Concentration in Mathematics classes/lessons. As X<sub>T2</sub> noted,

When you are teaching and you are not in eye to eye contact with them, some will be doing other things; maybe looking at their handsets, watching films on their handsets or doing other subjects’ assignments while the Mathematics lesson is going.

X<sub>T1</sub> mentioned that, “When you discover maybe sometime, not always, one of them might be doing something different from the subject you are taking; it shows that one or two of them were not really concentrating.” Nevertheless, “It is when you are teaching in the class; that’s the time they [students] will be doing it [assignments] of which they will lose contact to the teacher teaching.”

Many of the issues listed above are reflected in overall performance. As one teacher said, "The students' performances are very poor, only few are good, very poor." X<sub>T2</sub> rated the students, "... say average." Another, Z<sub>T1</sub>, responded that, "In general note I will say they are average."

#### **4.2.5 Demands of Mathematics (Both Teachers and Students)**

Davis (2011) advocates that there should be compulsory provision of Mathematics up to the age of 18. The report advises that universities should make an A level in further Mathematics a standard requirement. While acknowledging that it is primarily STEM subjects that draw directly on Mathematics, the report also stresses the advantages of a strong mathematical background for students undertaking a wide range of courses, including psychology and law. This theme comprises The Subject (Mathematics), Demanding Nature of Mathematics, and Assignments.

The feelings gathered on The Subject (Mathematics) during the interviews of the teachers were that, "The subject, they [students] look at it as being too complex; because they have the feeling that Mathematics is meant for the gifted or talented students or teachers." "In these environments students do not like Mathematics," and, "Here the students do not come with Mathematics problems." Z<sub>T1</sub> asserted that, "These students, there are some that are not motivated. Nothing moves them, especially when it comes to the subject Mathematics; even when it is the simplest topic in Mathematics they are scared because the fear is already there." And, "What motivates me in Mathematics is that it is a practical subject and the knowledge from there is applicable to all fields of learning." However,

Generally the subject Mathematics frightens students whether they are males or females; but you will discover that girls majorly find the subject Mathematics difficult so most of them are scared. Nevertheless, if you are the person who understands the students you will be able to let them know what the subject stands for and you will be able to generate their interest in the subject which in a very long way I have been able to do in the school here.

Another vital aspect of this theme is the Demanding nature of the subject, Mathematics. "It is demanding because you rarely see people go to the higher institution to read Mathematics." And, "As a Mathematics teacher you are there at all times to impart knowledge in them [students]; furthermore, without Mathematics in Nigeria here there is no way you can go into the higher institutions." Z<sub>T1</sub> noted that,

Teaching Mathematics is very demanding; in the sense that you must be up and doing, prepare your lessons, then reach/attend to your students at when needed, mark assignments, classwork here and there, because those are things that will guild you to tell you the areas where the students are lacking or having weaknesses so that you could assist them.

On a final note, "It is demanding in the sense that the teaching aids are not there." Furthermore, "It is demanding because the subject is supposed to be taught every day. And, it is something that needs practice all the time and you have to put in your best." Therefore, "It is, very, very demanding; you can see that I'm the only Mathematics teacher in this school. So based on that, I teach Mathematics every day in the school."

Assignments are very necessary in Mathematics education. As noted, "The problem I do have with them [students] is that when they are given assignments in another subjects, if you are not vigilant enough in the class when teaching, it is that assignments they forgot to do at home they will be doing at that time." Extending on that claim, Z<sub>T2</sub> declared that, "They also fail to do assignments in most cases." One teacher revealed that,

Parents also are not helping matters. If you give students assignments and they refuse to do the assignments, maybe they forgot or they were occupied with one thing or the other; at the end they may fail to do the assignments. And for students not to do assignments there is no way you will know whether the students are really performing/doing well or not.

Furthermore, when I visited one of the classrooms with a teacher, I observed that,

The students do not do most of the assignments or homework on Mathematics given to them by their teachers due to their domestic duties at home. Simply put, most of the students do not do their homework (Z<sub>OF</sub>, 2013, July 30).

In line with the above, Z<sub>T1</sub> said that, "... Parents do not encourage them to study Mathematics; in the sense that they do not do their assignments and their parents do not bother to check or correct them when they failed to do their assignments." On the other hand, "Another thing is that the time for marking the classwork and other assignments would not be there; that is why I said the time per period is very short."

In terms of what teachers said I have presented the findings in relation to Teacher Mindset, Qualifications, Classroom Conditions, Teacher View of Students and Demands of Mathematics (Both Teachers and Students).

### **4.3 Students' Views**

The views of the students are presented under the following themes, Classroom Conditions, Learning, Student Mindset, Retention/Individual Differences, Demands of Mathematics and Teaching.

#### **4.3.1 Classroom Conditions**

In education one of the paramount features that impact teaching and learning is the physical classroom. We are often drawn to issues and concerns around what I termed, Classroom Conditions. This theme deals with, Text Books, Mathematics Laboratory, Classrooms, Library, Over Crowding, and Furniture.

The students interviewed expressed their views on Mathematics Text Books. These views ranged from, "To learn Mathematics you must focus on the teacher and read textbooks so that it could be easy for you," however, "The books are not current," and "There are some Mathematics text books you won't find some topics. In short, there are no good Mathematics text books in the school." Y<sub>S8</sub> claimed that, "It is [Mathematics] only

requires your attention; and you need to have the required textbooks.” Zs<sub>1</sub> echoed, “Our problem is that we need more text books.”

Another vital aspect of the Classroom Conditions is the issue of Mathematics Laboratory. It is obvious from the unanimous claims of the students that, “There is no Mathematics Laboratory.” Xs<sub>5</sub> did mention that, “We do not have a Mathematics Laboratory.” Ys<sub>5</sub> added, “We do not have a Mathematics Laboratory; we only have one laboratory. I do not know the name; we go there to learn Physics, Biology and Chemistry.”

One of the more positive aspects of this exploration of Classroom Conditions was the classrooms where most of the teaching and learning of Mathematics takes place. The claims made by the students include, “In the classroom we are comfortable” and “We normally use to learn under the rain. Also, the sun was heating us directly and we were looking for a place to put our desks and chairs.” There were these consistent statements about the classroom roof that, “The roof is not good at all, and when rain is falling we will be running from one place to another seeking for better place.” Ys<sub>6</sub> complained that, “In my class, we have an opening on the roof. So when the sun is hot, it will be heating the whole classroom; thereby making it not conducive to us to stay.” Moreover, Xs<sub>6</sub> specified that, “The roof leaks when it is raining; there are no good doors.” In the same vein, Xs<sub>7</sub> posited that, “The class is so messed up; most times the class smells and the roof is not in good shape. Rain comes in when it is raining; that is the roof use to gorge out water when it rains.” Ys<sub>9</sub> concurred that, “Our classroom roof is bad; so when rain is falling water comes in. More so, there are holes on the floor of the classroom.” Ys<sub>3</sub> also mentioned that, “We cannot sit in our classroom to learn when it is raining; because the water comes in. Besides when it is dry season (that is sun) everywhere is so hot because we do not have enough ceiling.” Furthermore, Ys<sub>8</sub> collaborated that, “There are leakages on the roof; when it is raining the students will not be able to learn in such condition because the rain will be touching/disturbing them.” While Zs<sub>2</sub> noted, “It is just that the classrooms are usually hot in the afternoon and there are no fans/air.” On the other hand, Zs<sub>6</sub> sited that, “The classroom is not all that conducive; because when it rains water comes in, and we will be catching cold.” Ys<sub>2</sub> added, “During rainy season, it is (classroom) not conducive for us to learn; rain will be passing through the windows into the class.” Ys<sub>7</sub> elaborated that,

If it is raining everywhere [and we] will be scattered because water will be entering the classroom since there are holes in the zinc (roof). More so, after break periods the classroom will be hot when it is sunny; thereby making the classroom not to be conducive for us to stay.

Furthermore, when we moved round the school, I observed that,

The students make use of plywood/ply board put on blocks as desks and chairs in the classrooms. Likewise, there are no ceilings in some of the classrooms, thereby making the classrooms very hot when the sun is shining. More so, when it rains, water comes into the classrooms through the roof (leakages on the roof), windows and doors (Y<sub>OF</sub>, 2013, July 11).

Finally, X<sub>S5</sub> claimed, “All the windows cannot be locked; [there are] no doors and the roof is scattered.” On this note, X<sub>S1</sub> pleaded that, “My classroom is not good; we want the government to do something about it.”

The role of Library in the academic settings cannot be overlooked. “Academic libraries play a significant role in the student experience by providing access to informational resources” (Cox and Jantti, 2012, p. 1). The students interviewed expressed their concerns about the availability and assessment of the Library. The responses of the students ranged from, “We do not have a library,” to “No library” and “We do not have a library in this school.” X<sub>S8</sub> specifically revealed that, “We do not have a library for Mathematics.” Moreover, Y<sub>S7</sub> cited that, “There are some Mathematics text books you won’t find some topics. In short, there are no good Mathematics text books in the school.” Nevertheless, Z<sub>S2</sub> commented that, “The library building is not conducive.” Besides, Z<sub>S3</sub> definitely echoed, “Well I have not been there (Library) before.”

Adding to the condition of classrooms is the issue of overcrowding and inadequate seating. As noted by Anderson (1955, p. 1) claims that, “Of the many problems which confront the typical school principal, ‘overcrowding’ is one of the most serious because it influences nearly every aspect of the school work with children.” X<sub>S2</sub> revealed that, “Some of the students come from the other classes to join us in our class; thereby making the seats



to be crowded with students.” In addition, when I went to the classrooms I observed that, “The desk and chairs are not enough. The classrooms are over populated and about seventy students in a class with about five students sharing/sitting on one desk” (X<sub>OF</sub>, 2013, June 25). Y<sub>S3</sub> complained that, “We do not have enough chairs to sit on; and we cannot learn properly with that.” Furthermore, Y<sub>S8</sub> claimed that, “The classroom is not well equipped because most of the chairs are weak; it may quit/break.” Similarly, Y<sub>S9</sub> added that, “Some students are sitting on a ply board placed on blocks because the chairs are bad.

### **4.3.2 Learning**

Learning is a goal-directed act, acquiring new, or modifying and reinforcing, existing knowledge, behaviors, skills, values, or preferences and may involve synthesizing different types of information. In other words, Learning produces changes in the organism and the changes produced are relatively permanent (Scott, 2012). To this effect, the theme covers; Studying and Practicing, Focus, as well as Assignments.

One of the integral parts of Learning is Studying and Practicing. The students interviewed responses ranged from, “I always do that (study and practice Mathematics) every day. Besides, every time we learnt Mathematics at school, when I get home I do study Mathematics on my own,” and “I do read and practice Mathematics only when I have problems in a particular area.” Y<sub>S9</sub> echoed, “Certainly, I read and practice Mathematics.” In the same manner, X<sub>S4</sub> said “I read every day and I always study Mathematics when I’m at home.” However, X<sub>S1</sub> revealed that, “I pass Mathematics when I study; but I do not study all the time.” Z<sub>S3</sub> stated that, “I do not read and practice Mathematics.”

Maintaining focus in the classroom is imperative to academic success. No matter how much or how well you study at home, if you miss out on the important content your teacher delivers in class, then you’re setting yourself up for failure come test time. Focus isn’t something that just happens naturally - at least not for most people. For the majority of us, focus requires both mental and physical preparation (Kamal, 2013). X<sub>S1</sub> cited that, “When you are learning Mathematics you must focus on the teacher and read textbooks so that it could be easy for you.” X<sub>S8</sub> noted that Mathematics is “Easy because when you focus

and listen to the teacher you should be able to solve problems on your own.” Zs<sub>7</sub> emphasized that, “If you are not intelligent when you are learning Mathematics and you are focused and determined, as time goes on you will know it.” In the same vein, Zs<sub>4</sub> noted that, you will have a good knowledge of Mathematics “If you put your mind on Mathematics and you pay regular attention when your teacher is teaching.” Xs<sub>5</sub> specifically complained that, “The boys do not use to focus or pay attention in the class.” Xs<sub>8</sub> added that, “Whenever we want to study Mathematics, they (boys) always move from one place to another or leave the class.” Moreover, Xs<sub>4</sub> stated that, “They (students) are not regular to class; and they (boys) often move out when it is time for the Mathematics teacher to teach. ...The students do not attend Mathematics class.” Precisely, Xs<sub>4</sub> added that, “Boys do not always concentrate when the teacher is explaining.” At this point, Ys<sub>8</sub> declared that, “Mathematics is easy when you focus on it.”

Assignments in education are tasks given to students by their teachers to be completed out of the class time. Homework, or homework assignment, refers to tasks assigned to students by their teachers to be completed outside the class (Cooper, 2013). The students that were interviewed expressed their views on Assignments. Xs<sub>6</sub> stated that, “When the teacher gives us an assignment, if you do not have the right answer she will flog you. This makes me not to feel happy whenever it is time Mathematics.” Zs<sub>3</sub> confessed, “I do not do assignments all time.” Zs<sub>3</sub> further explained that,

I do not understand Mathematics; as in, sometimes when they teach I use to understand it. Likewise, when they give us assignments to take home, when I get home to do the assignments I will be confused; and won't be able to do it. So somehow, I do not like the subject Mathematics.

However, Xs<sub>2</sub> noted that, “I do my assignments.” Xs<sub>7</sub> collaborated that, “I do them (Assignments).”

### 4.3.3 Student Mindset

Mindset is a set of assumptions, methods, or notations held by one or more people or groups of people that is so established that it creates a powerful incentive within these people or groups to continue to adopt or accept prior behaviors, choices, or tools. Simply put, Mindset is a fixed mental attitude, disposition, a habit or inclination that predetermines a person's responses to and interpretations of situations (Dweck, 2013). This theme examines from a student perspective Gender Issues, Interest and Determination, Happy when Learning, as well as Relationship with Teachers.

The students interviewed expressed their opinions on Gender Issues. In terms of the knowledge of Mathematics, there is a belief that girls are better than boys. Xs<sub>1</sub> explained that, "Girls are better in Mathematics than the boys because boys do not focus on their studies; nevertheless, when the teacher is teaching the girls listen more than the boys." When I met a teacher in a classroom I observed that, "Some of the students, especially the boys, do not stay in the classrooms (Mathematics lesson). When they obtain permission to make use of the washroom, they leave from there without coming back to the classrooms for the lesson" (X<sub>OF</sub>, 2013, July 4). In the same vein, Xs<sub>4</sub> echoed that, "The girls are better than the boys; because they (boys) do not always concentrate when the teacher is explaining." However, Ys<sub>2</sub> explained that, "... Some people say boys are those that naturally know Mathematics better. That is why you rarely see a lady that is a Mathematics teacher." Furthermore, Zs<sub>1</sub> stated with emphasis that,

In the class, when we are being given class work or anything like problems you will find out that it is the girls that will first of all raise up their hands to say a word before a boy; coming to the board to answer a question you will see that it is the girls that will first of all raise up their hands to come out to answer the question.

Zs<sub>5</sub> concurred that, "Some of the girls are sharper and use to think very well. More so, some of the boys are shy; but the girls are not shy." On a neutral basis, Zs<sub>7</sub> confessed, "Actually, I cannot say. Let me say all are the same."

Adding to the Gender Issues being considered under Student Mindset are the perspectives of the students in terms of their interest in Mathematics. In response to this, Ys<sub>6</sub> revealed that, "The subject is interesting; and I will like to go further in it so that I can know more of it." On the other hand, Zs<sub>7</sub> cited that, "Mathematics is not all that easy because it involves solving problems and stressing the brain. However, Mathematics is only interesting when the topic they are teaching is simple and understandable." Xs<sub>1</sub> indicated that, "For me, it is easy to learn and interesting because my foundation in Mathematics is very good. Besides when you know the formulae in Mathematics, it becomes very easy." Finally, Ys<sub>6</sub> says, "Actually, Mathematics is interesting but not easy to learn."

Another vital aspect of this theme is Interest and Determination for the subject, Mathematics. Interest is the feeling of wanting to know or learn about something or someone; Determination is the engine that drives perseverance (Oxford Dictionaries, 2013). Xs<sub>2</sub> declared that, "Whenever the Mathematics teacher comes to the class, some of the students go outside saying, "I do not like this Mathematics," thereby going to the other classes to learn other subjects." Ys<sub>7</sub> noted, "If you have the interest to learn Mathematics it will be easy for you." However, Ys<sub>5</sub> said, "You do not need to be very intelligent to learn Mathematics; it depends on your determination. You need to be determined." Zs<sub>2</sub> collaborated that, "You must not be intelligent; if you have the determination and you are willing. Even though you are dull you would be able to learn and have a good knowledge of Mathematics." Zs<sub>6</sub> further supported that, "When you are determined and you have the mindset to learn and know Mathematics, you will know it."

Adding to the complex area of Student Mindset is the issue of difficulty with some Topics in Mathematics. The statements of the interviewed students ranged from "I find some areas difficult in Mathematics; for instance, trigonometry," to, "I have problem with a Mathematics topic, quadratic equations" and "The area of quadratic equations that involves graph plotting. That is where I have problems." In like manner, Zs<sub>4</sub> explained that, "Like this topic, factorization; I do not normally give my time to it. I do think that it is a long process in solving it; and most of the time when I solve it, I do not have the right answer for it." Furthermore, Zs<sub>3</sub> claimed, "My problem is that when the Mathematics teacher is teaching the topic, Bearing. I do not understand it." Zs<sub>2</sub> categorically claimed that, "They always say

in the problems (Quadratic Equations) that one should look/find  $x$ ; and I do not know how to go about looking for it ( $x$ ).” However, Zs<sub>1</sub> stated that, “It (Mathematics) is easy when you put your attention in the class; and interesting because it has many areas.”

According to the data collected in the study, Happy when Learning was considered a very pertinent issue in the school settings. These comments ranged from “I do not like some Mathematics topics because they are difficult to me. Due to this, I do not feel happy whenever it is time for Mathematics lessons,” to “When I know that the subject (Mathematics) we are about to learn is difficult, I’m not always happy; but when the subject is simple to understand, I’m always interested in learning it,” and “Whenever you are solving a particular problem, and you are able to find the solution to that problem; there will be joy in your heart.” In agreement to these, Xs<sub>6</sub> noted that, “When she (teacher) gives us assignment; if you do not have the right answer she will flog you. This makes me not to feel happy whenever it is time Mathematics. So I’m not happy whenever she enters the class.” On a final note, Xs<sub>7</sub> echoed that, “I feel afraid most times; especially when she (Mathematics teacher) is coming. Anyway, I’m afraid of the teacher and Mathematics.”

Another vital aspect of this exploration of Student Mindset was the expressed relationship with teachers. “Students’ relationship with teachers has important, positive and long-lasting implications for students’ academic and social development” (Rimm-Kaufman, 2013, p. 1). Xs<sub>6</sub> noted that there is “no good relationship” with the Mathematics teacher. Moreover, “She (Mathematics teacher) is not friendly.” My field notes are in agreement with above. When I met a teacher in the classroom I observed that, “The students are somehow scared of their Mathematics teacher, there appears to be a gap in the teacher/student relationship” (X<sub>OF</sub>, 2013, July 4). However, Zs<sub>1</sub> claimed that, “There is a good relationship” with the teacher and “He is a pleasant teacher.”

#### **4.3.4 Retention and Individual Differences**

For the purposes of this study, Retention is seen as the ability to retain facts and figures in memory. Individual Differences are those attributes that make people different from each other. We all know that we are different from each other, in our physical aspects,

our likes and dislikes, interests, values, psychological makeup (Rovee-Collier, 2013). In education we are often drawn to matters and concerns around Retention/Individual Differences. This theme contains, for my purpose here, Performances in Mathematics Examinations, Intelligence, and Individual Differences.

The students interviewed expressed their views on their Performances/Mathematics Examinations. These ranged from, "I pass Mathematics when I study," to "I pass Mathematics examinations easily" and "I always pass Mathematics examinations." On the contrary, Zs<sub>2</sub> said that, "I do not pass Mathematics examinations easily."

The other aspect of this theme is Intelligence. Intelligence has been defined in many different ways. Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings—"catching on," "making sense" of things, or "figuring out" what to do (Gardner, 2013). In this regards, Ys<sub>2</sub> added that, "Some people that are intelligent know other subjects, but they do not know Mathematics." Nevertheless, Zs<sub>2</sub> opined that, "You must not have to be intelligent to have the knowledge of Mathematics. If you have the determination and willing; even though you are dull, you would be able to learn Mathematics and be good in it." In collaboration with Ys<sub>5</sub> remarked that, "You do not need to be very intelligent to learn Mathematics; it depends on your determination. You need to be determined." Furthermore, Ys<sub>7</sub> noted, "If you make good of your brain, you will make it. It is not that you must be very intelligent to learn Mathematics." In the same vein, Ys<sub>3</sub> added, "You do not have to be very intelligent; it depends on your brain and the way you listen to the teacher when he/she is teaching."

Another relevant aspect of this theme is students' Individual Differences in the class. "Individual differences are the variations from one person to another on variables such as self-esteem, rate of cognitive development or degree of agreeableness. Historically, psychological Science has overlooked individual differences in favor of focusing on average

behavior” (Fraser-Thill, 2012, p. 1). Zs<sub>1</sub> asserted that, “Some people are special or gifted when it comes to Mathematics.” As pointed out by Ys<sub>5</sub>, being intelligent “Depends on the person (individual).” Ys<sub>6</sub> complemented that, “It depends on your intelligence and your capability to learn and to know Mathematics.” On a final note, Ys<sub>7</sub> proclaimed that, “Everybody has the same ability to learn. God gives everybody equal brain; it depends on the way you use it. If you use it well you will make it.”

#### **4.3.5 Demands of Mathematics**

In education, the issues and concerns of Demands of Mathematics as a subject/course in most disciplines is of a paramount concern. This theme entails The Subject (Mathematics), Importance of Mathematics, Engagement and Compulsion.

The students interviewed voiced their opinions on Mathematics as a subject. These extended from, “Mathematics is very demanding because it is one of the subjects that are compulsory and you must pass it before you go to the university,” to “Mathematics is a must when you want to move/pass to the next higher class/level. If Mathematics is not among your passed subjects, that means that you have not started yet,” and “Mathematics is not all that easy; it involves solving and stressing the brain. Zs<sub>5</sub> highlighted that, “Mathematics is important and compulsory to everybody.” On the contrary, Zs<sub>3</sub> cited that, “Mathematics is not very important for my future career.” According to Xs<sub>5</sub>, “Mathematics takes time and involves so many things” and “If you could know the Mathematics you could know the rest of the subjects.” On a final note, Ys<sub>9</sub> claimed that, “... We have some subjects that are very difficult (Mathematics is one of the subjects) and we have to put in more effort to learn them.”

The Importance of and Engagement with Mathematics cannot be overemphasized. Mathematics is used throughout the world as an essential tool in many fields, including natural Science, engineering, medicine, finance and the social Sciences. On this issue, Xs<sub>1</sub> specifically mentioned that, “Mathematics is important to me.” Likewise, Xs<sub>1</sub> indicated that, “Mathematics is very important for my future career.” However, Zs<sub>3</sub> commented that, “I’m in art class now. Besides, what I want to become in future is a lawyer; in this case

(profession) Mathematics is not important.” On the issue of engagement, Xs<sub>1</sub> pointed out that, “I would like to be engaged in the study of Mathematics in future.” In the same vein, Zs<sub>6</sub> said, “I would like to be engaged in the study of Mathematics in future if given the opportunity.”

Lastly, in terms of the Demands of Mathematics, one of the vital aspects of the investigation was the Compulsion of Mathematics as a subject. At this point, Zs<sub>5</sub> asserted that, “Mathematics is important and compulsory to everybody.” Also, Ys<sub>3</sub> pointed out that, “It (Mathematics) is compulsory for all courses in the higher institutions; so we have to learn it.” In the same vein, Xs<sub>6</sub> specifically noted that, “Mathematics is very compulsory; especially in my future career, as an accountant.” On a final note, Ys<sub>7</sub> remarked that, “Mathematics is compulsory and it is a must.”

#### **4.3.6 Teaching**

Teaching refers to the process of imparting knowledge and skills from a teacher to a learner. It encompasses the activities of educating or instructing. It is an act or experience that has a formative effect on the mind, character or physical ability of an individual. Simply put, Teaching is the imparting of knowledge by a teacher or other knowledgeable person (Danza, 2012). This theme comprises of Teachers and Detailed Explanation, as well as Mathematics Lessons.

Students expressed their feelings on the teacher’s ability to explain Mathematical concepts. For example, “She (teacher) always explains so that we can hear her very well.” More so, “Some of the teachers when they come to the class, they will explain very well the way you understand it; while some will just come, they won’t bother to explain. They just come to the class to give notes and leave” Ys<sub>3</sub> complained that, “They do not get/understand what the teacher does explain to them.” Likewise, Ys<sub>2</sub> noted that, “It is not because the subject is difficult; but the person that is teaching the subject does not explain.” Furthermore, Ys<sub>9</sub> echoed that, “They [teachers] do not know how to explain it well, so we find it difficult to understand.” Ys<sub>3</sub> claimed that, “I would like to have an audible teacher, that will explain and help me to understand what he or she is teaching.”



Another important aspect of this theme is Mathematics Lessons. The students have variances on the number of times they learn or take Mathematics lessons per week. This ranged from, “We learn Mathematics twice; Two times,” to “We learn Mathematics four times” and “We learn Mathematics five times in a week.” Zs<sub>1</sub> stated that, “We learn Mathematics every day (Mondays, Tuesdays, Wednesdays, Thursdays and Fridays).” Finally, Xs<sub>2</sub> echoed, “Whenever the Mathematics teacher comes to the class for Mathematics lessons, some of the students go outside and later join other classes to learn other subjects; saying, ‘I do not like Mathematics’.

In terms of what students said, I have presented the findings in relation to Classroom Conditions, Learning, Student Mindset, Retention/Individual Differences, Demands of Mathematics and Teaching.

## **5 Summary**

This chapter of the study presented the Primary data gathered through the various interviews and observational fieldnotes. I now proceed to an Analysis of the Data, Conclusion and Recommendation in the next chapter.

## **Chapter 5: Analysis of Data and Conclusions**

### **5.1 Introduction**

In this chapter of the study a thorough discussion of findings was done. As noted in the preceding chapters, this study is a qualitative inquiry into *The Impact of Teacher Development and Student Preparation in Mathematics Education in Senior Secondary Schools in Delta State, Nigeria: A Case Study*. Chapter One provides the Introduction to the Study; Chapter Two, Theoretical Foundation/Literature Review; Chapter Three, Research Methodology; and Chapter Four, Presentation of the Data (a presentation of themes and categories which emerged from the data collected through interviews and observational fieldnotes). Chapter Five includes data analysis and conclusions.

### **5.2 Analysis**

The lens of qualitative research theory has influenced the conception, design, and implementation of this qualitative case study; similarly, the themes from the qualitative literature (Harvey, 1990 and Kincheloe, 2002). For my purpose here, the themes for analysis are Classroom Conditions, Teacher Mindset, Student Mindset, Qualifications, Teacher View of Students, Demands of Mathematics (Both Teachers and Students), Learning, Retention, Individual Differences, and Teaching.

#### **5.2.1 Classroom Conditions**

From the teachers' perspective, it is important to note that classrooms are one integral part for teaching and learning of Mathematics. As presented in the data this theme encompasses: Overcrowding, Time constraints, Teaching Aids/Instructional Materials, Facilities/Learning Materials, Library and Textbooks.

From the students' perspective we are also drawn to issues and concerns around what I termed Classroom Conditions. This theme consists of, Textbooks, Mathematics Laboratory, Classrooms, Library, Overcrowding, and Class Furniture. It is obvious that there are similarities in topics between the responses of teachers and students. It is not surprising that an immediate concern raised by both teachers and students was the reality of overcrowding in the classrooms. Teachers noted that while the mandated size of classrooms is forty students, the reality is often more than fifty. It should be noted that until recently classrooms sometimes held up to one hundred students. My fieldnotes concur with the teachers' claims about overcrowding. In the literature, Daso (2012) asserts that despite the importance of Mathematics, many problems seem to beset Mathematics education in Nigeria. This has resulted to the consistent poor performance in senior school certificate examination (SSCE) in the subject. Prominent among these problems is overcrowded Mathematics classrooms.

The data presented in Chapter Four indicated that students were less concerned with the numbers of students in classrooms as they were with the conditions of the classrooms. The students were elaborate in describing the physical conditions of the classrooms, and of the roofs in particular. The students complained about the poor state of the classroom roof. They noted that it is difficult to sit in class when it is hot and when it is raining. The roofing does not always protect them from sun or rain. They expressed strong views on what needs to be done to make the classrooms more conducive to learning. My fieldnotes taken at the time of those interviews concurred with the claims made by the students.

Teachers' lack of instructional time was seen as a vital issue in relation to teaching and learning. The particular issue was that the time allotted for individual classes, forty five minutes, was too short. Teachers interviewed gave their reasons why the length of these class periods was not adequate. These reasons ranged from the fact that some Mathematics problems might consume the whole class, and that is not adequate time to explain the Mathematics problems to low achieving students. It is worth noting that the length of the class time was not an issue for students.

Students were concerned about the date and condition of textbooks. The students interviewed expressed a need for the “required textbooks” that contained the required Mathematics topics. The students indicated that focusing on the teacher is not enough, resources, in the form of textbooks must be available. The teachers interviewed were also very aware of the problems associated with the textbooks required by students. Many of these concerns became evident in their discussions about the school library. They were adamant in their claim that the textbooks were not current and did not reflect the latest thinking about and topics used in Mathematics education. As noted in chapter four in the presentation of data, teachers gave detailed descriptions of the state of the textbooks and the impact this had on student learning. The fieldnotes made as I toured the school with teachers confirmed this reality. It should be noted that some schools did not have a library, and teachers were vitally aware of the place a library holds in their students’ learning.

There is a strong cry for more appropriate facilities and adequate learning materials. High on the list of teacher needs was for a functioning laboratory for Mathematics. This cry was also noted by students and echoed in the literature that the success of any teacher of any learning process depends largely on the instructional procedures and for a given instructional procedure to achieve desired objectives it must be properly harnessed through adequate and proper use of instructional facilities (Gistarea, 2013). Furthermore, some of the problems of teaching and learning of Mathematics are lack of instructional materials; poor classroom organization by teachers; and lack of an equipped Mathematics laboratory for practical (Odili, 2006).

### **5.2.2 Teacher Mindset**

Increasingly, Mathematics has become an essential part of basic education (UNESCO - United Nations Educational, Scientific, and Cultural Organization, 2003). As presented in the data, this theme includes Teacher Interest in Teaching Mathematics, Teacher Motivation, Teacher Enjoyment of Work and Professional Development, as well as Relationships with Students.

Stemming from the issues and concerns related to the teaching of Mathematics, it is apparent that the teachers are somewhat contradictory in their claims. Some teachers said that they are interested and find joy in the teaching of Mathematics due to the fact that it is their area of specialization. On the other hand, this claim was tempered by some teachers who declared that they don't enjoy, and are not interested in, the teaching of Mathematics. Nevertheless, it was noted in the literature that UNESCO's main activities in Mathematics education puts emphasis on raising public awareness and interest in mathematical concepts which develop scientific thinking as well as practical capabilities in Mathematics and related Sciences (UNESCO, 2012).

The data presented in Chapter Four often shows that teachers were not motivated in the teaching of Mathematics. To be specific, the teachers bemoaned that they have little motivation, and that Mathematics is a subject they never expected or wanted to teach because they did not study Mathematics in the higher institutions. More so, some of the teachers were compelled to teach Mathematics. It is worthy of note here that there are general types of needs (physiological, survival, safety, love, and esteem) that must be satisfied before a person can act unselfishly. These needs are called "deficiency needs." Adolphus (2011) has identified lack of incentives for teachers as factors responsible for the dismal performance of students in the subject

There is serious concern about the availability of professional development. Many of the teachers had the same claims that they were not receiving the professional development that they believed they needed. Even the expectation for professional development for some teachers is lacking; some teachers have never attended staff development programmes. Most importantly, as referenced in the literature, for Nigeria to take its rightful position among the committee of nations there is an urgent need to have indigenous critical mass of trained scientists and engineers. Such critical mass can only be acquired by a well-organized Mathematics programmes at all levels of schooling (Daso, 2012).

The issue of teachers' relationships with students was seen as a significant one. There was a near unanimous claim by the teachers that there was a positive relationship

with students in that students see teachers as their uncle or parent in school, as well as their friends. My fieldnotes taken at the time of interviews with students did not support this claim made by the teachers. It is important to note here that improving students' relationships with teachers has important, positive and long-lasting implications for students' academic and social development. More so, as reflected in the literature; those students who have close, positive and supportive relationships with their teachers will attain higher levels of achievement than those students with more conflictual relationships. If a student feels a personal connection to a teacher, experiences frequent communication with a teacher, and receives more guidance and praise than criticism from that teacher, then the student is likely to become more trustful of that teacher, show more engagement in the academic content presented, display better classroom behavior, and achieve at higher levels academically. Positive teacher-student relationships draw students into the process of learning and promote their desire to learn (Rimm-Kaufman, 2013).

### **5.2.3 Student Mindset**

As was earlier noted, mindset is a set of assumptions, methods, or notations held by one or more people or groups of people that is so established that it creates a powerful incentive within these people or groups to continue to adopt or accept prior behaviors, choices, or tools (Argyris, 2004). In light of this, the categories of the theme: student mindset varies from that of the teachers' mindset. This entails Gender Issues, Interesting, Interest and Determination, Topics and Happy when Learning, as well as Relationship with Teachers.

As the data show, the students were in agreement in claiming that girls are better than the boys in the knowledge of Mathematics. Most of the students further claimed that it is because the population ratio of boys in most cases is always more than the girls in terms of Mathematics education, hence the assumption/feeling that boys are better. Yoeman (2007) offers helpful insights on the question of gender noted here. As was echoed in the literature, "the percentage of men entering STEM fields was higher than that of women (33 percent vs. 14 percent), especially in the fields of Mathematics (Chen 2009). As evident in

the literature, teaching strategies is a variable that can easily be manipulated by teachers to increase students' retention rate and performance as well as reduce or eliminate sex-related differences in Mathematics performance (Mari 2002). Nevertheless, other research findings have shown that individual students' characteristics variables such as motivational orientations, self-esteem and learning approaches are important factors influencing academic achievements (Adedeji, 2007).

To a large extent, the issue of Mathematics being interesting or not is a function of one's own Interest and Determination. Most students believe that when the interest and determination is there Mathematics becomes easy and interesting. Furthermore, the students noted that knowledge of Mathematics does not depend on one's intelligence but on personal interest and determination. More so, the willingness to learn Mathematics needs to be there. Students revealed that whenever it is time for Mathematics lessons some of the students leave the class for something else. This negative attitude of the students in Mathematics education is an indication of lack of interest in the subject. Nevertheless, it was cited in the literature that despite the importance of Mathematics, many problems still seem to beset Mathematics education in Nigeria. This has resulted in the consistent poor performance in senior school certificate examination (SSCE) in the subject. As presented in the previous chapter, one of the prominent problems is students' negative attitude towards Mathematics (Daso, 2012).

There are some Topics in Mathematics that present problems for students. These Topics ranged from Trigonometry, Quadratic Equations to Bearings. It is pertinent to indicate here that these topics are fundamental and applicable to other topics in Mathematics and other Mathematics related subjects. As was claimed in the literature, a student needs fundamental knowledge of Mathematics to understand other major topics like Ecology in Biology, Mensuration in Further Mathematics, Diffusion in Chemistry and Floatation in Physics (Oguntuase, Awe and Ajayi, 2013). However, as students noted, Mathematics is easy when you pay attention to it. Nevertheless, finding some topics difficult is based on one's mindset, interest, determination, willingness to learn, good teaching and availability of resources.

Happy when Learning Mathematics is another telling aspect of this theme. According to the data collected, Happy when Learning was considered a very significant issue in the school settings. Most of the students interviewed confessed that they are not happy when studying Mathematics. This is most especially true when it's time for Mathematics lessons. Students often do not feel happy because they are scared of their teacher who always punish or flog them whenever they could not answer questions correctly in the classroom. As noted in the literature, resourcefulness in teaching Mathematics demands that the teacher focus attention on those methods of teaching that stimulate learner's zeal, interest and higher retention rate. In addition to this, teachers need to be aware of the individual abilities of learners in the classroom, taking into consideration the individual differences of learners (Kurumeh, Onah and Mohammed, 2012).

From the students' perspective, it must be concluded that there is little agreement between teacher and students on their mutual relationships. A large number of the students claimed that their teacher is not friendly, that they are scared of the teacher, and above all, they cannot walk up to the teacher whenever they have problems because they would not be listened to, and may even get punished by the teacher. Furthermore, from my observational fieldnotes as I toured the classrooms with the teachers, I actually observed that the students were scared of their Mathematics teachers. This, naturally, results in a poor relationship. It should be noted that some students did not agree with this claim. According to Rimm-Kaufman (2013), positive teacher-student relationships draw students into the process of learning and promote their desire to learn. Teachers who foster positive relationships with their students create classroom environments more conducive to learning and meet students' developmental, emotional and academic needs.

#### **5.2.4 Qualifications**

In the presentation of the data, it was seen that teacher qualifications had a significant impact on the teaching of Mathematics, and education in general. This theme includes: Teachers' Certificates, Staff Strength and Corps Members (Coppers).



From the teachers' point of view, only a few of the teachers are properly qualified to teach Mathematics. However, it is evident that the majority of Mathematics teachers do not have the basic qualifications to teach the subject. For example, a teacher with National Certificate of Education (NCE) in Accounting and Business Education teaches SSS Mathematics. Also, Coppers are used as substitutes to teach the Senior Secondary School (SSS) students who are preparing for their final and external examinations, despite the fact that the Coppers lack the basic qualifications and experiences. This was also evident in the data collected in observational fieldnotes. Further to this situation, Coppers do not stay for more than a year thereby creating a lack of continuity or continuous follow-up with the students. This was indicated by a Copper's claim that, "In no distant time, say, about six months' time, I will be leaving the school for my career because I'm not happy teaching in the classrooms and I can't wait to stop it." It was asserted in the literature that research reports have offered several reasons for the students' poor performance in Mathematics. One of these reasons is the lack of qualified Mathematics teachers, and the exhibition of poor knowledge of Mathematics content by many Mathematics teachers (Agwagah, 2001; Daso, 2012).

Following on the above, it is obvious that teachers' qualifications have a direct relationship with staff strength. Stemming from the presentation of data, there was a consistent alarm noted by the teachers that insufficient well-trained personnel was problematic. Apparently, the teachers pleaded for the Delta State government, in particular, to aid in increasing the staff strength with qualified teachers. Chapter Two revealed that some of the problems of teaching and learning of Mathematics are as follows: shortage of Mathematics teachers; acute shortage of qualified professional Mathematics teachers; unqualified teachers in the system;... (Odili, 2006; Adolphus, 2011 and Daso, 2012). To reinforce the seriousness of this situation, a Mathematics development needs assessment showed that the ratio of Mathematics teachers to students was 1:350 (Nyesom, 2013).

Another issue that needs to be addressed in this theme was the exploitation and use of corps members (Coppers) for the teaching of Mathematics. The responses of the teachers noted in the data presented show that the lack of qualified Mathematics teachers has necessitated the substitutions of Coppers (without a Mathematics/Education qualification)

for Mathematics teachers. However, the Coppers revealed that it was not their intention to teach Mathematics. Nevertheless, they were compelled to go to the classrooms owing to the fact that it is a mandatory programme from the federal government. It was noted in the literature that in any educational system, academic achievement and performance of the learners largely depend on the quality of the teachers, among other variables. The teachers have various roles to play in the process of teaching and learning, most especially in teaching of Mathematics. Therefore, there is a need to be competent in a teacher's own area of specialization and also to be able to apply different methods of teaching and strategies that help student learning. (Okpala, 1999; Onoshakpokaiye, 2011).

### **5.2.5 Teacher View of Students**

The data gathered and presented from interviews and observational fieldnotes indicated that issues of Teachers' View of Students are significant in terms of learning. As in the previous chapter presented, this theme includes Poor Foundation, Gender Issues, Attendance, Attentive, and Performance.

The data shows that the teachers are not comfortable with students' foundation in Mathematics. The teachers involved in this study expressed their dismay with regards to the poor foundation of the students. From the perspective of the teachers it is important to note that the foundational level of the students in Mathematics should be taken seriously. The literature agrees that a poor primary school background in Mathematics is one of the factors responsible for the dismal performance of students in the subject (Adolpus 2011). The teachers concurred by revealing that this lack of preparation is one of the major problems that they are encountering with students starting from the primary school level and continuing to the Junior Secondary School (JSS) level.

Another expressed concern of teachers was around Genders Issues. The data presented in chapter four reflected two contradicting views from the point of view of teachers. One group of teachers claimed that Mathematics is not a function of gender. What actually counts is the student's determination to learn. Given this logic, being a female or male does not have anything to do with the knowledge of Mathematics. However, a second

group of teachers claimed that the girls are better than the boys in their knowledge of Mathematics. In collaboration with the second group of teachers, Blundin (2013) remarks that,

Boys are generally more capable in the logical-mathematical category, BUT-and this is a significant BUT-girls have been gaining ground in these areas over the last twenty or so years. This could be a clear example of how society's desire to encourage girls in math has forced schools to demand more of girls in math class, thus stimulating that intelligence in them. As girls have no doubt begun to wonder, they have been questioning this male dominance and have begun to enter math and Science fields in greater numbers in recent years (p. 1)

As indicated in the presentation of data, and adding to the complex area of the theme, is the issue of Attendance. It is significant to note that the teachers unanimously claimed that students are not in regular attendance at Mathematics classes. Furthermore, it was claimed, the students have negative attitudes towards attending Mathematics classes. A teacher noted that during morning periods most of the students are in the classrooms but after break periods (that is, the afternoon periods) you will find out that almost half of the students who were present in the morning period have gone home to support their parents in domestic and/or business activities.

Another area of Teacher View of Students is the issue of the students being Attentive in Mathematics classes. There is a lack of concentration. Teachers claimed that obviously everyone does not pay attention in class. Moreover, when the teacher is teaching you will notice that some of the student will be doing something else: operating mobile phones (handsets), watching films on their handsets or doing other subject assignments while the Mathematics lesson is going on. The teachers echoed that these attitudes of the students negatively affect the students' performances. As highlighted in Chapters Two and Four, one of many problems that seems to beset Mathematics education in Nigeria is students' negative attitude towards Mathematics (Daso, 2012).

### **5.2.6 Demands of Mathematics (Both Teachers and Students)**

In terms of the Subject (Mathematics), it is obvious from the data on teachers' perspective that students view the subject as being too abstract and complex. Simply put, the teachers reveal that students find Mathematics difficult. They claim, therefore, that Mathematics is meant for the gifted or talented ones. Furthermore, a strong claim made by the teachers was that students are scared of Mathematics, especially when it's time to study and learn the subject because they are always tense or frightened. Adolphus (2011) identifies that the perception that Mathematics is difficult and the psychological and physical fear of the subject represent some of the factors responsible for the dismal performance of students in Mathematics. Teachers, in this study, did claim that most of the students don't bother to come to them with the problems they have with Mathematics. However, the teachers admitted that when teaching they should be involved with students and should patiently generate interest in Mathematics, and give them the proper guidance in learning the subject. Onoshakpokaiye (2011) concurs that the teachers have various roles to play in the process of teaching and learning, most especially in teaching Mathematics. Also, the teachers should be able to apply different methods of teaching and strategies as well as understand the learning styles of students.

The students voiced their opinions on Mathematics as a subject, claiming that Mathematics is a major compulsory subject that a student must pass before moving from a lower level to higher level in the secondary school and venturing into the higher educational institutions. In addition, the students note that Mathematics is only interesting when the topics are easy and understandable. As stated in chapter two, Mathematics is one of the core subjects to be offered to all students up through the tertiary levels of education. This compulsory nature of Mathematics carries with it the assumption that the knowledge of the subject is essential for all members of our society (Adolphus, 2011). The students complained that Mathematics involves stress on the brain, it is time consuming, and demands a lot of effort. In the literature, according to Salau (2002), the road to better Mathematics education is tortuous and difficult. Mathematics involves thinking, modeling, conjecturing and describing all aspects of reasoning about situations as well as organizing

one's expression (Onoshakpokaiye, 2011). The students remarked that if one has good knowledge of Mathematics, the other subjects would be much easier.

Arising from Chapter Four is another vital aspect of the Demands of Mathematics, for both teachers and students. The trend from the teachers' perspective shows that Mathematics is very demanding. It was evident, in the teachers' statement, that it is rare to find people that go on to higher institutions to read Mathematics and to become Mathematics teachers. As noted, the teachers view was that Mathematics is "so" demanding to a large extent that as a teacher one must be up and doing, preparing lessons, reaching your students any time especially when the need arises, marking assignments, and facilitating classwork. Simply put, teaching Mathematics is very demanding

Another category on this theme as found in the data presentation is Assignments. Assignments are very necessary in Mathematics education. The teachers have various opinions on the issue of assignments. Some of the teachers asserted that many of the students were interested in their given assignments while some were not. The students simply complained that there were too many assignments. However, other data revealed that the students are not interested in their given assignments; instead they spend their time with cellular phones watching films. From the teachers' perspective, and supported by my observational fieldnotes, parents are not seen to be checking on their children. Instead, the parents prefer to engage the students with much domestic work and various duties at home to the detriment of their academic studies.

Actually, as reflected in the presentation of the data, the Importance of Mathematics could not be overemphasized. At this juncture, the majority of the students declared that Mathematics is very important to them as well as in their future careers. Many students asserted that they would like to be engaged in Mathematics in their life endeavours. Tali, Mbwas and Abe (2012) indicated that Mathematics is quite rich in concepts that directly translate to important life skills, and this importance cannot be over emphasized. However, a few students stressed that Mathematics is not important to them, as they are Arts inclined. Conversely, the importance of Mathematics permeates all aspects of human

endeavor. However, the societal values and views about Mathematics' importance among the school subjects have not been fully explored (Amoo and Disu, 2012).

Lastly, in the presentation of the data in terms of the Demands of Mathematics, one of the vital aspects of this investigation was the Compulsory nature of Mathematics as a subject. Even the students realized that Mathematics is compulsory. As stressed in Chapter Two, the importance of Mathematics to the modern culture of Science and Technology has been well recognized and generally accepted worldwide. The increasing importance and attention given to Mathematics emanated from the fact that without Mathematics there is no Science, without Science there is no modern Technology and without modern Technology there is no modern society (Daso, 2012).

### **5.2.7 Learning**

As established in the data presented, the theme of Learning covers Studying and Practicing, Focus, as well as Assignments.

As indicated in the presentation of the data one of the integral parts of Learning Mathematics is Studying and Practicing. In this regard, there are two opposing perspectives from students. Most of the students claimed that they always study and practice Mathematics, especially at home. In contrast to that claim, some students confessed that they do not read and practice Mathematics at all. As revealed in the literature, it is important to note that other research findings have shown that individual student characteristics such as learning approaches, cognitive styles, ... are important factors influencing academic achievement (Adedeji, 2007).

Another aspect of effective learning, as illustrated in the presentation of the data, is that of maintaining focus in the classroom, which is imperative to academic success. The students claimed that focusing on the teaching in the class when learning Mathematics makes it easy, even in a situation where one is not intelligent about the subject. In the same vein, the students claimed that when they pay regular attention they could solve problems and arrive at the solutions. However, the students added that some of them don't attend Mathematics class regularly, which they see as an indication of a loss of focus. On a general

note, the student remarked that Mathematics is easy when you focus on everything that pertains to Mathematics as regards the teaching and learning aspect of it.

Another concern arising from the data, and noted above, is the concern of Assignments. In a form of collaboration with teachers' claims, some of the students agreed that they do the assignments given to them by their teachers, while others confessed they don't. Some students admitted that whenever they attempt to do their assignments at home they are confused, and unable to complete the work.

### **5.2.8 Retention and Individual Differences**

As presented in chapter four the theme of Retention and individual Differences contains Performances, Mathematics Examinations, and Intelligence.

From the data presented, the students held two contradicting perspectives on their performances during examinations in Mathematics. A group of the students expressed that they do pass examinations when they study. On the other hand, another group of students declared that they do not pass Mathematics examinations easily. The literature indicates that mass failure in Mathematics examinations is real and the trend of students' performance has been on the decline (Adolphus, 2011). Adedeji (2007) determines that various factors have been given for poor performance of students in Mathematics. Reporting to the National Council on Education (NCE) on students' performance, there have been expressed worries over the low achievement due to poor retention rate and interest in Mathematics by Nigerian candidates (Kurumeh, Onah and Mohammed, 2012).

Another aspect of this theme is Intelligence. Stemming from the data presentation, the importance of Intelligence in the learning process of the student cannot be overlooked. Students noted that some people may be intelligent but they don't have the basic knowledge of Mathematics. It appears that the most vital aspect of learning Mathematics is determination and the willingness to learn. The students claimed that the knowledge of Mathematics is not solely a function of being intelligent but depends on one's

determination and willingness. The claim is that even if a student is dull but determined and willing, that student will have a reasonable knowledge of Mathematics.

Another relevant aspect of this theme is the students' Individual Differences in the class. From the students' point of view, as noted in the data presented above, the students differ in their perspectives as regards Individual Differences in the learning process of Mathematics. Some students claimed that some of them are special or naturally gifted in terms of the learning and knowledge of the subject, Mathematics, while others declared that having a good knowledge of Mathematics depends on one's capability to learn. Others asserted that good knowledge of Mathematics depends on the individual. On a final note on this issue, some of the students remarked that they are given equal brain capability to learn and have knowledge of Mathematics. It all depends on how one makes use of it.

### **5.2.9 Teaching**

As indicated in the data presentation, this theme comprises Teachers, Detailed Explanation, and Mathematics Lessons.

Following on the data presented on Teachers and Detailed Explanation; the students expressed several views. They illustrated how some teachers are explicit and explanatory when teaching, while some are not. In light of this, many students claimed that to have a good knowledge of Mathematics solely depends on the teacher's ability to explain Mathematical concepts. Students claimed that their teachers do not explain well enough for them to understand the subject. From this point of view, teachers seem not to be competent enough to handle the subject in a fashion that students can learn effectively. As noted in the literature, Onoshakpokaiye (2011) believes that the teachers have various roles to play in the process of teaching and learning, most especially in the teaching of Mathematics. Furthermore, the teachers need to be competent in their own area of specialization and also be able to apply different methods of teaching and strategy and understand the learning processes of students.



The last on this theme is Mathematics Lessons. The students revealed that in the same school, some sections of the same level learn Mathematics twice in a week, some four times in a week and others throughout the school days of the week (that is five times a week). Furthermore, in terms of Mathematics Lessons, the students specifically noted that when it is time for the Mathematics lesson some students leave the classroom claiming that they are not interested in the subject. In Chapter Two, Makinde (2012) claims that one of the several reasons for the students' poor performance in Mathematics is students' lack of interest, as well as negative attitude towards Mathematics as a subject. Likewise, Adolphus (2011) identifies lack of learner's interest as one of the factors responsible for the dismal performance of students in the subject, Mathematics (Adolphus, 2011, p. 144).

### **5.3 Conclusions**

In reference to the intent of this study and the research questions presented in Chapters 1 and 3, there are several significant conclusions derived from the presented data and subsequent data analysis.

#### **5.3.1 Classroom Conditions**

The classrooms are not conducive to effective teaching and learning of Mathematics. Notably, there is a lack of vital instructional materials and aids and facilities. Also, overcrowding and leaky roofs.

#### **5.3.2 Teacher Mindset**

It was evident that most teachers are not motivated, interested and happy in the teaching of the subject of Mathematics. They find themselves teaching because they have no choice. In general, there is a poor teacher/student relationship. These factors have a great negative impact on Mathematics education.

### **5.3.3 Student Mindset**

It is obvious students believe that a good knowledge of Mathematics is not a function of gender. A good knowledge of Mathematics depends on one's determination, interest and attention given to it. Also, as was made evident from students, there is a poor teacher/student relationship in many schools. This will definitely affects students' learning of the subject, which in turn will have negative effects on their performances.

### **5.3.4 Qualifications**

A large number of the teachers who teach Mathematics do not hold the relevant degrees or qualifications for that subject area. This is seen as a powerful factor negatively affecting the teaching of Mathematics. Also, there is a lack of properly trained and qualified Mathematics teachers.

### **5.3.5 Teacher View of Students**

Most students have a faulty and poor foundation of Mathematics. This is a major contributor to the poor knowledge and assimilation of the subject; thereby posing difficulties in the teaching and learning process of it at the Senior Secondary School levels. This attribute of the students contributes greatly to their poor performances in the final and external examinations. In addition to that, students have nonchalant attitudes to Mathematics.

### **5.3.6 Demands of Mathematics (Both Teachers and Students)**

Mathematics is seen as a complex subject. Therefore, students are afraid of Mathematics. This being the reality, students have a lack of the interest in or willingness to learn the subject. This factor creates great difficulty given that Mathematic is compulsory and a must for all students. In addition to this issue, teachers do not have enough time to teach during Mathematics lesson periods. As a result of this, the teachers could not finish the syllabus, mark assignments, or attend to the mathematical needs of the students.

### **5.3.7 Learning**

The students do not study or practice Mathematics at the school or at home on a regular basis. Furthermore, the students don't attend Mathematics classes regularly, and if they do they don't always focus when they are in the class.

### **5.3.8 Retention and Individual Differences**

Good knowledge of Mathematics does not solely depend on intelligence. To a large extent, it depends on one's determination, courage, time given to it, and the willingness to learn it. Individual difference is one of the factors that contribute to knowledge of Mathematics. That is why someone could be intelligent but may not be good in Mathematics.

### **5.3.9 Teaching**

Many Mathematics teachers do not explain enough, in effective detail, to the students. Furthermore, there is a discrepancy in the amount of time dedicated to Mathematics, in various sections, of the same level but different sections in the schools. Given this discrepancy of class time, students still take the same examination.

## **5.4 Recommendations**

Based on the conclusions of the study, the following recommendations are made:

Firstly, that individuals, government and the public ensure that the classrooms are conducive to teaching and learning and make available the necessary and vital instructional materials and aids, and facilities, notably, Library and Mathematics Laboratory, for the effective teaching and learning of Mathematics.

Secondly, school management and government should give teachers incentives and ensure good welfare packages so as to motivate them, arouse their interest, and make them

happier in teaching Mathematics. Moreover, teachers should create an atmosphere for good teacher/student relationships.

Thirdly, that greater awareness be given to students and the public noting that a foundational knowledge of Mathematics depends on one's determination, interest and attention given to it.

In addition, the school management and government should ensure that teachers who teach Mathematics must hold the relevant degrees and qualifications, and that staff strength in terms of Mathematics teachers should be increased.

Moreover, that individuals, parents, government and public ensure that good foundation on Mathematics should be given to students' right from the beginning, especially at the Junior Secondary School (JSS) levels. Also, that greater awareness of the negative effects of nonchalant attitudes toward Mathematics is given to students.

Furthermore, the prevailing notion that Mathematics is a complex subject should be debunked through orientations by the teachers, parents and government in order to encourage students in the study of Mathematics.

That school management and government increase instructional time for Mathematics.

That teachers and parents monitor their students to see that they read, study, and practice Mathematics. Furthermore that teachers, parents, and management of schools put in place strict policies that will have students attend class regularly, and be focused in the class.

That students and public should be given the awareness that Mathematics does not solely depend on intelligence but on one's determination, courage, time given to it, and the willingness to learn it.

Moreover, the teachers, management of schools and government should put measures in place to ensure that the teachers explain Mathematical concepts in detail to

the students. That management and government ensure that there is uniform instructional time for Mathematics in all levels in different sections.

It is obvious that this study alone will not to change the entire ground of teacher development and student preparation in Mathematics education in senior secondary schools in Delta State. Given this reality, it will be expedient that further study is carried out in other States, Niger – Delta, as well as private schools in the country, Nigeria.

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## **Appendix A**

### **Date Collection Request Letters**

**Researcher:** Abel Aghogho Uwerhiavwe  
Faculty of Education,  
Memorial University of Newfoundland,  
St. John's, Canada.  
Cell: +1709-770-6363, +234-803-778-1258

Email: [aau805@mun.ca](mailto:aau805@mun.ca)

May 20, 2013.

**Supervisor:** Dr. Clar Doyle (Prof. Emeritus)

Email: [cdoyle@mun.ca](mailto:cdoyle@mun.ca)

The Honorable Commissioner  
Ministry of Education (Basic and Secondary Education)  
Asaba  
Delta State  
Nigeria.

**Attention:** Permanent Secretary

Dear Sir/Madam,

**Permission to Have Access to Your Schools**



My name is Abel Aghogho Uwerhiavwe. I am a full-time Masters student at Memorial University of Newfoundland in St. John's, Canada. I am carrying out a study titled, The Impact of Teacher Development and Student Preparation in Mathematics Education in Senior Secondary Schools in Delta State, Nigeria: A Case Study.

The study will attempt to determine the impact of teacher development and student preparation in Mathematics education in senior secondary school (SSS) 1 to 3.

I humbly request your permission to have access to three senior secondary schools, each from Delta North, Delta Central and Delta South for the purpose of observation and data collection. The information gathered through this observation will be used for analysis in my study. The data collected will be treated with confidentiality and the names of the schools, the principals, the teachers and the students will not be used in the analysis of the data. That is, the names and identities of your schools, the principals, the teachers and the students will be protected in this study by ensuring that fictitious name(s) are given to them.

The data collected will be kept for a minimum of five years, as per the Memorial University Policy on Integrity in Scholarly Research. The electronic data will be stored on a password-protected computer and all hard copies of data such as audio recording will be stored in a lock-up cabinet in my supervisors' office at Memorial University. After the mandatory storage period, all data will be appropriately destroyed.

My study will not interrupt the normal school programming; I will follow the normal school timetable. The participants (principals, teachers and students) may withdraw from the study at any time, until the thesis is submitted. If permission is granted by you, as well as the teachers, students, and their parents, I would also like to make audio recording of the interviews. This recording will be used as reference materials for my study. Segments of the recording may also be used at academic conferences, workshops and/or seminars.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, you may contact the Chairperson of the ICEHR at [icehr@mun.ca](mailto:icehr@mun.ca) or by telephone at +1709-864-2861.

Please do not hesitate to contact me if you have any queries or require any further clarification.

Thank you for your time and interest.

Yours faithfully,

Abel Aghogho Uwerhiavwe.

**Researcher:** Abel Aghogho Uwerhiavwe  
Faculty of Education,  
Memorial University of Newfoundland,  
St. John's, Canada.  
Cell: +1709-770-6363, +234-803-778-1258  
Email: [aa805@mun.ca](mailto:aa805@mun.ca)  
May 20, 2013.  
**Supervisor:** Dr. Clar Doyle (Prof. Emeritus)  
Email: [cdoyle@mun.ca](mailto:cdoyle@mun.ca)

The Permanent Secretary  
Ministry of Education (Basic and Secondary Education)  
Asaba  
Delta State  
Nigeria.

Dear Sir/Madam,

**Permission to Have Access to Your Schools**

My name is Abel Aghogho Uwerhiavwe. I am a full-time Masters student at Memorial University of Newfoundland in St. John's, Canada. I am carrying out a study titled, The Impact of Teacher Development and Student Preparation in Mathematics Education in Senior Secondary Schools in Delta State, Nigeria: A Case Study.

The study will attempt to determine the impact of teacher development and student preparation in Mathematics education in senior secondary school (SSS) 1 to 3.

I humbly request your permission to have access to three senior secondary schools, each from Delta North, Delta Central and Delta South for the purpose of observation and data collection. The information gathered through this observation will be used for analysis in

my study. The data collected will be treated with confidentiality and the names of the schools, the principals, the teachers and the students will not be used in the analysis of the data. That is, the names and identities of your schools, the principals, the teachers and the students will be protected in this study by ensuring that fictitious name(s) are given to them.

The data collected will be kept for a minimum of five years, as per the Memorial University Policy on Integrity in Scholarly Research. The electronic data will be stored on a password-protected computer and all hard copies of data such as audio recording will be stored in a lock-up cabinet in my supervisors' office at Memorial University. After the mandatory storage period, all data will be appropriately destroyed.

My study will not interrupt the normal school programming; I will follow the normal school timetable. The participants (principals, teachers and students) may withdraw from the study at any time, until the thesis is submitted. If permission is granted by you, as well as the teachers, students, and their parents, I would also like to make audio recording of the interviews. This recording will be used as reference materials for my study. Segments of the recording may also be used at academic conferences, workshops and/or seminars.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, you may contact the Chairperson of the ICEHR at [icehr@mun.ca](mailto:icehr@mun.ca) or by telephone at +1709-864-2861.

Please do not hesitate to contact me if you have any queries or require any further clarification.

Thank you for your time and interest.

Yours faithfully,

Abel Aghogho Uwerhiavwe.

**Researcher:** Abel Aghogho Uwerhiavwe  
Faculty of Education,  
Memorial University of Newfoundland,  
St. John's, Canada.  
Cell: +1709-770-6363, +234-803-778-1258  
Email: [aa805@mun.ca](mailto:aa805@mun.ca)  
May 20, 2013.  
**Supervisor:** Dr. Clar Doyle (Prof. Emeritus)  
Email: [cdoyle@mun.ca](mailto:cdoyle@mun.ca)

The Principal,  
XXXXXXXXXXXXXXXXXXXXX,  
XXXXXXX,  
Delta State,  
Nigeria.

Dear Sir/Madam,

**Permission to Have Access to Your School**

My name is Abel Aghogho Uwerhiavwe. I am a full-time Masters student at Memorial University of Newfoundland in St. John's, Canada. I am carrying out a study titled, The Impact of Teacher Development and Student Preparation in Mathematics Education in Senior Secondary Schools in Delta State, Nigeria: A Case Study.

The study will attempt to determine the impact of teacher development and student preparation in Mathematics education in senior secondary school (SSS) 1 to 3.

I humbly request your permission to have access to your school for the purpose of observation and data collection. The information gathered through this observation will be used for analysis in my study. The data collected will be treated with confidentiality and the

names of your school, the principal, the teachers and the students will not be used in the analysis of the data. That is, the names and identities of your school, the principal, the teachers and the students will be protected in this study by ensuring that fictitious name(s) are given to them.

The data collected will be kept for a minimum of five years, as per the Memorial University Policy on Integrity in Scholarly Research. The electronic data will be stored on a password-protected computer and all hard copies of data such as audio recording will be stored in a lock-up cabinet in my supervisors' office at Memorial University. After the mandatory storage period, all data will be appropriately destroyed.

My study will not interrupt your normal school programming; I will follow the normal school timetable. The participants (principal, teachers and students) may withdraw from the study at any time, until the thesis is submitted. If permission is granted by you, as well as the teachers, students, and their parents, I would also like to make audio recording of the interviews. This recording will be used as reference materials for my study. Segments of the recording may also be used at academic conferences, workshops and/or seminars.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, you may contact the Chairperson of the ICEHR at [icehr@mun.ca](mailto:icehr@mun.ca) or by telephone at +1709-864-2861.

Please do not hesitate to contact me if you have any queries or require any further clarification.

Thank you for your time and interest.

Yours faithfully,

Abel Aghogho Uwerhiavwe.

## Appendix B

### Data Collection Request Letters with Consent Forms

**Researcher:** Abel Aghogho Uwerhiavwe  
Faculty of Education,  
Memorial University of Newfoundland,  
St. John's, Canada.  
Cell: +1709-770-6363, +234-803-778-1258  
Email: [aa805@mun.ca](mailto:aa805@mun.ca)  
May 20, 2013.  
**Supervisor:** Dr. Clar Doyle (Prof. Emeritus)  
Email: [cdoyle@mun.ca](mailto:cdoyle@mun.ca)

The Parents

XXXXXXXXXXXXXXXXXXXXXXXXXX

Delta State

Nigeria.

Dear Sir/Madam,

#### **Permission to Have Access to Your Kid(s)**

Dear Parent,

My name is Abel Aghogho Uwerhiavwe. I am a full-time Masters student at Memorial University of Newfoundland in St. John's, Canada. I am carrying out a study titled, The

## Impact of Teacher Development and Student Preparation in Mathematics Education in Senior Secondary Schools in Delta State, Nigeria: A Case Study.

The study will attempt to determine the impact of teacher development and student preparation in Mathematics education in senior secondary school (SSS) 1 to 3.

I humbly seek your consent for your child to be part of this study for the purpose of data collection. Following your consent, participation in the study will depend on consent from your child. The data collected will be treated with confidentiality and the name of the school, the principal, the teachers and the students will not be used in the analysis of the data. That is, the name and identity of your child will be protected in this study by ensuring that fictitious name(s) are given to them.

The data collected will be kept for a minimum of five years, as per the Memorial University Policy on Integrity in Scholarly Research. The electronic data will be stored on a password-protected computer and all hard copies of data such as audio recording will be stored in a lock-up cabinet in my supervisors' office at Memorial University. After the mandatory storage period, all data will be appropriately destroyed.

My study will not interrupt your child's normal school programming; I will follow the normal school timetable. Your child may withdraw from the study at any time, until the thesis is submitted, and he/she will be excluded in the analysis of all data collected up to the point of withdrawal. If permission is granted by you, as well as the ministry of education, principal, and teachers, I would also like to make audio recording of the interviews. This recording will be used as reference materials for my study. Segments of the recording may also be used at academic conferences, workshops and/or seminars.

I will undertake to safeguard the confidentiality of the verbal protocols.



The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, you may contact the Chairperson of the ICEHR at [icehr@mun.ca](mailto:icehr@mun.ca) or by telephone at +1709-864-2861.

Please do not hesitate to contact me if you have any queries or require any further clarification.

Thank you for your time and interest.

Yours faithfully,

Abel Aghogho Uwerhiavwe.

### **Parents' Consent Form:**

Your signature on this form confirms that:

- You understand the scope and purpose of the study.
- You have been afforded the opportunity to ask questions about this study.
- You are satisfied with the answers to any questions you are posed.
- You understand that you are free to withdraw from the study at any time for any reason, and that doing so will not affect you now or in the future in any way.

Signing this form does not relinquish your legal rights, nor does it release the researchers from their professional responsibilities.

The researcher will give you a copy of this form for your records.

*Please indicate your consent to the following by placing a mark in the corresponding boxes*

I give consent for my child to be audio taped during the data collection.

I give consent for audio tapes of my child to be used for the purposes of research, teacher-education and teacher-training programmes.

**Your Signature:**

I have read and understood the description provided; I have had an opportunity to ask questions and my questions have been answered. I consent to participate in the research project, understanding that I may withdraw my consent at any time. A copy of this Consent Form has been given to me for my records.”

\_\_\_\_\_  
Signature of Participant’s Parent

\_\_\_\_\_  
Date

**Researcher’s Signature:**

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

\_\_\_\_\_  
Signature of Investigator

\_\_\_\_\_  
Date

Telephone number: +1709 7706363

E-mail address: [aau805@mun.ca](mailto:aau805@mun.ca)

**Researcher:** Abel Aghogho Uwerhiavwe  
Faculty of Education,  
Memorial University of Newfoundland,  
St. John's, Canada.  
Cell: +1709-770-6363, +234-803-778-1258  
Email: [aa805@mun.ca](mailto:aa805@mun.ca)  
May 20, 2013.  
**Supervisor:** Dr. Clar Doyle (Prof. Emeritus)  
Email: [cdoyle@mun.ca](mailto:cdoyle@mun.ca)

The Students

XXXXXXXXXXXXXXXXXXXXXXXXXX

Delta State  
Nigeria.

Dear Students,

**Request for Your Participation in an Interview**

Dear Student:

As a Masters student in the Faculty of Education at Memorial University, I am conducting a study from 2013/May/30 to 2013/June/30 on The Impact of Teacher Development and Student Preparation in Mathematics Education in Senior Secondary Schools in Delta State, Nigeria: A Case Study.

The study will attempt to determine the impact of teacher development and student preparation in Mathematics education in senior secondary school (SSS) 1 to 3.

As a student in the school, you are being asked to participate in this study voluntarily and be observed. The information gathered through this observation will be used for analysis in

my study. The data collected will be treated with confidentiality and the name of your school, the principal, the teachers and yours will not be used in the analysis of the data. Pseudonyms will be used as de-identifiers on all data collected.

The data collected will be kept for a minimum of five years, as per the Memorial University Policy on Integrity in Scholarly Research. The electronic data will be stored on a password-protected computer and all hard copies of data such as audio recording will be stored in a lock-up cabinet in my supervisors' office at Memorial University. After the mandatory storage period, all data will be appropriately destroyed.

My study will not interrupt your normal school programming; I will follow the normal school timetable. Your grades will not be affected in any way if you choose to participate or not to participate in the study. You may withdraw from the study at any time, until the thesis is submitted. If permission is granted by you, as well as the principal, and teachers, I would also like to make audio and video recordings of the interviews. This recording will be used as reference materials for my study. Segments of the recording may also be used at academic conferences, workshops and/or seminars.

I will undertake to safeguard the confidentiality of the interviews, but cannot guarantee that other participants in the study will do so. Please respect the confidentiality of the other participants by not disclosing the contents of the interviews, and be aware that others may not respect your confidentiality.

If you choose to participate in the study, you will be asked to consent to:

- Participating in an interview with the Masters student (researcher).
- Allowing the researcher or research assistant to use verbal protocols as a source of data.
- Allowing the researcher to record field notes during interviews.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) and found to be in compliance with Memorial

University's ethics policy. If you have ethical concerns about the research, you may contact the Chairperson of the ICEHR at [icehr@mun.ca](mailto:icehr@mun.ca) or by telephone at +1709-864-2861.

Please do not hesitate to contact me if you have any queries or require any further clarification.

Thank you for your time and interest.

Sincerely,

Mr. Abel Aghogho Uwerhiavwe.

***Masters Student***

### **Students' Consent Form:**

Your signature on this form confirms that:

- You understand the scope and purpose of the study.
- You have been afforded the opportunity to ask questions about this study.
- You are satisfied with the answers to any questions you are posed.
- You understand that you are free to withdraw from the study at any time for any reason, and that doing so will not affect you now or in the future in any way.

Signing this form does not relinquish your legal rights, nor does it release the researchers from their professional responsibilities.

The researcher will give you a copy of this form for your records.

*Please indicate your consent to the following by placing a mark in the corresponding boxes*

I give consent to be audio taped during the interviews.

I give consent for audio of me to be used for the purposes of research, teacher-education and teacher-training programmes.

**Your Signature:**

I have read and understood the description provided; I have had an opportunity to ask questions and my questions have been answered. I consent to participate in the research project, understanding that I may withdraw my consent at any time. A copy of this Consent Form has been given to me for my records.”

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

**Researcher’s Signature:**

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

\_\_\_\_\_  
Signature of Investigator

\_\_\_\_\_  
Date

Telephone number: +1709 7706363

E-mail address: [aa805@mun.ca](mailto:aa805@mun.ca)

## **Appendix C**

### **List of Participants**

X – School One.

Y – School Two.

Z – School Three.

$X_{T1}$ ;  $X_{T2}$ ; ...;  $X_{T10}$  – School One, Teacher One; School One, Teacher Two: ...; School One, Teacher Ten respectively.

$Y_{T1}$ ;  $Y_{T2}$ ; ...;  $Y_{T10}$  – School Two, Teacher One; School Two, Teacher Two: ...; School Two, Teacher Ten respectively.

$Z_{T1}$ ;  $Z_{T2}$ ; ...;  $Z_{T10}$  – School Three, Teacher One; School Three, Teacher Two: ...; School Three, Teacher Ten respectively.

$X_{S1}$ ;  $X_{S2}$ ; ...;  $X_{S10}$  – School One, Student One; School One, Student Two: ...; School One, Student Ten respectively.

$Y_{S1}$ ;  $Y_{S2}$ ; ...;  $Y_{S10}$  – School Two, Student One; School Two, Student Two: ...; School Two, Student Ten respectively.

$Z_{S1}$ ;  $Z_{S2}$ ; ...;  $Z_{S10}$  – School Three, Student One; School Three, Student Two: ...; School Three, Student Ten respectively.

X<sub>OF</sub> – School One, Observational Fieldnotes

Y<sub>OF</sub> – School Two, Observational Fieldnotes.

Z<sub>OF</sub> – School Three, Observational Fieldnotes.