

**IMPACT OF OUT-OF-FIELD SECONDARY SCHOOL BIOLOGY  
TEACHERS' CONTENT MASTERY AND CLASSROOM MANAGEMENT  
ANXIETY ON PEDAGOGICAL CONTENT KNOWLEDGE IN NIGER  
STATE, NIGERIA**

**BY**

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## ABSTRACT

This study examined the impact of out-of-field secondary school Biology teachers' anxiety on Content Mastery and Classroom Management on Pedagogical Content Knowledge in Niger State, Nigeria. The research design that was adopted for this study is the Correlation research design. Six research questions with four null hypotheses guided the study. The population of this study was six hundred and sixty-six (666) out-of-field Biology teachers' in 543 public and private senior Secondary Schools drawn from the seven educational zones in Niger State. Multi-stage sampling technique was adopted for this study; firstly, stratified sampling technique was used for selecting 226 senior secondary schools from 7 educational zones while simple random sampling technique was adopted in picking 501 respondents from the schools. Three researcher developed-questionnaires validated by 2 experts in science education and one psychologist were used for data collection. The questionnaire had two sections (A and B). Section A was designed to collect demographic data of respondents, while section B had 15 content mastery statements using anxiety constructs. The reliability coefficient of the instrument were 0.85; 0.84; and 0.86 respectively through Cronbach Alpha formula. Data collected were analyzed using descriptive statistics such as Percentages (%), bar charts, Mean and Standard Deviation were used in answering the research questions raised while inferential statistics such as linear and multiple regressions analysis were used to analyze data for hypotheses testing at 0.05 level of significance. The findings revealed that the level of anxiety of out-of-field Biology teachers was within the mean range of highly anxious. There is a significant relationship between the predictor (content mastery) and the criterion variables (pedagogical content knowledge). The study recommends among others that teaching in senior secondary schools should be 'strictly' professionalized in all respects and treated as such to remove quackery in its field of practice to ensure efficiency and efficacy.

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## LIST OF ABBREVIATIONS

<b>Abbreviation</b>	<b>Meaning</b>
TENS	Transforming Education in Niger State
PCK	Pedagogical content knowledge
FRN	Federal Republic of Nigeria
OECD	Economic Cooperation and Development
UNESCO	United Nation Educational Scientific and Cultural Organization
OOF	Out-of-field teaching
UK	Kingdom
USA	United States of America
TAS	Teaching Across Specialization
OOFT	Out-of-field Teachers
CM	Content Mastery
PCK	Pedagogical Content Knowledge
CMT	Classroom Management Techniques
EFL	English as a foreign language
SSCE	Senior School Certificate Examination
WAEC	West Africa Examination Council
NECO	National Examination Council
NPE	National Policy on Education
NCES	National Center for Educational Statistics
NCTAF	National Commission on Teaching and Future
STEM	Science Technology Engineering and Mathematics
NEEDS	National Economic Empowerment and Development Strategy
DSM-IV-TR	Diagnostic and Statistical Manual of Mental Disorders

AERA	American Educational Research Association
BBF	The Boundary Between Fields
MoE	Ministry of Education
PRS	Planning Research and Statistics

## CHAPTER ONE

### 1.0

### INTRODUCTION

#### 1.1 Background to the Study

Education is a continuous process of training and developing the knowledge, skills, mind and character of people. Ewetan and Ewetan (2015) and Ogunyinka, *et al.* (2015) defined education as the delivery of knowledge, skills, values and information from teachers to students. It is the bedrock of any society and a major tool for developing any nation of the world. Furthermore, Transforming Education in Niger State (TENS 2017) asserted that education is a fundamental social process that uses the context of formal, informal or non-formal instruction to transfer knowledge, skills, ideas, insights, attitude or something akin to any of these so as to empower an individual to execute certain activity to a desirable standard, or manifest desirable behaviour of benefit to himself and the society (TENS, 2017). Olurotimi and Olutope (2014) remarked that the heart of educational system is the teacher including the science teacher. They impact students with the necessary skills to better the society, as science is a tool for national growth and development. The important roles of science towards national development make it important and practically necessary for science to be taught in an organized and well-structured manner.

Science is a fundamental basic tool for man's process and development. The ability to teach science effectively requires a thorough knowledge of how to teach science. Ogunleye and Babajide (2011) emphasized the importance of scientific knowledge in boosting national prestige, national income and international rating of the country. According to them, science gave birth to the production of micro-computers and their innovative applications which earned the developed countries such as the United States of America and Japan unparalleled national wealth and enviable national prestige.

Hence, effective science teaching is pertinent, as it is the gateway to attainment of scientific and technological greatness. Schwab (1978) in Nixon (2015) divided science into three distinctive disciplines which include Physics, Chemistry and Biology.

Biology is one of the basic science subject taught in senior secondary schools. It is one of the most utilized basic science subjects in most technology and technology-related profession. This merely indicates the enormous role that Biology plays in the technological growth of any nation which cannot be undermined. It is germane to say that the technological growth of a nation leads to its social and economic development. For this reason, the importance of Biology for the development of a nation is glaring. It is also a cross-cutting discipline that has applications in many sectors of economic development, including health, agriculture, food production, inbreeding, blood transfusion, in-vitro fertilization, hybridization to mention but a few (Akpomedaye, 2014). The effective teaching of the subject in schools is therefore desirable.

Nevertheless, the problem of getting sufficient numbers of qualified teachers to staff classrooms, for efficiency and effectiveness in the delivery of instructions, most especially in the sciences and mathematics is a nightmare. Cobbold (2015) submitted that United States of America (USA) and United Kingdom (UK) for example faced an uphill battle to fill their science and mathematics classrooms with qualified teachers while Organization for Economic Cooperation and Development (OECD) corroborates that its member countries equally experience acute shortages of teachers (OECD, 2005). Nilsson (2003) analyzed various country reports presented at the 2000 World Education Forum in Dakar, and noted that many African countries such as Angola, Central Africa Republic, Malawi, Ghana, Eritrea, Nigeria and Zambia equally faced large shortage of teachers, with sciences and mathematics been the worst hit.

In Nigeria for instance, Akinsolu (2010) investigated the problems of teacher shortage in secondary schools in Kwara State and found out hidden shortage of teachers have contributed to massive failures as a result of poor teaching quality. Adeyemi (2011) remarked that the poor performance of students in Mathematics was as a result of poor knowledge in the subject which was brought about by hidden shortage of teachers teaching Mathematics in schools. Similarly, in Ekiti State, Adeyemi (2011) reported serious unfilled vacancies in Biology as he stated that, out of the 2178 Biology teachers needed in urban schools in 2011, only 762 teachers were in post leaving a deficit of 1416 Biology teachers. Similarly, Adeyemi (2011) examined the performance of Nigerian students in Physics, Chemistry and Biology in the West African School Certificate examinations and reported that “the high failure rate was due partly to the acute shortage of science teachers”. The result of this shortage of qualified teachers in Secondary Schools may have required teachers to teach outside their specialty areas, which is known as out-of-field teaching (Adeyemi, 2011; Hobbs, 2012; Du Plessis, 2015; Nixon *et al*, 2017).

Out-of-field teaching (OOF) has been a trending phenomenon which is referred to as teaching in a subject area where the teacher does not possess the prerequisite academic and professional qualification, or the teacher has neither a major nor a minor tertiary teaching qualification. For example, if a graduate of Chemistry Education is assigned to teach Biology or Physics at Secondary School, then such a teacher is assigned OOF. In the same vein, if a National Certificate in Education (NCE) holder is assigned to teach Biology or Chemistry at the senior Secondary School then such teacher is OOF. Ingersoll ( 2004) in Du Plessis (2017); Nixon, *et al*. (2016) and Cinkir and Kurum (2015) explained that, out-of-field teaching entails teachers teaching subjects for which they have little training or no certification in or teach subjects /year-levels outside their field of qualification or expertise. This explanation was expanded further by Weldon

(2016) to mean that secondary school teachers' teaching a subject for which they have not studied above first year at university and for which they have not studied teaching methodology. To a certain level, no school is spared in this menace, from public to private, from religions to secular schools and from urban to rural schools. Survey of teaching force of many nations has shown that, a very high percentage of teachers are assigned to teach out of their field of specializations (Cinkir & Kurum, 2015; Sambe, 2015; Subair & Talabi, 2015).

Today, out-of-field teaching is not seen as an aberration neither is it restricted to only few subjects. It affects all subject areas and year levels with science subjects and mathematics been the most affected. Kenny and Hobbs (2015) reported that, Out-of-field teaching is a global phenomenon and is widespread across various countries. It affects countries such as USA, UK, South Africa, Namibia and Nigeria to mention but a few. The concept of OOF teaching can be related to what is called 'specialization' in some regions of the world. This practice appears in schools as a result of managerial decision by the principals or proprietors, governmental recruitment and placement procedures (mis-assignment), shortage of qualified teachers, continuous curriculum changes and transformation oblige teachers to teach subjects for which they do not have the required qualifications (Du Plessis, 2017). This problem is one of the major unrecognized administrative problems in our school system. It is described as education's 'dirty little secret' and 'a wolf in a sheep's cloth' by some other researchers (Du Plessis, 2015). The comments of these various researchers only reflect their concerns for 'out-of-field' teaching which negatively affected the images and output of our school system. This expresses the havoc that, this practice has caused to the education sector and also a threat to the professional ethics of teachers.

In view of that, this phenomenon in teaching is under-theorized and under-researched (Du plessis, 2015; Schueler, *et al.*, 2016) in respect to their professional knowledge and practices. By virtue of this practice, out-of-field teachers are faced with huge knowledge gaps in the mastery of content and in the skills delivery, which make them professionally incompetent. However, this gap may be as a result of inadequate and inaccurate understanding of the content and lack of skills to deliver. They continually face the challenge of understanding the structure and nature of the discipline. This may decrease their teaching effectiveness which may affect their capability to teach effectively and efficiently in the classroom. As a result, impede students' achievement. Therefore, inadequate knowledge of the teacher in the subject matter, alongside poor preparation coupled with feelings of inadequacy may manifest in form of anxiety. The consequence of this anxiety may cause the out-of-field Biology teachers to teach Biology in a perfunctory or careless manner.

Anxiety is an affective construct which is defined as “something felt” by Freud, it is a kind of unpleasant emotional state or condition that includes feelings of uneasiness, worry and apprehension. According to American Psychiatric Association (2013) anxiety is a psychological and physiological state which is characterized by physical, emotional, cognitive and behavioural components. Supporting this definition, Jenaabadi, *et al.* (2016) attest that anxiety is a group of physical, behavioural and mental changes occurring in response to threat which results in ineffectiveness, wearing out, lack of energy and power, and an exhaustion of the inner resources of an individual due to unsatisfied needs. Teaching anxiety is the association between anxiousness and teaching which the out-of-field Biology teacher experiences during instruction from preparation to execution of classroom activities. Anxiety as an affective state, Tüfekçi (2018) classified anxiety into three types as trait (A-trait), state (A-state) and situation-specific anxiety. Trait anxiety is a kind of constant personality trait in an individual that is

inborn, State anxiety, is a transient or momentary anxiety and situation-specific anxiety is associated with explicit situations and events. Out-of-field teachers' anxiety is a state condition which is seen as a psychological discomfort or apprehension which is unique to out-of-field teachers who are responsible for teaching learners how to learn effectively and professionally in a classroom setting using all skills and sub skills required for teaching. A-States related behaviours of OOF Biology teachers' include feeling of inadequacy as a result of teachers' insufficient content knowledge, lack of knowledge about subject-specific and topic-specific strategies and loss of confidence. Cheng and Liao (2016) and Buckler (2013) classified symptoms of A-States into cognitive and somatic or physiological. According to them, cognitive symptoms include anxiousness, nervousness, fear, panic, mental disorientation and apprehension, while physiological A-States are increased respiration, rapid pulse, sweaty palms, stress, burnout and high blood pressure. A-States symptoms were adopted in this study in order to determine the anxiety levels of the OOFT. A-traits did not apply in the present study because; they tend to be innate or in-born and are not acquired as a result of experience (Aynur & Aydın, 2014; Bilali & Tarusha, 2015).

Studies have shown that anxiety is considered on a continuum from normal levels of anxiety, which can be helpful (facilitating), to excessive anxiety which can be detrimental (debilitating) and may negatively impede performance. The continuum include from mild level, to moderate level, to severe level and lastly to panic level of anxiety which can hamper on the teaching process, from preparation to actual implementation stage. However, Sammeper and Wanphet (2013) purported that teachers with higher levels of anxiety give less verbal support to their students, spend more time organizing classroom exercises and their students are liable to hostile remarks and actions. For instance, OOFT who do not understand about the positive and negative sides of a Biology model or practice about different possible experiments that could be

used for a particular topic (content knowledge) may have difficulty in instruction which may lead to high anxiety.

Content Mastery (CM) as a variable is a phrase that describes the teacher's knowledge of a subject specific area which is obtained through formal training at the university or Colleges of Education. Content knowledge is foundational to effective teaching. Evens, *et al.*, (2015) defined Content Knowledge as the knowledge of subject or discipline per se and included substantive structures and syntactic structures. Substantive content knowledge refers "to the concepts, principles, laws, and models in a particular content area of a discipline while syntactic content knowledge is the "set of ways in which truth or falsehood, validity or invalidity are established. More so, Geoffrey, *et al.* (2014) affirmed that content knowledge is a long established basic prerequisite for teaching a subject, and it is an essential requirement for teacher certification. Literature on teachers' knowledge posits that a deeper and coherent knowledge can be used for identifying relevant and accurate examples of concepts. This implies that teachers with stronger content knowledge are more likely to teach in ways that will help students to construct knowledge, create appropriate questions, suggest alternative explanations, and propose additional inquiries (Uya, 2011; Afolayan, *et al.*, 2013).

The evidence gained from different studies on Content Mastery is contradictory. Several studies show a positive relationship between teachers' preparation in the subject matter they later teach and anxiety while others have less unequivocal results. Morteza and Morteza (2013) in a study of teachers' anxiety among practicing EFL teachers in Iran reported that EFL teachers, experience high rate of anxiety (57.62%) as a result of language proficiency. Most researchers have found that anxiety declines linearly as a function of mastery of the subject (Haciomeroglu, 2014). Others have reported no statistically significant differences between levels of anxiety and content mastery of

pre-service teachers (Akinsola, 2008). Additionally some previous studies found that younger and newly employed teachers experienced higher levels of anxiety than older and experienced teachers (Du plessis, 2015; Nwimo, 2004) while other studies indicated that older and experienced teachers' exhibit higher anxiety than newly employed teachers.

Ultimately, literature has indicated that, content knowledge is not sufficient for effective teaching without pedagogical knowledge. Thus, what makes a teacher capable of teaching is how well he or she facilitates learning. This facilitation is achieved by combining subject content knowledge with Pedagogical Content Knowledge (PCK). This is because subject mastery is distinguishable from PCK and is not enough to bring students comprehension (McConnell, *et al.*, 2013; Kola & Sunday, 2016).

PCK is a practical knowledge that is used by teachers to guide their actions in a highly contextualized classroom setting. That is, their own special forms of professional delivering of their subject matter. Aina and Sunday (2015) acknowledges PCK to be the analytic bond between teacher's content knowledge and teachers' knowledge of pedagogy. It is the characteristics of teacher knowledge of how to teach the mastered content. This construct is unique and is used only in the realm of education (teaching). Agboade (2009) reiterated that PCK enables the teacher to transform the content mastery into a form that students can use. It helps teachers create an understanding of how certain topics and problems are presented and adapted to the learners' interest and abilities. This knowledge is developed over time and through experience (Loughran, *et al.*, 2012; Evens, *et al.*, 2015). PCK enable science teachers to use pictures, drawings, examples, models, videos and analogies which are to help students to understand specific science concepts. For instance, teachers have to know about the positive and negative sides of a Biology model or practice about different possible experiments that

could be used for a particular topic (Halim, *et al.*, 2014). If teachers do not know the positive and negative sides of demonstrations, they cannot use the demonstrations in their courses and their students can have misconceptions in these courses.

With regard to the relationship between anxiety and PCK, previous studies had mixed results as to whether or not anxiety differed based on a teachers' PCK. However, the result is inconclusive. A plethora of studies indicated that older teachers' exhibited higher level of anxiety while some other studies showed that older teachers had low level of anxiety (Nwimo, 2004) based on their PCK. Some researchers have argued that there is not always a sharp distinction between PCK and subject matter knowledge because subject matter knowledge functions as a source to be transformed for teaching. On the other hand, student-teachers having inaccurate and inadequate knowledge might transfer their own misconceptions to their students and in this way add to students' conceptual difficulties. Kaya (2008) showed that there was a significant interrelationship between the subject matter and pedagogical knowledge of the pre-service science teachers. Similarly, many researchers such as Halim, *et al.*, (2012), Van Driel and Berry (2012) concluded that content knowledge had influence on pedagogical content knowledge and their anxiety level.

The recognition of one's PCK is most evident when teaching outside an area of subject expertise, despite having a strong specialist content mastery and a developed knowledge of pedagogy in one owns discipline, a combination of such teacher's skill is not enough to use it to teach in another subject area (McConnell, *et al.*, 2013). Similarly, when an out-of- field Secondary School Biology teacher is confronted with topic in which he has little familiarity, he gets challenged both in content knowledge, skills and in attitudes to confront situations. Consequently he becomes unqualified to teach that subject. It is worth noting that, this construct differs from one discipline to another, for example

PCK for teaching Biology is different from PCK for teaching Chemistry or Physics. According to Du Plessis (2015), out-of-field teachers (OOFT) do not feel in control of their PCK as they mostly avoid challenging part of the curriculum and at the same time shy away from assigning group work describing it as difficult. It was further noted that insufficient PCK restrict the ability of OOFT to maximize the curriculum potentials and its expectations. Thus, restricted PCK of a classroom OOF teacher can negatively affect teaching. A classroom is a workplace or learning environment where teaching and learning activities take place. Classroom, according to Nwiyi (2017) is the meeting point for both teachers and students where curricular activities are implemented. The classroom environment is characterized by a network of interpersonal relationships directed at the attainment of educational goals by the teacher. The process of organizing human and material resources in the classroom for the purpose of educational goals is referred to as classroom management.

Classroom Management is a terminology often used to describe the process of ensuring that lessons are smoothly carried out despite disruptive behaviours of the learners. Sakirudeen, and Sunday (2017) defined classroom management as any action a teacher takes to create an environment that supports and facilitates both academic and social-emotional learning. This ranges from the physical environment, establishing rules and procedures, maintaining students' attention to lessons and engagement in activities to improve teacher-student relationships. Furthermore, Yasar (2008) claimed that classroom management is a comprehensive concept that consists of three independent dimensions: people management, behaviour management and instructional management. The people management dimension is centered on how the teacher perceives the students and how they view their relationship with the students. Behaviour management focuses on a teacher's pre-planned methods of preventing misbehaviour, rather than simply their reaction to it once it occurs. Finally, instructional management dimension

is based on the daily routines of the classroom and allocation of materials. To this end, good classroom management can imply good instruction delivery and prevention of misbehaviour (proactive) before they occur in the classroom environment. However, teachers sometimes have problems with learners' behaviour and frequent manifestation of classroom indiscipline, which often result in high level of stress on the part of the teacher and symptoms of burnout or anxiety (Ali-Satar, 2017).

On the influence of classroom management and anxiety, Findings from previous studies also had mixed result. Some studies revealed that the newly employed teachers experienced higher level of anxiety in the management of behavior, while a plethora of studies indicated that there was no difference in the level of anxiety in classroom management and time management (Kowsalya & Nalinilatha, 2017). Some other empirical studies revealed low level of anxiety was experienced by unqualified science teachers who had been teaching for over many years. The success of any teaching to a large extent depends on the way classroom management are deployed. However, failure to effectively manage the classroom by out-of-field teaching can have an overall negative effect on the sound academic performance of the students. Conversely, ineffective management leads to serious condition of indiscipline and causes damage to the conducive climate for learning. In a disorganized and chaotic classroom where the out-of-field Biology teacher is grossly inadequate in CK and PCK, little teaching may take place and students in such a class may be bored, uninteresting, confused, inattentive, annoyed, lost, asleep, unsecured, resentful and not concentrating when they perceive that the teacher is not communicating effectively or carrying them along in the classroom teaching (Ngerem & Ezikpe, 2017). Researches indicate that females are getting significantly poorer in science education than males even when they are in the same classroom (Ewetan & Ewetan, 2013; Ambe & Agbor, 2014).

Gender as a variable refers to masculinity and femininity found in an individual. In education, gender inequality has remained an issue of concern and interest to teachers, school administrators and stakeholders in the education sector. Gender differences have become critical issues of concern around the world most especially to educators and researchers. Awodun et al, (2015) reported that there is no country in the world that has reached equality state between women and men in different critical areas such as in economic participation or in education. Some researchers believe that people react differently to anxiety based on their gender when put under same experiences, expectation and similar circumstance. This is so because they perceive the threatening situation differently as a result of their biological, psychological and emotional differences (Morteza & Morteza, 2013).

On the influence of anxiety on gender, findings from studies appeared to be inconclusive. Some previous studies have reported higher levels of anxiety in males than females. Lampadan (2014) reported that there is a correlation between science anxiety and gender differences in teaching as females are more anxious than their male counterparts. A perusal of empirical educational literature reveals that there is significant noticeable difference in the proportion of male to female science teachers. However, this phenomenon has been disturbing despite the clamour for gender equality treatment and advancement in teaching of science. Uzoma (2019) stated that males and females secondary school teachers' level of stress/ anxiety has no significant difference. In the same vein, Akinsola (2014) reported that there was no significant difference between male and female pre-service teachers teaching anxiety in mathematics. Similarly, in studies conducted on pre- service teachers by Yayli and Gungor (2012) and Aynur and Aydin (2013) in Turkey found that there was no significant difference between anxiety of male and female English as a foreign language (EFL) instructors

towards teaching. Studies have indicated that teacher's experience irrespective of gender exerts a great influence on students' achievement.

The term teacher experience is used here to denote the number of years a teacher has been practicing the art of teaching. Experience, they say, is the best teacher. Teachers' experience is a unique quality for teaching effectiveness. Experienced teachers are great asset to novice teachers who need advice, encouragement and continuous guidance. Austin & Omomia (2014) stated that experience is directly related to teachers' ability to plan lessons, address divergent student responses, and reflect on their teaching effectiveness and their ability to stimulate student inquiry. Ameen, *et al.* (2002) and Clayford (2010) commented that experience improves teaching skills while students learn better at the hand of teachers who have taught them continuously over a period of years. According to Rice (2003) the magnitude of the effect of teacher experience varies depending on the teacher's level of education and the subject area. He further opined that experience gained over time, enhances the knowledge, skills, and productivity of workers. These qualities facilitate students' skills and also enable thorough understanding of Biology concepts. Some studies show a stronger positive relationship between teacher experience and teacher anxiety. Kumar and Deo (2011) discovered that junior college teachers experienced extremely more anxiety/stress on most of the dimensions of stress in comparison to senior teachers. Additional years of experience had a significant positive effect on teachers' while very few years had a negative impact on their performance. Study by Numaya (2013) affirmed that younger and less experienced teachers felt greater anxiety/stress than their colleagues from pressures associated with discipline, poor promotion prospects and management issue. Teachers with long years of experience are confident that even the most difficult student can be

reached if they exert extra effort; while teachers without experience feel a sense of helplessness.

Research on teacher experience is sparse and the results are inconclusive, as there is a wide range of findings on the relationship between years of teaching experience and teachers' anxiety. Past studies on the effects of teacher experience showed that experience had statistical significant effect on teachers' anxiety. Nwimo (2004) stated that there was difference between anxiety and years of teaching experience. In the same vein, Numaya (2013) submitted that anxiety and years of teaching experience had no significant difference while Nwimo (2004) also found no significant difference when age, gender and work experience were considered. Some studies also revealed that experienced teachers with longer years of service experience more anxiety than less experienced ones as a result of work over load and managerial responsibilities. In a relationship among teacher variables and school type, Adesoji and Olatunbisun (2008) discovered a correlation between years of experience and public schools in urban area.

School type (ownership) in Nigeria is the controlling force in terms of the administration of the school and this could be divided into two broad structures which are: Public and private schools. Schools that are established and run by governments are called public schools while those established by non-government agencies such as individuals, associations or organizations and missionaries are referred to as private schools (Owoeye & Yara (2011). These schools are established for profit making. McConney and Price (2009) as well as Weldon (2016) reported that OOF teaching is more prevalent in private schools than in public schools. In a survey of teachers in Perth metropolitan region of Western Australia (WA) in 2007 and 2008, Weldon (2016) reported that the rate of OOF teaching in government schools stood at 14–18% while that of non-government schools was 27–30% whereas schools in rural location had

higher rate of OOFT as it is 26% in government and 39–44% in non-government schools.

On the influence of anxiety on school type, findings from studies appeared to be inconsistent. Some previous studies have reported higher levels of anxiety exists in private school teachers than in public school teachers, while other studies revealed that public school teachers have a higher anxiety level than private schools teachers'. Other studies show no difference in level of anxiety. From the foregoing, Public and Private schools are situated in geographical areas using the location planning techniques to ensure even distribution (Owoeye & Yara, 2011).

School location is one of the powerful factors that influence the distribution of educational resources. School Location is defined as the environmental condition around a school. According to Mhiliwa, (2015) the location of the school is crucial to teacher's performance. Schools are located both in urban and rural centres. As the names denote, urban schools are schools located in Urban or Metropolitan centres while rural schools are schools located in rural or remote areas. Oredein (2016) conceptualized urban schools as schools located in urban centre where there is high population density containing a high variety, beauty and common place views, such as recreational centers, modern markets, banks, hotels, and good road network. Owoeye and Yara (2011) accentuated that highly qualified teachers prefer to serve therein rather than the rural areas. Rural schools are schools located in rural areas, where there is low population density, containing low variety and isolated place views with few settlements with subsistence mode of life, monotonous and burdensome.

Making a critical analysis of location, Owoeye and Yara (2011) and Oredein (2016) noted that teachers do not accept postings to rural areas because their conditions are not up to the expected standard, and their social life in the areas is virtually restricted as a

result of inadequate amenities, deficient facilities, unequipped playground and libraries are without books. These reasons have given rise to OOF teaching as many rural teachers teach subjects out of their areas of specialization. Literature posits that low-income public schools had higher rates of out-of-field teaching than schools in prosperous or urban communities. In rural schools in Western Australia, about 48% of teachers reported teaching out-of-field across all sectors, with the independent sector reporting 70% of secondary teachers working out-of-field (McConney & Price, 2009; Shaplin, 2014). Findings from literature reviewed appeared to be inconclusive. Christopher, *et al.*, (2018) submitted that there were significant differences between anxiety/stress and biographical variables such as gender and certification and between public schools and private schools, while Pasek (2006) reported that qualification and anxiety of 154 teachers in Australia had no significant differences. However, Sharma (2008) found out that there is a high and significant relationship between teachers' qualification and anxiety.

With regard to the relationship between level of study and academic-related anxiety, research findings have been mixed. Whereas most of researchers have found that anxiety declines linearly as a function of year of study (Aftab & Khatoon, 2016), others have reported no statistically significant differences between levels of study with regard to anxiety (Bowers, 2010). Additionally, teachers in urban schools are more qualified than their counter part in rural schools. Teacher qualification refers to academic and professional qualifications that enables a person to become a registered teacher at all levels of education. It also relates to the acquisition of relevant knowledge, skills and competence and creativity needed for quality productive engagement in the teaching profession. Teachers' certification status and degree in area of specialization are very significant and positively correlated with students learning outcomes in science and mathematics. It is the most important factor in improving students' achievement in

Biology. Teacher specialization is a pre-requisite requirement for meeting the objectives of the Biology curriculum (Ofosuhene, 2018).

Research on the value of a teacher's advanced degree is mixed: some studies show that while additional teacher education has a negative correlation with anxiety in some cases, others find that it positively affects anxiety. Ayansina (2015) and Ewetan and Ewetan (2013) found that a teacher's advanced degree is not generally associated with increased anxiety, but having an advanced degree in Math and Science for Math and Science teachers appears to influence anxiety. In the same way, Oludipe (2014) stated that the findings of other studies about the impact on anxiety of teachers' advanced degrees are inconclusive because they considered only the level of the degree and not the subject of the degree, which may affect teachers' anxiety and student achievement in different ways than the degree level.

## **1.2 Statement of the Research Problem**

Despite the importance of teachers to students' academic achievement, results of students in Biology and other related science subjects in Senior School Certificate Examinations (SSCE) such as WAEC and NECO in Niger state has fallen to an alarming level. In Niger State, there is the problem of shortage (dearth) of qualified teachers' in senior secondary schools to teach science subjects (TENS, 2017).

TENS (2017) reported that senior Secondary Schools in Niger State lacked sufficiently qualified teachers to teach core science subjects, such as Biology and Mathematics. Pilot study conducted by the researcher shows that Senior Secondary Schools in the state are plagued with hidden shortage (where teaching in a subject is given by teachers considered to be inadequately qualified) and modernized shortage (where teachers who are formally qualified but already are out of touch). The result of this shortage of

qualified teachers in senior Secondary Schools may have required the head teachers which are to a greater extent in control of their schools to bear the brunt of assigning teachers' to teach outside their specialty area. This has led to increased use of non-subject teachers which are recruited as a result of management decisions as "quick fix" (quick replacement of non-subject teachers' to teach the subject); "hire less qualified teachers", deploy or redeploy teachers trained in another field or substitute teachers. All these leads to out-of-field teaching, which has been a trending phenomenon in most of our schools. Although there is no statistics to show for the existence of out-of-field teaching in Niger State, this hydra headed monster is a reoccurring phenomenon in our schools.

If out-of-field Biology teachers' who may be anxious about Biology are charged with teaching students Biology, their anxieties may have consequences on their students' achievement. Since this teachers have inadequate knowledge of the content and skills to teach this subject effectively, they may transfer their own misconceptions of the subject to their students and in this way add to students' conceptual difficulties. Anxious teachers may unintentionally transfer anxiety to students in their classroom. The consequences of this practice may have resulted in raised anxiety levels which have shown up in a spectrum of behaviors and students achievement in internal and external examinations. This problem is widespread and continuing. For this reason, this study is one of such endeavours, as it tends to bring to light the concept of OOF teachers' anxiety and how it impacts students' performance. It is against this background that the study focuses on the impact of out-of-field secondary school Biology teachers' Content Mastery and Classroom Management anxiety on Pedagogical Content Knowledge in Niger State, Nigeria.

### **1.3 Aim and Objectives of the Study**

The aim of this study is to understand the impact of out-of-field secondary school Biology teachers' Content Mastery and Classroom Management anxiety on Pedagogical Content Knowledge in Niger State, Nigeria.

The objectives of the study are to determine:

1. The level of anxiety of out-of-field Biology teachers' on Content Mastery
2. The level of anxiety of out-of-field Biology teachers' on Classroom Management
3. The influence of out-of-field Biology teachers' anxiety on Content mastery and Pedagogical Content Knowledge (PCK)
4. Examine the relationship between out-of-field Biology teachers' anxiety on Classroom Management and Pedagogical Content Knowledge
5. The relationship between out-of-field Biology teachers' anxiety on Content Mastery, school type, school location, gender, years of teaching experience, educational qualification on Pedagogical Content Knowledge (PCK)
6. Examine the relationship between out-of-field Biology teachers' anxiety on Classroom Management, school type, school location, gender, years of teaching experience, educational qualification on Pedagogical Content Knowledge (PCK).

### **1.4 Research Questions**

The following research questions were raised to guide the study

1. What is the level of anxiety of out-of-field Biology teachers' on Content Mastery?
2. What is the level of anxiety of out-of-field Biology teachers' on Classroom Management?

3. What is the relationship between out-of-field Biology teachers' anxiety on Content Mastery and Pedagogical Content Knowledge (PCK)
4. What is the relationship between out-of-field Biology teachers' anxiety on Classroom Management and Pedagogical Content Knowledge (PCK)
5. What is the correlation between out-of-field Biology teachers' anxiety on Content Mastery, school type, school location, gender, years of teaching experience, educational qualification on Pedagogical Content Knowledge?
6. What is the correlation between out-of-field Biology teachers' anxiety on Classroom Management, school type, school location, gender, years of teaching experience, educational qualification on Pedagogical Content Knowledge?

### **1.5 Research Hypotheses**

The following research hypotheses were formulated and tested at 0.05 significant level

1. There is no significant relationship between out-of-field Biology teachers' anxiety on Content Mastery and Pedagogical Content Knowledge (PCK)
2. There is no significant relationship between out-of-field Biology teachers' anxiety on Classroom Management and Pedagogical Content Knowledge (PCK)
3. There is no significant correlation between out-of-field Biology teachers' anxiety on Content Mastery, school type, school location, gender, years of teaching experience, educational qualification on Pedagogical Content Knowledge
4. There is no significant correlation between out-of-field Biology teachers' anxiety on Classroom Management, school type, school location, gender, years of teaching experience, educational qualification on Pedagogical Content Knowledge.

## **1.6 Scope of the Study**

The geographical scope for this study is all the out-of-field Secondary School Biology teachers' employed to teach in public and private senior Secondary Schools in Niger State. Niger State has a landmass of 72,000 km<sup>2</sup> of approximately 8.6 million hectares. It lies on latitude 3.20° East and longitude 11.30° North. The State derived its name from River Niger and is situated in the North-Central geopolitical zone of Nigeria. The State has 25 Local Government Areas and is the second largest State in Nigeria. It shares boundary with Federal Capital Territory (FCT), Zamfara (North), Kebbi (North-West), Kwara (South-West) and Kaduna (North-East). The population of Niger State based on the 2006 National Census figures was below 4, 000,000 people. The content scope for this study is Biology teaching while the variable scope: dependent variables are anxiety, content mastery, pedagogical content knowledge and classroom management techniques and the independent variable is out-of-field Biology teachers while the moderating variables are gender, teaching experience, school location and type. The instrument scope is the questionnaires developed by the researcher and the time scope (fieldwork aspect of this study) will last for eight weeks.

## **1.7 Significance of the Study**

Findings of the study would be useful to students, teachers, parents, educational administrators, education planners, policy makers, researchers and the entire educational system.

Findings of this study would be useful to the students. Students deserved to be taught by a competent, confident and a well-prepared Biology teacher' who will teach the students' in order to gain understanding of the abstract nature of Biology, by moving from a simpler understood concept to a more difficult concept in Biology.

To the teachers, this study would help the out-of-field Biology teacher to embark on self-empowerment to better their core knowledge, identifying appropriate pedagogical skills suitable to a content area as proposed in the curriculum and to adequately relate instruction to classroom management.

To the school administrators, it would provide the school administrators with an insight on this caliber of Biology teachers' and begin to checkmate their activities in the classroom and offer support where necessary.

Findings of this study would be useful to policy makers as it will enable them to provide policies that can support, protect and prepare out-of-field teachers' especially when teaching circumstances are challenging.

The education planners would ensure intensive professional development opportunities for the out-of-field Biology teachers', and to give continuous close monitoring with the school heads to address their limitation.

Findings of this study would be useful to the parent by having an open discussion of out-of-field teachers' with the parents. It would encourage the parents to show empathy hence collaborate and work with school management to fill the gap in pedagogical content knowledge.

This study would encourage the Ministry of Education to train this group of teachers as professionals. This will be relevant to on-the-job training and in-service teacher development. Also the Ministry of Education would be encouraged to know the cadre of teachers to remove from the teaching position, by so doing entry into the teaching field will be curtailed and controlled, thus focusing on manpower planning, training and development.

This study could contribute to the debates about the importance of teacher on students' achievement, and the reality of out-of-field teaching in Nigeria and Niger State in particular. It will contribute to literature as one of the few studies on out-of-field teaching in Nigeria and would add to the growing research on quality and effectiveness of Biology teachers' education in Nigeria.

## 1.8 Operational Definition of Major Terms

**Anxiety:** This refers to out-of-field Secondary School Biology teachers' feelings of worry, apprehension, nervousness wearing-out and ineffectiveness during the course of their teaching in the classroom.

**Classroom Management:** This refers to the classroom arrangement that has been specially created to promote teaching, involves the proper control of the classroom and also the provision of learning experience to students.

**Classroom Management Techniques:** This refers to the management of behaviour and instruction in the classroom by the out-of-field Biology teacher.

**Content Mastery:** This is the conceptual understanding of Biology curriculum

**Out-of-field teachers':** This refers to teachers' teaching Biology outside their field of qualification. This includes graduates in relevant field teaching Biology without education background. The field might be year level. For example NCE holder with major in integrated science is assigned to teach Biology in senior secondary school or a B.Sc holder in Biochemistry or B.Sc (Ed) in Physics assigned to teach Biology.

**Pedagogy:** This refers to methods of teaching Biology.

**Pedagogical Content Knowledge:** This refers to a teacher's knowledge about the teaching of Biology such that the particular learning demands characteristics to content-specific topics are put in to account.

**School Location:** Location of school means the area where the schools are built in relation to the availability of social interaction that will enhance instruction.

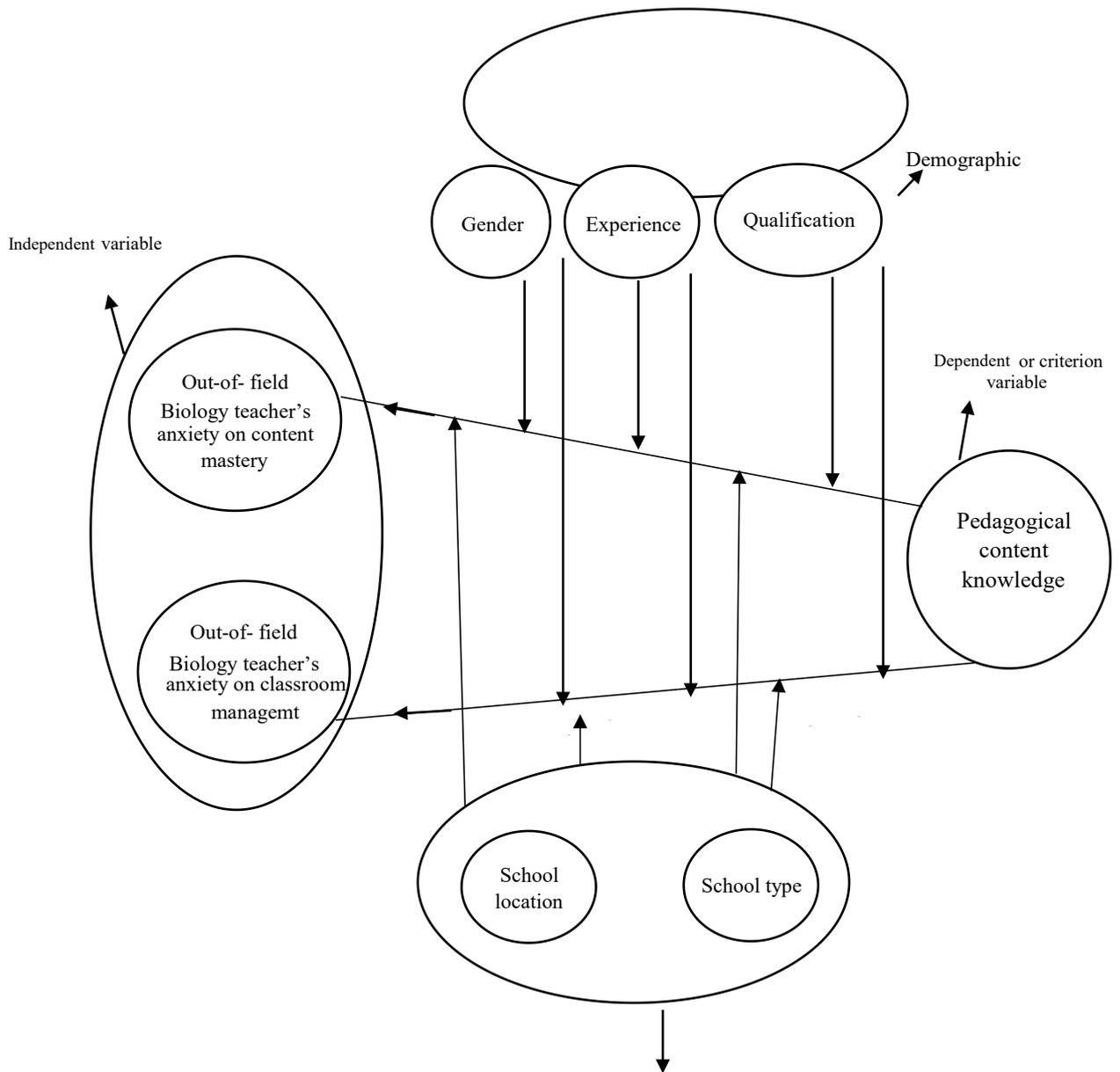
**School Type:** This refers to the authority that owns and finances a school. In this study private and public is considered as school type.

## CHAPTER TWO

### 2.0

### LITERATURE REVIEW

### 2.1 Conceptual Framework



**Figure 2.1:** showing the impact of out-of-field secondary school Biology teachers' anxiety on Content Mastery and Classroom Management on Pedagogical Content Knowledge

From the figure, the independent variables (out-of-field Biology teachers' content mastery and out-of-field Biology teachers' classroom management) exert anxiety on the dependent variables (out-of-field Biology teachers' pedagogical content knowledge). The moderating variables that is school location and school type (school factors) interacting with independent variables to produce anxiety of OOF Biology teachers in the classroom. More so, demographic factor (gender, teaching experience and teachers qualification) interacting with independent variables to produce anxiety of OOF Biology teachers. If an OOF Biology teachers' lack adequate knowledge in his teaching subject, such teacher may develop certain level of anxiety and as such lack effective way of communicating the subject matter to the students. In other words, the teacher is likely to experience a high level of stress which will affect his/her performance eventually leading to poor students' results

### **2.1.1. Biology as Subject in Nigeria Senior Secondary School**

Biology is a natural science subject that is concerned with life and living organisms. Biology is studied as a science subjects in senior secondary schools in Nigeria (Bello, 2014). It is also one of the core science subjects taught along with Mathematics, English Language and Economics. The study of Biology provides students with opportunities to develop an understanding of our living world; life and its evolution; organisms and their structures; functions, processes, and interactions with each other; and with their environments. According to Horan (2012) Biology teaches us" why we are the way we are, why we need what we need to survive, where we all come from and how all living things are categorized". This subject is vital for the nation's scientific and technological development. Without sound knowledge and wholesome attitude towards Biology, the much needed and vouched technological breakthrough may not be achieved.

Nsofor (2010) defined Biology as “the scientific study of all forms of life including plants, animals and micro-organisms”. It deals with internal, external and behavioral aspects of living organisms. The “numerous field” of Biology are cytology (study of cells), embryology (study of development), genetics (study of heredity), biochemistry (study of chemical structure of living things), morphology (study of anatomy), taxonomy (the identification, names and classification of organism) and physiology (the study of how organisms function and respond to stimulus). Biology is divided into two components, Botany (study of plants) and Zoology (study of animals). Plants and animals are living organism as they perform all the characteristics of living things such as movement, respiration, nutrition, growth, excretion, irritability, and reproduction. Biology dominates the science discipline within Science, Technology, and Engineering and Mathematics (STEM) education and represents the most commonly offered science subject in secondary school (Banilower, *et al.*, 2013).

The Secondary School Biology curriculum according to Nsofor (2010) have seven conceptual headings; Biology for life, interaction in nature, micro-organism, man and health, unit of life, living organisms in its environment, sexual reproduction and variability, heredity and evolution. The Senior Secondary Biology syllabus is spirally arranged to ensure that concepts learnt in SSS1 also feature in SSS2 and SSS3 in a higher orders. The objectives of teaching Biology at Secondary School level as stated in National Policy on Education (NPE) (FRN,2013) involve ability of the learners’ to develop awareness of the environment, to have meaningful and relevant knowledge in Biology necessary for successful living in a scientific and technological world and to make room for technological advancement. It is also the foundation for specialized courses in the fields of pharmacy, biochemistry, nursing, medicine and other allied courses (Bello, 2014). The importance of Biology to human and National development, have brought the need of Biology to Secondary School curriculum. It is the only science

subject that is compulsory for both arts and science students in the Senior Secondary and it is offered in private as well as public Schools. Biology as a discipline tends to study all living things and their interactions in the biosphere. Biology is the only science subject that includes both substantive and syntactic structures. Substantive structures suggest ways of organizing biological concepts and principles while Syntactic structures indicate ways by which extremes such as truth and Falsehood are established.

Biology is taught through two major components, that is, theory and practical. It is a prerequisite that Biology teacher should have his subject matter at his fingertips, both in theory and practical work, the efficacy with which Biology teacher conducts his Biology lessons is dependent on the level of preparation he/she was exposed to in pre-service teacher education time. Prospective Biology teachers have to be familiar with national curricula in Biology education, and they have to know about Biology-specific objectives since curriculum is so dynamic that it changes regularly. Thus, a teacher must have a strong foundation in pedagogical knowledge to understand how students or learners want to learn. Biology helps students to develop empirical practical skills in experimental work as observation, accurate recording, logical reasoning and effective manipulation of equipment. Therefore, owing to difficulty in obtaining qualified science teachers, Biology inclusive, appointments of Science teachers' are often made knowing fully well that these teachers' were employed with no previous teaching experience or formal content knowledge which made them OOF.

### **2.1.2 Evolution of 'Out-Of-Field Teaching' concepts**

Out-of-field teaching is a phenomenon peculiar with American classrooms. "Out-of-field teaching was first discussed within the context of teachers in schools in United States of America (USA). A Research studies conducted by Ingersoll (1998; 1999) in Salleh and Darmawan (2013) in University of Pennsylvania, identified the failure to

staff classrooms in America public schools with qualified teachers. As this was one of the major problems in American education. The phenomenon had existed in American classrooms for at least half of century, and extensively studied since in the 1990s, with the publication of a series of reports from the National Center for Educational Statistics (NCES) (Morton *et al.*, 2008; Zhou, 2012). Zhou (2012) claimed that out-of-field teaching manifested as a result of poor teacher quality in America's schools, as teacher education in America then was not rigorous enough to equip future teachers with sufficient knowledge for teaching. Salleh and Darmawan (2013) stated that the problem of out-of-field in America became much worse between the periods 1993-1994 and 1999-2000. However, despite the existence of this phenomenon for half a decade, it was only recently that out-of-field teaching had become an issue of policy in America. This phenomenon had been a problem in the United States but was largely unrecognized, due to inaccurate information on the situation. Nixon (2015) in a seminar paper on the incidence of out-of-field teaching in US schools, classified out-of-field teaching in to two types

1. Teaching a subject area in which the teacher does not have a college major or minor, such as teaching physics with a degree in Biology.
2. The second type occurs within a multi-disciplinary field such as science or social studies. This would include teaching Biology with a degree in physics.

Although holding a degree in the subject area does not ensure that a teacher will have the necessary content knowledge for teaching, holding a degree in the content area serves a readily available minimum requirement (Nixon, 2015). Since Ingersoll (1998) early work on out-of field teaching, a number of studies have been carried out to investigate the issues surrounding out-of-field teaching in other parts of the world to determine the prevalence of this ugly practice. In addition, OOF teaching is also known

as Teaching Across Specialization (TAS), Foreign Subject Teaching (FST), Non-specialist teaching or hidden shortage in some other regions of the world (Hobb, 2013). This phenomenon has its root in literature. Albert Shanker former American Head of teachers' in Sambe (2015) condemned out-of-field teaching as education's "dirty little secret". It is also called a "wolf in a sheep's clothing" and a "hydra-headed monster" by different researchers. These comments by these various researchers reflect their concerns for Out-of-field teaching (OOFT) and have expressed the havoc it causes to education. This practice may pose threat to the professional ethics of the teachers'. This phenomenon has been defined in different way by different researchers. Du Plessis (2017) defined out-of-field teaching as a situation where teachers are placed in teaching positions in which they have to teach subjects or year-levels outside their field of qualification. This field might be a specific subject or year level. Weldon (2016) expanded the definition further to mean secondary teacher teaching a subject for which they have not studied above first year at university, and for which they have not studied teaching methodology. This is because the tasks of teaching, such as selecting appropriate method of teaching, learning activities, giving helpful explanations, asking productive questions, and evaluating students' learning, all depend on the teacher's understanding of what students are to learn. As teachers are expected to have a thorough understanding of the subjects they teach and the methods of delivery. Research has shown that these are the key attributes of highly effective teachers.

Cinkir and Kurum (2015) expressed that out-of-field (OOF) teaching results from inconsistency between field of study and field of assignment and happen when Principals assign teachers to teach a subject for which they are not prepared. Sambe (2015) concurred that out- of- field teaching was a mismatch between teacher's qualification and area of assignment while on the job. This does not mean that out-of-field teachers' are unqualified, they are qualified teachers just mis-assigned to teach in

areas outside their field of preparation. Furthermore, OOF teaching is grouped in to four categories according to their role and phase assignment. According to Sharplin (2014) role displacement, is a situation where the skills and qualification of the teacher do not match the role to which he or she is appointed; role stretched, is where the skills and qualifications of the teacher match some aspects of the appointed role while including additional roles for which the teacher has no prior qualifications; phase displacement, is where the skills and qualifications of the teacher do not match the appointed sector (primary, secondary or tertiary); and phase stretched, is where the skills and qualifications of the teacher match the appointed sector but also include placement in part of the sector for which he or she has no prior experience. Under normal circumstances, the role and phase of a teacher should be compatible with his or her area of expertise for effective instructional delivery.

### **2.1.3 Prevalence of out-of-field Teaching**

Out-of-field teaching is a global practice and has its highest percentage in USA. It is common in Australia, Brazil, Germany, Malaysia, Namibia, Korea and South Africa. No country is spared and no school is also spared from public to private, from religions to secular schools, from urban to rural schools (Sambe, 2015). Research from across the globe has indicated that many teachers, especially science teachers, are assigned OOF due to shortage of teachers in core subjects, mis-assignment of teachers and managerial decision (Du Plessis, 2015; Aina & Sunday, 2015). Analyzing data on science and mathematics teachers from 15 countries, Zhou (2012) found that the prevalence of teachers assigned OOF ranged from Hungary (1.97%), Brazil (15.7%), In US (20.3%) of all science teachers, (33.1%) of life science teachers, and (56.5%) of physical science teachers, and in South Africa, 39% of science teachers were OOF. US department of education reported that School and Staff survey (SaSS) (2010) revealed that (24-42%) Biology or life science teachers' are out-of-field. In Ireland, Ní Ríordáin and Hannigan

(2011) claimed that OOF mathematics teaching is prevalent” and younger and weaker students are generally taught mathematics by OOF teachers.

Other studies have found similar high percentages of OOF teaching in US science classrooms. According to the US Department of Education, (71%) of students in physical science classes were taught by a teacher without a background in physical science. It is important to note that out-of-field teaching varies greatly across schools, teachers, and classrooms and hired teachers are more often assigned to teach subjects out of their field of training. Data from U.S reaffirmed the prevalence of out-of-field teaching to be more in high poverty schools and in Small private schools than in affluent schools. Du Plessis (2014) stressed that its occurrence is “Sky rocketed” in high poverty, high minority rural schools. Ee-gyeong [2011] reported from Korea that science and mathematics students were taught by out-of-field teachers’ while McConney and price (2009) reported from Western Australia, that 24% of teachers were out- of- field and that these out-of-field teachers had twenty (20) years’ experience.

#### **2.1.4 Factors that led to the Employment of out-of-field Teaching**

One of the obvious causes commonly cited is shortage of teachers’. Teachers are assigned OOF because sufficiently qualified teachers are not available to fill needed positions. However, several researchers have argued that teacher shortages contribute to OOF teaching but are not the sole or main causes. In contrary, OOF teaching also occurs in disciplines with surpluses, such as English and in schools that had reported no hiring difficulties (Ingersoll, 2004; Du Plessis, 2015). These authors argue that OOF teaching is not due to a limited number of prepared teachers, but to their mis assignment. Shortage of teachers in science has led to an increase in the number of teachers teaching out of subject. However, this statement was affirmed by the views of (McConney & Price, 2009; Nixon, 2017) who contends that OOF teaching also occurs in disciplines

with surpluses, such as English and in schools that had reported no hiring difficulties the previous year. Another reason pointed out in literature is lack of enough funds. Many schools do not have the budget to hire all the teachers they need for all the courses they have. Hobbs (2012) stated that schools in rural areas tend to have the highest number of teachers who are incorrectly assigned. Teachers are assigned OOF more frequently in some school types than others. Researchers have found that schools with higher percentages of students living in poverty are more likely to have teachers who are assigned OOF than schools with fewer students living in poverty (McConney & Price, 2009). In addition, poor schools, small sized schools, often located in rural areas, tend to suffer the most from OOF teaching. The incidence of out-of- field teaching is more acute in small urban Secondary Schools, medium sized private schools and in most rural government schools (Kenny & Hobbs,2015: Du Plessis;2014; Subair and Talabi 2015). Another reason is inadequate teacher training (teacher quality) and teachers' supply and demand.

### **2.1.5 Out-of-field Teaching in Nigeria**

In Nigeria and Niger State in particular, there is no data to show for the occurrence of OOF teaching (Umoinyang et al. 2011), but National Certificate of Education (NCE) holders who are trained to teach in primary schools or at most junior Secondary Schools are seen teaching in some senior Secondary Schools as a result of high attrition rate of teachers in STEM subjects and shortage of suitably qualified teachers. Furthermore, it is also a common practice in Niger State to see a science teacher specialized in a particular field teaching all the science subjects (physics, chemistry and Biology) in schools in rural areas, and in some public and private schools. In the same way, Ayansina (2015) asserts that most public Secondary Schools in Nigeria are 300% over their capacities as a result of increased students' enrolment at senior Secondary level. This has necessitated the need for more teachers. These obvious teachers' shortages have

necessitated the employment of alternative teachers who may not possess the required qualification in subject areas. Similarly, when some head teachers' are faced with emergency situation such as lack of enough fund to employ qualified teachers. Principals of such schools may tend to resolve this problem by placing teachers as quick fix (quick replacement of non- subject teachers' to teach a subject), or 'hire' less qualified teachers to teach the subject (Du Plessis, 2017) all this leads to OOF teaching.

Gbore and Daramola (2013) have drawn attention on the educational analysis carried out in Nigeria by the National Economic Empowerment and Development Strategy (NEEDS, 2005). The analysis indicated that more than forty nine percent (49%) of the teachers in Nigeria are unqualified. This showed the quality of teachers teaching various school subjects to the Secondary School students. However, Biology teachers teaching in various Secondary Schools would probably be amid the said over 49% unqualified teachers'. Supporting these arguments, Adeyemi (2011) has dealt at length with the problem of teacher shortage in Ondo State and reported that the supply of qualified teachers to Ondo State Secondary Schools did not match the demand for them. He reported that in Biology, out of the 2178 teachers required in urban schools in 2011, 762 teachers were in post leaving a deficit of 1416. In the same vein, out of the 1440 Biology teachers required in rural schools in 2011, 1402 teachers were in post leaving a shortfall of 38 Biology teachers. Adeyemi (2011) reported that the performance of Nigerian students in Physics, Chemistry and Biology in the West African School Certificate examinations was poor. "The high failure rate was due in part to the acute shortage of science teachers." All this have proved the prevalence of OOF teaching in Nigeria.

### **2.1.6 Measuring Out-of-field Teaching**

To measure whether a teacher has sufficient content mastery training, past studies typically followed one or several measures of out-of-field teaching suggested by the National Center for Education Statistics (NCES) in the United States (Zhou, 2012). Out-of-field is measured by any of the following strategies adopted by researchers. Out-of-field teaching by subject area taught; Out-of-field by main assignment; Out-of-field teaching by class taught and number of students taught by teachers who are out-of field in a specific subject.

### **2.1.7 Impact of Out-of-field on Teachers**

Teachers cannot be persuasive in fields which they are not familiar with and expect their students to be high achievers, This is because the affected teachers may have a hard time with a subject which they are unskilled or inexperienced, as they lack necessary background knowledge and skills required to teach it effectively. This mean that they have to do extra study and work hard to be prepared for the class, this will add anxiety and more stress to their existing schedule, which can contribute to the problem of teacher exhaustion (burnout) due to work overload (Luft, 2015).

Several studies have illustrated that out-of-field teaching affect administrators or teachers self-esteem, teachers' sense of identity and overall well-being. It equally affects the students who are the end receivers. As this practice contribute to decrease in student's achievement. Researchers and policymakers submitted that OOF teaching negatively impacts instruction, as it affects teachers' efficacy and well-being, add to teachers' stress, exhaustion or burnout and also affects their competence in the classroom. (McConney & Price, 2009; Du Plessis, 2015). Literatures posit (McConney & Price, 2009; Du Plessis, 2017) that OOF teaching have a negative effect on classroom practice and student learning. In a study carried out with three experienced teachers

teaching within and outside their area of expertise by Sanders, Borko, and Lockard in Mizzi (2013) it was submitted that experienced teachers sometimes acted like novice teachers when teaching OOF, as they encountered difficulties in planning lessons, they are not certain of the time required to develop different concepts and how to sequence the content, how different concepts were interrelated and cannot decide what was important. More so, their lessons did not flow smoothly as within their area of specialization and made quick and frequent changes in the content, lastly they were unable to build explanations in response to students' questions.

This was consistent with the study of Childs and McNicholl, (2007) with novice and experienced teachers, who revealed that when teachers were OOF, their lessons was conservative, lack cognitive challenges, it was teacher dominated and teachers' relied heavily on textbooks for instruction and less risky instructional activities were planned. In addition to their practical work, they lacked knowledge about technical and safety details as they were anxious about how to explain unexpected or wrong results due to lack of confidence in the subject. However, experienced teachers on their own, due to in-depth knowledge on the subject could provide alternative explanations or use different approaches to help students understand complex concepts. They were able to draw links between different areas of knowledge in the same subject. This imply that OOF teaching negate teachers mode of instruction, to such an extent that it causes decline in preparation time for teaching; reduction in time for teaching; and decrease in teacher confidence and commitment. Lastly, less time to focus on students' needs understanding and interests.

The teachers' in-field teaching had fine-tuned lessons, had multiple ways of presenting the concepts, and effective responses to students questions. When teaching OOF, the same teachers struggled to respond to students questions and were more rigid in their

interactions with students (like seeking exact definitions to tell students, spending more time explaining content). Furthermore, when teachers were conversant about a subject, they determine how the content will be presented, rather than simply following the textbook. Additionally, teachers used synthesis level questions in subjects in which they were conversant, and resorts to recall level questions in subjects in which they are not conversant with. Du Plessis (2015) found that OOF teachers in South Africa expressed difficulties in dealing with students' motivation and in selecting appropriate instructional strategies, they felt inadequate, anxious and stressed while working with students.

### **2.1.8 Anxiety among Out-of-field Biology Teachers**

Anxiety is described as subjective feelings associated with worries, nervousness and tension. This concept was first grabbed by Sigmund Freud. He speculated that anxiety was a psychosomatic (emotional) disorder that is “something felt”. It is one of the most common and wide spreading mental illnesses, with approximately 40 million adults, worldwide, age 18 and above suffering from cases of excessive or overbearing levels (Anxiety Disorders Association of America, 2010; Diagnostic and Statistical Manual of Mental Disorders [DSM–IV–TR] American Psychiatric Association, 2013). It is a term used to designate an “unpleasant emotional state.” Anxiety is defined as an unpleasant emotional state of uncertainty, fear, worry, discomfort, loss of control, and expectation that something bad will happen (Sahin, 2014; Anusiem & Okoiye, 2015).

In general terms, anxiety is defined as a state of worry and discomfort felt by individuals when faced with a threatening situation. Cimen and Yilmaz (2015) described anxiety as the state of alertness brought up with feeling of tension, fear and worries that people show when they are threatened. This feeling comes along with increased vigilance, increased sympathetic nervous system and difficulty in

concentrating. Boadu (2014) and Headley and Campbell (2013) corroborated that anxiety is a future oriented mood state which is associated with preparation for possible upcoming negative events. However, it is an important variable that can influence the teaching process.

Anxiety has been called by many names by several researchers. Anxiety hysteria or globus hystericus, nervous exhaustion, soldier's heart or Da Costa's Syndrome, phobic-anxiety depersonalization syndrome, are just a few that represent anxiety in past studies. Newer names interchanged for anxiety are school phobia, social anxiety disorder or social phobia (Buchler, 2013) while the Diagnostic and Statistical Manual of Mental Disorders, (DSM-IV-TR) American Psychiatric Association, (2013) provided a list of specified anxiety disorders, including panic disorders; specific phobias; obsessive-compulsive disorders; post-traumatic stress disorder; acute stress disorder; and generalized anxiety disorder. An anxious person experiences physical feelings and worrying thought which make it hard to do even simple tasks. Anxiety can be facilitating and debilitating. Where a small amount of it improves performance and spur teacher's action it is facilitating, and it becomes a debilitating disorder when it is excessive, overbearing, and uncontrollable, when it requires no specific external stimulus, and when it begins to show itself through a wide variety of physical and affective symptoms, as well as changes in cognitive abilities and behavior.

When anxiety is extreme, it interferes with the ability to carry out everyday activities. Park (2011) noted that, it is the unpredictability, uncertainty, and uncontrollable feelings that provoke anxiety to a level that basic functioning of the body is interrupted. However, Sammerphet and Wanphet (2013) stressed that anxiety was a major concern not only to student teachers but also to experienced and out-of-field teachers. As the negative impact of anxiety has a strong influence on the teaching performance of student teachers and out-of-field teachers. Out-of-field teachers' anxiety is the tension,

apprehension and worry which may be experienced by an out- of-field teacher while teaching a subject outside their field of specialization. This may occur during planning and preparing to teach Biology concepts, theories and formulas or during practical work. This state of discomfort can occurs in response to situation involving teaching a subject without an adequate knowledge and skills. These feelings of anxiety can lead to fear, distress, shame, inability to cope, sweaty palms, nervous stomach, difficulty in breathing, and loss of ability to concentrate (Sahin, 2014; Oludipe, 2014). Other symptoms include tension, nervousness, worrying, edginess, impatience, confusion, fear, and developing a mental block. Anxiety can also be an emotional and physiological arousal which is triggered by “fear-provoking thoughts” and can be caused by the inability to influence events and social conditions that significantly affect one's life (Oludipe, 2014).

Teaching anxiety is the association between anxiousness and teaching. It leads to physiological arousal, subjective distress, and behavioral disruption that one may experience when faced with an out-of-field teaching situation. Teaching anxiety according to Gardner and Leak as cited by Lampadan (2014) is the “anxiety experienced in relation to teaching activities that involve the preparation and execution of classroom activities. It is a form of state anxiety that results from cognitive operations. Thomas (2006) suitably saw it as those feelings, beliefs, or behaviors that interfere with a person’s ability to start, continue, or finish teaching tasks (drafting lesson plans, managing classroom and disruptive behavior) and it hinges on the teachers’ knowledge of her subject, her determination to impart student learning, her creativity with lesson plan design, and her energy level in the classroom.

Anxiety to an out-of-field secondary school Biology teacher can be a frequent fear that can lead to series of task avoidance. It may reflect real or perceived knowledge deficits

in subject content as well as in pedagogy (skill of delivery). There may be several reasons for teaching anxiety in out-of-field Secondary School Biology teacher. Some of the reasons are; Anxiety may arise due to the fact that the teaching subject is difficult; competence for teaching a particular concept may be inadequate; level of interest towards the teaching profession may be inadequate (Sammerphet & Wanphet, 2013); It may be due to incompetence to teach in a way which is appropriate to the level of the developmental stage of the learners (Cheng & Liao 2016). Studies have shown that anxiety and stress can negatively affect the body. It develops into many challenging issues such as school absenteeism, low self-concept, verbal and nonverbal problems, deficiencies in academic performance, decrease in focus and concentration, behavioral problems, heightened dependence, attention seeking behaviors, and difficulties staying on task. If left untreated, anxiety and stress can turn into medical issues such as high blood pressure, heart disease, obesity, and depression (Oludipe, 2014).

The negative impact of anxiety always has a strong influence on the teaching performance of the out-of-field teachers particularly in the initial encounter with students in classroom. However, there are a large number of studies on learners' anxiety in learning, but there are not so many researchers who have conducted research on teachers' anxieties, particularly out-of-field teaching and their anxiety management. Thus, it is important and worthwhile to study these particular fields for in-depth understanding. Anxiety is caused by fear, the fear that a teacher may do any unintentional damage to students. In contrast, anxiety can relate to expectations, a person can have anxiety when his expectation is not met. This is evident in the study of Kongchan and Singhasiri (2008), which revealed that the teachers expected to teach the students who had high English proficiency. But in reality, the teachers had to teach low English proficient students. The consequence of this in expectedness caused those teachers to worry.

### **2.1.9 Characteristics and Physical Symptoms of Anxiety**

Anxiety is the anticipation of a future threat with symptoms including muscle tension, avoidance, and cautious behaviors (American Psychiatric Association, 2013). Anxiety symptoms are hands trembling, fast heart beats, sweating, nausea or abdominal discomfort, dizziness, hot flashes, chills, panic, tension, fear, helplessness, shame, distress, inability to cope, sweaty palms, and difficulty breathing were common physical symptoms of anxiety with hand trembling, difficulties breathing, loss of ability to concentrate and fast heart beats are the most common (Cheng, 2016; Buchler, 2013). When teachers feel overwhelmed or anxious about a subject, they tend to close down, lose interest, and can underperform in that subject, which in turn causes negative experiences. When an out-of-field teacher encounters such emotions, it often results in a low level of self-esteem and self-confidence. Afolayan, Bitrus, Olayinka, Adeyanju and Agama (2013) ranked anxiety into four levels: mild, moderate, severe and panic anxiety.

1. Mild level of anxiety is healthy, at this level, perceptual field is heightening, and sense of touch is highly sensitive. Teaching and cognition is in its best state and this stage improves academic performance.
2. Moderate level of anxiety is unhealthy, the perceptual field of a person at this level is narrowed; individuals experiencing this level of anxiety have selective inattention. They have decreased focus, and automatism can be observed such as shaking of the hands and feet, twirling of hair and, tapping of fingers. Academic performance at this level depends on the individual's ability to control the anxiety and carry out the assigned task.
3. Severe level of anxiety is characterized by reduced perceptual field and a difficulty in communication. Gross motor movements, such as pacing are characteristic of people at this stage. Teaching at this stage depends on the educator's ability to recognize such individuals and provide a safe environment

for them. Communication should be kept short and simple since communication is altered. Performance at this stage is reduced since most educators may not be able to provide such environment for the students.

4. Panic level of anxiety is the worst and most severe form of anxiety. Total disruption of perceptual field is present. It is also characterized by loss of ability to communicate, loss of rational thought and total loss of conscious thinking. Academic performance at this level is very poor since the student will be unable to remember exactly what he/she is supposed to do.

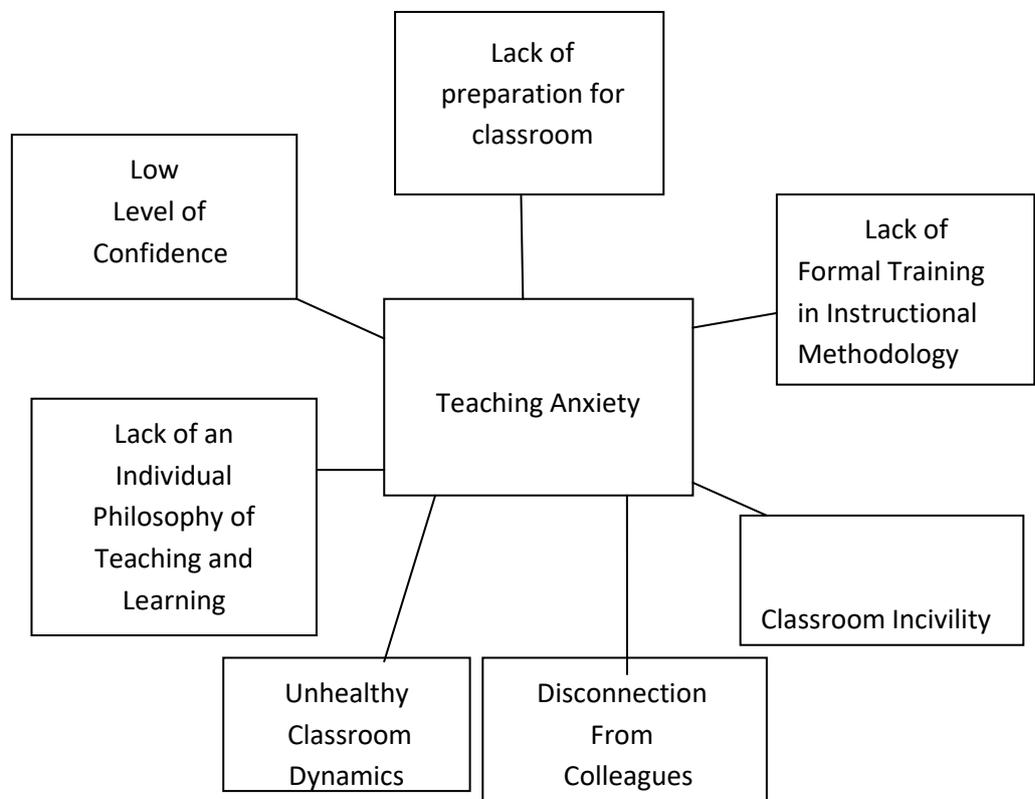
#### **2.1.10 Causes of Anxiety among Biology Teachers**

The possible causes of anxiety of out-of-field teachers' may be insufficient grasp of the content, challenges in lesson planning and preparation and insufficient skills or lack of teaching methodology. Gardner and Leak as cited in Cimen and Yilmaz (2015) developed a questionnaire to determine how frequently and intensely psychology instructors experience anxiety. They find out that the possible causes of anxiety includes preparing to teach, standing before a class, addressing student hostility, and offering insufficient responses to students' questions; formal evaluation are also identified as a potential anxiety trigger. Sammerphet and Wanphet (2013) and Akinsola (2014) asserted that evaluation, ambiguities (having an ambiguous situation); inadequate teaching skills; inadequate mastery of subject matter are anxiety triggers; More so, rhetorical tasks like interactions involving questions from students, immediate negative feedback, class disruptions, or end-of-term students' evaluations also triggers anxiety.

Sammerphet and Wanphet (2013) went further to divide the pre service and out-of-field teachers' anxiety into three stages that is the "before teaching hour", "while teaching hour", during "after teaching hour". During" before teaching hour "the out-of-field teacher is worried about planning lessons or preparing materials for a successful

lesson.” During the “teaching hour”, this teacher is worried about unexpected situations which may arise during interaction with students or managing time and classroom. In after teaching hour”, the anxieties still remain because the teachers are edgy about evaluation. Boadu (2014) also cited six anxiety inducing areas for outof-field and student teachers. These are lesson planning; classroom management; evaluation; less preparatory time; lack of content mastery and less pedagogy.

**Sources of teaching anxiety**



Thomas (2006)

**Fig 2 : Source of Teaching Anxiety**

### **2.1.11 Biological Origins of Anxiety**

Biologically, anxiety might be a result of a physical condition, an illness or a medication. Some individuals have a biological predisposition toward anxiety. They are literally more susceptible to pressure and tension in their everyday lives than others might be. The medical or biological model traces the source of anxiety to the brain. Engler (2006) affirmed that modern researchers can access the living brain in ways never dreamt of in the past. Through the use of positron emission tomography (PET) scans experts have identified which areas of the brain specialize in fear and anxiety. More specifically, neurons in a region of the brain stem identified as the locus ceruleus became more active during experiences of anxiety. In animal studies, when cells in the locus ceruleus were stimulated with electricity, a fear response ensued. When these cells were destroyed, anxiety was resolved (Comer, 2005).

### **2.1.12 Psychological Origins of Anxiety**

According to the psychodynamic approach, anxiety indicates the presence of a threat to the “integrity of the ego” The ego is one of three components (id, ego and superego) of the personality and is sometimes referred to as operating on the principle of reality (Comer, 2005). To manage anxiety, the ego utilizes defense mechanisms which have a two-pronged mission. They keep the anxiety at bay and also banish it to the subconscious (Engler, 2006). The risk of anxiety is beneath the individual’s conscious awareness and could result in the loss of “control, relationship(s), competence, or guilt feelings and loss of self-esteem”

### **2.1.13 Types of Anxiety**

From the psychological perspective, Spierberger in Cheng, (2016) classified anxiety into two types, trait and state anxiety. Trait anxiety is the tendency of a person to be

nervous irrespective of what he/she is exposed to. Such anxiety is part of a person's character and hence is permanent and difficult to get rid of. Trait anxiety is a stable predisposition; people with high levels of trait anxiety are generally nervous people in a wide range of circumstances. State anxiety (situational) is an apprehension expected at a particular moment in time as a response to a definite situation, hence it is not permanent. State anxiety is a situation-specific anxiety in which a person can become anxious in a particular type of situation, such as during out-of-field teaching (Biology). This type of anxiety occurs when the out-of-field Biology teacher is exposed to stressful situation such as foreign content.

Teachers' anxieties are thus linked to those situational factors which call into question their ability and competence. In Gardner and Leak (1994) study in Cheng, (2016) they stated that not all respondents experienced anxiety with the same frequency and intensity as others, and that some apparently felt no anxiety whatsoever. Assuming that all teachers (regardless of level, rank, or discipline) encounter at least one or more situational factors which might trigger anxiety, then it means that some teachers are more predisposed to anxiety than others. In fact, during classroom instruction, the development of apprehension may be due to intellectual incompetence in content mastery and skill delivery (pedagogical content knowledge). Studies have shown that content mastery and Pedagogical content knowledge are key components of teacher competences that may affect the teacher during presentation or instruction (Buchler, 2013; Cheng, 2016).

#### **2.1.14 Concept of Content Mastery**

One of the attribute of being a good teacher is having a very good foundation of the content. Content Mastery (CM) otherwise known as content Knowledge (CK) is viewed as the profound understanding of subject-specific curricular, and is regarded as one of

the most important category of teachers' professional knowledge. It is a basic prerequisite for teaching a subject, and is an essential requirement for teacher certification. Fernandez (2014) has shown that there is relationship between content knowledge (CK) and good teaching. Teachers with an in-depth mastery of the subject can draw links between different areas of knowledge in the same subject and can prepare and plan for a lesson sequentially. From the foregoing, CK consists of an explanatory framework and the rules of evidence within a discipline which include an understanding of the information and concepts within a particular domain such as conceptual understanding and the skill in that discipline. Laverty (2015) affirmed that this knowledge consist of both substantive, that is organization of facts and ideas, and syntactic, that is set of rules and norms that support the content. Syntactic knowledge is only found within the context of Biology. Furthermore, this knowledge is used in recognizing, understanding, and responding to the content practices that teachers engage in as they teach a subject (Du Plessis, 2017). This implies that CK is the conceptual understanding of the subjects that teachers' do teach in order to help students have a change of concept from the unscientific that they hold to an acceptable scientific concept. Teachers' lack of content limits their ability to anticipate the directions in which pupils' learning might proceed. They may not be able to prepare effectively for lessons, as lesson that is not well prepared contains incomplete subject matter, incorrect facts, lacks the necessary details and suitable illustrations. The presentation may become disorderly, haphazard and uncoordinated (Ambe & Agbor (2014).

According to Fernandez (2014) and Phelps, Weren, Gitomer, and Croft, (2014) literatures suggest that good background in content mastery is a pre-requisite for good planning and teaching. However, teachers' adequate content mastery of the subject may enable them to be aware of students' misconceptions and difficulties students may encounter in trying to learn Biology concepts. Hence, there is the likelihood of the

teacher helping the students to correct these misconceptions, and overcome learning difficulties. In other words, if Biology teachers do not have mastery of the concepts they are teaching, then meaningful conceptual change cannot take place in students because teachers can only teach what they know and leave that which they do not know (Ijeh, 2013; Eraikhuemen & Ogumogu, 2014). It is a statement of fact that nobody can teach what he does not understand, literature has established that there is high correlation between what teachers know and what they teach (Ijeh, 2013). Thus, the ability to teach effectively depends on the teachers' knowledge, but teacher's effectiveness is impeded if the teacher is unfamiliar with the body of knowledge taught. The implication of this is that they must thoroughly understand the content of what they teach. The teacher whose understanding of topic is thorough use clearer language, their speech is more connected and integrated, they provide better explanation than those whose background is weaker. For instance, Nixon and Luft (2016) observed experienced teachers' instruction of both an in-field topic and OOF, they reported that the teachers' in in-field teaching had fine-tuned lessons, multiple ways of presenting the concepts, and effective responses to student questions, but when teaching OOF, these teachers struggled to respond to student questions and were more rigid in their interactions with students (e.g., seeking exact definitions to tell students, spending more time explaining content). While these teachers struggled with limited subject matter knowledge, they were able to rely on well-developed pedagogical knowledge to support their instruction when teaching OOF.

Research studies which have attempted to find a relationship between CK and good teaching in McConnell, Parker and Eberhardt (2013) with six experienced Secondary School teachers preparing to teach topics within and outside their area of specialization showed remarkable differences in planning, response to students' questions and

conduction of lessons based on their prior CM. Within their field of expertise, teachers had a wider knowledge base of the subject, knew the subject in-depth and were able to connect between different areas of knowledge in the same subject discipline. Experienced teachers have the ability to make linkages between the different areas of the science curriculum. Davis (2007) argued that “when teachers have stronger subject mastery, they are more likely to engage in sophisticated teaching practices”. Teachers who are conversant with content can make amendment according to the way they developed their schemata. In their study, they reported that teachers with good mastery of their content can generate their own activities, ask higher-level questions, detect students’ misconceptions and deal effectively with students’ difficulties than teachers with lower background of content. They added that these teachers ardently followed textbooks, could not generate new activities and could not detect students’ misconceptions.

In similar study, Childs and McNicholl (2007) undertook a study with novice and experienced teachers, they reported that lessons with OOF teachers were tightly controlled and included less discussions, open-ended questions, anecdotes, illustrations and analogies. Practical work was closely directed and textbooks were used more often. Lessons taught outside of subject specialism were perceived to be rigid and constrained. Childs and Mc Nicholl, (2007); Kind, (2009) declared that OOF teachers lacked methodological, technical and safety details in carrying out practical work and as such are anxious about how to deal and explain unexpected or wrong results due to their lack of confidence in the subject. An out-of-field teacher with little or fragmented knowledge may engage in shallow lesson with the student, less discussions in the classroom, open-ended questions, little or no illustrations and analogies in their teaching. Teachers must understand subject matter if they are to make it comprehensible for students, while this understanding is integrated with other knowledge bases to develop

PCK. CM is different from PCK, without a strong CM strong PCK will not develop (Nixon et al., 2017).

### **2.1.15 Concept of pedagogical content knowledge**

Shulman (1986, 1987) in Zhou (2012) was the first to introduce the idea of pedagogical content Knowledge as an element of knowledge base for teaching through a series of professional publications as an effort to redirect educational research. PCK is a construct that has been widely used in literature. This construct was introduced during a presidential address to the American Educational Research Association (AERA) in a seminar presentation on teaching and teacher education (Koehler, 2011). He observed that research dealing with teacher's knowledge on content of lessons taught was undeservedly ignored. He further explained that the construct is widely known as a teacher's knowledge base for teaching and is regarded as a teachers own special form of professional understanding of a particular topic. Hill (2013) and Zhou,Wang and Zhang (2016) asserted that PCK is a 'unique and discrete knowledge domain that is developed as teachers engaged in practice. It bridges content knowledge and the practice of teaching (pedagogy)'.

PCK is a type of knowledge that is unique to teachers, a knowledge of how to make specific subject interesting and understandable to the students. Expression of PCK was initially presented by Shulman to denote a specific type of teacher knowledge, knowledge that differentiates a teacher in a given discipline from an expert of that discipline. PCK is a unique knowledge possessed only by individuals within the profession of teaching. Consequently, this concept is useful to help teachers' understand what teachers know, what teachers ought to know, and how they might develop it (Chapoo, Thathong & Halim, (2013). Key elements in PCK are knowledge of representations of the specific content, instructional strategies and understanding of

learning difficulties, and students' conceptions of specific content in his description of knowledge base for teaching, he singled out PCK as a unique form of knowledge for teaching and includes subject matter knowledge, knowledge of potential students' learning difficulties and students' prior knowledge for specific concepts. Park and Oliver (2008) described PCK as "an acknowledgement to the importance of the formation of subject matter knowledge per se into subject matter knowledge for teaching." Thus, PCK comprises the following:

Knowledge of the main subject of the discipline in their teaching contexts, what are the concepts and skills to be taught? How to organize and present the contents in a meaningful sequence? These forms of representation such as explanations, examples, demonstrations, analogies and metaphors should be provided in order to promote the students' understanding? Knowledge about the learners and learning processes. What learning difficulties can be expected in the course of the teaching of a certain subject? What are the conceptions and misconceptions within that sphere, prevalent among the pupils of various age groups and a diverse cultural background? How do all these factors relate to the methods of instruction to be used by the teacher? Koehler (2011) described PCK as the knowledge possessed by teachers which allows them to teach effectively within a discipline as opposed to the knowledge of the discipline itself. Out of field teachers usually have limited or minimal PCK as their knowledge about the content in the subject is sparse. A general description of PCK components was made as follows

...the most regularly taught topics in one's subject area, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations and demonstrations – in a word, the ways of representing and formulating the subject that make it comprehensible to other. Pedagogical content knowledge also includes an understanding of what makes the learning of Specific topics easy or difficult: the conceptions and preconceptions that students of different ages and backgrounds bring with them to the learning of those most frequently taught topics and lessons....SHULMAN as cited in Hodgin (2014)

According to Koehler (2011) PCK is a particular expertise with individual idiosyncrasies and significant differences that are influenced by (at least) the teaching context, content, and experience. PCK stands out as different and distinct from knowledge of pedagogy or knowledge of content alone. Pedagogical content knowledge is also a form of practical knowledge that is used by teachers to guide their actions in highly contextualized classroom settings.

Similarly, Nuangchalern (2012) is the ability to combine knowledge of a particular discipline along with the teaching of that discipline. He further stressed the need for the teacher to be able to blend content knowledge with the pedagogical. In a similar manner, Melo, Canada, Mellado and Buitrago (2013) explained that PCK is specific to how each particular subject is taught and is a form of reasoning and educational action using which teachers transform the subject matter into representations that are comprehensible to the students. PCK distinguishes between a trained teacher, and the untrained one who teaches a subject he/she had no adequately training. Schneider and Plasman (2011) accentuated the importance of PCK to teaching and learning as a construct to help our thinking about what teachers continue to learn as they study their teaching practice. This implies that untrained teacher would not possess adequate PCK. PCK is considered by Zhou (2012) to be knowledge of teaching that is domain specific; it is making what teachers know about their subject mastery known to the students. They may have real knowledge of the subject but understanding the process of learning is germane. No matter how brilliant a teacher may be, the moment he or she could not interpret the subject matter knowledge to facilitate student learning he or she has not achieved anything. Therefore, PCK is referring to as teachers' interpretations and transformation of knowledge of subject matter to facilitate student learning. The implication of this for teachers is that they must thoroughly understand the content of what they teach. For

out-of-field teacher whose knowledge in content is not sufficient cannot deliver or teach Biology or science subject effectively. PCK also refers to the best way teachers organize and present subject matter by explaining, telling, guiding, demonstrating, illustrating,, and using texts, animations, computers, media, or workbooks in order to re-package content knowledge into a form that is accessible to students.

PCK is the single characteristic that separates a teacher with content knowledge from a teacher who can represent ideas, so that the unknowing can come to know, those without understanding can comprehend, and the unskilled can become fully skilled. The development and selection of tasks, the selection of representations and explanations, the facilitation of productive classroom discussions, the interpretation of student responses, the emphasis on student comprehension and the quick and appropriate analysis of student mistakes and difficulties are all underlying elements of PCK. It is within these contexts that out-of-field Biology teachers' are constantly challenged to make Biology comprehensible and interesting for their students.

The General Taxonomy of PCK is proposed by Veal and MaKinster (1999) in Zhou. (2012) to provide categorization scheme for studies of PCK development in teacher education. This is to addresses the hierarchical relationships between the three levels of teacher knowledge: (a) discipline specific PCK (examples; English, Math, History, or Science), (b) domain-specific PCK (e.g., physics, chemistry, geology, or Biology), and (c) topic-specific PCK (e.g., genetics or evolution). This PCK provides a classification system to more accurately identify and address distinctions among knowledge bases required for teaching content in each of the three levels. Thus, the model indicates PCK is unique to different levels of specificity. For instance PCK necessary for teaching science is different from that necessary for teaching mathematics. The nature of PCK for teaching Biology is different from that necessary for teaching physics. The Veal and

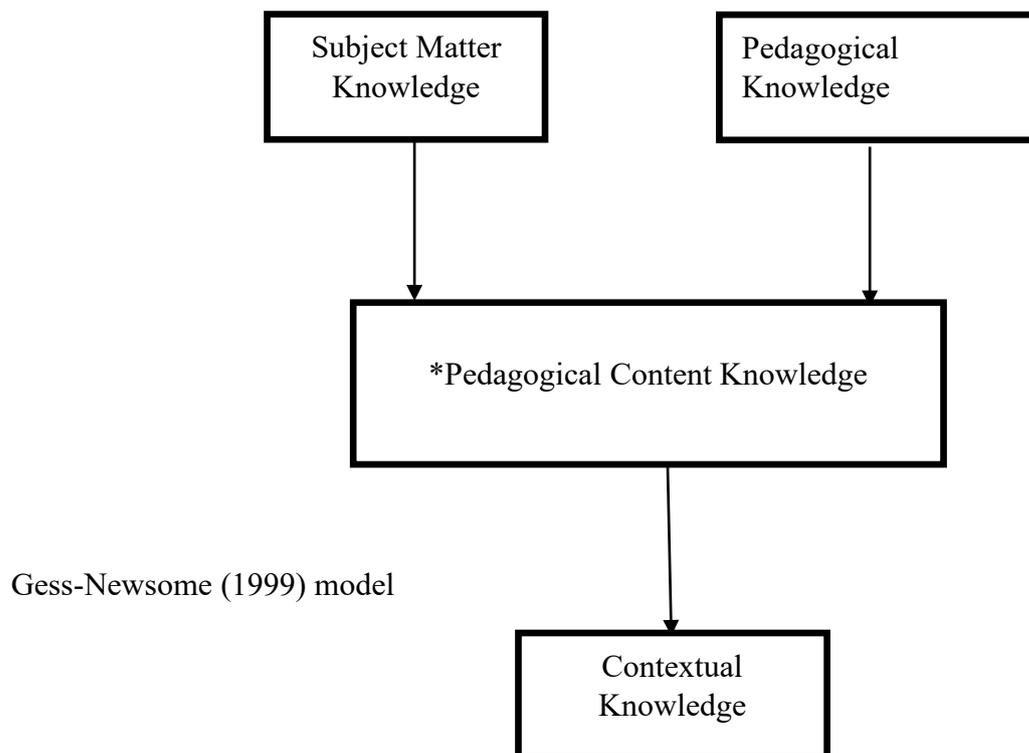
MaKinster (1999) in Zhou. (2012) taxonomy of teaching specific topics within a domain of science necessitates PCK which includes knowledge of potential student learning difficulties as well as knowledge of the most effective representations, instructional strategies, curricular resources, and assessments for teaching a specific topic.

### **2.1.16 Models of PCK**

Since Shulman (1987) introduction of PCK, the concept has been adopted by other researchers, various authors have studied and elaborated on Shulman's initial framework, by proposing that teachers develop or construct PCK not only by the amalgam of content and pedagogy but also by blending those two knowledge categories with student, curricular and context knowledge. There is no universally accepted conceptualization of PCK between scholars; however, differences occur with respect to the elements they include in PCK and to specific labels or descriptions of these elements.

Researchers such as Mizzi (2013) and Fernandez (2014) agreed on Shulman's two key elements that is, knowledge of representations of subject matter and understanding of specific learning difficulties and student conceptions. In addition, there appears to be agreement on the nature of PCK. First, as PCK refers to particular topics, it is to be discerned from knowledge of pedagogy, of educational purposes, and of learner characteristics in a general sense. Second, because PCK concerns the teaching of particular topics, it may turn out to differ considerably from subject matter knowledge per se. Finally, all researchers suggest that PCK is developed through an integrative process rooted in classroom practice, implying that prospective or beginning teachers usually have little or no PCK at their disposal.

Gess-Newsome (1999) model, the nature of pedagogical content knowledge under this model is grouped in to two; the integrative model and the transformative model. The researcher stated that the integrative model is based on the idea that pedagogical content knowledge is not a separate knowledge domain for teachers; instead, it emerges as an integration of subject-matter knowledge, pedagogy, and context during the act of teaching. In this model, teaching is conceived as the presentation of content to students using appropriate forms of instruction. The task of the teacher in this model is to integrate subject-matter, pedagogy, and context to blend with the purpose of the lesson to create effective learning opportunities for the learners.



**Fig 3:** Gess-Newsome (1999) model

### 2.1.17 Model of teacher knowledge needed in the classroom teaching

The integration depends on the purpose of the lesson; hence teachers should integrate all types of knowledge specifically for each topic taught. In the integrative model, expertise in teaching is defined as possessing well-organized individual knowledge bases and the

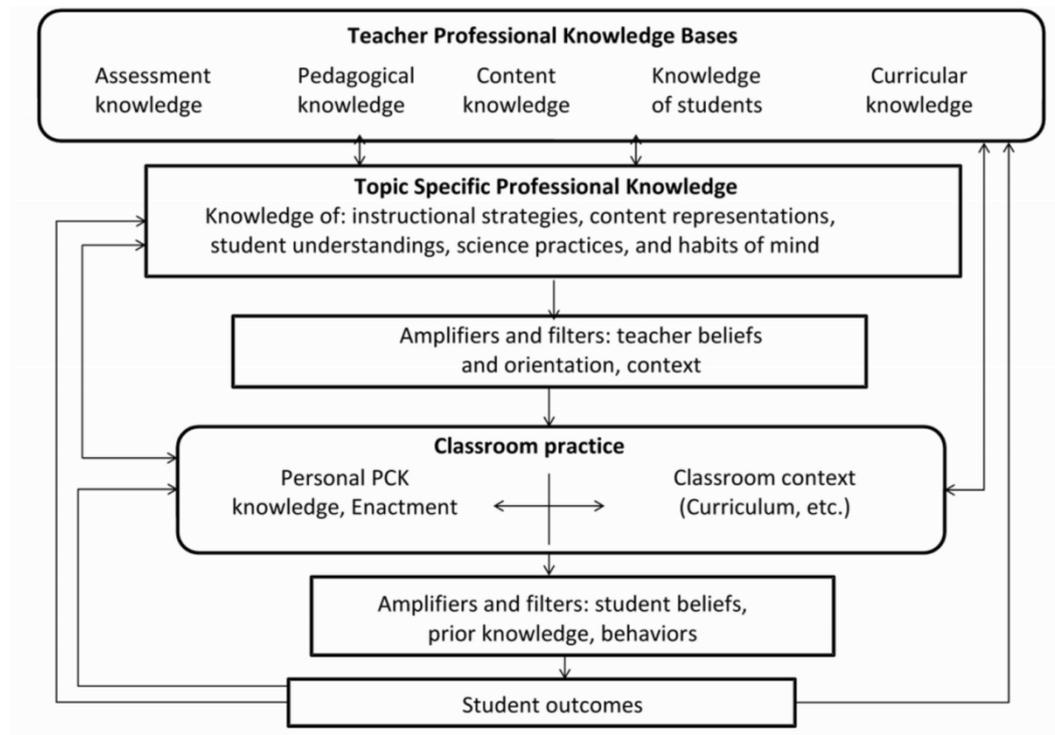
ability to move smoothly from one knowledge base to the next base. The second model for pedagogical content knowledge is the transformative model. In this model, pedagogical content knowledge is seen as a synthesized knowledge base for teaching. Knowledge base for subject-matter, pedagogy and context exist, but are useful only when transformed into pedagogical content knowledge. In the transformative model, effective teaching is possible when teachers possess well-structured and easily accessible pedagogical content knowledge for all topics taught. Its implications for teacher preparation is that integrative model suggests that knowledge bases can be taught separately or integrated, and teaching experiences support the development, selection, integration and use of knowledge bases. On the other hand, the transformative model suggests that knowledge bases are best taught in an integrated fashion, and teaching experiences support the development, selection, and use of pedagogical content knowledge.

#### **2.1.18 Model of PCK summit**

This is the latest model and is the result of a conference held in 2012, in which thirty researchers met and discussed the PCK, aiming to reach consensus to make the definition of PCK adopted by several researcher (Fernandez, 2014). In the PCK Summit model, Helms and Stokes (2013) reported that five main domains are defined for teachers' profession: knowledge of assessment; pedagogical knowledge; content knowledge; knowledge of students and curricular knowledge. These five knowledge influences are influenced by the professional knowledge of a particular topic.

This professional knowledge includes knowledge of instructional strategies and representations of content, student understanding, scientific practices and habits of mind. This specific professional knowledge passes through filters and amplifiers, which are the teachers' beliefs, the context in which it is inserted and the orientations for teaching.

After this filter, this specific professional knowledge will be transformed and adapted during the classroom practice transforming it in the personal PCK. Then this knowledge passes through filters and amplifiers of students taking into account their beliefs, prior knowledge and their behavior then to be assessed through student outcomes.



**Fig 4:** Consensus model of PCK from PCK Summit (Helms & Stokes, 2013)

PCK develops with teachers' experience. It is a cyclical process whereby teachers transform, reflect and evaluate their practice and continue to learn as they develop their practice. PCK is subject-specific or content specific knowledge which is fundamental for effective science teaching. Subject-specific knowledge entails general strategies applicable to teach science. Content-specific strategies, such as illustrations, models, analogies, experiments and activities are required when teaching particular topics within a science field. Abell (2008) acknowledged that PCK differs from one discipline to

another, for example teaching Biology is different from teaching chemistry. This implies that when teachers teach outside their area of expertise they also need to develop different instructional strategies. An out of-of-field secondary school Biology teacher teaching Biology with limited knowledge of topic-specific representations and inadequate skills can negatively impact instruction.

### **2.1.19 Concept of Classroom Management**

Educational plans of a school involving teaching and learning takes place in the classroom. Classroom is an environment with its own ecology, which includes teacher, pupils and their Interrelationships, the equipment, books and a range of activities, all interact to influence the behavior of the room's inhabitants. The classroom is characterized by a network of interpersonal relationships directed at the attainment of educational goals. In this vein, good classroom environment should be well ventilated, fully equipped with chairs and desks, have adequate spatial arrangement, have sizeable chalkboard, good floors, attractive walls and lightings. In addition, good classroom environments facilitate desirable behavior and attitude among students and thus enhance academic performance positively. Such an environment provides avenue for effective teacher/students and students/students interaction (Asiyai, 2011).

Osakwe (2014) and Nwiyi (2017) defined classroom as an operational venue in schools which holds students together and offers them the opportunity of achieving the purpose of education. It is a room in a school where a group of students are taught lessons. Thus, classroom should be well managed and maintained to bring about healthy learning environment, virtually free from behavioral problems which goal is to maintain a positive productive learning environment and quality performance. Oliver et al., (2011) acknowledged that classroom is the meeting point for both teachers and students where

curricular activities are implemented. Demirdag (2015) contended that classroom is a unique unit where the teacher and the students interact for the purpose of teaching and learning. However, effective teaching cannot take place in poorly managed classrooms. Classrooms with frequent disruptive behaviors have less academic engagement, and the students in disruptive classrooms tend to have lower grades and do poorer on tests and examination. In order to have a conducive environment for teaching, teachers play a fundamental role in the cognitive and emotional development of students by giving them the opportunity to learn. Effective classroom management sets the stage for this learning. As without it, classrooms are disorganized and chaotic, this disorganization may lead to anxiety and as such little teaching or no teaching will take place.

Classroom Management (CM) is a term used to describe the process of ensuring that classroom lesson run smoothly despite disruptive behavior by students, and also how to prevent such disruptive behavior. Management of the classrooms supports the proper execution of curriculum development, developing best teaching practices, and putting them into action. It is a key to high student achievement (George, et al., 2017). Classroom Management to some researchers is a construct that refers to every word and every action a teacher takes (which include collection of useful assessment data, the creation of racially and culturally inclusive environment and a curriculum that is intellectually challenging to the students) in the classroom to orchestrate, facilitate and optimize student learning (Ngerem & Ezikpe, 2011). Demirdag (2015) define classroom management as the actions taken to create and maintain a teaching environment that is conducive for successful instruction (arranging the physical environment, establishing rules and procedures, maintaining students' attention to lessons and engagement in activities. Austin and Omomia (2014) and Oliver et al. (2011) posited that classroom management is “a collection of non-instructional classroom procedures implemented by teachers in classroom settings with all students

for the purposes of teaching prosocial behavior as well as preventing and reducing inappropriate behavior". The goal of classroom management is not to only maintain order but to optimize student learning. Chamundeswari (2013) stated that poor classroom management skills results in a lower rate of academic engagement in the classroom. Nevertheless, it takes account of students and their environment, and is intended to increase students' achievement by the process of planning, student engagement, assessment, and evaluation. Classroom management also has been seen as an example of positive behavioral support for students with discipline issues.

According to Korpershoek, *et al.* (2014) CM are "the actions teachers take to create an environment that supports and facilitates both academic and social-emotional learning. Such actions includes; organizing the physical environment, establishing relationships and facilitating interactions, planning and conducting instruction, maintaining order, motivating students and keeping them on task and developing rules and procedures so that students know what to do responsively. Korpershoek, *et al.*, (2014) further restated that CM helps the teachers to create a learning environment whereby students feel comfortable to receive and share the knowledge gained from the teachers during tutorials, lecture, workshop or seminar. According to these authors, to achieve this, teacher has to be competent in knowledge and skill to provide a positive teaching environment to ensure that learning takes place in the classroom.

Chamundeswari (2013) revealed that classroom management is a major area of concern for all groups of teachers, as ineffective management leads to serious conditions of indiscipline, causing damage to the conducive teaching in the classroom. In order to create an inviting and appealing classroom for teachers' teaching and students' comprehension, teachers should develop positive principles based on positive classroom environment that encompasses effective teacher-student relationships. This principle is

known as classroom management techniques (CMT). Effective classroom management enforces little wasted time, confusion, or disruption, and creates a classroom environment, which is work-oriented but relaxed and pleasant. Teachers must implement predictable and consistent classroom procedures and practices in order to achieve high academic standard (Demirdag, 2015; Wong & Wong, 2005).

#### **2.1.20 Classification of classroom management**

There are four main components of classroom management according to Grapragasem, et al. (2015), these include content management, conduct management, covenant management and time management. Content management is related to teachers managing space, materials, equipment, and the movement of people, lessons and all that make up a curriculum or program of studies. From the foregoing, these researchers further elaborated that content management does not refer to skills unique to teaching a particular subject but rather those skills that cut across subjects and activities. This type of management places a special emphasis on instructional management skills, sequencing and integrating additional instructional activities, and dealing with instruction-related discipline problem. Oliver, et al., (2011) stated that good classroom managers choose management styles that match their instructional goals, classroom activities, and students' characteristics.

Conduct management refers to the set of procedural skills that teachers employ in order to address and resolve discipline problems in the classroom. Conduct management is essential for the creation of an orderly and task-oriented approach to teaching and learning in the classroom, thus leading to granting students' greater independence and autonomy through socialization. It is crucial for instructors to address discipline problem in class as it hinders proper teaching and learning. Marzano (2003) posited

that the classroom disturbances are the biggest threat to new teachers and out-of-field teachers'; as they feel unprepared to deal with them. Some of the conduct management components which are employed includes , acknowledging responsible behavior, correcting irresponsible and inappropriate behavior, ignoring, proximity control, gentle verbal reprimands, delaying, preferential seating, time-owed, time-out, notification of parents/guardians, written behavioral contracts, setting limits outside the classroom, and reinforcement systems.

Covenant management according to Grapragasem *et al.* (2015) focuses on the classroom group as a social system with its own features and teachers have to take into account when managing interpersonal relationships in the classroom. Establishing a warm and caring environment creates a classroom which is friendly, pleasant and an encouraging place for teachers and students to socialize and learn efficiently.

Time management is about working actively to create efficiency and effectiveness within stipulated period. Kauchak and Eggen (2008) divided class time into four categories, namely allocated time, instructional time, engaged time, and academic learning time. Allocated time is the total time allotted for teaching, learning, and routine classroom procedures like attendance and announcements. Allocated time is also what appears on a student's schedule, for example "Biology: 9:50-10:30 a.m." or "chemistry: 1:15-2:00 p.m. Instructional time: Instructional time is what remains after routine classroom procedures are completed. That is to say, instructional time is the time wherein teaching and learning actually takes place. Teachers may spend two or three minutes taking attendance, for example, before their teaching begins. The time it takes for the teacher to do routine tasks can severely limit classroom instruction.

Teachers must get a handle on classroom management to be effective. Engaged time is also called time on task. During engaged time, students are participating actively in learning activities, asking and responding to questions, completing worksheets and exercises, preparing skits and presentations. Academic learning time: Academic learning time occurs when students participate actively and are successful in learning activities. Effective classroom management maximizes academic time. Effective time management is a core skill that enables out-of-field secondary school Biology teacher to perform a teaching job effectively. As the ability of out-of-field secondary school teachers to organize classrooms and manage the behavior of their students is critical to achieving positive educational outcomes. A major area of concern for out-of-field secondary school teachers and practicing teachers according to Boadu (2014) is maintaining good behavior and discipline in the classroom, and how to successfully deal with students misbehavior.

#### **2.1.21 Classroom management approach**

Classroom management is a multifaceted concept. Styles in managing a classroom differ variously. However, there's no single method for managing a classroom effectively, because different situations require different approach. The root of the problem determines which approach to apply. Yasar (2008) stated that the most useful organizer for classroom management is the degree of control that teacher exerts on the students and the classroom. Viewed in this way, Kazemi and Soleimani (2016) proposed that classroom management manifests itself in three main areas: behavior management, people management, and instructional management. Based on this classification, teachers' efforts to help students as individuals fall in the category of people management; their attempts at monitoring students' behaviors pertain to behavior

management; finally, teachers' attempts at selecting materials for instruction and setting daily routines falls under instructional management.

Classroom management approach is grouped under three main headings by Yasar (2008) which includes

1. The intervening model which consists of high control approaches, they are Behavior Modification, Assertive Discipline, Positive Discipline, and Behaviorism and Punishment
2. The interacting model which is medium-control approaches they are; Logical Consequences, Cooperative Discipline, Positive Classroom Discipline, Non-coersive discipline, discipline with dignity, and judicious discipline.
3. The guiding model or low-control approaches include Congruent Communication, Group Management, Discipline as Self-Control, Teaching with Love and Logic, inner discipline and from discipline to community. In a similar manner, Ali Satar (2017) expressed classroom management approach in a continuum from interventionist to noninterventionists, with interactionist in the middle, while Rogers and Freiberg in Yasar (2008) classified classroom approach to teacher-centered and student-centered approach. These models fall in a continuum between a behaviorist and a constructivist perspective of classroom management.

Non-interventionist also referred to as student-centered and the interventionist also called teacher-centered classrooms. The Non-interventionist (student-centered) vary greatly in respect to the role of the teacher, the role of the students, classroom rules and procedures, rewards and punishments, teacher's expectations, students' autonomy, instruction and time spent on management. The interventionist classroom (teacher-centered) on the other hand is very different. The teacher leads the class, with classroom

rules and procedures set by the teacher (without negotiation). Moreover, the teacher is responsible for instruction with a great deal of recitation and individual seatwork, and time spent on management is perceived as a waste. Instead, academic performance and classroom discipline are most valued. Lastly, the interactionalists which are the midway between these extremes, they draw strategies from both non-interventionist and interventionist perspectives.

**Table 2.1 Class management model**

<b>Interventionist</b>	<b>Interactionalist</b>	<b>Non-interventionist</b>
Teachers has primary responsibility for control	Teacher and student share responsibility for control	Students have the primary responsibility for control
Teacher develops the rules	Teacher develops rules with some students input	Students develop rules with teacher guidance
Primary focus is on behaviour	Initial focus is on behavior, followed by thoughts and feelings	Primary focus is on thoughts and feelings
Minor emphasis on individual differences in students	Moderate emphasis on individual differences in students	Major emphasis on individual differences in students
Types of interventions are rewards, punishments	Types of interventions are consequences and class meetings	Types of interventions are non-verbal cues and individual conferences
Teachers moves quickly to control behaviour	Teacher allows sometime for students control behavior, but teacher protects right of the group	Teachers allows time for students to control behaviour

**Source:** Wolfgang and Glickman in Yasar (2008)

**Table 2.2: Comparison in Teacher-Centered and Student-Centered Classrooms**

<b>Teacher-Centered</b>	<b>Student-Centered</b>
Teacher is the sole leader	Leadership is shared
Management is a form of oversight	Management is a form of guidance
Teacher takes responsibility for all the paperwork and organization	Students are facilitators for the operations of the classroom
Discipline comes from the teacher	Discipline comes from self
A few students are the teachers helper	All students have the opportunity to become an integral part of the management of the classroom
Teachers makes the rules and posts them for all students	Rules are developed by the teacher and students in the form of constitution or compact
Consequences are fixed for all students	Consequences reflect individual differences
Rewards are mostly extrinsic	Rewards are mostly intrinsic
Students are allowed limited responsibilities	Students share in classroom responsibilities
Few members of the community enter the classroom	Partnerships are formed with business and community groups to enrich and broaden the learning opportunities for students

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**Source:** Rogers and Freiberg in Yasar (2008)

## 2.2 Theoretical Framework

This section deals with theories that provided support for this study and how the individual theory support each construct.

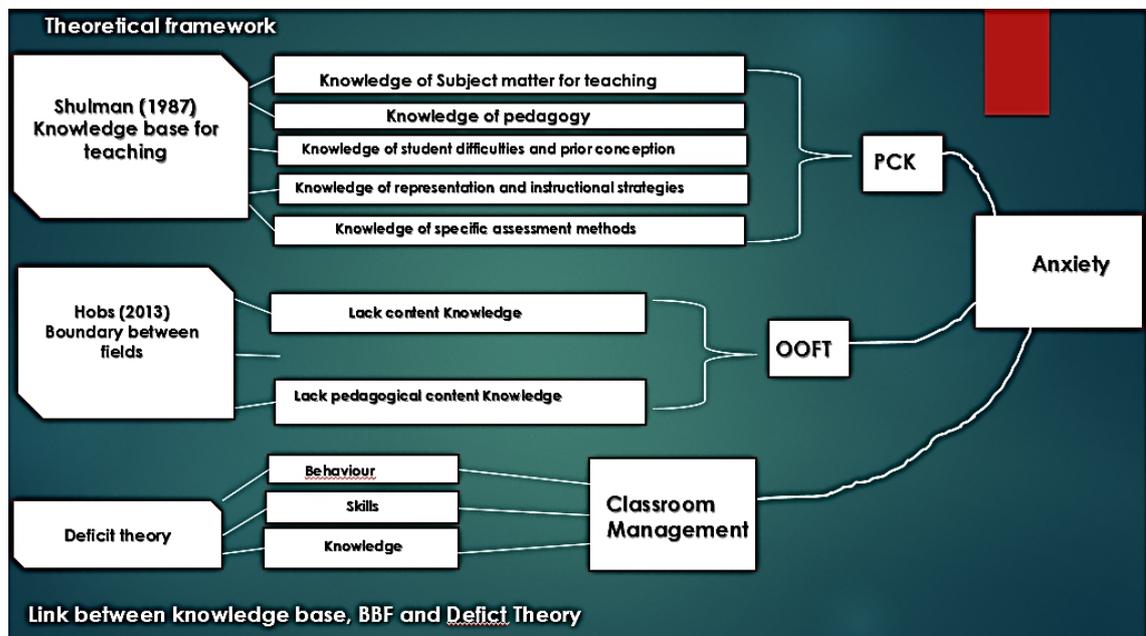


Figure 2.2 Link between Knowledge base, BBF and Deficit Theory

### 2.2.1. Shulman (1987) knowledge base for teaching

This study is anchored in the theoretical framework of the Knowledge base for teaching. The assessment of Content Mastery and Pedagogical Content Knowledge is an essential aspect of this study, and as such Shulman's (1986; 1987) idea on knowledge base for teaching guides this study. Shulman (1987) identified seven knowledge domains for teachers, namely; subject-matter knowledge (content knowledge); general pedagogical knowledge; pedagogical content knowledge; knowledge of learners and learning; curriculum knowledge; knowledge of educational contexts; and knowledge of educational philosophies, goals and objectives.

According to Shulman (1987) in Kilic (2009) harmonizing all these knowledge base might yield effective teaching practices. However, a teacher does not immediately

achieve this harmony that would facilitate their teaching except through continuous efforts to balance among content, students, curriculum, educational goals and assessment tools. Being a good teacher is to know how to orchestrate the teaching environment in order to facilitate students' understanding of a particular concept, and also, to contribute to their intellectual development. The knowledge that teachers have of their subject matter influence their teaching practice, as teachers must internalize a deep knowledge of their subject matter and knowledge of the curricular to be successful. Van Driel and Berry (2010) noted that having PCK is more than acquiring instructional strategies and techniques. These researchers further highlighted the need for teachers to have deep conceptual understanding before they can bring about conceptual change in their students. Du Plessis (2015) reaffirmed that the essence of PCK, CK, and PK is indivisible from teacher effectiveness, quality and OOF teaching. Therefore, teachers have a fundamental influence on the teaching and learning, as a teacher can only dispense 'what he has and not what he does not have' (Adediwura, 2007). Opataye (2012) states that educational qualities cannot exceed the quality of its teachers. Hence, misinterpreting the curriculum that must be impacted influences education quality. Since OOF teacher's compromise teacher quality due to lack of PCK and CK, then their understanding of the expectations and requirements of curricular of the teaching subject becomes complicated. From the foregoing, Hattie in DuPlessis (2015) asserts that understanding of content ensures a special connectedness between the subject and the students; it supports reasoning and helps in internalizing the concepts to stimulate deep learning.

As OOF, these teachers rely on text books and rote learning of concepts without an in-depth conceptual understanding of concepts. Du Plessis (2015) explained that isolated facts learnt by heart have limited use and are quick to forget. In applying this theory to this work, subject-matter knowledge for teaching is knowing the facts, concepts, and

procedures. Subject-matter knowledge certainly influences instruction because teachers need to decide what students should know in order to perform well in the subject-matter. Substantive knowledge refers to knowing how the concepts and facts are organized, and is influential in curricular decisions while syntactic knowledge is knowing the syntactic structures that guide inquiry in the discipline and such knowledge enables teachers to be critical about the legitimacy of new information in their discipline. When OOF teachers do not know the subject-matter thoroughly, they are unable to make connections between topics and provide conceptual explanations for procedures for their students (Du Plessis, 2015).

Subject-matter knowledge (content knowledge) is the organization of or knowing the facts, concepts, procedures and syntactic, as the set of rules and norms that support the content of Biology and substantive knowledge refers to knowing how the Biology concepts and facts are organized. This knowledge influences instruction because OOF Biology teachers need to decide what students should know in order to perform well in the subject-matter and this knowledge enables teachers to be critical about the legitimacy of new information in Biology. Additionally, when OOF Biology teachers do not know the subject-matter thoroughly, they are unable to make connections between topics and provide conceptual explanations for procedures (Du Plessis, 2015).

Pedagogical Content Knowledge is a unique knowledge domain for teachers and refers to teachers' knowledge of how to organize and represent particular topics or issues to facilitate students' understanding and learning. According to Shulman (1986) in Van Driel & Berry (2012) PCK is the synthesis of a teacher's knowledge base that include knowledge of representation of subject matter for teaching, knowledge of relevant instructional strategies and knowledge of learners' conception (preconception, the

alternative conception and misconception). These elements of PCK will enable the teachers to transform the subject in such a way that their learners would be readily being able to access the content. For further understanding, OOF Biology teacher needs a good grasp of the object before being able to transform it. Secondly, the OOF Biology teacher needs a teaching method to use to make Biology accessible to the students. Lastly, the OOF Biology teachers' need to have an idea of possible students' conception that the students may have on topics so as to prepare explanations that will help to eliminate or re-enforce the notions as is necessary. For this reasons, OOF Biology teachers are expected to know how Biology concepts are developed and know the connections between them. However, in ability of the OOF Biology teacher to develop this knowledge for teaching may not be able to impact positively on the students.

General pedagogical knowledge this relates to the organisation of the classroom, to motivating and retaining students' attention, pooling resources, learning theories and pedagogical theories. This knowledge covers planning and organization of a lesson and teaching strategies in Biology. Teachers who have strong pedagogical knowledge, have rich repertoires of teaching activities and are able to choose tasks, examples, representations, and teaching strategies that are appropriate for their students. In addition, they know how to facilitate classroom discourse and manage time for classroom activities effectively. On the other hand, OOF Biology teacher who do not have strong pedagogical knowledge, or have rich repertoires of teaching activities may not be able to choose teaching strategies that are appropriate for their students.

Knowledge of curriculum involves awareness of how items are arranged both within a school year and ways of using curriculum resources. Such as textbooks to organize a program for the students. It also includes knowledge of learning goals for different grade levels and knowledge of instructional materials. Teachers with strong knowledge

in this area know how to choose appropriate materials (e.g. textbooks, technology, and manipulative) to meet the goals of the curriculum and use them effectively.

Knowledge of learners refers to OOF Biology teachers' knowing students' common difficulties, errors, and misconceptions. Teachers who possess a strong knowledge base in Biology know what biological concepts are difficult for students to grasp, which concepts students typically have misconceptions about, possible sources of students' errors, and how to eliminate those difficulties and misconceptions. Nevertheless, OOF Biology teacher that do possess this knowledge might finds it difficult to identify such students' misconception.

Knowledge of contexts refers to knowledge of the environment and the circumstances where a teacher is required to work: the school, the region, the state. Specifically, it comprises knowledge of the students and their family background, as well as the entire local community, education system, the organisation and management of the school unit, the history and philosophy of education in every state, the institutional framework and administrative structure of education. .

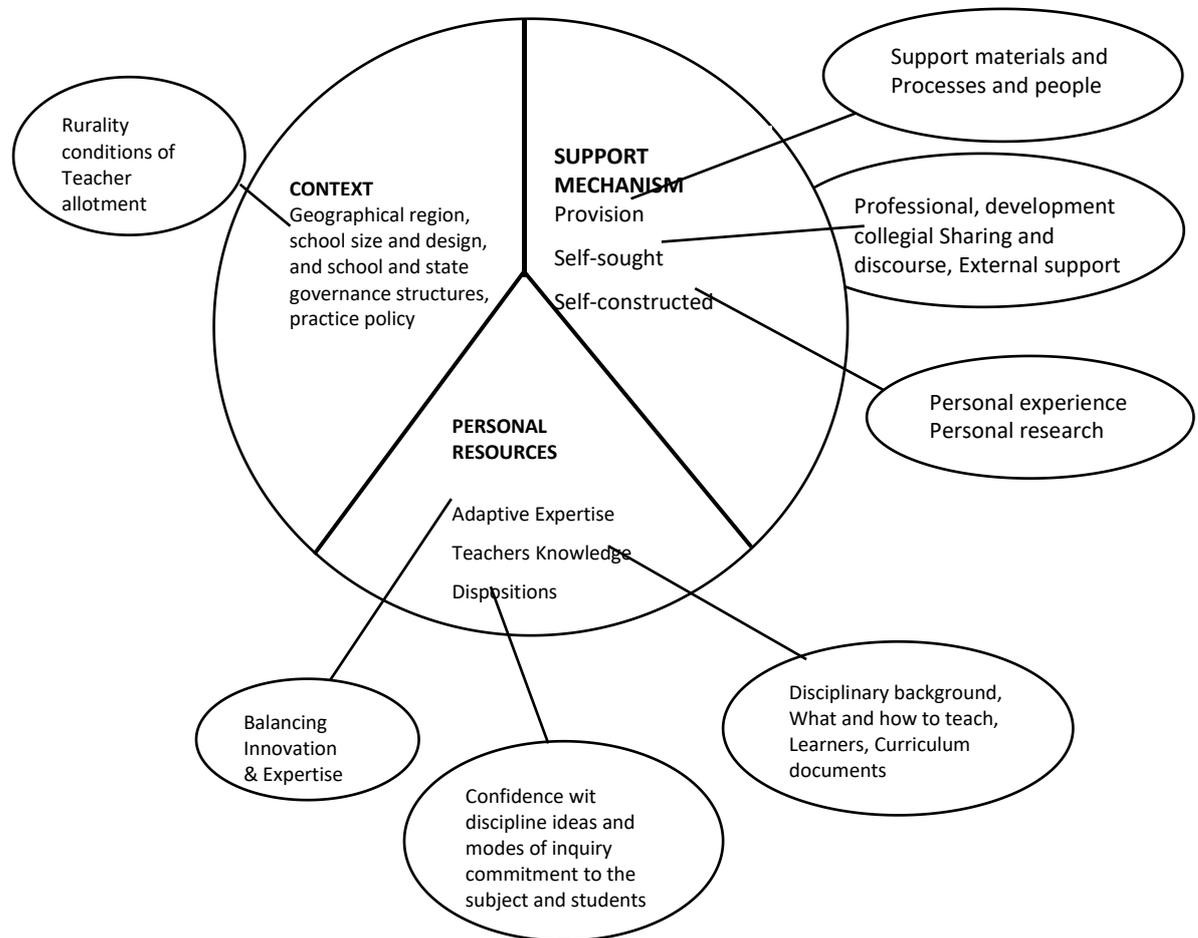
### **2.2.2 The Boundary Between Fields Model (BBF)**

Another theoretical framework for this study is based on the theory of “Boundary Between Field (BBF) Model”. The Boundary Between Fields (BBF) Model was propounded by Hobbs (2013) in an article titled “teaching out-of-field as a boundary-crossing event: factors shaping teachers' identity”. The theory stated that when teaching OOF, teachers who lack expertise to teach in a content area experience a “boundary crossing event”. Boundaries according to Akkerman and Bakker (2011) are the “socio-cultural differences that give rise to discontinuities in action and interaction”, while boundaries crossing is the efforts made by individuals or groups at boundaries to

establish or restore continuity in action or interaction across practices (Akkerman & Bakker, 2011). Similarly, Daskolia (2016) viewed boundaries crossing as a person's transitions and interactions across different sites. Hobbs (2013) and Nixon and Luft, (2015) noted that differences between the science disciplines or two disciplines can be conceptualized as a boundary, this is because boundary crossing divides socio-cultural practices based on similarities of the things within the boundary and differences with things outside the boundary.

Hobbs (2013) study conceptualized out-of-field teaching as a boundary crossing event that focused on out-of-field teachers' identity of Australian science teachers. She found out that boundaries are often due to differences in identity, discourse, and knowledge. The study further identified factors that influenced whether a teacher identified him or herself as out-of-field. She identified three factors that influenced the identity construction of OOF teachers. Namely, Contextual Factors (CF); Support Mechanism (SM) and Personal Resources (PR). These factors form the BBF model as shown in the diagram below.

**Diagram showing factors influencing out-of-field teacher's identity construction (Hobbs 2013).**



**Fig 5: factors influencing out-of-field teacher's identity construction**

Contextual Factors (CF): refer to the geographical location; school size and design, school and state government structures and policies. The researcher observed that in rural and local areas, rurality influenced the availability of resources, community support and professional learning opportunities. The rural settings of these teachers' create a series of limitations and opportunities for the out-of-field teacher. In addition, this setting reduced the availability of subject specialists who can readily lend advice, mentoring and professional development. Certainly, difficulties in the attraction and retention of qualified teachers in rural areas provide a constant pressure on school.

Hence, school management are usually left with no option but to fill the gaps on the timetable with any available teacher. Akkerman and Bakker (2011) asserted that the existence of socio-cultural differences results to discontinuities. In order to overcome this boundary, the OOF teacher begins to negotiate and combine ingredients from different contexts to achieve hybrid situations. Thus boundary crossing is bidirectional and dynamics (Daskolia, 2016).

Support Mechanisms: can be referred to as ‘boundary objects’ that assist in moving between infield and out-of-field spaces. These boundary objects are artifacts, tools, or ideas that “inhabit several intersecting social worlds” (Hobs, 2013; Daskolia, 2016). These objects are the structures, facilities, resources (human and material) provided by the school to enhance teaching. Hobbs (2013) opined that if teachers are to adapt to a new field, conditions must be conducive to encourage a good landing and adjustment to the new field. To avoid anxiety, support mechanisms may be vital and are likely to lead to effective teaching and positive identity construction. In the absence of these mechanisms, the OOF teacher struggle with the content

Personal resources: can be studied in term of what teachers bring and do not bring to their out-of-field teaching. Hobbs (2013), called it ‘adaptive expertise’. This refers to the ability of a teacher to cope with changes associated with out-of-field. For instance when a teacher can apply knowledge effectively to novel problems using cognitive, motivational and personality-related components, he is said to possess adaptive expertise. How a teacher response to the dynamic nature of teaching and its constant need for innovations is crucial to their practice and professional identity. Other factors that influence teachers’ perception about themselves as out-of-field teacher includes: teacher knowledge, knowledge of how to teach, knowledge and accessibility of curriculum documents, knowledge of the learners, teacher commitment and confidence.

Hobbs (2013) acknowledges that context, support and personal resources constitute teachers lives and work, and as such they take on certain meaning when arising at the boundary between subjects where teachers move from one system of knowledge and practice to another. However, teacher content knowledge is a known major factor in how a teacher identified him or herself as out-of-field. Rushton *et al.*, (2014) speculated about how out-of-field teacher negotiate the boundary crossing between science disciplines in terms of content knowledge. Also, Christiansen and Rump (2008) investigated how the topic of thermodynamics varied across the disciplines of physics, chemistry and engineering. The authors argued that the discontinuity makes it challenging for teachers to apply knowledge learned in one course in another course. Literature on boundary crossing suggested that crossing boundaries is often challenging because it requires people to “enter onto territory in which they are unfamiliar and, to some significant extent unqualified to act” (Suchman, 2003). Additionally, in-field teachers with many years of teaching experience, competence and identity within a domain of specialized professional practice, placing them in OOF situation becomes difficult, as it may lead to painful reflections on their own life and position.

In relation to this work, boundary is claimed to be a barrier in teaching. Because of the elevated incidence of out\_of\_field teaching as a result of shortage of qualified teachers, it is imperative to note that the boundary crossing becomes a barrier as they tend to negotiate across two different fields. They encounter challenges and difficulties while developing the content knowledge needed for teaching, most especially difficult topics. Conversely, development of teacher’s content knowledge is hampered when such teacher has not had content preparation at the college level. Hence, the lines of demarcation between practices are uncertain or destabilized because of feelings of threat (anxiety).

### 2.2.3 The Deficit Theory of Anxiety

The deficit theory posits that when foundational concepts are missed at some point, or if a Biology teaching disability is present in a teacher, deficits occur and can lead to anxiety (Carey, *et al.*, 2016). In light of above, Carey *et al.*, (2019) describes the deficits as stemming from either study skills, in which learning is insufficient, or from teaching skills, in which teachers are assigned subject outside their field of certification. The idea is that gaps in learning, teaching difficulties, and poor performance can all lead to anxiety. The literature provides evidence for the deficit model's explanation of how anxiety originates.

Carey, *et al.*, (2016) stated that anxiety performance link has two causal directions, the first of this direction is encapsulated by deficit theory which claims that poor performance leads to higher anxiety (deficit theory), while the second direction is that anxiety reduces performance by affecting the pre-processing, processing, and retrieval of information (debilitating anxiety). The last stages may influence performance by cognitive interference. However, literature also abounds with evidence that science anxiety is the cause of deficits in science ability and lower science achievement (Carey *et al.*, 2019). The debilitating anxiety model suggests that anxiety hinders teaching and performance because it causes stress and makes thinking difficult. This appears to be the case for learning Biology, teaching Biology and even more so for teaching Biology with time limit. The gender gap in science (Biology) majors and related careers in science, engineering, and technology (STEM), is supported by the debilitating anxiety model. Because females experience more anxiety than males, including that caused by stereotyped beliefs, they tend to avoid college majors and careers that are science/math-based (Beilock, *et al.*, 2015; Wang & Degol, 2017). Although both deficit theory and debilitating anxiety model are well-supported by the literature.

## **2.3 Empirical Studies**

### **2.3.1 Review of Empirical Studies related to Out-of-field Teaching**

Previous studies on out-of-field shows that a larger number of teachers involved in out-of-field teaching are from low income, high minority schools when compared to more affluent schools; In assigning teachers out-of-field, Ingersoll (1999) in Cinkir and Kurum (2015) reported that one fifth of science teachers, one third of all mathematics teachers, one fourth of all English teachers, and one fifth of all social studies teachers lacked a major or minor in their subject or a related field.

Umoinyang, *et al.* (2011) carried out a study titled the influence of out-of-field teaching on the teachers' job performance in Akwa Ibom State, Nigeria. The study employed the causal comparative ex-post factor research design. The population of the study was seven thousand and thirty one (7031), was drawn from two hundred and twenty nine (229) public secondary schools in that state. A stratified random sampling was utilized in selecting the schools and teachers' that was used for the study, by classifying the schools in to rural and urban schools in their respective local government areas. The sample of the study was one hundred and fifty five (155) schools with three thousand one hundred (3100) teachers. That is, five schools were randomly selected from each local government by selecting two from urban and three from rural areas and twenty teachers from each school. Data for the study was collected using researcher developed questionnaire tagged "Teachers Job Performance Questionnaire" (TJPQ). The data was analyzed and tested at 0.05 level of significant using the independent t-test statistics. The result revealed that, teachers' job performance was influenced significantly by their involvement in out-of-field teaching. Based on the finding, the researchers recommended that only teachers who were certified in particular subject discipline

should be made to teach each subject to serve as a check against the present day falling standard of education.

Cinkir and Kumur (2015) examined out-of-field teachers' employment in Turkey. It was a qualitative research design that employed the phenomenological approach. The sample of the study was determined by criterion sampling. The study group consisted of twenty (20) participants teaching in public schools in Ankara. Data collection was by structured interview. The reliability of the instrument was 88.37%. The collected data was analyzed using content analysis techniques. The research finding was that out-of-field teacher employment was disapproved due to lack of content knowledge; teaching experience and professional specialization. The findings also showed that out-of-field teachers have troubles with issues of commitment, job satisfaction and motivation, subject knowledge in teaching and adaptation to the job. On the other hand, out-of-field teacher employment provides advantages such as meeting the teacher shortages, decreasing unemployment and providing different perspectives on teaching. The researchers stated that despite the advantages of out-of-field teacher employment as a means of meeting the teacher shortages, this practice should be put to an end. The findings of the study contributed to discussions about out- of- field teaching and help educational stakeholders to increase their awareness about out -of- field teaching by giving real life examples. Permanent employment policies must be created in order to provide better and more consistent system of education.

Nixon and luft (2015) carried out a study on teaching Chemistry with a degree in Biology: crosscutting concepts as boundary objects. The design of the study was qualitative in nature. Three new Chemistry teachers participated in the study. Each of these teachers had taught Chemistry for their entire teaching career with a degree in Biology. Data collection was through structured interview designed to probe the

Content Knowledge of these teachers. Interviews were recorded, transcribed, and then analyzed in NVivo 9 (QSR International, 2010) qualitative analysis software. The study found out that teachers drew on Biology ideas in order to respond to questions regarding chemical equilibrium. An analysis of how those ideas were used contributes to the understanding of how teachers negotiated the task of teaching Chemistry with a degree in Biology. The findings provided an insight into how new teachers negotiate the challenges of out-of-field teaching and how new teachers draw on ideas from their discipline of specialization when out-of-field.

Du Plessis (2015) investigated on the understanding of out -of-field teaching experience in Australia and South Africa. The study was a transnational research that examined the true experience of out-of-field teachers'. The study was a qualitative research design that used the phenomenological approach. The sample of the study was seven (7) schools. Seven schools were conveniently selected; forty-eight (48) participants were purposively selected. Thirty-three (33) were Australian while fifteen (15) were South Africans. The schools used for the study were selected from independent, public, suburban and remote schools. Data collection was through one-on-one semi-structured interview, close classroom observation and document analysis (field diary, minutes and agendas of meeting). Interview data was colour coded and organized under three headings; general emotions, perception and expectation; school leadership, classroom and behavior management. Classroom observation and document analysis was triangulated. The result of the study shows that out-of-field teachers find it hard to identify and manage students' area of difficulty and misconceptions. Out-of-field teachers opted to leave teaching as a result of unpleasant experience. Out-of-field teaching greatly influences the quality of teaching; data reveals that out-of-field teachers do not feel in control of PCK when linked to their out-of-field position, they become anxious and tend to omit challenging part of the curriculum. Classroom

observation showed that the out-of-field teacher do not have confidence, and have strained relationship with their students because of their lacks of knowledge of the subject. Nixon, et al., (2016) investigated the Subject Matter Knowledge (SMK) of new secondary science teachers assigned to teach Chemistry in their first three years of teaching in United States (US). These new teachers do not have the advantage of years of experience to develop their SMK. Half of them hold a degree in Biology rather than Chemistry. An exploratory qualitative design was used to investigate the effects of a subject-area degree and classroom experience on new Chemistry teachers' SMK on the topics of conservation of mass and chemical equilibrium. Participants who held a degree in Biology were contrasted with participants who held a degree in Chemistry. Teachers' explanations of Chemistry concepts provided insights into their SMK. The sample size was six new teachers who had been teaching Chemistry as their primary subject. Data collection was through semi-structured interviews. The interviews was digitally recorded and lasted approximately 20 minutes. The interviews were transcribed using NVivo 9 (QSR International, 2010). The limitations of the study were that the sample of teachers was small, and the number of topics was limited. This study sought to understand new Chemistry teachers' SMK by analyzing their explanations of two chemical phenomena. Results indicated that the SMK of teachers who had a Chemistry degree and more teaching experience was more coherent, Chemistry-focused and sophisticated than that of teachers who lacked this preparation and experience. This study provides evidence that new science teachers' SMK is influenced by both holding a degree in the subject area and having classroom experience.

McConney and Price, (2009) carried out a survey on out-of-field teaching in Western Australia (WA) by showed that school location and school level had impact on level of out-of-field teaching. In their study, a total of 535 teachers were randomly selected from

Western Australia and there was a proportional representative of the various levels of schooling (the state's three school sectors and major regions were represented). A 23-item survey which comprised mainly closed-ended (fixed response) demographic and likert type items was used as the instrument for data collection. The items interrogated teachers' years of experience, qualification held and main areas of tertiary study in addition to assessing their views and feelings regarding teaching out-of-field. The survey was made available to potential respondents in both paper-and pen and on-line modalities. The survey response received showed that the overall rate of teaching out-of-field in WA for the both 2007 and 2008 school years was 24%. It was further observed that in the Metropolitan schools, the overall rate of out-of-field teaching in Government schools was 15%, which was different from the Catholic schools which was 28% and independent schools 29.7% respectively. On the other hand, the country area schools reveal the overall out-of-field teaching in the Government schools has 24.5% as contrasted with the Catholic schools which were 44.4% and 42.3% for the independent school respectively. With respect to subject areas, 16% and 18% of out-of-field teaching was observed in Mathematics and Science (including Physics, Chemistry and Biology) respectively.

Nixon, *et al.*, (2017) carried out a study on the prevalence and predictors of out-of-field teaching in the first five years in US. The design of the study was mixed method. They employed both qualitative and quantitative research design. 137 teachers who taught in secondary schools in five states in the Midwestern and Southwestern US were purposefully selected and constituted the population of the study. It was a longitudinal study and data collection began in the 2005-2006 School year and concluded in the 2009-2010 School year, during which time NCLB legislation was in full effect. Data for the study was collected by the help of four (4) research assistants through interviews

and official school, district, or university documents. The researchers followed the teachers across their first five years of teaching, including those who changed locations (e.g., schools, districts, states) during the period of the study. Teachers were first interviewed during the summer prior to their first year of classroom teaching, then at the end of each subsequent School year, with the last interview after their fifth year of teaching. Data from these interviews were transformed into quantitative form and entered into a spreadsheet. Data was then analysed using a simple frequency count. Their findings showed that there was a high prevalence of OOF teaching among new secondary science teachers across their first five years, with science subjects the worst hit with 64.3%. A large portion of new secondary science teachers are assigned to teach science disciplines for which they are inadequately prepared. Based on the findings of the study, the researchers suggested that policymakers, administrators, and teacher educators should provide supports, such as science-specific induction programs designed for new teachers who are assigned OOF, and science teacher educators should prepare prospective teachers to teach multiple science disciplines, lastly, the Federal Legislation in the United States sought to eliminate OOF teaching.

### **2.3.2 Anxiety and Gender**

Gender is the masculinity and femininity found in a person and there are mixtures of both on most human being. Nsofor (2010) posits that the normal male has a preponderance of masculinity and normal female has a preponderance femininity. This aspect of educational research has generated conflicting and non-conflicting finding. Some indicated significance difference existed between the anxiety level of male and female teachers. Other findings showed that gender had no impact on teachers' anxiety.

Everyone would agree that males and females act differently in what comes to be a similar circumstance. As human being, men and women share many of the same

experiences and expectations and as individuals they are each entirely unique. As a matter of fact, male and female teachers perceive the threatening situations differently because of their biological, psychological, physiological and emotional differences. A male teacher may handle a special circumstance easily while their opposite sex may experience a high level of anxiety and stress. The aforementioned differences can be considered context specific since some findings reject the correlation between some demographic features and anxiety. Putter (2003) besides proposing teaching as a stressful job, claimed that there is no meaningful difference in the amount of anxiety or stress in regard to gender, age and teaching experience.

Akinsola (2014) reported no significant difference between male and female pre-service teachers teaching anxiety. His report was in line with Yayli & Gungor (2012) who has found that there is no statistically significant relationship between the gender and anxiety levels of student teachers. Frost, Hall, and Ferguson (2012) submitted that there was no significant difference between anxiety, gender, grade level and job satisfaction. Kumar and Deo (2011) discovered that junior college teachers experienced extremely more stress on most of the dimensions of stress in comparison to senior teachers. They found that female teachers suffer from more stress in comparison to their male counterparts. Yaz and Altun (2013) examined conditions of beginning teaching and anxiety perceived in teacher candidates. Results of their study illustrated that there was no significant differences between the anxiety of females and males teacher. Except that significant difference only existed in somatic symptoms between men's anxiety and that of women. Mallow (2010) undertook a study on 500 teachers and reported that females are significantly higher in anxiety towards science than their male counterpart. Desouky and Allam (2017) reported gender difference in anxiety and depression in their study , as female teachers showed a higher rate of very severe anxiety and stress compared to

their males counterpart. On the contrary, Aftab (2016) stated that males display more occupational stress/ anxiety towards teaching than the females.

### **2.3.3 Content Mastery and Anxiety**

Christopher, *et al.*, (2018) carried out a Comparative study to determine the occupational stress level and professional burnout in special school teachers working in private and government schools in Kanchipuram district in India. The aim of the study was to determine and compare the occupational stress level and professional burnout in teachers working in private and government schools. The population of the study was all the teachers in private and government school in Kanchipuram. Schools were selected by cluster random sampling technique while simple random sampling technique was used in selecting 240 teachers (120 private school teachers and 120 government school teachers). Questionnaire developed by researchers was used for data collection. Data was analysed using chi square test, independent t test and ANOVA. Results indicated that Stress level and burnout level varies significantly between male and female Indian school teachers. Government schools teachers had higher stress level than Private schools teachers based on not having enough time to finish up the syllabus. Similarly the burnout also have the most in government schools ( $59.43 \pm 11.78$ ) compare to private schools ( $48.61 \pm 11.94$ ), ( $t=7.07$ ,  $p=0.001$ ). The researchers recommended that leaders and decision makers required making early identification and counseling about different factors that influence stress level in private and Government school teachers.

Abdul Hadi *et al.*, (2009) examined the prevalence and factors associated with stress among secondary school teachers in Kota Bharu, Kelantan, Malaysia. This research attempted to determine the prevalence of stress and the associated factors contributing to stress among teachers in Malaysia. The design of the study was cross-sectional. The population of the study was all the secondary school teachers in Kota Bharu, A simple

random sampling technique was applied to select 580 secondary school teachers in 20 secondary schools in Kota Bharu District. The instrument used for data collection was an adopted and modified Depression, Anxiety and Stress Scale (DASS 21) and Job Content Questionnaire (JCQ) questionnaires. The reliability was calculated using Cronbach's alpha coefficients, and the coefficients are 0.75 psychological, job demand of 0.50 and social support of 0.84 respectively. Data were analysed with descriptive statistics such as medians, inter-quartile ranges, means and standard deviation, frequencies and percentages were used for categorical variables and multiple linear regression analysis were carried out for inferential statistics. The result revealed that the majority of teachers had a mild level of stress (17.4%) towards the triggers of anxiety such as knowing the content and objectives such as what i am teaching, younger teachers had more stress than the older teachers. This study indicates job-related factors did not contribute much to stress among secondary school teachers. The study recommended non-job-related factors should be further studied to determine methods for stress reduction in teachers in Malaysia.

Morteza and Morteza (2013) investigated teacher anxiety among practicing EFL teachers in the Iranian context. The study tried to identify different sources of anxiety among male and female teachers across novice and experienced EFL instructors. Using a self-report questionnaire, adapted from Ferguson (2012), the researcher collected data from 114 EFL teachers working in universities, high schools and language centers. The analysis of data revealed that about 57.65% of teachers had the feelings of anxiety in one way or another. Result of the findings of the study revealed that there was a high rate of anxiety (57.62%) as a result of language proficiency and knowledge, when students are not motivated or are not interested in their English classes among novice and experienced teachers. In addition, both male and female teachers showed a high level of tension in their jobs. Other categories, language proficiency and knowledge,

facilities and resources and other factors, exercised moderate effects on teacher anxiety. The study also found that most of the localized items were of great influence on teaching anxiety. In addition, there was a weak and negative relationship between years of experience and the amount of tension experienced by teachers. However, no meaningful correlation was found between gender and occupational anxiety.

Sharma (2008) studied the occupational stress among teachers working in secondary schools of Karauli district of Rajasthan state, India. The design of the study was cross-sectional survey. Cluster sampling method was adopted for the study due to feasibility to researcher. The Study population comprised of all the teachers working in 229 (82 public and 147 private) secondary schools of Karauli district. The sample of the study comprised of randomly selected 154 teachers randomly selected from 40 schools (15 public and 25 private). Data was collected with two researcher developed questionnaire. The instrument had a reliability coefficient ranging between 0.82 and 0.86. Data were analysed with mean and standard deviation and Chi-square test. Result revealed high level of occupational stress among Indian school teachers. Sex was not found to have significant relationship with stress among teachers. Teaching experience was found to have statistically significant association with occupational stress. No relationship was found in stress level based upon workplace environment. Type of school was not found to be significant. School location was also not found as significant predictor of occupational stress after final analysis. There was no significant relationship in sex and level of stress. The study recommends that counseling and stress management programmes must be started in schools on pilot basis. Successful programme models must be extended to all schools, more so, interventions like training about relaxation techniques and more social interactions with school events might be helpful.

Lampadan (2014) study explored the understanding, causes of anxiety and coping strategies of Student- teachers during their internship: The design of the study was a qualitative method of phenomenological approach. This was to understand their lived experiences in relation to anxiety and coping strategies. Eight student-teachers from the Faculty of Education and Psychology at a faith-based International University, Central Thailand, participated in the study: five from Myanmar, two from Malaysia and one from Sri Lanka. Data was collected through individual meetings, group forums, observations and individual interviews. The result obtained was triangulated; theme generated was divided in to subgroups under three categories of the causes of anxiety. Lack of English language proficiency, inadequate level of preparation for lesson, failure to implement or execute classroom rules and lack of self-confidence. This finding confirms that anxiety increases when teachers have insufficient English language abilities from both location of school while adaptation, preparation attitude and relationship are coping strategies.

#### **2.3.4 Pedagogical content Knowledge and Anxiety**

Patra and Guha (2017) conducted a study to compare the pedagogical content knowledge and self-efficacy of geography teachers in relation to location and gender and to also find out the relationship between the pedagogical content knowledge and self-efficacy in southern part of West Bengal, India. The design of the study was descriptive survey. The population of the study was all the secondary school geography teachers from West Bengal. 401 geography teachers from 327 schools which were randomly selected constituted the sample. Two researcher developed tools was used for data collection. The collected data were analyzed by using mean, SD, t-test and Pearson correlation. The study raised four (4) research questionnaire and 5 hypotheses. The study found that, there was significant difference in pedagogical content knowledge and

self-efficacy of rural and urban geography teachers; there was also no significant difference in pedagogical content knowledge and self-efficacy of male and female geography teachers; and the pedagogical content knowledge and self-efficacy of geography teachers was positive and significantly related, Based on the findings, it was recommended that, different authorities are engaged to train both pre-service and in-service programme for making and developing of geography teachers have to improve teachers' self-efficacy and to support them to face professional requirements with high level of PCK.

Nisbet (2015) investigated the teaching experiences of six elementary pre-service teachers (EPTs), three with high mathematics anxiety and three with low mathematics anxiety, during their student teaching semester. The EPTs were selected from an initial pool of 121 EPTs who took the Abbreviated Mathematics Anxiety Scale. The cases were compared in a cross case analysis to highlight mathematics teaching experiences among EPTs. Data was collected from researcher journal entries, interview transcripts, pre-lesson surveys, field notes, lesson plans, and artifacts of observed lessons. The collected data were transcribed and findings revealed both similarities and differences across EPTs as related to four major categories: (a) planning and resources used, (b) role of the cooperating teacher, (c) content knowledge, and (d) pedagogical content knowledge. All EPTs used mostly direct instruction and relied on the course textbook and their respective cooperating teacher as their primary resources for planning. Also, EPTs with high mathematics anxiety were weaker with respect to content knowledge and pedagogical content knowledge. Findings suggest a need to re-design methods courses to address improving the pedagogical content knowledge of EPTs with mathematics anxiety. Findings also suggest a need to develop content specific mathematics courses for EPTs to improve their content knowledge.

Saravanan and MuthuLakshmi (2017) examined occupational Stress: A case study among primary school teachers in Nagapattinam district in Tamil Nadu. The study was designed to explore the relationship of occupational stress of the fresh set up primary school teachers with demographic variables like gender. The design of the study was descriptive survey. The population of the study was all the primary school teachers in Nagapattinam District. A sample of 100 teachers from Nagapattinam district were selected by using simple random sampling. 50 primary school teachers each from government and private schools. Occupational stress scale was used for collecting data. To analyze the data and interpret the data, the investigator used the statistical techniques for Mean, Standard Deviation, t-test and ANOVA to compare groups. Result revealed 64% of the Primary school teachers were found to be highly stressed due to pedagogy. There is no significantly relationship in the level of occupational stress of private male and private female primary school teachers as a result of teacher's instruction.

Uusimak and Nason (2004) investigated the causes underlying a sample of eighteen third-year Australian pre-service primary teachers' negative beliefs and anxiety about mathematics. The design of the study was qualitative in nature. The sample of the study was eighteen pre-service primary teachers' (17 female and 1 male) who were selected from a pool of forty-five selfidentified Mathematics-anxious students who volunteered for the study. Data collection was through semi-structured interview. The collected data was transcribed. The generated theme was converted to percentage scores. Result indicate that the participants felt most anxious about mathematics when they had to communicate their mathematical knowledge in some way (48%). Also, causing a lot of anxiety was the teaching of mathematics in practicum situations (33%) due to insecure feelings of making mistakes or not being able to solve it correctly. It was found that most of the participants' Mathematics-anxiety could be attributed to situations such as

teaching mathematics and specific mathematics content as source of anxiety. Situations which caused most anxiety for the participants included communicating one's mathematical knowledge through tests and verbal explanations when teaching in front of the classroom. Houlihan *et al.*, (2009) examined the personality effects on teaching anxiety and teaching strategies in University Professors in Canada. The design of the study was descriptive survey.

Forty-two university faculty members (26 women and 16 men) from a small undergraduate Canadian institution constituted the sample of the study. Two instruments on a 4-point scale ranging from not at all to severely namely the survey of teaching anxiety and the survey of instructional methods and classroom settings were used for data collection. The reliability of the instruments are 92 and 75 respectively. Data were collected through an online medium using survey monkey. The collected data was analyzed using multiple regression. Result revealed a positive and significant correlations between anxiety instrument and all four components of inclass teaching strategies such as student-to-student discussions and evaluation using student/group presentations and prevention of cheating in the classroom, however the correlations were of a high magnitude as professors who scored high on the anxiety instrument is strongly correlated with high teaching anxiety and the component of higher neuroticism and lower extraversion were related to teaching anxiety, while personality was related to in-class teaching strategies, particularly in the use of student-to-student discussions and group work.

Olugbemi (2011) carried out a study on assessment of PCK of in-field and out-of-field Chemistry teachers in Abuja Nigeria. The design of the study was a descriptive survey. The study aimed at assessing OOF teaching and secondary School students' perception of Chemistry teachers PCK. The study was guided by four objectives, four research

questions and three hypotheses. The population of the study was all the Chemistry teachers in public and private schools in FCT, Nigeria. Proportional stratified random sampling technique was used in selecting 56 Chemistry teachers and 420 students from rural and urban schools. Two research instrument were used for data collection. The collected data was analyzed using frequency count, mean, standard deviation and chi-square was used to test the hypotheses at 0.05 alpha levels. The result revealed significant and positive relationship between teacher pedagogical content knowledge and student teacher learning in rural and urban areas. The in-field Chemistry teachers had more experience in teaching Chemistry compared to the out-of-field Chemistry teachers. This indicates that the in-field teacher had a higher level of presenting a good role model to the students, compared to the out-of-field teachers. In addition, the OOF teachers in the rural areas did not have full understanding and practice of CK and PCK in Chemistry and as such felt less confident in their teaching. They were less innovative and cannot develop their own ideas as such depend solely on textbooks. Both teachers from urban and rural areas do not imbibe the students' centered teaching methods. Instructional practice employed by teachers in the urban areas was somewhat different from that used in the rural areas.

Hismanoglu (2013) investigate English language teacher candidates' language learning anxiety with independent variables such as gender, age and grade level. 132 (46 male and 86 female) were randomly selected among the first-year, second-year, third-year and fourth-year from English language department. Data was collected using a researcher developed foreign language classroom anxiety scale (FLCAS) consisting of 33 items on a five-point Likert scale .The instrument have a Cronbach alpha coefficient of .79. The collected data was analyzed with descriptive statistics such as frequencies, percentages, means, standard deviation using the Statistical Package for the Social Sciences (SPSS, version 16.0). The results of the study showed that English language

teacher candidates had low levels of foreign language learning anxiety and that there was a significant relationship between anxiety and independent variables such as gender, age and grade level.

### **2.3.5 Classroom Management and Anxiety**

Maulimora (2019) examined English pre-service teachers' perception of anxiety in peer teaching: a case study at Universitas Kristen Indonesia. The study aimed at investigating English pre-service teachers' perceptions of anxiety in peer teaching. Data collection was with questionnaires and open-ended questions. Findings revealed that the majority of the pre-service English teachers were highly anxious about their first peer teaching practice. It was shown that pre-service teachers were unconfident; worried about their English language skills, teaching skills, evaluation skills, and classroom management; and were not sure of the preparations they had made. The top factor causing their anxiety was their classroom management skills. This means that they put the greatest concern on the way they would manage the class. Nevertheless, by knowing the causes of the anxiety, they got the opportunities to reduce it in the next teaching.

Sanchez and Halet (2017) examined teachers' classroom anxiety: A case study of immigrant, in-service teachers of English East Asia. Three participants from different institutions in East Asia took part in the study. A multi -method approach such as autobiographical account, journals and semi structured interview was used for data collection. Content analysis was performed on autobiographical account and journal entries while interviews were transcribed and open codes were applied to key words and ideas which were significant to the study. The study revealed that immigrant teachers experience high degree of classroom anxiety which exert specific physiological effects on them. Anxiety catalyst included lower self-efficacy, insufficient knowledge on classroom management strategies, feelings of frustration and discomfort , discrepancy between teaching goals, lack adequate subject matter, inability to learn students names,

uncertainty of not been able to give correct answer to technical questions when asked by students, inaccurate diagnosis of students level of comprehension and lack of guidance for lesson preparation.

Gonca and Burçak (2016). Conducted a study on Student Teachers in the Practicum: To Be Anxious or Not. This study was conducted on 52 pre-service language teachers at a state university in Turkey during their practicum. The study aimed to find out the reason why they experienced, or did not experience anxiety with reference to culture specific reasons. This was done by focusing on factors that reduce or provoke practicum anxiety. A questionnaire comprising 25 open-ended questions was developed from the Student Teacher Anxiety Scale (STAS). The items in the scale were converted into questions and the participants were asked to clearly state why they felt anxious or easy. The responses were analysed through content analysis and then quantified to show frequencies. The findings indicated that the student teachers experienced high anxiety due to problem behaviour in the classroom as well as stress of being evaluated. The results also revealed that helpful and supporting staff at the host school reduces teaching anxiety. The student teachers also felt at ease with a supervisor that they had a partnership with from the micro-teachings in their methodology courses through to supervision in their practicum.

Asa and Lasebikan (2016) explored the prevalence of teachers stress (TS), depression (D) and generalized anxiety disorder (GAD) among selected secondary school teachers in Ibadan, Nigeria. The design of the study was descriptive cross sectional study, 471 primary school teachers were selected by a multistage sampling technique. The Teacher Stress Inventory was used to determine prevalence of teachers' stress and MINI International Neuropsychiatric interview to determine prevalence of depression and GAD. The results was analysed using descriptive statistic (means, frequency count and

standard deviations) and inferential statistical methods using SPSS 17.0. Pearson's chi square statistics was used to examine the relationship between the categorical variables. The result showed no significant relationship between the stress, depression and GAD of older teachers and those teaching in private schools and teachers in public schools. Older teachers and those who were married were less likely to have GAD. Also, male teachers experience less stress, depression and GAD than their female counterpart in private school as compared to the public schools.

Mosaddaq and Barahmeh (2016) carried out a study on the sources of EFL student teachers anxiety during practicum experience. The study aimed at exploring the different sources of anxiety of EFL student teachers experience while doing their practicum courses in Arab American University of Jenin (AAUJ). The research design was qualitative in nature. Data collection was through student-teacher's daily diaries and through discussion. The sample of the study was Twenty two (22) student teachers. The collected data was triangulated and result from the study revealed that the main source of anxiety was, feeling of anxiety in classroom management, time management, lesson planning, and lack of fluency in language. The researchers found a moderate level of anxiety rate among respondents. This was due to their lack of teaching experience. This signifies that there was relationship between anxiety and sources of anxiety which is related to classroom management.

Kowsalya and Nalinilatha (2017) carried out a comparative study on classroom management techniques among government and private school. The study aimed to examine the comparative study on classroom management techniques among government and private school teachers. The investigator adopted survey method to study the classroom management techniques among government and private school teachers. For this study a sample of 300 school teachers from six various schools

situated in Coimbatore district selected by the investigator using simple random sampling technique. The findings revealed no impact of demographic variables was found both on emotional competency and classroom management techniques among school teachers. It was inferred that there is no significant relationship among the teachers in their class room management techniques with respect to their locality of the schools. It was inferred that there is no significant relationship among the teachers in their class room management techniques with respect to their medium of teaching, it is inferred that there is no significant relationship among the teachers in their classroom management techniques with respect to their type of the schools.

Harish and Jeya Prabha (2018) carried out an empirical study on the stressors of teachers and its impact on occupational stress and job satisfaction of teachers in government and private schools in Chennai, India. This study emphasized on the factors that cause stresses amongst the teachers in private and the government schools. The study was a descriptive survey and 4 research questions and 4 hypotheses guided the study. The sample size was 300. Descriptive statistics and inferential statistics were used to analyze the collected data. The study revealed significant relationship in the occupational work stress of private school teachers compared to the government school teachers due to low salary per month, lack of communication and lack of adequate classroom management. The female secondary school teachers have significantly high levels of stress as compared to their male counterparts in regard to the teaching techniques used in the classroom. Recommendation was made based on the findings of the study.

Gugeneswari and Kumaran (2015) investigated the stress level and coping strategies among primary Tamil school teachers in Selangor state, Malaysia with regards to location. The sample of the study was 240 teachers. Data were collected using DASS21 researcher developed questionnaire. Collected data was analyzed by the use of ANOVA.

Result shows that urban and rural teachers depression were the same while urban teachers had a higher anxiety and stress level than rural teachers due to their inability to manage the classroom during instruction. There is significant relationship between stress levels and coping is done using one way MANOVA analysis. The study recommends that Tamil teachers should maintain effective stress coping strategies for optimal level of emotional wellbeing.

Nweze (2014) assessed the level of anxiety manifestation among junior secondary school teachers in Ebonyi State. The study looked at basic concepts and some literatures in the areas of anxiety, assessment and factor influencing anxiety. The study was descriptive survey and stratified random sampling technique was employed to select schools while random sampling was used to select teachers. The population was all the junior secondary school teachers in rural and urban schools. Sample size was 120 teachers (60 males and 60 females). Split-half method and Spearman Brown formula was used to calculate the reliability coefficient. The reliability of the instrument was estimated at 0.91 percent. A 100% return rate of the instrument was recorded and the instrument was validated by experts in the field of psychology. Data was analyzed using simple mean, standard deviation and t-test statistics. The results revealed no significant difference between anxiety in males and females teachers; it was also found that those in the rural schools manifested high level of anxiety more than their urban counterparts due to inability to control the classroom, inadequate knowledge of the teaching subjects among others. Recommendations were made on the findings of the study.

Aynur and Aydin (2013) investigated the anxiety level of novice and experienced EFL a case study of Aydin University. The study employed the survey design. The sample of the study was 35 (30 Females and 5 Males). A researcher developed 5-point Likert type scale was used for data collection twenty six (26) items. The reliability coefficient of the instrument was 0.98 using Cronbach Alpha. The result of the study was calculated

using Kruskal Wallis test and this was used to find out the correlation between experience and anxiety. The study revealed that there was no significant relationship between gender, and anxiety level of experienced teachers was lower than novice teachers but there was a significant relationship between years of experience and anxiety levels of instructors. The study revealed that teachers with higher levels of anxiety gives less verbal support to their students, spends more time organizing classroom exercises and tends to resort to more frequently hostile remarks and actions. They concluded by saying that training should be organized to raise the awareness of novice teachers.

Mutodi and Ngirande (2014) explored students' teachers mathematics anxiety levels at a selected tertiary institution in South Africa. The research examined the differences in mathematics anxiety levels according to gender, age and home language. This study examined responses to a questionnaire administered to students, utilizing a quantitative research. Data on perceived notions of students' mathematical experiences was collected. The study involved 120 respondents (84 male and 36 female) randomly selected. The instrument used to measure mathematics anxiety levels was adopted from Jerran's Maths Centre (2012). The data was analysed using Statistical Package for the Social Sciences (SPSS), version 20.0. Hypotheses were formulated to test the information that was generated. A t-test for the difference between means of the anxiety levels of males and females, Chi-square tests for association and ANOVA for testing differences among language backgrounds and anxiety levels were used as statistical analyses to measure responses. The findings of the study indicated that there are high mathematics anxiety levels among the respondents. The results also show high levels of mathematics anxiety among female students' teachers. The t-test showed that the mean difference between mathematics anxiety and gender is significant. There is no association between age and math anxiety level and there is no association between

home language and math anxiety level. Based on the findings of this study, it noted that mathematics anxiety is one psychological factor that affects students' achievement and their general practices. Therefore, facilitators/teachers should strive to understand mathematics anxiety and implement teaching and learning strategies and study habits that can help them overcome anxiety.

Yaratan and Kasapoğlu (2012) investigated differences in attitudes, anxiety, and mathematical achievement due to gender, and school location; and to depict how well anxiety and attitudes towards mathematics determine students' teachers mathematical achievement controlling for gender and school location. Attitude and anxiety scales were administered to 188 eighth grade students' teachers and the data collected were analyzed using t-test and multiple regression analyses. Results revealed significant differences in attitude, and in mathematics scores, but no significant relationship in the anxiety scores with respect to gender, and location of schools.  $R^2=.448$  implied that 44.8% of the variability in the mathematical achievement of students teachers can be explained by students' anxiety (Beta=-.432), attitudes (Beta=.216), gender (Beta=-.113), and school location (Beta=-.291).  $R^2$  change=.377, depicts that students from similar school (Cronbach's Alpha) were found as .937 for the attitude scale and .920 for the anxiety scale and both were considered to have excellent reliability. For finding answers for the second research question, it was investigated how attitudes and anxiety levels of students' teachers towards mathematics predict students' achievement controlling for gender and school location. The multiple regression results indicated that gender, school location, attitudes and anxiety accounted for about half of the variance in mathematical achievement. The students' teachers' anxiety levels made the most significant contribution, while gender made the least.

Amalraj *et al.* (2018) carried out a comparative study to determine the occupational stress level and professional burnout in special school teachers working in private and

government schools. The study determined and compared the occupational stress level and professional burnout in teachers working in private and government schools. 120 private school teachers and 120 government school teachers were recruited for the study. The data collected was analysed with Chi square test, Student independent t test and ANOVA. Results revealed that stress level and burnout level varies significantly between male and female Indian school. Government schools have higher stress level than Private schools. Governmental schools having more stress compare to Private schools. Similarly, the burnout also having the more in government schools compare to private schools. Conclusions: The government teachers have more stress compared to the private school teachers in India. The study proved that teachers with higher workload (Headmaster and Assistant Headmaster) were more stressed. Stress from pupil misbehavior and time pressures was significantly greater than stress from poor working conditions for both private/government school teachers. Poor working conditions and time pressures predicted burnout for private school teachers; pupil misbehavior and poor working conditions predicted burnout for government school teachers.

### **2.3.6 Influence of Out-of-field Teaching on School Type and Location**

A survey on 'out-of-field teaching in western Australia (WA), showed that school location and school level had impact on level of out-of-field teaching. The prevalence of out-of-field teaching has its impact on every level of education, particularly at the secondary school. Factors such as school location (urban and rural), type (public and private) and size have been found as contributing factors to the increase of out-of-field teaching. Ingersoll (2003) as cited in Aina and Sunday (2015) claimed that there were striking differences in the level of out-of-field teaching across different types of schools in America. It was believed that poor and low income communities were often most

affected by this problem and this may have accounted for the poor performance of students in their examinations. Another observed factor was the school type and size. The data collected also showed that 10% of grade 7-12 teachers in the large sized private schools (that is schools that have over 1000 students) account for the practice of out-of-field teaching while 47% of grade 7-12 teachers in small sized private schools ( that is schools with less than 300 students) account for the practice of out-of-field.

Doss, et al., (2018) carried out a comparative study to determine the occupational stress level and professional burnout in special school teachers working in private and government schools in India. The study aimed to determine and compare the occupational stress level and professional burnout in teachers working in private and government schools. The design of the study was descriptive survey. The population of the study was all the school teachers in private and government school. Schools were selected by cluster random sampling technique while simple random sampling was used to select teachers from government and private schools. Data for the study was collected with three research instruments. Descriptive statistics like mean standard deviation and bar chart and inferential statistics like t-test and chi square was used for data analysis. Result indicates that Stress level and burnout level varies significantly between male and female Indian school. Government schools have higher stress level than Private schools. Similarly the burnout/ anxiety is more in teachers working with government schools compare to teachers working with private schools.

Anbu (2015) studied the professional stress of higher secondary school teachers, Survey method was used for this study. The sample consisted of 200 post graduate teachers working in government and private higher secondary schools in and around Nagercoil region. The Occupational Stress Inventory was used for data collection. The five point scale consists of 37 test items, which includes positive and negative statement. The female higher secondary school teachers have more stress than the male higher

secondary school teachers. The reason is that female teachers apart from guiding the terminal stage school students, have to look after their family members, they were not able to allocate equal weight age to working as well as family environment, hence this result in enhanced stress level. Married higher secondary school teachers have more stress than the unmarried higher secondary school teachers because married teachers are shouldering more responsibility than the unmarried in terms of school work as well as in the family and society, hence they are in the position to satisfy all the dimensions, this results in higher levels of stress. Higher secondary school teachers working in government schools have more stress than those working in private higher secondary schools because the government teachers have to fulfill the work and the task given to them time by time from the administration as well as from the government departments, hence they are more responsible to the government officials than the private school higher secondary school teachers, hence a higher level of stress was evident in the government school higher secondary school teachers.

### **2.3.7 Empirical Studies on Experience and Anxiety**

Ameen, *et al.* (2010) investigated among accounting professors anxiety in the United State, it was found that teaching anxiety is mainly associated with rank, age and years of experience. Age and experience have also been linked to the experience of stress in teaching in that it was found that the highest levels of stress was experienced by recent entrants to the profession (usually younger teachers). This may be due to the fact that they have not yet acquired the expertise required to cope with the job. A study by Aslrasouli, *et al.* (2014) concluded that younger and less experienced teachers felt greater anxiety and stress than their colleagues from pressures associated with discipline, poor promotion prospects and classroom management issues.

Clayford (2010) carried out a comparative study of burnout among educators in a youth juvenile rehabilitation center, an ex-model C school, and public schools in South Africa. The study aimed at identifying which various educator demographic variables correlate with high burnout levels. The purpose of this study was to determine whether there are differences and relationship in the levels of burnout in educators between different types of schools? This study examined three schools; namely a public, ex model C (private), and a youth juvenile rehabilitation school. A non-experimental survey design was used for the study. The sample consisted of 47 educators across the three types of schools. Data was collected by means of two instruments: a demographic questionnaire, and the Maslach Burnout Inventory (MBI) consisting of three subscales namely; Emotional Exhaustion, Depersonalization, and Diminished Personal Accomplishment. Burnout among educators in public and youth juvenile rehabilitation schools was higher than educators in ex model C schools (private). Correlational results of the study found no significant relationships between the three subscales of the MBI and gender, and also no correlation between MBI and the three types of schools. Post Hoc comparison tests showed Public school educators exhibited the highest levels of burnout in terms of Emotional Exhaustion across the three types of schools, while educators in the youth juvenile rehabilitation schools showed the lowest levels of burnout in terms of emotional exhaustion. Also the study revealed that teachers who have been in the teaching profession for many years are less prone to high levels of burnout. In addition to this, younger trained educators entering the teaching field displayed the highest levels of Emotional Exhaustion with the Youth rehabilitation center teachers having the lowest levels of exhaustion.

Hadley and Dorward (2011) examined the relationship among elementary teachers' mathematics anxiety, mathematics instructional practices, and student mathematics achievement. The design of the study was descriptive survey. The sample of the study

was 692 teachers in grades one through six from 49 elementary schools in the western United States. There were 48 male and 644 female respondents. Data collection was with an adapted Mathematics Anxiety Rating Scale-Revised with a reliability of 0.80. The collected data was analysed using Mean and Standard Deviation. The result revealed that Teachers with less experience were more anxious than the more experienced teachers about teaching elementary mathematics while male teachers had lower anxiety than the female teacher about mathematics.

Desouky and Allam (2017) carried out a study on occupational stress (OS) among teachers predisposed to depression and anxiety among Egyptian teachers. The study aimed to assess the prevalence of OS, depression and anxiety among Egyptian teachers in private and government schools. The design of the study was cross sectional. A multistage sampling technique was used in selecting the schools from their various strata and simple random techniques were employed in selecting the teachers. The sample of the study was 568. From this number, 236 teachers were from primary school, 240 teachers were from preparatory school and 92 teachers were from secondary schools. Data for the study was collected using the Arabic version of Taylor manifest anxiety scale, Beck Depression Inventory BDI and the Arabic version of occupational stress Index's. These scales have a reliability index of 0.70. Data was analysed using SPSS version 20. Descriptive data was expressed as numbers and percentages, and Chi-squared test was used to test the relationship between variables. The result indicated that private school teachers showed moderate to severe level of stress and depression than teachers from government schools. Teachers from private and government schools showed moderate level of anxiety. Teachers with higher teaching experience and higher qualifications exhibited higher level of anxiety, stress and depression which resulted from the challenges faced on the job.

### **2.3.8 Anxiety and Qualification**

Aftab and Khatoon (2016) examined the demographic differences and occupational stress of secondary school teachers in India. The study aimed at examining the relationships of a set of independent variables (gender, qualification, teaching experience, salary, subjects taught and marital status) with stress/anxiety among secondary school teachers. The design of the study was descriptive in nature. The population of the study was all the secondary school teachers in Uttar Pradesh, India. The sample consisted of 608 secondary school teachers, selected from 42 schools in Uttar Pradesh, India. 281(46.22%) were male and 327 (53.78%) were female teachers. The teachers Stress/anxiety scale was used for data collection. The scale has a reliability of 0.79. The instrument was a five point Likert scale ranging from 5 (strongly agree) to 1 (strongly disagree) while t-test and F-test are used for statistical analysis. The study revealed teachers with higher academic qualification, such as bachelor or higher degree was less stressed than their colleagues with lower academic qualification, such as diploma. More so teachers with an experience of 6-10 and 11-15 years have most stress while 0-5 years were less stressed. Lastly, the researchers reported that nearly half of secondary school teachers experience less stress.

Ofosuhene (2018) investigated on the demographic characteristics of individuals associate with job stress levels? Perspectives from University of Cape Coast, Ghana. This study aimed to examine the association between individual demographic characteristics with their job stress/ anxiety levels. The research design for the study was descriptive in nature. The population comprised all the employees of the University of Cape-Coast, convenience sampling was used to select 223 employees for the study. Data for the study was collected through survey questionnaire. The questionnaire comprised of 20 questions of 6 point likert-type. The instrument's reliability was 0.81. Data was analysed using descriptive statistics and Pearson chisquare was used to test

the association between study variables. The study revealed that females had higher level of stress than the males and that there was no significant relationship between educational qualification and the level of stress/ anxiety.

Nwimo (2004) examined the health status, anxiety and stress of Secondary School teachers in Enugu State. The purpose of the study was to determine the health status, anxiety and stress of Secondary School teachers in Enugu state. The survey research design was used for the study. The study was guided by six specific objectives, and six hypotheses were postulated. The sample for the study consisted of 640 Secondary School teachers, out of which the responses of 598 (93.4%) were used. The instrument for data collection was an 89-item teacher stress, anxiety and health status questionnaire (TSAI-ISQ), which consisted of four sections A, B, C and D. Five experts in Health and Physical Education, Psychology, Educational Psychology, and Measurement and Evaluation validated the instrument. Cronbach's alpha reliability was used for test of reliability. Descriptive statistic such as mean and standard deviation were used for answering the research questions, while t-test and regression analyses were used for verification of the postulated hypotheses. The results of the study showed that, the teachers experienced both low level of stress and anxiety, there was significant difference in the teachers' mean anxiety index according to educational qualification that is teachers with higher educational qualification (e.g., B.Sc. & above) had lower anxiety than those with lower qualification. Teachers with NCE had higher mean anxiety index than teachers who had B.Sc. and above. The anxiety level suffered by the teachers when gender was considered was that male teachers had lower anxiety than female teachers. Similarly, it was observed that the younger teachers (<40 years,  $R = 1.66$  < 40 > years,  $R = 1.68$ ) were less anxious than their 40 years and above colleagues. In relation to location of school finding, there was no significant relationship between

the mean anxiety index of rural school teachers and urban school teachers. No significant relationship was found in the mean anxiety of teachers when years of work experience was considered. It was recommended that exercise and recreational facilities should be provided in all local government headquarters where the teachers will spend their leisure hours.

### **2.3.9 Relationship Between Anxiety and Three Independent Variables**

Emerole and Olanrewaju (2015) investigated the teaching practice anxiety sources as correlates of teaching performance among student teachers in federal colleges of education in Southwestern Nigeria. Descriptive research design of ex-post-facto was used in the study. One thousand four hundred and sixteen (1,416) respondents were selected from student teachers in federal colleges of education in Southwestern Nigeria. The respondents were measured with self-developed scales and the data obtained was analyzed using Pearson Product Moment Correlation (PPMC) and Multiple Regression Statistical analysis of (SPSS). Three research Questions were raised and answered in the study. The result showed that teaching performance among student teachers was significantly correlated with teaching confidence ( $r = .783$ ;  $p < .05$ ), supervision anxiety ( $r = .613$ ;  $p < .05$ ), content mastery ( $r = .801$ ;  $p < .05$ ), relating with other student teachers ( $r = .832$ ;  $p < .05$ ), relating with students ( $r = .713$ ;  $p < .05$ ), classroom control ( $r = .681$ ;  $p < .05$ ), lesson preparation ( $r = .913$ ;  $p < .05$ ) and lesson presentation ( $r = .837$ ;  $p < .05$ ), independent variables when pulled together had significant effect on the teaching productivity among secondary school teachers ( $R$  (adjusted) = .617 &  $R^2$  (adjusted) = .674) and each of the independent variables made significant contribution to the prediction of teaching performance among student teachers in federal colleges of education. In view of these findings, the study stressed and advocated that the staff and the students prior to the period of teaching practice should be prepared for the task

ahead with a good frame of mind and school counselors should intensify their effort to organize seminars/conferences on the implications of these teaching practice anxiety sources (Teaching confidence, supervision anxiety, content mastery, relating with other student teachers, relating with students, classroom control, lesson preparation and lesson presentation) so as to ameliorate the persistent occurrence of low teaching performance among student teachers in federal colleges of education.

Hughes (2016) examined the relationship of mathematics anxiety, mathematical Beliefs, and instructional practices of elementary school teachers in Georgia. The design of the study was quantitative survey. The study was guided by 3 research questions and 3 hypotheses. Population of the study consisted of 505 elementary teachers from 19 public primary schools in Georgia. The sample size was 153 Pre-K–5 teachers from 19 elementary schools from a suburban school district in the state of Georgia. Data collection was done with the help of 3 adopted instrument using an online survey monkey as a medium of data collection. Data from the survey were analyzed using SPSS, An online survey ([www.surveymonkey.com](http://www.surveymonkey.com)) was used to collect data over a 2-week period in August 2015. Data were collected for the study using three instruments: Descriptive such as means and standard deviations and inferential statistics were used, including correlational and regression procedures. The Pearson product-moment correlation was used to analyze relationships. The result indicated that overall teachers had a lower to neutral sense of mathematics anxiety. The correlational analyses showed a significant negative relationship between mathematics anxiety and instructional practices. The correlational analyses showed a significant, positive relationship between mathematical beliefs and instructional practices. Lastly, multiple linear regressions result on mathematics anxiety and mathematical beliefs were predictors of teachers'

instructional practices. The findings showed the relationship between mathematics anxiety and instructional practices was not significant.

Akinsola (2008) examined psychological variables in predicting problem solving ability of in service mathematics teachers in Bostwana. The design employed in the study was an ex-post facto. Two research questions and 3 hypotheses guided the study. The population of the study was all the in-service mathematics teachers while the sample of the study was 122 in-service mathematics teachers comprising 92 females and 30 males.. Five standardized instruments were used to collect the data on teachers' mathematics anxiety, mathematics teaching efficacy belief, locus of control, study habits and problem solving ability. The data collected were analysed with multiple regression, Chi-square analysis and Pearson moment correlation coefficient. The result revealed no significant relationship was found between in-service teachers with low mathematics anxiety and problem solving ability whilst significant relationship was found between in-service teachers with high mathematics anxiety and problem solving ability. The results show that mathematics anxiety, mathematics teaching efficacy belief, locus of control and study habits all have significant relationships with problem solving ability with mathematics anxiety having the highest contribution. However, the result shows that in-service teachers with low mathematics anxiety had a higher problem solving ability whilst in-service teachers with high mathematics anxiety had a low problem solving ability. The study recommends that a high mathematics teaching efficacy, a low mathematics anxiety, and internal locus of control and a good study habits are essential factors for would be mathematics teacher to be able to perform his teaching tasks creditably and optimally.

Nwimo and Onwunaka (2015) studied the stress among Secondary School Teachers in Ebonyi State, Nigeria: Suggested Interventions in the Worksite Milieu. The aim of the

study was to determine the level of stress experienced by secondary school teachers in Ebonyi State. The dimensions of stress studied included physical stress (PHS), mental stress (MTS), emotional stress (EMS) and social stress (SOS). The study adopted the cross-sectional survey design. Using a sample of 660 (male 259, female 401) teachers were randomly drawn from 33 secondary schools in Ebonyi State. The secondary schools were selected from two (Abakaliki and Afikpo) out of three education zones in Ebonyi State. In each school, 20 teachers were randomly selected using systematic random sampling technique. A self-developed instrument titled: Teacher Stress Questionnaire (TSQ) was used to collect data for the study. Five experts in Health Education and Psychology validated the TSQ. Data collected from 30 secondary school teachers yielded an overall reliability coefficient of  $r = 0.72$ . The researchers personally collected the data which were analysed using mean, standard deviation, t-Test, Pearson's correlation and Stepwise Multiple Regression. Six hundred and fourteen copies (male 232, female 382) of the questionnaire, representing about 93% return rate, were used for analysis.

The results showed that the secondary school teachers had a high level of stress and the difference in the level of stress reported by male and female teachers was significant with male teachers reporting higher level of stress than female teachers. It was observed that the relationship between the overall level of stress and each of its dimensions was significant. This indicates that each dimension contributed significantly to the level of stress reported by the secondary school teachers. The regression B weight (range  $B = 0.190-0.428$ ) indicated that each dimension accounted for not less than 19.0% of the variance. This is an indication that each dimension could, to some extent, predict the level of stress which teachers experience. Each dimension of stress contributed significantly to the overall level of stress experienced by the secondary school teachers.

The study recommended interventions, such as stress management, which can be carried out to reduce stress in the worksite.

Haciomeroglu (2014) examined the structure of elementary pre-service teachers' mathematics anxiety and mathematics teaching anxiety in Turkey. The design of the study was cross-sectional survey. The population of the study was all the elementary pre-service mathematics teachers'. The sample of the study was 260 (165 females and 95 males) elementary pre-service mathematics teachers. Data were collected with two instruments (an adopted Turkish Mathematics Anxiety Rating Scale Short Version and the Mathematics Teaching Anxiety Scale). Data were analyzed with descriptive (mean and standard deviation) and inferential statistics (pearson product moment correlation). Results revealed that the relationships between social and content knowledge, and application and content knowledge were found to be non-significant at  $F(5, 254) = 29.29, p > 0.05$ , respectively. These findings demonstrated that application and social anxiety were unrelated to content knowledge. Results of the standard multiple regression analysis was demonstrated that overall there was a significant relationship between predictors (i.e., test, course, and computation) and content knowledge anxiety related to mathematics teaching. This present study revealed that elementary pre-service teachers held a low-level of mathematics anxiety.

Peker and Ertekin (n.d.), the aim of this study is to examine the relationship between pre-service teachers' anxiety levels in relation to teaching of mathematics and their mathematics anxiety levels, as well as to determine gender differences in these two anxieties. Survey research design was adopted for the study. A total of 316 pre-service teachers were involved in this study. Of the total, 100 were pre-service primary school teachers, 115 were pre-service elementary mathematics teachers, and 101 were pre-service secondary mathematics teachers. A 23-item Mathematics Teaching Anxiety

Scale and a 45-item Mathematics Anxiety Scale were used in data collection. Data analysis involved Pearson Product Moments Correlation Coefficient analysis in order to investigate the relationship between mathematics teaching anxiety and mathematics anxiety and an independent samples t-test in order to examine gender differences in mathematics teaching anxiety and mathematics anxiety. The results indicated a positive, moderate relationship between pre-service teachers' mathematics teaching anxiety and mathematics anxiety. That is the pre-service teachers' mathematics teaching anxiety was found to increase when their mathematics anxiety increased.. Anxiety towards the mathematics lesson, "anxiety caused by content knowledge", Anxiety caused by self-confidence, and anxiety by attitude towards a moderate, positive relationship was observed between total and mathematics anxiety teaching mathematics caused by regarding no significant gender differences were found in pre-service teachers' mathematics teaching anxiety and mathematics anxiety. This study recommends that teacher educators should recognize their students' mathematics anxiety and teaching anxiety. If teacher educators recognize their students' mathematics anxiety level they may help them to increase their confidence in mathematics teaching.

#### **2.4 Summary of Related Literature Have Been Reviewed**

Plethora of studies on out-of-field abounds in literature. Researchers have worked on the existence of OOF teaching and it's implication on teachers and students in the western world (Ingersoll, 1998, 1999, 2004; Cinkir& Kurum, 2015). More so, literature on OOF teaching hovers around live experiences of OOF teachers and the implication of this practice on school management (Du Plessis, 2014, Du Plessis, 2015). In Malaysia and Turkey the growing studies on OOF surrounds relationship and differences of in-field and OOF teaching in different disciplines (Salleh, 2013) while Nixon *et al.* (2017) in USA examined how Chemistry teachers use the repertoire knowledge in Chemistry to negotiation and teach Biology. It appears that not many

researchers focused on the anxiety of OOF teachers. This specific group has largely been ignored especially in Nigeria with special emphasis in Niger State. No study of such nature have been carried out in the State, therefore, there is a need to further understand the complicated nature of OOF anxiety in this specific group of teachers in sciences with particular reference to Biology subject.

Many research on anxiety are mostly on teaching anxiety of pre service teachers' with central attention on the causes and coping strategies have been conducted. The result of such study revealed that the intensity of respondents' anxiety was positively related to several situational variables. Finally, a large body of research surrounds mathematics and the causes of anxiety in teachers and students. The result of such studies indicates that mathematics anxiety is cyclic and can be transferred to the student there by causing Underachievement in mathematics. There is limited number of studies relating OOF teachers or under qualified teachers' anxiety with their classroom practices in this part of the world, especially in Niger State. Hence, this research tends to investigate the impact of out-of-field secondary school Biology teachers' anxiety on Content Mastery, Classroom Management on Pedagogical Content Knowledge in Niger State, Nigeria.

## CHAPTER THREE

### 3.0 RESEACRCH METHODOLOGY

#### 3.1 Research Design

The research design that was adopted for this study is the Correlational research design. A correlational study is a type of research design where the researcher seeks to understand what kind of relationship variables have with one another and how they interact with one another. It seeks to figure out if two or more variables are related and if so why. This means that an increase or decrease in one variable corresponds to an increase in the other variable. According to Cresswel (2012), a correlation is a statistical test that determine the tendency for two or more variables or two sets of data to vary consistently. This imply that, two variables sharing common variance or the covary together (predicting a score on one variable with the knowledge about the individual's score on another variable). Correlation research design has the advantage of analyzing the relationship among a large number of variables in a single study. It also permit the researcher to know the degree and direction of the relationship (Crawford & Brown, 2014).

#### 3.2 Population of the Study

The population of this study is all the Out-of-field Secondary School teachers' in all the senior Secondary Schools in Niger State. The population of this study is six hundred and sixty-six (666) out-of-field Biology teachers' (MoE, 2018). Out of this number, three hundred and twenty eight (328) (M= 199, F=129) are from public schools while three hundred and thirty eight (338) (M=216, F=122) are from private schools. This data is obtained from all the five hundred and forty three (543) public and private senior Secondary Schools in Niger State. Out of this number, two hundred and ninety three (293) are public senior Secondary Schools while two hundred and fifty (250) are private

senior Secondary Schools respectively. This data is obtained from Planning Research and Statistics unit (PRS) of Niger State Ministry of Education (2019).

**Table 3.1: Distribution of Population of Senior Secondary Schools in Niger State by Zones and School Ownership in 2018/2019 Academic Session.**

<b>S/N</b>	<b>Educational Zones</b>	<b>Senatorial Zones</b>	<b>Public SSS in each zones</b>	<b>Private SSS in each zone</b>	<b>Total</b>
1	Minna	B	88	100	188
2	Bida	A	61	30	91
3	Kutigi	A	49	8	57
4	Suleja	B	30	80	110
5	Kontagora	C	28	22	50
6	New-Bussa	C	21	7	28
7	Rijau	C	16	3	19
	<b>Total</b>		<b>293</b>	<b>250</b>	<b>543</b>

**Source: MoE (PRS), (2018)**

**Table 3.2: Distribution of population of out-of-field Biology teachers' by Zones and School Ownership based on gender in 2018/2019 for Public Schools and Private Schools**

S/N	Educational Zones	Senatorial Zones	Public SSS		Private SSS		Total
			M	F	M	F	
1	Minna	B	71	50	66	46	233
2	Bida	A	37	24	40	18	119
3	Kutigi	A	25	14	5	4	48
4	Suleja	B	41	26	73	35	175
5	Kontagora	C	10	6	22	13	51
6	New-Bussa	C	9	6	7	4	26
7	Rijau	C	6	3	3	2	14
	Total		199	129	216	122	666

Source: MoE (PRS), (2018)

**M=Male; F=Female**

### 3.3 Sample and Sampling Techniques

A sample is a subset of a population from which data for a study is collected (Bello, 2014). A multi-stage sampling technique was used in this study. Firstly, stratified sampling techniques was used in selecting schools based on the existing seven educational Zones in Niger State, while random sampling technique was adopted in picking the respondents who are Biology teachers across the seven educational Zones in Niger State. During stratified random sampling, the researcher divided the entire population into subgroups then selects the final subject proportionally from different

strata. In stratified sampling, equal fraction was selected from each subgroup. This is to ensure uniformity in the total number of respondents that were used for the study. At the initial stage, 226 senior secondary schools were selected from 543 senior secondary schools from public and private for this study (Krejcie and Morgan, 1970). Out of this number, 122 schools were selected from public schools while 104 schools were selected from private schools. However, from the public sector, 47 SSS were selected from Zone A (Bida and Kutigi Educational zones); 49 from zone B ( Minna and Suleja Educational zones) and 27 from zone C ( Kontagora, New-Bussa and Rijau Educational zones). From the private sector, 15 SSS were selected from Zone A, 75 were selected from zone B and 14 from zone C respectively.

At the second stage, random sampling technique was adopted in selecting the respondents who are out-of-field Biology teachers across the seven educational Zones in Niger State. The out-of-field Biology teachers' that were selected for this study was five hundred and one (501) (private = 246 & public =255) (Krajcie & Morgan, 1970). See the distribution table 3.3.4 and 3.3.5.

Third stage Five (5) respondent were selected from each school in their respective Local Government Areas.

**Table 3.3.4: Distribution of Sample of Out-of-field SSS Biology teachers' for Public and Private Schools by gender**

S/N	Educational Zones	Public schools			Private schools		
		S	M	F	S	M	F
1	Minna	97	58	39	82	60	22
2	Bida	47	30	17	42	28	14
3	Kutigi	30	19	11	07	06	01
4	Suleja	50	35	15	79	50	29
5	Kontagora	12	09	03	25	21	04
6	New Bussa	12	08	04	08	06	02
7	Rijau	07	05	02	03	03	00
	Total	255	163	92	246	174	72

**Source:** Niger State Ministry of Education (2018)

**Note:** S= Sample; M= Male; F=Female

### 3.4 Instrument for Data Collection

Three research instruments were developed by the researcher for eliciting opinions or views from respondents on Biology teachers' anxiety. The three instruments are namely; Out-of-field Secondary School Biology Teachers' Anxiety on Content Mastery Questionnaire; Out-of-field Secondary School Biology Teachers' Anxiety on Pedagogical Content Knowledge Questionnaire; Out-of-field Secondary School Biology Teachers' anxiety on Classroom Management Techniques. Fifteen (15) anxiety constructs was used to develop each of the three questionnaires for the research. (See appendix A). Anxiety questions were formulated considering anxiety triggers obtained

from literature, These includes anxiety arising from lack of content mastery, anxiety arising from lack of self-confidence, anxiety arising from the attitude towards teaching and anxiety arising from lack of teaching knowledge.

#### **3.4.1. Out-of-field Secondary School Biology Teachers' Anxiety on Content Mastery Questionnaire**

The instrument is called Out-of-field Secondary School Biology teachers' anxiety on Content Mastery Questionnaire (OFBIOTACMQ). This is an adapted 5-point Likert rating scale type. The five (5) constructs of strongly agree, agree, undecided, disagree, and strongly disagree were changed to five (5) anxiety continuum of always anxious (AA), moderately anxious (OA), sometimes anxious (SA), rarely anxious (RA), and never anxious (NA). The weighing of the construct remained the same as 5,4,3,2, and 1 for positive items and 1,2,3,4, and 5 for negative items. The OFBIOTAQ is divided into sections A and B. Section A deals with demographic information and section B contains features of Fifteen (15) items based on the sub structure about anxiety on content mastery of Biology curriculum starting from planning to execution to evaluation by the OOF Biology teachers. This instrument enable the researcher to determine the out-of-field secondary school Biology teachers' anxiety that will be brought about during instruction.

#### **3.4.2. Out-of-field Secondary School Biology Teachers' Anxiety on Pedagogical Content Knowledge Questionnaire**

The second instrument is tagged OFBIOTAPCKQ. This instrument was constructed by the researcher along a 5- point Likert rating scale. It measured the out-of-field Secondary School Biology teachers' anxiety on PCK. The questionnaire was developed based on five (5) components of science PCK identified, which are knowledge of

subject matter, knowledge of instructional strategies, knowledge of concept representational, knowledge of teaching objectives and context, knowledge of students understanding and evaluation.

**3.4.3** Out-of-field Secondary School Biology Teachers' anxiety on Classroom Management. The third instrument is the Out-of-field Biology Teachers' anxiety on Classroom Management Technique, which is tagged (OFBIOTACMQ) .This questionnaire, assessed the out-of-field Biology teachers' anxiety on their Classroom Management techniques. Constructs used for developing items on this questionnaire was based on various classroom management approaches found in literature. This includes assertive discipline, re-enforcement (positive and negative), punishment (positive and negative), and motivation (extrinsic and intrinsic).

### **3.5 Validation of the Instruments**

The instruments for data collection were validated by three experts. One research expert from Science Education Departments in Ibrahim Badamasi Babangida University (IBBU) Lapai and two from Federal University of Technology Minna (FUT) out of which one was a psychologist were given the instruments for content, construct and face validation. These experts checked for content specificity, construct relatedness and general outlook of the instrument for appropriateness and fitness for purpose of the research study. They also examine the clarity and simplicity of the questionnaire. Their comments and suggestions were incorporated in the production of the final instruments that were used for the study.

### **3.6 Reliability of Instruments**

The validated questionnaires were pilot tested in some selected senior Secondary Schools that are not involved in the final study, which are however within the population of the study. The pilot test was to determine the reliability of the instruments designed for the study. The researcher alongside with one trained research assistant administered the questionnaires using the face to face administration method. The filling and returning of the three instruments per respondents lasted for about two hours.

During the test, the three instruments were separated and analyzed as follows; The three out-of-field secondary school Biology teachers' anxiety questionnaires were administered to fifteen (15) out-of-field Secondary School Biology teachers' in public senior Secondary Schools and fifteen (15) private senior Secondary Schools which are not involved in the main study but are within the population of the study. Cronbach Alpha was used to calculate the reliability of the collected data. The calculation was carried out with the aid of IBM SPSS version 23 Computer Software. The reliability coefficients obtained for each of the instruments are as follow. The reliability coefficient of Content Mastery questionnaire was calculated to be 0.85; that of Pedagogical Content Knowledge was found to be 0.84; and Classroom Management Techniques was calculated to be 0.86.

### **3.7 Method of Data Collection**

The researcher first visited the various sampled schools to get familiar with the school management and to seek for their consent to use their school for the study. Thereafter, the researchers obtained permission from the school authorities used for the study. The consent of participants were equally sought and obtained. After the consent of the participants was obtained, the researchers administered copies of the instrument with

explanation on the purpose of the research and how to complete them. Two month was used for visitation and training of the research assistants in different senior secondary schools that was used for the study. The researcher trained the research assistants that were involved in the study. The researcher with one research assistant administered the questionnaires. Five months was used for the administration and collection of research instruments across all the selected senior secondary schools in both public and private schools in Niger State. The research instruments were administered on the spot to the respondents using the face-to- face administration. The filling of the questionnaire lasted for one and half to two hours. See appendix C.

### **3.8 Method of Data Analysis**

Data collected were analyzed using descriptive statistics. Frequency count, Percentages (%), bar charts, scattered plot, Mean and Standard Deviation were used in answering the research questions raised while inferential statistics such as linear and multiple regressions analysis were used to analyze data for hypotheses testing at 0.05 level of significance. The analysis was carried out with the aid of IBM SPSS version 23.

## CHAPTER FOUR

### 4.0

### RESULT AND DISCUSSIONS

#### 4.1 Answer to Research Questions

**4.1.1 Research Question One:** What is the level of anxiety of out-of-field Biology teachers' on Content Mastery?

To answer research question one, mean and standard deviation was employed, and the result is presented in Table 4.1

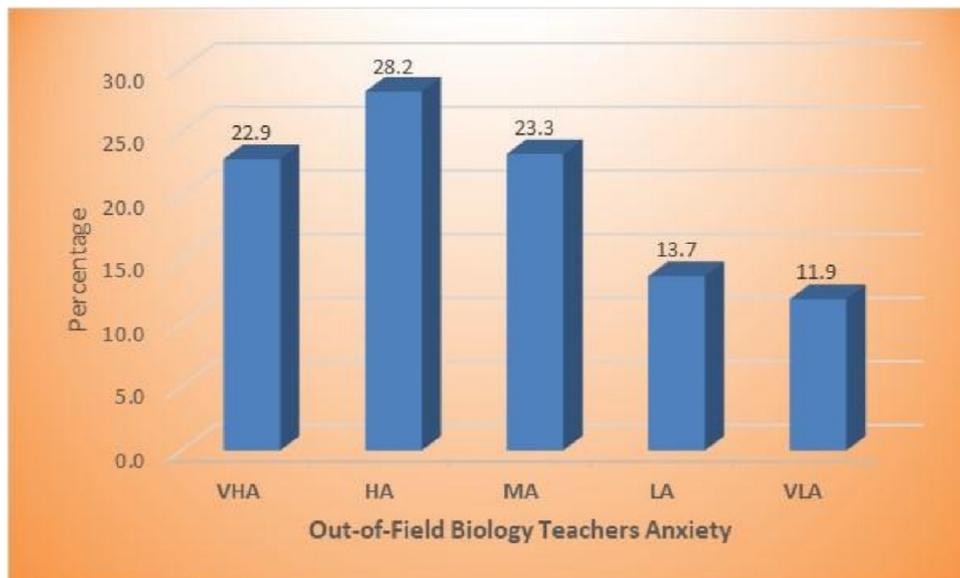
**Table 4.1 Mean and Standard Deviation of out-of-field Biology teachers' Anxiety on Content Mastery**

ITEMS	N	VHA (%)	HA (%)	MA (%)	LA (%)	VLA (%)	Mean	Std. Deviation
1	501	151 (30.1)	145 (28.9)	80 (16.0)	63 (12.6)	62 (12.4)	3.52	1.360
2	501	85 (17.05)	138 (27.5)	115(23.0)	68 (13.6)	95(19.0)	3.10	1.357
3	501	113(22.6)	131(26.1)	129(25.7)	70 (14.0)	58 (11.6)	3.34	1.286
4	501	123 (24.6)	150(29.9)	97 (19.4)	73 (14.6)	58 (11.6)	3.41	1.313
5	501	140 (27.9)	128 (25.5)	104 (20.8)	77 (15.4)	52 (10.4)	3.45	1.319
6	501	134 (26.7)	124 (24.8)	125 (25.0)	72 (14.4)	46 (9.2)	3.46	1.275
7	501	132 (26.3)	154 (30.7)	105 (21.0)	59 (11.8)	51 (10.2)	3.51	1.275
8	501	91 (18.2)	166 (33.1)	116 (23.2)	72 (14.4)	56 (11.2)	3.33	1.243
9	501	129 (25.7)	133 (26.5)	126 (25.1)	63 (12.6)	50 (10.0)	3.46	1.271
10	501	115 (23.0)	141 (28.1)	121 (24.2)	80 (16.0)	44 (8.8)	3.41	1.245
11	501	97 (19.4)	167 (33.3)	125 (25.0)	69 (13.8)	43 (8.6)	3.41	1.193
12	501	132 (26.3)	154 (30.7)	117 (23.4)	48 (9.8)	50 (10.0)	3.54	1.253
13	501	102 (20.4)	143 (28.5)	128 (25.5)	72 (14.4)	56 (11.2)	3.33	1.260
14	501	82 (16.4)	129 (25.7)	140 (27.9)	63 (12.6)	87 (17.4)	3.11	1.313
15	501	96 (19.2)	120 (24.45)	122 (24.4)	76 (15.2)	87 (17.4)	3.12	1.357
Total Average	501	(22.92)	(28.2%)	(23.3)	(13.68)	(11.9)	3.36	1.288

Table 4.1 shows the mean and standard deviation of out-of-field Biology teachers' Anxiety on Content Mastery. The findings indicated that in all the items the mean of the respondents is between 3.10 - 3.54 while the grand mean was 3.36. The decision rule was based on the average of a five-point Likert scale which is 3.0. Therefore, a mean response of less than 3.0 is considered low anxiety, while a mean of 3.0 and above is considered high anxiety. Indicating that the respondents in this population agree that out-of-field Biology teachers have high Anxiety on Content Mastery given the grand mean of 3.36. The standard deviation of the respondents is between 1.19 – 1.36,

indicating that the standard deviation means in the data set are close to the group mean of the data set.

The findings on Table 4.1 is further highlighted in a graphical form and the results is presented in Figure 4.1



**Figure 4.1:** The total percentage of the anxiety of out-of-field Biology teachers' content mastery

**KEY:**

**VHA:** Very Highly Anxious, **HA:** Highly Anxious, **MA:** Moderately Anxious, **LA:** Low Anxious

**VLA:** Very Low Anxious

Figure 4.1 shows the total percentage of the anxiety of out-of-field Biology teachers' content mastery. The result shows that 28.2%, 23.3% and 22.9 of the respondents in the population agree that out-of-field Biology teachers have high, moderate and very high anxiety towards content mastery respectively. On the contrary, 13.7% and 11.9% agree that out-of-field Biology teachers have low and very low anxiety towards content mastery respectively.

**4.1.2 Research Question Two:** What is the level of anxiety of out-of-field Biology teachers' Classroom Management?

Descriptive statistics of Mean and Standard deviation were used to answer this research question and the results is presented in Table 4.2

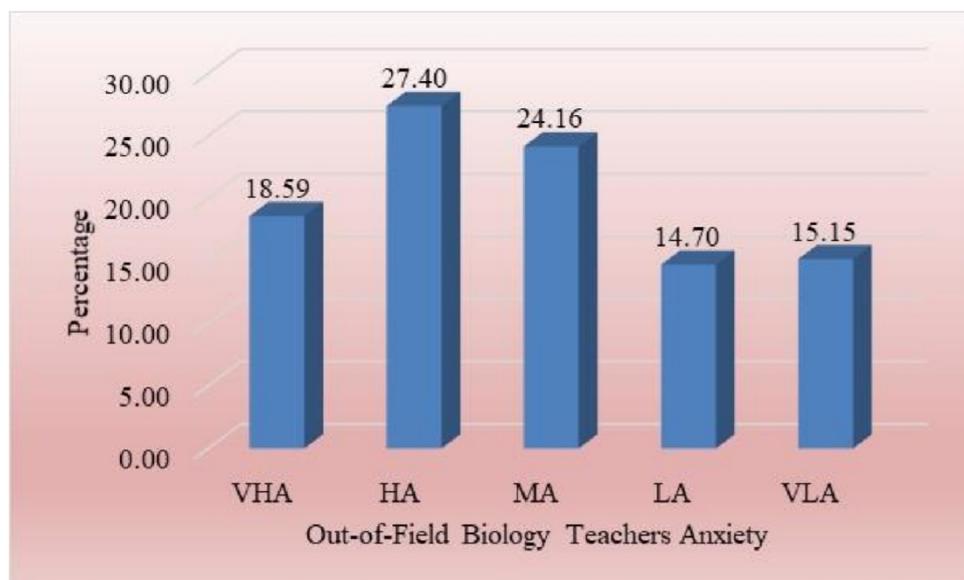
**Table 4.2 Mean and Standard Deviation of out-of-field Biology teachers' Anxiety on Classroom Management**

ITEMS	N	VHA (%)	HA (%)	MA (%)	LA (%)	VLA (%)	Mean	Std. Deviation
1	501	104 (20.8)	129 (25.7)	119 (23.8)	79 (15.8)	70 (14.0)	3.24	1.324
2	501	81 (16.2)	151 (30.1)	124 (24.8)	77 (15.4)	68 (13.6)	3.20	1.268
3	501	80 (16.0)	151 (30.1)	129 (25.7)	61 (12.2)	80 (16.0)	3.18	1.293
4	501	133 (26.5)	129 (25.7)	102 (20.4)	71 (14.2)	66 (13.2)	3.39	1.368
5	501	92 (18.4)	154 (30.7)	126 (25.1)	77 (15.4)	52 (10.4)	3.31	1.231
6	501	109 (21.8)	140 (27.9)	128 (25.5)	71 (14.2)	53 (10.6)	3.36	1.260
7	501	113 (22.6)	127 (25.3)	112 (22.4)	94 (18.8)	55 (11.0)	3.30	1.303
8	501	75 (15.0)	136 (27.1)	126 (25.1)	86 (17.2)	78 (15.6)	3.09	1.289
9	501	88 (17.6)	113 (22.6)	124 (24.8)	72 (14.4)	104 (20.8)	3.02	1.380
10	501	58 (11.6)	144 (28.7)	132 (26.3)	83 (16.6)	84 (16.8)	3.02	1.261
11	501	76 (15.2)	114 (22.8)	125 (25.0)	74 (14.8)	112 (22.4)	3.00	1.370
12	501	86 (17.2)	117 (23.4)	133 (26.5)	65 (13.0)	100 (20.0)	3.05	1.360
13	501	123 (24.6)	157 (31.3)	87 (17.4)	65 (13.0)	69 (13.8)	3.40	1.349
14	501	89 (17.8)	163 (32.5)	121 (24.2)	60 (12.0)	68 (13.6)	3.29	1.272
15	501	88 (17.6)	139	128	68	78 (15.6)	3.18	1.307

			(27.7)	(25.5)	(13.6)			
<b>Total</b>	<b>501</b>	<b>(18.59)</b>	<b>(27.4)</b>	<b>(24.16)</b>	<b>(14.7)</b>	<b>(15.15)</b>	<b>3.20</b>	<b>1.309</b>
<b>Average</b>								

Table 4.2 shows the mean and standard deviation of out-of-field Biology teachers' anxiety on classroom management. The findings indicated that in all the items, the mean of the respondents is between 3.00 - 3.40 while the grand mean is 3.20. The decision rule was based on the average of a five-point Likert scale which is 3.0. Therefore, a mean response of less than 3.0 is considered low anxiety, while a mean of 3.0 and above is considered high anxiety. However, this indicates that the respondents in this population agree that out-of-field Biology teachers have high Anxiety on classroom management. Given the grand mean of 3.20. The standard deviation of the respondents is between 1.23 – 1.38, indicating that the standard deviation means in the data set are close to the group mean of the data set.

The findings on Table 4.2 is further highlighted in a graphical form and the results is presented in figure 4.2



**Figure 4.2:** the total percentage of the anxiety of out-of-field Biology teachers' classroom management.

**KEY:**

**VHA:** Very Highly Anxious, **HA:** Highly Anxious, **MA:** Moderately Anxious, **LA:** Low Anxious

**VLA:** Very Low Anxious

Figure 4.2 shows the total percentage of the anxiety of out-of-field Biology teachers' classroom management. The result shows that 27.40%, 24.16% and 18.59 of the respondents in the population agree that out-of-field Biology teachers have high, moderate and very high anxiety towards classroom management respectively. On the contrary, 14.70% and 15.15% agree that out-of-field Biology teachers have low and very low anxiety towards classroom management respectively.

**4.1.3 Research Question Three:** What is the relationship between out-of-field Biology teachers' anxiety on Content Mastery and Pedagogical Content Knowledge (PCK)?

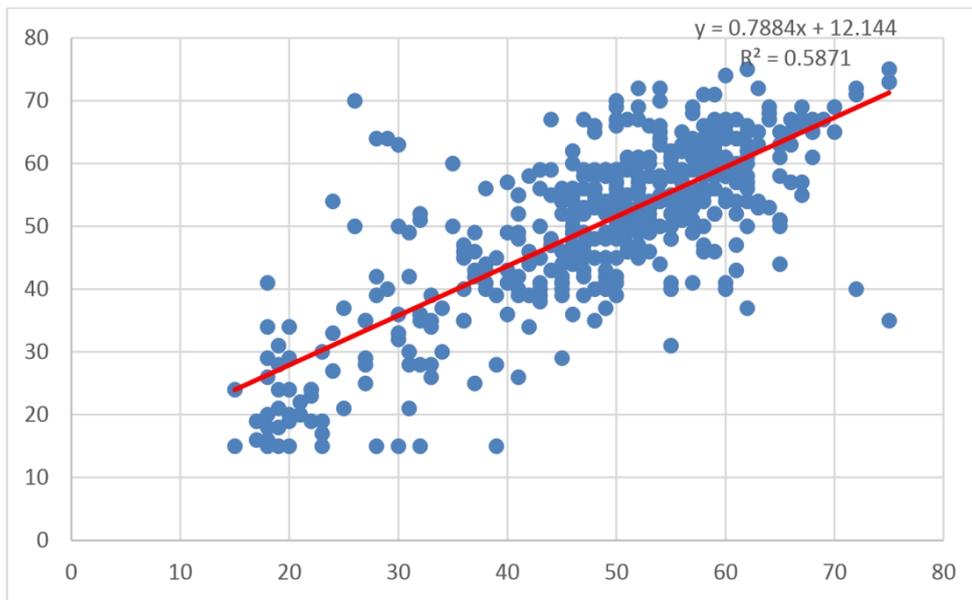
The descriptive statistics of Mean and Standard Deviation were used to answer this research question and the summary of the result is presented in Table 4.3

**Table 4.3: Out-of-field Biology teachers' anxiety on Content Mastery and Pedagogical Content Knowledge**

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Mean difference</b>
Pedagogical Content Knowledge	501	48.64	12.77	1.85
Content Mastery	501	50.49	13.14	

Table 4.3 shows that mean and standard deviation of out-of-field Biology teachers' anxiety on Content Mastery and Pedagogical Content Knowledge. The finding shows the computed Mean score of 48.64 with Standard Deviation of 12.77 for out-of-field Biology teachers' pedagogical content knowledge and Mean score of 50.49 with standard Deviation of 13.14 for out-of-field Biology teachers' anxiety on Content Mastery. This gives Mean difference of 1.85 between their Pedagogical Content

Knowledge and Content Mastery. Therefore, linear regression was used to determine the relationship between the two constructs. The finding is highlighted using a scattered plot in figure 4.3



**Figure 4.3** above is a Scattered Plot on the Relationship between Out-Of-Field Biology Teachers' anxiety on Content Mastery and Pedagogical Content Knowledge.

The scattered plot indicates that there seem to be a positive relationship between the two construct. Therefore, linear regression was used to determine the strength of the relationship.

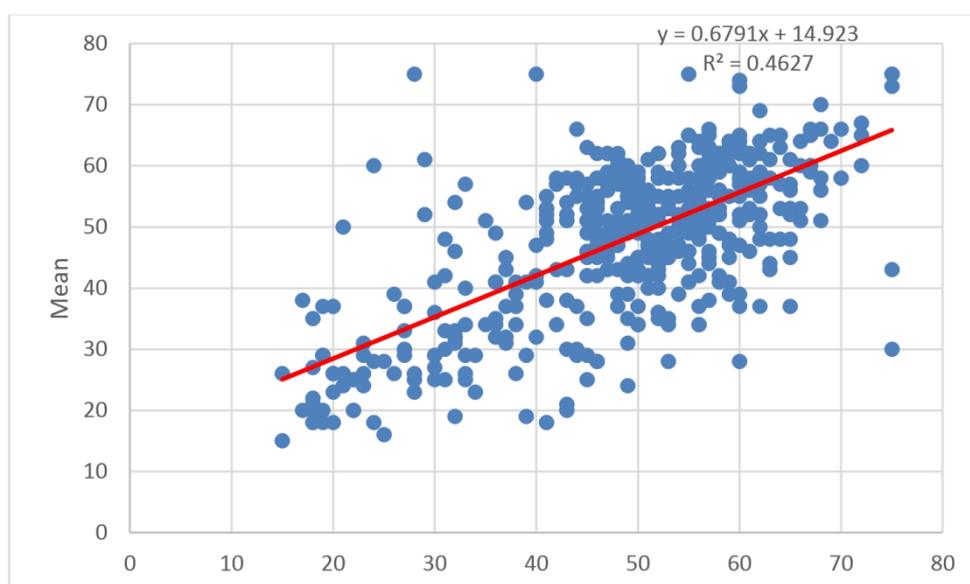
**4.1.4 Research Question Four:** What is the relationship between out-of-field Biology teachers' anxiety on Classroom Management and Pedagogical Content Knowledge (PCK)? This research question was answered using descriptive statistic of Mean and Standard Deviation, and the summary of the result is presented in Table 4.4

**Table 4.4: Out-of-field Biology teachers' anxiety on Classroom Management and Pedagogical Content Knowledge**

Variable	N	Mean	Standard	Mean
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		Deviation difference		
Pedagogical Content Knowledge	501	48.64	12.77	0.69
Classroom management	501	47.95	12.75	

Table 4.4 shows that Mean and Standard Deviation of out-of-field Biology teachers' anxiety on Classroom Management and Pedagogical Content Knowledge. The finding shows the computed Mean score of 48.64 with Standard Deviation of 12.77 for out-of-field Biology teachers' pedagogical content knowledge and Mean score of 47.95 with standard Deviation of 12.75 for out-of-field Biology teachers' anxiety on classroom management. This gives Mean difference of 0.69 between their pedagogical content knowledge and classroom management. Therefore, linear regression was used to determine the relationship between the two constructs. The finding is highlighted using a scattered plot in figure 4.4.



**Figure 4.4 above is a Scattered Plot on the Relationship between Out-Of-Field Biology Teachers' anxiety on Classroom Management and Pedagogical Content Knowledge.**

The scattered plot indicates that there seem to be a positive relationship between the two construct. Therefore, linear regression was used to determine the strength of the relationship.

**4.1.5 Research Question Five:** What is the correlation between out-of-field Biology teachers' anxiety on Content Mastery, school type, school location, gender, years of teaching experience, educational qualification on Pedagogical Content Knowledge?

The descriptive statistics of Mean and Standard Deviation were used to answer this research question and the summary of the result is presented in Table 4.5

**Table 4.5: Out-of-field Biology Teachers' anxiety on Content Mastery, Demographic and School factors on Pedagogical Content Knowledge**

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Standard Deviation</b>
Pedagogical Content Knowledge	501	48.64	12.77
School Type	501	1.48	.524
School Location	501	1.52	.523
Gender	501	1.33	.472
Qualification	501	4.31	2.321
Years of Experience	501	1.87	.776
Certificate	501	1.47	.500
Content Mastery	501	50.49	12.75

Table 4.5 shows that mean and standard deviation of out-of-field Biology teachers' anxiety Content Mastery, Pedagogical Content Knowledge, demographic and school

factors. The finding shows that the computed mean score of 48.64 with Standard Deviation of 12.77 for out-of-field Biology teachers' Pedagogical Content Knowledge and Mean score of 50.49 with standard Deviation of 12.75 for out-of-field Biology teachers' anxiety on Content Mastery. Similarly, the mean of school factors (school type, school location) are 1.48 and 1.52 respectively and their standard deviations are .52 and .53 respectively. The data also shows the mean of out-of-field Biology teachers' gender, qualification, years of experience and certificates; 1.33, 4.31, 1.87 and 1.47 respectively while their standard deviations are .47, 2.32, .77, and .50 respectively. Therefore, multiple regression was used to determine the relationship between these constructs and pedagogical content knowledge.

**4.1.6 Research Question six:** What is the correlation between out-of-field Biology teachers' anxiety on Classroom Management, school type, school location, gender, years of teaching experience, educational qualification on Pedagogical Content Knowledge?

The descriptive statistics of Mean and Standard Deviation was used to answer the research question and the summary of the result is presented in Table 4.6

**Table 4.6: Out-of-field Biology Teachers' anxiety on Classroom Management, Demographic and school factors on Pedagogical Content Knowledge**

Descriptive Statistics			
N	Mean	Standard Deviation	
Pedagogical_Content_knowledge	48.64	12.777	501
SCHTYPE	1.48	.524	501
LOCA	1.52	.523	501
GENDER	1.33	.472	501

QUALI	4.31	2.321	501
YEAROFEXP	1.87	.776	501
CERTIFY	1.47	.500	501
Class Management Total	47.95	12.756	501

Table 4.6 shows that mean and standard deviation of out-of-field Biology teachers' anxiety on Classroom Management, demographic and school factors on Pedagogical Content Knowledge, The finding shows that the computed 4mean score of 48.64 with Standard Deviation of 12.77 for out-of-field Biology teachers' Pedagogical Content Knowledge and Mean score of 47.95 with standard Deviation of 12.75 for out-of-field Biology teachers' Classroom Management. Similarly, the mean of school factors (school type, school location) are 1.48 and 1.52 respectively, their standard deviations are .52 and .53 respectively. The data also shows the mean of out-of-field Biology teachers' gender, qualification, years of experience and certificates; 1.33, 4.31, 1.87 and 1.47 respectively while their standard deviations are .47, 2.32, .77, and .50 respectively. Therefore, multiple regression was used to determine the relationship between these constructs and Pedagogical Content Knowledge.

## 4.2 Analysis of Null Hypotheses

### 4.2.1 Hypothesis one

HO<sub>1</sub>: there is no significant relationship between out-of-field Biology teachers' anxiety on Content Mastery and Pedagogical Content Knowledge (PCK).

This formulated null hypothesis was tested using linear regression and the summary of the results is presented in Table 4.7

**Table 4.7a: Linear Regression Model Summary Showing the Influence of OOF Biology teachers' anxiety on Content Mastery and Pedagogical Content Knowledge**

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate
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1	.766 <sup>a</sup>	.587	.586	8.219
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Table 4.7a shows the regression coefficient for the independent variable; Content Mastery. The result shows  $r(1,499) = 0.766$ ,  $r^2 = 0.587$ . This indicates that 58.7% of the total variance in out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge (PCK) is accounted by Content Mastery. To determine whether the model was a good predictor, ANOVA result was presented Table 4.7b

**Table 4.7b: Regression ANOVA of OOF Biology teachers' anxiety on Content Mastery and Pedagogical Content Knowledge**

Model		Sum of Squares	df	Mean Square	F <sub>cal</sub>	Sig.
1	Regression	47920.993	1	47920.993	709.469	.000 <sup>b</sup>
	Residual	33704.891	499	67.545		
	Total	81625.884	500			

Table 4.7b displays ANOVA results. The findings shows that there is a significant relationship between the predictor (Content Mastery) and the criterion variables (pedagogical content knowledge)  $F(1,499) = 709.469$ ,  $p(0.00) < 0.05$ . This indicates that the model is a good predictor.

**Table 4.7c: Linear Regression Coefficient between OOF Biology teachers' anxiety on Content Mastery and Pedagogical Content Knowledge**

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.040	1.458		7.569	.000
	Content mastery	.745	.028	.766	26.636	.000

Table 4.7c shows the regression coefficient between content mastery and pedagogical content knowledge. The result shows that out-of-field Biology teachers' anxiety on content mastery is a significant predictor of their anxiety in pedagogical content knowledge ( $B = .75$ ,  $t = 26.63$ ,  $p(0.00) < 0.05$ ). The regression coefficient indicates that for any increase in one unit of out-of-field Biology teachers' anxiety in content mastery will cause an increase in 11.04 anxieties in pedagogical content knowledge.

#### 4.2.2 Hypotheses Two

**HO<sub>2</sub>:** there is no significant relationship between out-of-field Biology teachers' anxiety on Classroom Management and Pedagogical Content Knowledge (PCK). This formulated null hypothesis was tested using linear regression and the summary of the results is presented in Table 4.8

**Table 4.8a; Linear Regression Model Summary Showing the Influence of OOF Biology teachers' anxiety on Classroom Management and Pedagogical Content Knowledge**

<b>Model Summary<sup>b</sup></b>									
<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>	<b>R Square Change</b>	<b>F Change</b>	<b>df1</b>	<b>df2</b>	<b>Sig. F Change</b>
1	.680 <sup>a</sup>	.463	.462	9.375	.463	429.792	1	499	.000

a. Predictors: (Constant), Classroom Management

b. Dependent Variable: Pedagogical\_Content\_knowledge

Table 4.8a shows the regression coefficient for the independent variable; classroom management. The result shows  $r(1,499) = 0.680$ ,  $r^2 = 0.463$ . This Indicates that 46.2% of the total variation in out-of-field Biology teachers' anxiety on Pedagogical Content

Knowledge (PCK) is accounted by classroom management. To determine whether the model was a good predictor, ANOVA result was presented Table 4.8b

**Table 4.8b: Regression ANOVA of the OOF Biology teachers' anxiety on classroom management and Pedagogical Content Knowledge**

ANOVA <sup>a</sup>						
Model	Sum of Squares	Df	Mean Square	Feat	Sig.	
1	Regression	37771.790	1	37771.790	429.792	.000 <sup>b</sup>
	Residual	43854.094	499	87.884		
	Total	81625.884	500			

a. Dependent Variable: Pedagogical\_Content\_knowledge

b Predictors: (Constant), Classroom Management

Table 4.8b display ANOVA results. The findings shows that there is a significant relationship between the predictor (classroom management) and the criterion variables (pedagogical content knowledge)  $F(1,499) = 429.782$ ,  $p(0.00) < 0.05$ . Indicating that the model is a good predictor.

**Table 4.8c: Linear Regression Coefficient between Classroom Management and Pedagogical Content Knowledge OOF B**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		

	(Constant)	15.963	1.631	.681		9.788	.000
1	Classroom management		.033		.680	20.731	.000

Table 4.8c shows the regression coefficient between Classroom Management and Pedagogical Content Knowledge. The result shows that out-of-field Biology teachers' anxiety on classroom management is a significant predictor of their anxiety in pedagogical content knowledge ( $B = .68$ ,  $t = 20.73$ ,  $p(0.00) < 0.05$ ). The regression coefficient indicates that for any increase in one unit of out-of-field Biology teachers' anxiety in classroom management will cause an increase in 15.96 anxiety in Pedagogical Content Knowledge.

#### 4.2.3 Hypotheses Three

**HO<sub>3</sub>** there is no significant correlation between out-of-field Biology teachers' anxiety on Content Mastery, school type, school location, gender, years of teaching experience, educational qualification on Pedagogical Content Knowledge. This formulated hypothesis was tested using correlation matrix (to examine the direction of the relationship between the variables). The summary of the results is presented in Table 4.9a

**Table 4.9a: Correlation Matrix showing the inter-correlation among Variables**

		GENDER	SCH. LOC	YEAR OF EX.	CER T	CM	PCK
CM	Pearson Correlation	.143**	-.040	-.261**	.019	1	
	Sig. (2-tailed)	.001	.366	.000	.676		
	N	501	501	501	501	501	

PCK	Pearson						
	Correlation	.107*	-.027	-.230**	.003	.766*	1
	Sig. (2-tailed)	.017	.550	.000	.955	.000	
	N	501	501	501	501	501	501

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Table 4.9a shows the relationship between the independent variable Content Mastery, school location, gender, years of teaching experience, educational qualification, and the dependent variable Pedagogical Content Knowledge. The analysis indicates that gender has a positive relationships with anxiety on content mastery, the coefficient  $r = 0.143$  indicating a positive but weak relationship. The relationship between school location, years of teaching experience and anxiety on content mastery shows a negative relationship with coefficient  $r = -0.04$  and  $-0.26$ , respectively. This indicates that school location and years of experience does not influence an individuals' anxiety on content mastery. A positive relationship exists between certification and anxiety on content mastery, the coefficient  $r = 0.019$ , indicates a positive but weak relationship between the two constructs. This imply that an individual's level of education could influence his anxiety on content mastery. Given the preceding, multiple regression was used to determine the magnitude of the relationship between these independent variable on content mastery anxiety. This formulated null hypothesis was tested using multiple regressions and the summary of the results is presented in Table 4.9b

**Table 4.9b multiple regression Model summary showing the influence of Content Mastery, school factor and demographic factor on Pedagogical Content Knowledge**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.767 <sup>a</sup>	.589	.583	8.252

a. Predictors: (Constant), Content mastery

- b. Certificate, School Location, School Type, Gender, Year of experience, Qualification

Table 4.9b shows the regression coefficient for the independent variables; content mastery, school factors (school location, school type), and demographic factors (gender, years of experience and qualification). The result shows  $r(1,499) = 0.767, 0.589$ . Indicating that 58.9% of the total variation in out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge (PCK) is accounted by one or two or more independent variables. To determine whether the model was a good predictor, ANOVA result was presented Table 4.9c

**Table 4.9c Regression ANOVA of Content Mastery, School Factors and Demographic Factors on Pedagogical Content Knowledge**

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48058.413	7	6865.488	100.832	.000 <sup>b</sup>
	Residual	33567.471	493	68.088		
	Total	81625.884	500			

a. Dependent Variable: Pedagogical\_Content\_knowledge

b. Predictors: (Constant), Content Mastery, Certify, SchLoca, Schtype, Gender, Year of Exp, Qualification

Table 4.9c displays ANOVA results. The findings shows that there is a significant correlation between the predictors content mastery, school factors, demographic factors and the criterion variables (pedagogical content knowledge)  $F(1,499) = 100.832, p(0.00) < 0.05$ . Indicating that the model is a good predictor.

**Table 4.9d Multiple Regression Coefficient showing the contribution of Content Mastery, School Factors and Demographic Factors on Pedagogical Content Knowledge**

**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error				
	(Constant)	13.570	3.335		4.069	.000
	SCH Type	.218	.736	.009	.296	.768
	Sch Location	.157	.727	.006	.216	.829
1	GENDER	.014	.812	.001	.017	.987
	QUALI	-.086	.187	-.016	-.462	.644
	Year of Exp	-.637	.516	-.039	-1.233	.218
	Certificates	-.782	.901	-.031	-.868	.386
	Content Mastery	.737	.030	.758	24.944	.000

a. Dependent Variable: Pedagogical Content Knowledge

Table 4.9d shows the results of school type, school location, gender, qualification, year of experience, certificates and content mastery. The result indicates that school type is a non-significant positive predictor of out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge (PCK) ( $B = .218$ ,  $t = 0.296$ ,  $p (0.76) > 0.05$ ). Similarly, school location, gender, qualification, year of experience, certificates are not significant predictors of out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge (PCK). However, content mastery is a significant predictor of out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge (PCK) ( $B = .737$ ,  $t = 24.99$ ,  $p (0.00) < 0.05$ ) while holding constant teacher characteristics; gender, qualification, year of experience, certificates and content mastery and school characteristics; school type and location. This indicate that an increase in one unit of out-of-field Biology teachers' anxiety in content mastery will increase of .737 unit of their anxiety in Pedagogical Content Knowledge (PCK)

#### 4.2.4 Hypotheses Four

**HO<sub>4</sub>:** there is no significant correlation between out-of-field Biology teachers' anxiety on Classroom Management, school type, school location, gender, years of teaching

experience, educational qualification on Pedagogical Content Knowledge. This formulated hypothesis was tested using correlation matrix (to examine the direction of the relationship between the variables).

**Table 4.10a: Correlation Matrix showing the inter-correlation among Variables**

		SCH		YEAR			
		GENDER	LOC	QUALI.	OF EXP	CERT	C.Magt
Class Management	Pearson Correlation	.014	.046	.001	-.131**	.013	1
	Sig. (2-tailed)	.758	.300	.987	.003	.780	
	N	501	501	501	501	501	501
Pedagogical Content knowledge	Pearson Correlation	.107*					
	Sig. (2-tailed)	.107*					
	N	501	501	501	501	501	501
	Pearson Correlation	.107*	-.027	.000	.003	.680***	1
Pedagogical Content knowledge	Sig. (2-tailed)		.550	.501	.955	.000	150
	N		501		501	501	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

Table 4.10a shows the relationship between the independent variable Classroom management, school location, gender, years of teaching experience, educational qualification, and the dependent variable Pedagogical Content Knowledge. The analysis indicates that gender has weak relationships with anxiety on classroom management, the coefficient  $r = 0.14$  indicating a positive but weak relationship. The relationship between school location and anxiety on classroom management shows no relationship with coefficient  $r = 0.046$ . This indicates that school location does not influence an out-of-field Biology teachers' anxiety. The relationship between year of experience and classroom management shows a negative relationship with coefficient  $r = -0.131$ . This implies that an individual's years of experience could influence his anxiety on classroom management. Relationships do not exist between certification and anxiety on classroom management with coefficient  $r = 0.013$ . Indicating certificates do not influence one's anxiety. Given the preceding, multiple regression was used to determine the magnitude of the relationship between these independent variables on classroom management anxiety.

This formulated null hypothesis was tested using multiple regression and the summary of the results is presented in Table 4.10b

**4.10b Multiple regression Model summary showing the influence of Classroom Management, school factor and demographic factor on Pedagogical Content Knowledge**

<b>Model Summary</b>				
<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
1	.703 <sup>a</sup>	.494	.487	9.153

- 
- a. Predictors: (Constant),
  - b. Class Management Total, Quali, Gender, Year of Exp, SchLoca, Schtype, Certify

Table 4.10b shows the regression coefficient for the independent variables; content mastery, school factors (school location, school type), and demographic factors (gender, years of experience and qualification). The result shows  $r(1,499) = 0.703$ ,  $r^2 = 0.494$ . This indicates that 49.4% of the total variation in out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge (PCK) is accounted by one or two or more independent variables. To determine whether the model was a good predictor, ANOVA result was presented Table 4.10b

#### 4.10c Regression ANOVA of Classroom Management, School Factors and Demographic Factors on Pedagogical Content Knowledge

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	40323.992	7	5760.570	68.761	.000 <sup>b</sup>
	Residual	41301.892	493	83.777		
	Total	81625.884	500			

a. Dependent Variable: Pedagogical\_Content\_knowledge

b Predictors: (Constant), Class Management, Quali, Gender, Year of Exp, Sch. Loca, Sch. type, Certify

Table 4.10c displays ANOVA results. The findings shows that there is a significant correlation between the predictor classroom management, school factors (school location, school type), demographic factors (gender, years of experience and qualification), and the criterion variables (pedagogical content knowledge)  $F(1,499) = 68.761$ ,  $p(0.00) < 0.05$ . Indicating that the model is a good predictor.

#### Table 4.10d Multiple Regression Coefficient showing the contribution of Classroom Management, School Factors and Demographic Factors on Pedagogical Content Knowledge

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	18.487	3.680		5.024	.000
	SCH TYPE	1.584	.827	.065	1.915	.056
	SCH LOCA	-.458	.807	-.019	-.568	.570
	GENDER	1.932	.895	.071	2.160	.031
	QUALIFICATI	.039	.207	.007	.187	.852
	YEAROFEXP	-2.324	.559	-.141	-4.161	.000
	CERTIFY	-1.422	.999	-.056	-1.424	.155
	Class	.671	.033	.670	20.331	.000

a. Dependent Variable: Pedagogical\_Content\_knowledge

Table 4.10b shows the results of school type, school location, gender, year of experience, qualification and class management. The result indicates that school type is a non-significant predictor of out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge (PCK) ( $B = 1.54, t = 1.95, p(0.56) > 0.05$ ). Similarly, school location, level of qualification, certify teacher are not significant predictors of out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge (PCK). However, gender is a significant predictor of out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge (PCK) ( $B = 1.93, t = 2.16, p(0.03) < 0.05$ ), while holding constant classroom management, student characteristics; qualification, year of experience, certify teacher and school characteristics; school type and location. A glimpse at the table also show that years of experience is a negative significant predictor of out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge (PCK) ( $B = -1.93, t = -2.16, p(0.03) < 0.05$ ). Indicating that an increase in the years of experience result in decrease on out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge whiles other predictors remain constant. Similarly, out-of-field Biology teachers' anxiety on classroom management is a significant predictor of out-of-field Biology teachers' anxiety on Pedagogical Content Knowledge (PCK) ( $.67, t = 20.33, p(0.00) < 0.05$ ). This indicates that an increase in one unit of out-of-field Biology teachers' anxiety in classroom management will increase .67 units of their anxiety in Pedagogical Content Knowledge (PCK), holding all other predictors constant.

### 4.3 Summary of Findings

The following are summaries of finding in the study

1. The results revealed that, majority of the out-of-field Biology teachers' have high anxiety on Content Mastery
2. The results revealed that majority of the out-of-field Biology teachers have high anxiety on Classroom Management
3. There is a relationship between OOF Biology teachers' anxiety on content mastery and pedagogical content knowledge
4. There is a relationship between OOF Biology teaches' anxiety on classroom management and pedagogical content knowledge
5. There is a significant correlation between the predictors content mastery, school location, school type, gender, teaching experience qualification and the criterion variables (pedagogical content knowledge)
6. There is a significant correlation between the predictor classroom management, school factors (school location, school type), demographic factors (gender, years of experience and qualification) and the criterion variables (pedagogical content knowledge).

#### **4.4 Discussion of Results**

The finding on research question one that investigated on the level of anxiety of out-of-field Biology teachers' on Content Knowledge showed that the level of anxiety of out-of-field Biology teachers was within the mean range of highly anxious. This implies that Content Mastery had influence on out-of-field Biology teachers' level of anxiety on PCK. This finding corresponds with the findings of Nisbet (2015) that investigated the teaching experiences of six elementary pre-service teachers (EPTs) and Lampadan (2014) who studied causes of anxiety and coping strategies of student- teachers during their internship and found that EPTs and student- teachers had high mathematics anxiety. Similarly, the finding agrees with the findings of Nwimo, and Onwunaka (2015)

who studied the stress among Secondary School Teachers in Ebonyi State, Nigeria and the results showed that the secondary school teachers in Ebonyi had a high level of stress. Also, the finding supports the study of Morteza and Morteza (2013) and Mutodi and Ngirande (2014) and who found high rate of anxiety among EFL teachers in Iran and among students' teachers in tertiary institution in South Africa. However, the finding was in contrast to the finding of Sammephet and Wanphet (2013) that studied the pre-service teachers' anxiety and anxiety management in Thailand and found out that the pre-service teachers experience moderate level of anxiety when confronted with complexity in implementing lesson plan. Similarly, the study opposed the study of Abdul Hadi *et, al.*, (2009) and Hacıomeroglu (2014) examined the prevalence and factors associated with stress among secondary school teachers in Kota Bharu, Kelantan, Malaysia and the result revealed that the majority of teachers had a mild level of stress (17.4%) towards the triggers of anxiety such as knowing the content and its objectives. The studies' finding can be attributed to out-of-field Biology teachers' lack of in-depth knowledge in Biology (subject) and lack of pedagogy to effectively teach the students; more so, the high level of anxiety experienced might also be as a result of being unable to organize taxonomies of learning in Biology; being unable to give reasons for getting wrong results in practical lessons and when they cannot detect students' difficulties and misconceptions in Biology.

The result on research question two that was meant to find out the level of anxiety of out-of-field Biology teachers on Classroom Management revealed that the level of anxiety of out-of-field Biology teachers was within the mean range of highly anxious. Research question two indicated that Classroom Management had impact on out-of-field Biology teachers' level of anxiety on PCK. This is consistent with the study of Sanchez and Halet (2017) who examined teacher's classroom anxiety: A case study of immigrant in-service teachers of English in East Asia, revealed that immigrant teachers

experienced high degree of classroom anxiety which exert specific physiological effects on them due to inability to learn students name, insufficient knowledge of classroom strategies, lower self-efficacy, inaccurate diagnosis of students level of comprehension. Also, the finding supports the study of Gonca and Burçak (2016) who conducted a study on Student Teachers in the Practicum: to be anxious or not. The findings indicated that the student teachers experienced high anxiety due to problem behaviour in the classroom as well as stress of being evaluated. Similarly, the finding supports the study of Maulimora (2019) who examined English pre-service teachers' perception of anxiety in peer teaching: a case study at Universitas Kristen Indonesia, found that pre-service teachers' were highly anxious as a result of lack of classroom management skills, teaching skills. However, the study was in contrast to the study of Mosaddaq and Barahmeh (2016) who explored the sources of EFL student teachers anxiety during practicum experience and the researchers found a moderate level of classroom anxiety rate among respondents. Similarly, this finding was not in support of the finding of Hacıomeroglu (2014) that examined the structure of elementary pre-service teachers' mathematics anxiety and mathematics teaching anxiety in Turkey and observed elementary pre-service teachers held a low-level of mathematics anxiety. The finding can be attributed to out-of-field Biology teachers' lack of knowledge of reinforcement and students' reward; lack of knowledge of innovative instructional strategies; inability to make the classroom interactive during instruction; inability to eye track students perpetual attention during instruction in the classroom.

The result on hypothesis one revealed that there was a significant relationship between the predictor (content mastery) and the criterion variables (pedagogical content knowledge). This study is in agreement with the finding of Nixon and luft (2015) that carried out a study on teaching Chemistry with a degree in Biology: crosscutting

concepts as boundary objects, which found that teachers drew on Biology ideas in order to respond to questions regarding chemical equilibrium and those ideas contributed to the understanding of how teachers negotiated the task of teaching Chemistry with a degree in Biology. Similarly, this study is also in line with the findings of Patra and Guha (2017) that compared the pedagogical content knowledge and self-efficacy of Geography teachers in India submitted that pedagogical content knowledge and self-efficacy of Geography teachers was positive and significantly related. In the same vein, the study also support the findings of Haciomeroglu (2014) that examined the structure of elementary pre-service teachers' mathematics anxiety and mathematics teaching anxiety in Turkey and found a significant relationship between predictors (i.e., test, course, and computation) and content knowledge, that is anxiety is related to mathematics teaching. The study is also consistent with the findings of Peker and Ertekin (n.d.) who examined the relationship between pre-service teachers' anxiety levels in relation to teaching of mathematics and their mathematics anxiety levels and found a positive moderate relationship between pre-service teachers' mathematics teaching anxiety and mathematics anxiety. That is the pre-service teachers' mathematics teaching anxiety was found to increase when their mathematics anxiety increased. Especially anxiety towards the mathematics lesson, and "anxiety caused by content knowledge". Nevertheless, the study opposes the findings of Mutodi and Ngirande (2014) that explored students' teachers' mathematics anxiety levels at a selected tertiary institution in South Africa and found that there is no association between home language and math anxiety level. Likewise, the study do not agree with the findings of Hughes (2016) who examined the relationship of mathematics anxiety, mathematical Beliefs, and instructional practices of elementary school teachers in Georgia and reported a significant negative relationship between mathematics anxiety and instructional practices. This finding can be attributed to out-of-field Biology teachers'

inability to transfer the subject content effectively to the students' and engage the students' effectively in the learning process; inability to prepare or set laboratory properly before demonstration this will inhibit effective teaching and practical demonstrations; being unable to effectively prepare, plan and write lesson efficiently. This will impede effective lesson delivery during instruction; can be attributed to inability of out-of-field Biology teachers' to comfortably provide clear and vivid explanation on certain difficult topics, in this way affect students' engagement in learning during instruction; this can also be ascribed to teachers' inability to evaluate students level of conceptual difficulty after teaching.

The result on hypothesis two revealed that there is a significant relationship between the predictor (classroom management) and the criterion variables (pedagogical content knowledge). The finding of this study accede the findings of Emerole and Olanrewaju (2015) ) who investigated the teaching practice anxiety sources as correlates of teaching performance among student teachers in federal colleges of education in Southwestern Nigeria and found that teaching performance among student teachers was significantly related with teaching confidence, supervision, content mastery, relating with other student teachers, relating with students, classroom control, lesson preparation and lesson presentation.. In the same way, the finding of the study support the findings of Houlihan et al. (2009) that examined the personality effects on teaching anxiety and teaching strategies in University Professors in Canada and reported a positive and significant correlations between anxiety instrument and all four components of in-class teaching strategies such as student-to-student discussions and evaluation using student/group presentations and prevention of cheating in the classroom.

However, this study does not support the finding of Saravanan and MuthuLakshmi (2017) that examined occupational Stress among primary school teachers in

Nagapattinam district in Tamil Nadu and revealed that there was no significant relationship in the level of occupational stress of primary school teachers as a result of lack of teacher's instruction. This finding can be attributed to inability of the teachers to use appropriate instructional strategy to teach Biology contents to the students, this will impede students' engagement in learning; this can also be attributed to teachers' inability to maintain order in a disrupted and chaotic classroom during instruction. If teachers do not necessarily uphold order in their classroom management practices then students are unable to reach their true potential socially and academically and are denied the opportunity to grow in a supportive environment.

The result on hypothesis three revealed that there is a significant correlation between the predictors content mastery, school location, school type, gender, teaching experience qualification and the criterion variables (pedagogical content knowledge). The finding is consistent with the finding of Nwimo, and Onwunaka (2015) that studied the stress/anxiety among Secondary School Teachers in Ebonyi State, Nigeria: The results showed that the secondary school teachers had a high level of stress and the difference in the level of stress reported by male and female teachers was significant with male teachers reporting higher level of stress than female teachers. It was observed that the relationship between the overall level of stress and each of its dimensions was significant. Equally, the finding is in agreement with the finding of Amalraj *et al.*, (2018) that carried out a comparative study to determine the occupational stress/anxiety level and professional burnout in special school teachers working in private and government schools and reported that stress level and burnout level varies significantly between male and female Indian school teachers, government schools have higher stress level than Private schools. Similarly, the burnout was more in government schools compare to private schools. On the contrary, the study opposes the finding of Yaratan and Kasapoğlu (2012) that investigated differences in attitudes, anxiety, and mathematical

achievement due to gender, and school location and found no significant relationship in the anxiety scores with respect to gender. More so, the study is not in line with the study of Nwimo (2004) that examined the health status, anxiety and stress of Secondary School teachers in Enugu State, the result revealed that teachers experienced both low level of stress and anxiety, higher educational qualification had lower anxiety than those with lower qualification, male teachers had lower anxiety than female teachers, younger teachers were less anxious than their 40 years and above colleagues and there was no significant relationship between the mean anxiety index of rural school teachers and urban school teachers and no significant relationship was found in the mean anxiety of teachers when years of work experience was considered.

The result on hypothesis four revealed that there is a significant correlation between the predictor classroom management, school factors (school location, school type), demographic factors (gender, years of experience and qualification) and the criterion variables (pedagogical content knowledge. the study is consistent with the findings of Harish and JeyaPrabha (2018) that carried out an empirical study on the stressors of teachers and its impact on occupational stress and job satisfaction of teachers in government and private schools in Chennai, India and found significant relationship in the occupational work stress of private school teachers compared to the government school teachers, lack of communication and lack of adequate classroom management. The female secondary school teachers have significantly high levels of stress as compared to their male counterparts in regard to the teaching techniques used in the classroom. In the same way, the study support the finding of Amalraj et al., (2018) that carried out a comparative study to determine the occupational stress level and professional burnout in special school teachers working in private and government schools the results of the study revealed that stress level and burnout level varies significantly between male and female Indian school. Government schools have higher

stress level than Private schools. Similarly, the burnout is more in government schools compared to private schools. The study opposes the finding of Clayford (2010) that carried out a comparative study of burnout among educators in a youth juvenile rehabilitation center, an ex model C school, and public schools in South Africa and found no correlation between the three subscales of anxiety subscale and gender, and also no correlation between three subscale and the three types of schools. Nonetheless, the study is not in line with the finding of Ofosuhene (2018) that investigated on the demographic characteristics of individuals associate with job stress levels in University of Cape Coast, Ghana, the result of the study revealed that females had higher level of stress than the males and that there was no significant relationship between educational qualification and the level of stress/ anxiety.

## CHAPTER FIVE

### 5.0 CONCLUSION AND RECOMMENDATIONS

#### 5.1 Conclusion

The findings of this study established that out-of-field Biology teachers' in Niger State exhibit high level of anxiety as a result of lower level of mastery in the subject, lack of classroom management practices and lack of knowledge of innovative instructional strategies. The findings revealed a strong correlation between OOF Biology teachers' anxiety on content mastery and pedagogical content knowledge, also between OOF Biology teachers' anxiety on classroom management and pedagogical content knowledge. This mean that an increase in anxiety on content mastery leads to an increase in anxiety in pedagogical content knowledge. Indicating that out-of-field Biology teachers' are not capable of transferring the subject content effectively to the students' and cannot engage the students' efficiently in the learning process as a result of anxiety.

The study show that gender correlate positively and year of experience correlate negatively with OOF Biology teachers' anxiety on content mastery while school factor, qualification and certification do not correlate with OOF Biology teachers' anxiety on content mastery. This imply that these variables are not responsible for causing anxiety in OOF Biology teachers. More so, the study revealed that gender, school factor, qualification and certification do not correlate with OOF Biology teachers' anxiety on class management while year of experience negatively correlate with OOF Biology teachers anxiety on class management.

## 5.2 Recommendations

Based on the findings of the study, the following recommendations are made.

1. To minimize hiring or assigning of out-of-field teachers' to teach Biology and other science related subjects, school authorities' in Niger State, should endeavour to carry out regular recruitment of qualified and competent teachers to fill vacancies.
2. Teaching in senior secondary schools in Niger State should be strictly professionalized in all respect to remove quackery in its field of practice.
3. In order to maintain quality education in Niger State, out-of-field teachers should be encouraged to attend in-service programmes where they will be exposed to subject knowledge, classroom management, time management, class discipline and new innovations in education.
4. Policy makers in the educational sector in Niger state should incorporate education courses such as educational psychology and techniques of enhancing classroom management in the curriculum during the teacher training workshops and seminars programmes
5. Niger State government and relevant stakeholders should regularly organize seminars, workshops and training programmes for out-of-field Biology teachers' to enhance mastery of the subject matter.
6. In-house seminars on supporting and guiding the out-of-field teachers' and newly employed on how to manage their own anxieties as they teach the curriculum must be started on pilot basis in secondary schools.

### **5.3 Contribution to Knowledge**

1. The result of this study has contributed to current literature on out-of-field teaching.
2. The instruments used for data collection was developed by the researcher, and as such can be adopted or adapted by researchers for further or future studies
3. The study shed light on the mental and emotional health of out-of-field teachers and its impact on their competence.
4. The result obtained from this study supports literature on teachers' with high level of anxiety unknowingly passing their anxiety to their students.

### **5.4 Suggestion for Further Studies**

Based on the findings of this study, the following studies are suggested for further research.

1. This study can be replicated in other subjects especially (Physics, Chemistry and Mathematic) or other places to validate the findings of this study.
2. Experimental or empirical studies on the effect of out-of-field teaching on students' academic achievement in science subjects should be explored.
3. Experimental research could be carried out to compare teaching methods and Content Mastery of in-field and out-of-field Biology teachers and their impact on students' performance in the classroom.
4. Studies can be carried out on the coping techniques on how to alleviate the syndrome of anxiety in out-of-field Biology teachers in Niger State.

5. Future studies could include a longitudinal study to follow highly anxious OOF teachers who take content specific science courses to observe their content knowledge and anxiety.
6. Further research should be carried out in Niger State on the job performance of out-of-field teacher to determine the teacher efficiency.

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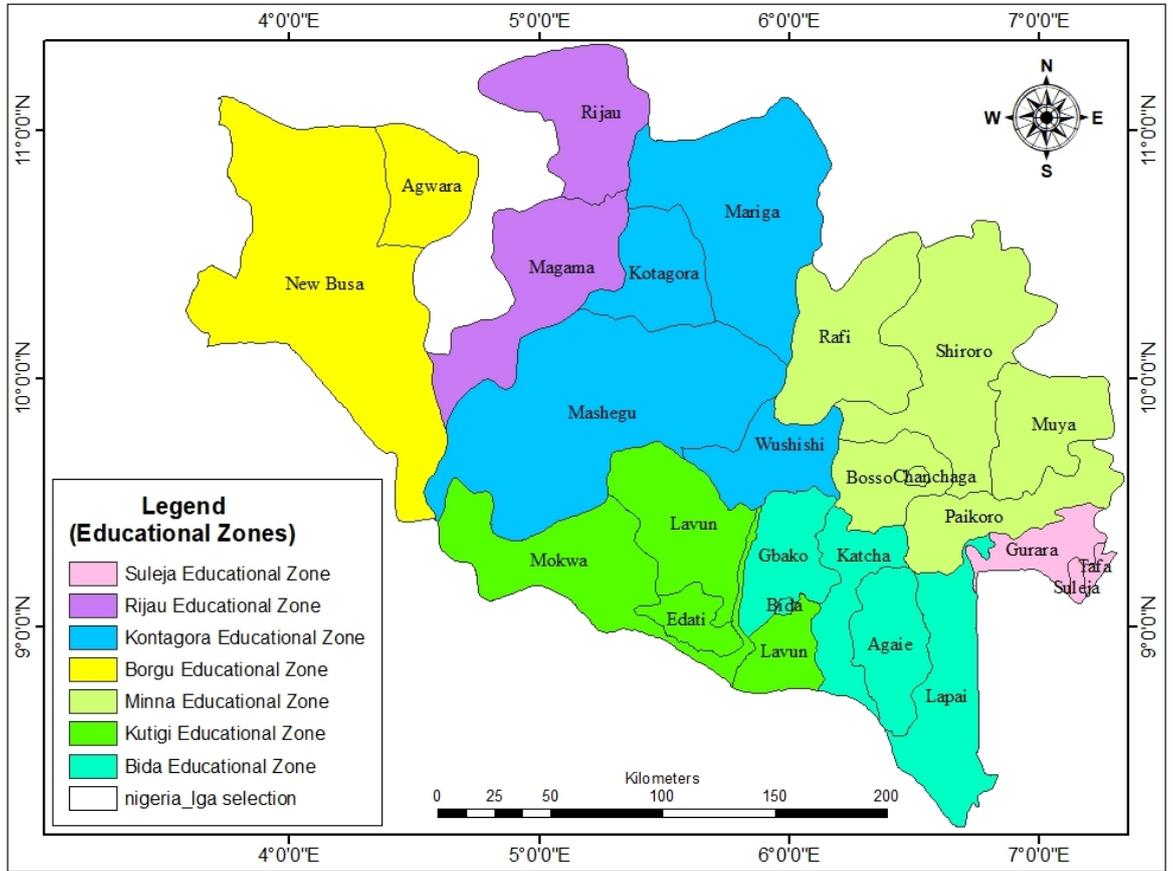
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# APPENDIX A



**APPENDIX B**  
**FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA**  
**SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION**  
**DEPARTMENT OF SCIENCE EDUCATION.**

**OUT-OF-FIELD SECONDARY SCHOOL BIOLOGY TEACHERS' ANXIETY  
ON CONTENT MASTERY QUESTIONNAIRE (OFBIOTACQ)**

**Dear Respondent,**

The instrument before you is designed to elicit information on Out-of-field Secondary School Biology Teachers' Anxiety on content mastery of Biology curriculum in Secondary Schools in Niger state.

Please, tick (✓) where appropriate the option that best describe your opinion. The information collected will be used for the research only and as such will be treated with utmost confidentiality.

Thank you.

**Section A: Demographic Data**

1. Name of School.....

2. School type:	Public	<input type="checkbox"/>	Private	<input type="checkbox"/>
1. School Location:	Urban	<input type="checkbox"/>	Rural	<input type="checkbox"/>
2. Gender:	Male	<input type="checkbox"/>	Female	<input type="checkbox"/>
5. Qualification Obtained:	HND	<input type="checkbox"/>		
	B.Sc	<input type="checkbox"/>		
	B.Tech	<input type="checkbox"/>		
	M.Sc/M.Tech	<input type="checkbox"/>		
	B.Ed Sc	<input type="checkbox"/>		
	PGDE	<input type="checkbox"/>		
	NCE	<input type="checkbox"/>		
	Others Specify	<input type="checkbox"/>		
6. Years of Teaching Experience:	0-5 years	<input type="checkbox"/>		
	6-10 years	<input type="checkbox"/>		
	Above 10 years	<input type="checkbox"/>		
7. Are you a certified teacher?	Yes	<input type="checkbox"/>		
	No	<input type="checkbox"/>		

**Section B:** Items on out-of-field Secondary School Biology Teachers' Anxiety on Content Mastery

Direction: For each statement below, please tick (√) the response that best describes what you feel while teaching in the classroom. There is no right or wrong answers, so, please respond as honestly as possible to what corresponds to your opinion.

The key to the anxiety continuum are: **Very High Anxious (VHA)**, **High Anxious (HA)**, **Moderately Anxious (MA)**, **Low Anxious (LA)** and **Very Low Anxious (VLA)**.

S/N	Items	VHA	HA	MA	LA	VLA
	<b>How anxious do you feel when carrying out the following content mastery related task</b>					
1	Stating clearly the objectives of teaching a particular topic in Biology?					
2	Planning and writing lesson notes in Biology?					
3	Organize taxonomies of learning in Biology?					
4	Explaining certain difficult topics to the students?					
5	Teaching Biology to your students ensuring that you have mastery of the subject content?					
6	Effort to complete the syllabus successfully and adequately?					
7	Working out practical result without correctly without any error					
8	Explaining the various concepts in Biology with adequate representation?					
9	Ensuring interaction/communication between you and the students during Biology teaching?					
10	Giving explanations in response to students' questions?					
11	Evaluating students' level of conceptual knowledge after teaching a topic in Biology?					
12	Identifying students' difficulties and misconceptions after teaching Biology?					
13	Use of textbooks as a major approach or tool to					

	proffer explanations to biological concepts?					
14	Thinking about preparing the lesson on topic you are going to teach in Biology					
15	Developing your own ideas in preparing lessons?					



Above 10 years

7. Are you a certified teacher? Yes

No

**Section B:** Items on out-of-field Secondary School Biology Teachers' Anxiety on Pedagogical Content Knowledge

Kindly indicate how you feel while employing the following pedagogical practices in the classroom. For each statement below, please tick (✓) the response that best describes your feeling while teaching in the classroom using the anxiety continuum key: Very High Anxious (VHA), High Anxious (HA), Moderately Anxious (MA), Low Anxious (LA) and Very Low Anxious (VLA).

S/N	Items	VHA	HA	MA	LA	VLA
	<b>How anxious do you feel when carrying out the following pedagogical practices</b>					
1	Teaching a particular topic in Biology?					
2	Preparing or setting laboratory up for a demonstration?					
3	Administering quiz to indicate student mastery of unit content?					
4	Providing multiple representations of content in the form of analogies, examples, and demonstrations in the classroom?					
5	Improvising teaching aid in the classroom?					
6	Using familiar analogies to explain concepts of subject matter to students?					
7	Provide series of tasks to reinforce a concept (drill and practice)?					
8	Integrating ICT (video) to make content clearer to the students?					
9	Getting students to do hands-on laboratory activities with clearly defined directives during practical class?					
10	Choosing instructional methods that will lead to the development of cognitive skill?					

11	Using familiar demonstrations to explain biological concepts in a particular lesson					
12	Using different teaching approaches to help students understand complex Biology concepts?					
13	Organizing students to work in small groups and to come up with joint solution to a problem?					
14	Provide/ use real objects to help students understand science concepts,					
15	Deploying good instructional strategy to teach difficult topics that will facilitate student learning?					

**APPENDIX D**  
**FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA**  
**SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION**  
**DEPARTMENT OF SCIENCE EDUCATION.**

**OUT-OF-FIELD SECONDARY SCHOOL BIOLOGY TEACHERS' ANXIETY  
ON CLASSROOM MANAGEMENT TECHNIQUES QUESTIONNAIRE  
(OFBIOTACMQ)**

**Dear Respondent,**

The instrument before you is designed to elicit information on Out-of-field Secondary School Biology Teachers' Anxiety on Classroom Management in Secondary Schools in Niger state.

Please, tick (✓) where appropriate the option that best describe your opinion or view. The information or data collected will be used for the research only and as such will be treated with utmost confidentiality.

Thank you.

**Section A: Demographic Data**

Name of School.....

- |                            |             |                          |         |                          |
|----------------------------|-------------|--------------------------|---------|--------------------------|
| 2. School type:            | Public      | <input type="checkbox"/> | Private | <input type="checkbox"/> |
| 3 School Location:         | Urban       | <input type="checkbox"/> | Rural   | <input type="checkbox"/> |
| 4. Gender:                 | Male        | <input type="checkbox"/> | Female  | <input type="checkbox"/> |
| 5. Qualification Obtained: | HND         | <input type="checkbox"/> |         |                          |
|                            | B.Sc        | <input type="checkbox"/> |         |                          |
|                            | B.Tech      | <input type="checkbox"/> |         |                          |
|                            | M.Sc/M.Tech | <input type="checkbox"/> |         |                          |
|                            | B.Ed Sc     | <input type="checkbox"/> |         |                          |
|                            | PGDE        | <input type="checkbox"/> |         |                          |
|                            | NCE         | <input type="checkbox"/> |         |                          |

Others Specify

6. Years of Teaching Experience: 0-5 years

6-10 years

Above 10 years

7. Are you a certified teacher? Yes

No

As an out-of-field Biology teacher, kindly indicate how the following practices of classroom management apply to you in your classroom using the anxiety continuum key: Very High Anxious (VHA), High Anxious (HA), Moderately Anxious (MA), Low Anxious (LA) and Very Low Anxious (VLA).

S/N	Items	VHA	HA	MA	LA	VLA
	<b>How anxious do you feel</b>					
1	Using corporal punishment to maintain order in the classroom?					
2	When you keep the whole class in, as a result of some students' misconduct in the class?					
3	Remaining calm, objective and consistent while presenting a lesson in the class?					
4	Taking money or seeking gratification to teach Biology					
5	When you try hard to teach and at the same time curbing misbehaviours in the classroom?					
6	Providing answer to confused students?					
7	Finding it difficult to inculcate positive behavior in your students?					
8	When you have to report to the principal for misbehaving?					
9	Developing caring and supportive relationships with your students?					
10	Directing questions towards students' who are inattentive in the class?					
11	Praising and recognizing well-behaved students in the class?					
12	The challenge of ensuring reward to students' who behave properly in class					
13	When your students do not promote interaction in class.					
14	When students generally embrace					

	collaborative effort towards a learning task					
15	When you engage students in active discussion about issues related to real world applications of what you taught in Biology					

## APPENDIX E

### Reliability Statistics of Questionnaires

Cronbach's Alpha	N of Items
.863	30

Reliability Statistics for Classroom Management Techniques

Cronbach's Alpha	N of Items
.852	30

Reliability Statistics for Content Mastery

Cronbach's Alpha	N of Items
.842	30

Reliability Statistics for Pedagogical Content Knowledge

## APPENDIX F

Proposed Research Plan for the Study

Data Collection shall last for five Months

Breakdown

Table: Field Work Plan

Time Plan/ Duration	Activity
First Month	Visitation to Planning and Research Department of MOE and NSSEB
Second month	Visitation to selected Schools for Formal introduction and to seek for permission for the study and meeting with the out-of-field teachers
Last week of second Month	Visiting Schools to train research assistant
Third Month	Administering of research instrument (questionnaire) to out-of-field Biology teachers in Zone A with the help of one trained research assistant through the face to face method
Forth Month	Administering of research instrument (questionnaire) to out-of-field Biology teachers in Zone B with the help of one trained research assistant through the face to face method

Fifth Month	Administering of research instrument (questionnaire) to out-of-field Biology teachers in Zone C with the help of one trained research assistant through the face to face method
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## APPENDIX G

Federal University of Technology , Minna

Department of Science Education

Consent form for the School Principals

Sir/ma

I, Aminat Abdullahi , a post graduate student in the department of Science Education Federal University of Technology , Minna , Niger state is currently embarking on a PhD research work titled **impact of out-of-field secondary school Biology teachers' content mastery and classroom management anxiety on pedagogical content knowledge in Niger State, Nigeria.**

The purpose of this research work is to understand the influence of out-of-field Biology teachers' Content mastery and classroom management anxiety on Pedagogical Content Knowledge with the view to improve teaching of Biology in order to ensure outstanding performance of students in Biology.

The purpose of this form is to seek your consent for the participation of your Biology teachers' in this study, which will be conducted during school hours. Any information obtained will be treated with utmost confidentiality and used for research purpose only. Thanks in anticipation of your cooperation.

I hereby consent to the participation of my Biology teacher in this research.

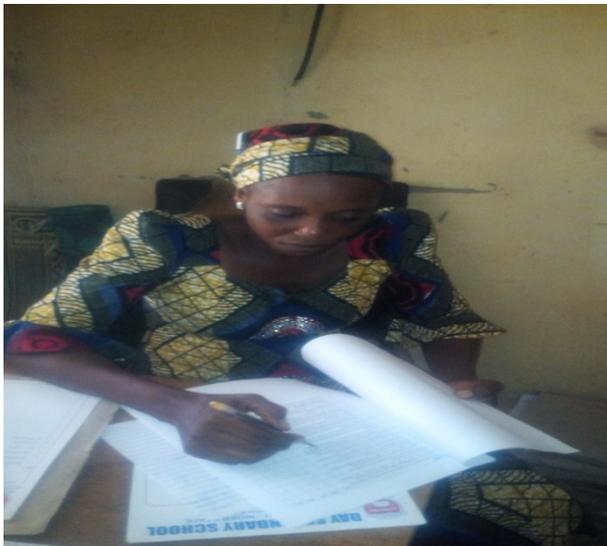
-----  
Principal

-----  
date

-----  
signature

**APPENDIX H**  
**FIELD WORK**

**I**



Government Secondary School, Suleja



Fema Nursery, Primary & Secondary School, Tudun Fulani



18.



Day Secondary School, Shakwatu

El-Masum Excellence Institute, Sarkin



Top International School, Sarkin Pawa



Muazu Babangida Aliyu, Sarkin Pawa



Aziziyah Model Academy, Bosso-Minna

Chanchaga



Government Secondary School, Eyagi Bida  
School Bida



Government Day Girls Secondary



Researcher collecting data at Epic  
International School, Chanchaga



Bilal Bin Rabah Islamic Science Secondary  
School



Research Assistant Collecting Data at Government Day Sec Sch Kontagora



Researcher collecting data at Government Day Secondary, School Gbako



Government Day Senior Secondary School, Nami at Agaie



Researcher collecting data Government Girls Secondary School, Lemu



Researcher collecting data Martins Luther Government Day Secondary School, Paiko



Researcher collecting data at Government Girls Day Secondary School, Kuta



Research Assistant collecting data at St. Michael Secondary School, Kontagora



Researcher collecting data at Women Day College, Paiko