pAN INVESTIGATION OF BIOLOGY TEACHERS PERCEPTION AND ATTITUDE TOWARDS INQUIRY TEACHING IN SENIOR SECONDARY SCHOOLS OF KANO MUNICIPAL EDUCATIONAL ZONE, KANO STATE, NIGERIA

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DECLARATION

I hereby declare that this dissertation titled **"** ***An Investigation of Biology Teachers Perception and Attitude towards Inquiry Teaching in Senior Secondary Schools of Kano Municipal Educational Zone, Kano State, Nigeria*****"*** is the product of my research efforts undertaken under the supervision of Dr. Ali Idris, and has not been presented anywhere for the award of a degree or certificate. All sources have been duly acknowledged.

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CERTIFICATION

This is to certify that the research dissertation entitled "***An Investigation of Biology Teacher's Perception and Attitude Towards Inquiry Teaching in Senior Secondary Schools of Kano Municipal Education Zone, Kano state-Nigeria"***. Carried out by Hadiza Lawal, meets the regulations governing the award of the degree of Master in Biology Education in the department of science and technology education, Bayero University, Kano, and is approved for the contribution to Knowledge and literary presentation.

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BSCS: Biological Sciences Curriculum Study

SPSS: Statistical package for social sciences

BTQ: Biology Teacher's Questionnaire

FRN: Federal Republic of Nigeria

F.M.E: Federal Ministry of Education

OECD: Organization for Economic Co-operation and Development

DEFINITIONS OF OPERATIONAL TERMS

Inquiry Teaching Method: is a method of teaching that involves students being active in the classroom (student-centered) and learn through creativity, critical thinking and logical reasoning like how scientist do while the teacher becomes a facilitator or guide.

Attitude: it is the favourable or unfavourable expression and feeling of an individual towards an attitude object.

Perception: perception is the individuals viewpoint about a situation.

ABSTRACT

The main objective of this study was to investigate Biology Teacher's Perceptions and Attitude towards Inquiry Teaching in Senior Secondary Schools of Kano Municipal Educational zone, Kano state-Nigeria. A descriptive survey research design was adopted for the study. The population for the study comprised of forty six (46) Senior Secondary Schools in Kano Municipal Education Zone with a total number of sixty two (62) biology teachers. The entire population was used as sample for the study. Five research questions and two research hypotheses were formulated to guide the study. The instrument for the study was the Biology Teachers Perception and Attitude towards Inquiry Teaching Questionnaire (BTPAITQ) used to gather data for the study. A reliability coefficient of 0.87 was obtained for the BTPAITQ by using spearman-brown coefficient generated via pilot study. The instrument was duly validated by experts in the field. Mean and standard deviation were used to answer the research questions, while the Mann Whitney U- Test was used to test the hypotheses at 0.05 level of significance. The results revealed that biology teachers show positive perception and attitude towards inquiry teaching. The biology teachers perceived lack of time; class size; lack of materials and resources; curriculum; class size; lack of management; lack of support; lack of confidence; assessment method and lack of access to professional development programs as factors affecting the use of inquiry teaching in biology classrooms. The findings also revealed that there is no significant difference between male and female teacher's perception as well as attitude towards inquiry teaching. Based on the findings, it was recommended that Teacher educators, administrators and planners of teacher education training programs should address the concerns about teacher's attitude and perception towards the use of inquiry teaching, especially by encouraging and providing opportunities for student teachers on the use of inquiry teaching method that would stimulate teacher's positive attitude and perception towards inquiry teaching.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Science as the knowledge of nature is derived from the Latin word "Scientia" meaning "Knowledge". It is the united human effort and activities of human to study and understand the nature of universe and how it works through observation, experimentation, explanation and predictions about a phenomenon in the natural world (Abdulganiyyi, Ibrahim, Lawal, Umar& Umar 2014). According to Lam (2015), science is the human's honest and earnest pursuit of knowledge about nature, which includes human, living and non-living systems, simple and complex systems. It is the general body of knowledge, accumulated and organized by systematic body which must be objective and possible to prove or disprove its objectives (Udousoro, 2012). In science, the systematic, objective and disciplined way to study and conduct scientific research about nature is through the application of what we called Scientific method.

Agommuoh and Ifeanacho (2013), connotes that science is applicable to life in areas like agriculture, medicine, energy, power supply, biotechnology, space research and nuclear technology which provides man to understand himself and the universe in which he lives in. Infact, science has played a vital role in areas like manufacturing, industries, communication, engineering, medicine, agriculture, technology, and transportation. Scientific disciplines include Biology, Chemistry, Physics, Mathematics, Agriculture, and Geography. The need to organize the study of science through learning method and transferred from one generation to another arises, which led to the development of science education (Aghogho & Donor, 2014). Therefore, scientific literacy of scientific disciplines (biology, physics, and chemistry) can be acquired through the principles and method of education termed Science Education.

Science Education is the acquisition of scientific knowledge and skills through the process of Educational method like discussion, teaching, training, forums, workshops and research, under the guidance of professionals, experts, teachers or self-learning by the students in an educational setting (Wellington, 2010). Celestine and Omorogbe (2013), defined science education as a field of study concerned with producing a scientifically literate society which provides students with basic knowledge, skills, norms and attitude needed for future work in science and science related fields. According to the Canadian ministry of education (2010), Science education strives at the development of scientific literate students through the processes of scientific inquiry (learning about the universe through posing questions and searching for explanation of phenomena), problem solving (seeks solutions to problem), and decision-making.

Aina (2013) stated that, science education is important towards personal, economic and national development through human development; youth empowerment: self-reliance and economic growth, thereby reducing poverty and illiteracy. The developmental level of any nation is largely based on the level of scientific knowledge (Kayode & Olatoye, 2014), while science and technology are the engines that drive the economy which transforms a nation (Aderogba & Oyelekan, 2010). Science education therefore is the bedrock and tool towards a sustainable, economic, social and political development of a nation which therefore should be given a great consideration.The general aim and objective of science education is to produce scientifically literate students (FRN, 2014),by exposing learners to scientific contents, as well as scientific methods (process) to acquire scientific knowledge for practical application (Babajide, 2015). Oji (2011), identifiedtwo important parts of science education- product(scientific knowledge) and Processes (scientific methods). Science education also provides the basis for acquisition of scientific concepts and process skills as well as foundation for further higher education.

Disciplines of science education include Biology Education, Physics Education, and Chemistry education, Geography Education, Mathematics Education and Technology Education.

Biology Education is the acquisition of biological knowledge through the educational setting. It is a discipline that develops biological knowledge based on discovery, experiments, and research activity through educational setting (AL-zahrani, 2015). The word biology is derived from the Greek words "Bios" meaning "life" and "logos" meaning "study". Biology means the study of life. To Ogunleye (2002), it is the "science of life'. These include living things and non-living things, their interaction with each other and their biological and physical environment, their characteristics (growth, behavior, reproduction, origin, and e.t.c). Branches of biology include zoology; botany; ecology, evolution, microbiology, biochemistry, e.t.c. Biology is related to general life of human and his way of living and doing things, this makes it to be unique among other science subjects (Ochima,2014) offered at all stages of education. The objective of Biology Education as provided by (FRN, 2014) is to produce citizenry that are biologically literates. According to Edward and Joel (2013), Biology Education is meant to expose learners to biological nature, principles, process, skills and attitudes and their application to real life situations. Some of the importance of biology education are to enable students the ability to solve simple day-to-day personal and professional problems, make predictions in any situation they are, and also to apply the concepts of biology to explain a phenomena (Paul, 2016). The teaching and learning of Biology Education at any stage is done through two major aspects-: The theoretical aspect and the practical aspect of biology.

The Teaching and learning of biology is a complex activity in any educational setting which involves teachers, students, and resources as well as their roles to play during the process of teaching and learning. The biology teacher is at the center, guiding and supporting students

while the students actively participate to a good teaching and learning to take place. Biology is taught through two components, these are the theoretical aspect which is the abstract presentation of biological nature (facts, principles, and concepts), and biological processes. While the other aspect is the practical aspect which is the real and actual aspect of doing science through discoveries, experiments and experiences. Practical aspect of teaching biology should be activity-oriented, student-centered and student-directed. This engages students to hands-on and mind-on activities (Ates & Eryilmaz, 2011). Nzewi (2008), asserted that practical activities are strategy adopted by teachers to make their teaching activities more real. Teachers should therefore plan activities that both the teachers and students can use during learning, providing the basis for observation, collection, experiment and analysis of phenomena.

Biology teaching in schools also requires the use of available and easily accessed resources and facilities for better understanding of the subject matter. It can be conducted in classrooms, well-organized and well-equipped outdoors and laboratories settings (indoor and outdoor) essential for easy and effective learning of biological concepts. Biology teachers should also create an enabling environment that is effective and student-centered for learning biology. Galvin, Mooney and Grady (2015), stated that to acquire accurate biological knowledge, effective and evidence-informed pedagogic practices are needed and required by both teacher and students. Muhammad (2017), suggested that the teaching of biology should be inquiry-based that demand for practical activities; enabling students to acquire skills and experience, leading to increase in their academic performance and permanent learning. As the goal of science is to understand how the universe works, biology focuses on the understanding of life (both living and non-living). Therefore, to gain scientific particularly biological knowledge about nature (physical

and biological phenomena), scientist use a particular approach called scientific inquiry (Harahap, Sani, & Simanjunlak, 2017).

Inquiry according to Hossain, Bumbacher, Brauneis, Diaz, Blikstein, Riedel-knese and saltarelli (2017), is an educational strategy in which students follow methods and practices similar to those of professional scientists in order to construct knowledge. It is used to characterize good science teaching and learning in science education (Anderson, 2002). To Ghumdia (2016), inquiry strategy is a student-centered and teacher-guided instructional approach that engaged students in investigating realwork and questions that they choose within a broad thematic framework. It requires the use of evidence, reasoning, imagination, critical and logical thinking in developing explanations about the natural world (Roster, 2006).

Inquiry is the exploration of phenomena driven by questions and hypotheses generated by students or teachers, develop method use to solve the problem or answer the question and use evidence to formulate explanation through scientific methods and skills of questioning, observing, inferring, predicting, measuring, hypothesizing, classifying, designing, experiments, collecting, analyzing and interpreting data through curiosity and creativity to construct new knowledge. National Research Council as well as other science education reform initiatives that emphasized the teaching of science through inquiry provides students the opportunity to do science as how scientists do, through creativity, critical thinking and logical reasoning. National Research Council (2000), identified five components of inquiry-based classroom activities during teaching and learning as follows- to scientifically engage in oriented questions; give priority to evidence; formulate explanations from evidence; evaluate explanation in line with alternative explanation; and lastly communicate ad justify proposed explanations. Prinosilova, Mechlova and Kubicova (2013), identified four levels of inquiry-based education as verification;

structured; guided; and open inquiry. Most teachers avoid the use of inquiry method in teaching, they focused on conventional method which is ineffective (Umoh, 2017: Isah, 2014). The use of inquiry teaching in classroom is affected by so many factors (Sarasci & Berlin, 2012).

Holloway (2015) : Gatt and Zammit (2017) reported that inadequate and insufficient teaching materials and equipment, class size and composition, assessment method, lack of access to professional development programs, over loaded curriculum content, lack of confidence, lack of funding, lack of support, teacher's lack of knowledge, teachers competence, time constraints and pressure of standardized test, lack of resources, teacher's gender, teachers belief, teachers attitude and teachers perception, among others as factors affecting teacher's use of inquiry teaching in classrooms. It has been reported that one of the factors affecting the use of inquiry teaching is teacher's perception (Wai, 2015: Sporea & Sporea, 2014).

Abidemi (2016) defined perception as a way of regarding, understanding or interpreting something; a mental impression. Individual ascribe different meanings to things or situation based on their perception which varies from person to person (Bako, 2013). According to Dutt (2018), it is the key to all spiritual understanding, the ability to see, hear or become aware of something through the senses which changes or alters with education and with knowledge. Teachers perception are the perceived ability to perform required teaching professional and organizational task, and regulate relations involved in the process of teaching students. It is the act of perceiving about a phenomenon by the mind (Carvalho, Freire, Conboy, Baptista, Freire, Azevedo & Oliveira, 2011). According to Ali (2014), teacher's perception is an opinion of someone (teacher) who exerts some interpersonal influences on another so as to make change in his/her behavior. Sikko, Lyngved and Pepin (2012) have found that teacher's perception influence teacher's use of inquiry teaching in classrooms positively or negatively. For instance, if

a teacher appears to perceive inquiry teaching negatively, the teacher will be unable to foster a supportive learning through the use of inquiry teaching and may not be as approachable to use inquiry teaching in classroom as teachers with positive perception of inquiry teaching. This implies that teacher's perception towards inquiry teaching is important. Also, teacher's attitude is another factor influencing the use of inquiry teaching in classroom.

The literature suggested that attitude of an individual have a powerful influence over individual's actions or behavior. This indicates that individual act or behave according to their attitude (Cherry, 2017). According to Eagly and Chaiken (1993), the behavioral component of attitudes refer to the way the attitude an individual have influences how he/she act or behave towards a situation. McLeod (2018) added that it is expected of the actions (behavior) of a person to be consistent with the attitudes that they hold. This is called the principle of consistency which reflects the idea that people are rational and attempt to act/behave rationally at all times and that a person's actions or behavior should be consistent with their attitudes. This indicates that individual attitude is often a good predictor of individual's action/behavior. Therefore, the stronger the attitude, the more likely it should affect behavior. Also, Perception plays a central role in individuals action. According to the psychological theory of perception-action, people perceive their environment, events or situation within it in terms of their ability to act (Witt, 2011; Proffitt, 2006). Kirsch (2019) suggested that the way individual act in a particular situation affects the individual perception of the environment and the body in this situation. Therefore, individual's ability to perform the intended action is influenced by individuals attitude and perception to act.

According to Pajares (1992), attitude is considered as a subset of beliefs. An attitude is a mindset that affects how a person thinks and acts (Agnes, 2013) :(David, 2013). Koballa (1988) in Thibaut, Knipprata, Deheane & Depaepe (2017) stated that, Attitude is the feeling towards an object (Affective). He also added that what the teacher believes to be true about inquiry teaching determines how the teacher feels about inquiry (Attitude). Therefore we can refer teachers Attitude as the generalized aspect of teacher's behavior which can be positive or negative, hence influencing teacher's use of inquiry teaching. Ramnarain and Hlatswayo (2018) reported that the attitude of the teachers positively or negatively, greatly affects teacher's use of inquiry teaching in classroom. For instance, negative attitude towards inquiry teaching will result in lack of use of inquiry teaching in classroom. Similarly, teacher's attitude towards inquiry teaching could also affect how well a teacher plans and prepares for a successful inquiry teaching in classroom. It has been established that teacher's attitude towards inquiry teaching highly influence students interest in learning through inquiry (Ukamaka, 2014). This will result in teachers to develop positive attitude towards inquiry teaching. This implies that teacher's attitude is important as it determine teacher's use of inquiry teaching.

Teacher's Attitude and Perception are important factors that influence teacher's behavior and classroom practices. They are not always measurable in the way that knowledge outcomes are measured, because, they are mental constructs, which must be inferred and assessed through observing of individual in action or through individual self-reporting on surveys and questionnaires (Mansour, 2013). Also, the question of gender influence on attitude and perception has generated a lot of concern in science education (Ebuoh, 2011).

According to Okorie and Ezeh (2017) Gender as an influencing factor on teaching and learning remains an important but a controversial issue among educationists and psychologists.

Various authors have defined gender on the basis of social and cultural constructs. Gender is the socially constructed characteristics of male and female which can be distinguished based on their roles and assigning responsibilities to both sex and analyzing conditions under which those responsibilities are assigned (Udousoro, 2011). According to Ugwu and Kok (2015), gender are social constructions in which individuals within the society are assigned expected attributes, behaviors and responsibilities based on being a male or female which differ according to the specific socio-cultural, economic and historical context. Gender in contrast to biological categorizations (sex) is dynamically constructed and reconstructed through psychological, interactional, institutional and cultural meanings individuals and societies ascribe to males and females (McGinn & Oh, 2017).

Also gender based on cultural construct described male behavior as aggressive, assertive, authoritative and competitive while female behavior is described as collaborative, communal, expressive and supportive (Eke,2012).There are some cultural practices that are gender biased at home or in work places like women perform the major role of caretaker at home and in the work place have tended to be employed in people-oriented, service occupations rather than things-oriented, competitive occupations which have been occupied by men (Lippa, Preston & Penner, 2014). This contrasting distribution of social role ascribed to male and female led to the generation of the concept of gender stereotypes which affects the choice of profession and subject especially science related subjects in our society (Koenig & Eagly, 2014). Teacher's gender also influences teacher's use of inquiry teaching in classroom. The study on teacher's gender and the use of inquiry teaching is limited. The researcher therefore, seeks to determine the extent to which gender could influence teacher's perception and attitude towards inquiry teaching in senior secondary schools of kano municipal educational zone, kano state.

This research study, therefore intends to investigate biology teachers perception and attitude towards inquiry teaching in Kano Municipal Educational Zone, Kano State, Nigeria.

1.2 Statement of the Problem

Despite the significance of inquiry teaching to learning, teachers prefer to teach using teacher-centered approach (traditional method). Teachers' preference of traditional method is that it allows a great deal of information to be passed to the learners and favours handling of large classes (Olayinka, 2015). This method of teaching is ineffective as it leads to ineffective learning and poor attitude of students towards the subject (Afolabi, Abidoye & Afolabi, 2013).

Researchers observed that teachers avoid the use of inquiry teaching due to numerous factors like time constraint, lack of resources, lack of funding, lack of support, lack of teachers knowledge, as well as influences of teachers gender, teachers attitude and teachers perception. Xie, Talin and Sharif (2014) reported that teacher's attitude influences the teacher's use of inquiry teaching in classroom. Adofo (2017) also reported that teacher's perception influences teacher's use of inquiry teaching to teach. Also, gender difference is influenced by different cultures and beliefs. Particularly in northern Nigeria, female are considered subordinate to their male counterparts. While male are more proficient and adventurous than females. Therefore, there is the need to investigate if these gender differences influenced by culture and beliefs also reflect male and female teacher's attitude and perception towards inquiry teaching. Also, the study of gender influence on teacher's perception and attitude towards the use of inquiry teaching is limited.

It is against this background that this research study intends to investigate biology teacher's perception and attitude towards inquiry instruction as well as the factors affecting the

use of inquiry in classrooms through perception of self and how their perception and attitude based on gender coincide and differ in senior secondary schools of Kano Municipal Educational Zone, Kano State, Nigeria.

1.3 Research Objectives

The objectives of this research were as follows -:

1. To examine the perception of biology teachers towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State.
2. To findout the attitude of biology teachers towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State.
3. To explore the factors affecting the use of inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State.
4. To determine whether male and female biology teachers differ in their perception of inquiry instruction in senior secondary schools of Kano Municipal Educational Zone, Kano State.
5. To determine whether male and female biology teachers differ in their attitude of inquiry instruction in senior secondary schools of Kano Municipal Educational Zone, Kano State.

1.4 Research Questions

The study investigated the following research questions:-

1. What is the perception of senior secondary school biology teachers towards inquiry teaching?
2. What is the attitude of senior secondary school biology teachers towards inquiry teaching?

3. What are the factors affecting the use of inquiry teaching in senior secondary schools in Kano Municipal Educational Zone, Kano State?
4. Do male and female biology teachers differ in their perception towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State?
5. Do male and female biology teachers differ in their attitude towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State?

1.5 Research Hypotheses

This research posed the following three null hypotheses:-

H_{o1} There is no significant difference between male and female biology teachers perception towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State.

H_{o2} There is no significant difference between male and female biology teachers attitude towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State.

1.6 Significance of the Study

The research findings of the study will provide information to science educators during workshops about the attitude of public secondary school biology teachers towards inquiry instruction

The research study will also reveal to educational planners on how teachers' perceive inquiry classroom teaching practices and develop a means to guide and assist biology teachers on how to build, plan and sustain successful inquiry in classroom teaching practices through professional development programme that will result in improving students learning in biology.

The research findings of the study will serve as a source of information and source of reference in library, for other future researchers who would engage in similar or related researches in order to consolidate the findings of the study.

The findings of the study will reveal to School administrators and other relevant stakeholders and authorities to be aware of the factors affecting the use of inquiry teaching so as to develop the possible means of overcoming those factors to improve the quality of education in the schools through workshops.

The research findings will serve as awareness to principal on teacher's attitude and perception towards inquiry so as to endeavour to mobilize them and other teachers to assist in creating awareness and advising students on the importance of learning through inquiry through conferences.

The findings will serve as source of awareness to teachers on their perception and attitude towards inquiry method of teaching during workshop, so as to clarify and consequently embrace inquiry method that seeks to provide them with skills and knowledge for effective teaching and learning of biology.

The findings of the study will also be significant to students, when teachers use inquiry teaching, students will develop interest, greater motivation and confidence for effective learning of biology to take place through inquiry.

1.7 Scope of the Study

Considering the fact that kano state comprises of six educational zone with numerous public and private schools, due to time factor and financial constraints, the research will cover kano municipal educational zone with the entire public senior secondary schools and their

respective biology teachers in kano state to investigate biology teachers' perception and attitude towards inquiry teaching in public senior secondary schools of Kano Municipal Educational Zone, Kano State, Nigeria. Biology teachers are selected in this study because considerable number of research that were conducted on teachers' perception and attitude towards inquiry instruction are mostly based on science teachers, physics teachers and chemistry teachers. Therefore, the present study used biology teachers to investigate their perception and attitude towards inquiry teaching.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter reviews key points and variables of the study, and reviews along, relevant concepts, theories and related empirical studies. The chapter is divided into the following sub-headings:-

- Theoretical Framework
    - Theory of Attitude (Rosenberg and Hovland, 1960)
    - Theory of Planned Behavior (Ajzen, 1991)
    - Self Perception Theory (Bem, 1972)
    - Gender Schema Theory (Bem, 1981)
- Conceptual Framework
    - The concept of Biology.
    - The concept of Biology Education.
    - Teaching of Biology in Secondary Schools.
    - Inquiry Method of Teaching.
    - Factors Influencing Inquiry Classroom Teaching Practices.
    - Biology Teacher in Secondary Schools.
    - Teacher's Attitude towards Biology.
    - Teacher's Perception towards Biology.
    - Perception and Preference for Instructional Strategies
    - Attitude and Preference for Instructional Strategies
    - The concept of Classroom Practice
    - The concept of Gender.

- Review of Related Empirical Studies.
- Implications of the Literature Reviewed to the Present Study.

2.2 Theoretical Framework

The researcher adopted the following theories to guide this particular study.

2.2.1 Theory of Attitude

Attitude is the basic expressions of approval or disapproval, favorability or unfavorability, or likes or dislikes of a person, object, place or issue that influences thought and action (Perloff, 2008). According to Veresova and Mala (2016), Attitudes structure can be described in terms of three components- the affective component (a person's feeling or emotions about an attitude object); behavioral or conative component (the way the attitude we have influence how we act or behave); and cognitive component (a person's belief or knowledge about an attitude object). Attitude cannot be accessed through direct observation but can be inferred from measurable reactions to the object which the reaction reflects the favorable or unfavorable evaluation of the attitude objects. Schau, Stevens, Dauphines and Del Vecchio (1995) categorized attitude into three components: Affective; Cognitive and Behavioral which are better and well understood through the theory of Hierarchical model of attitude offered by Rosenberg and Hovland (1960).

2.2.1.1 Hierarchical Model of Attitude

The Hierarchical model also referred to as the ABC or Three-component model offered by Rosenberg and Hovland (1960) postulates that, attitudes can be inferred from cognitive, affective or conative/behavioral responses to the attitude object. Allport (1954), categorized attitude responses into three- cognitive response; affective response; and behavioral response each with sub-group of verbal and non-verbal reactions which are used to infer attitude components. Each response category reflects a conceptually distinct component of attitude and

each component varies along an evaluative continuum. The model is diagrammatically shown in figure 1-

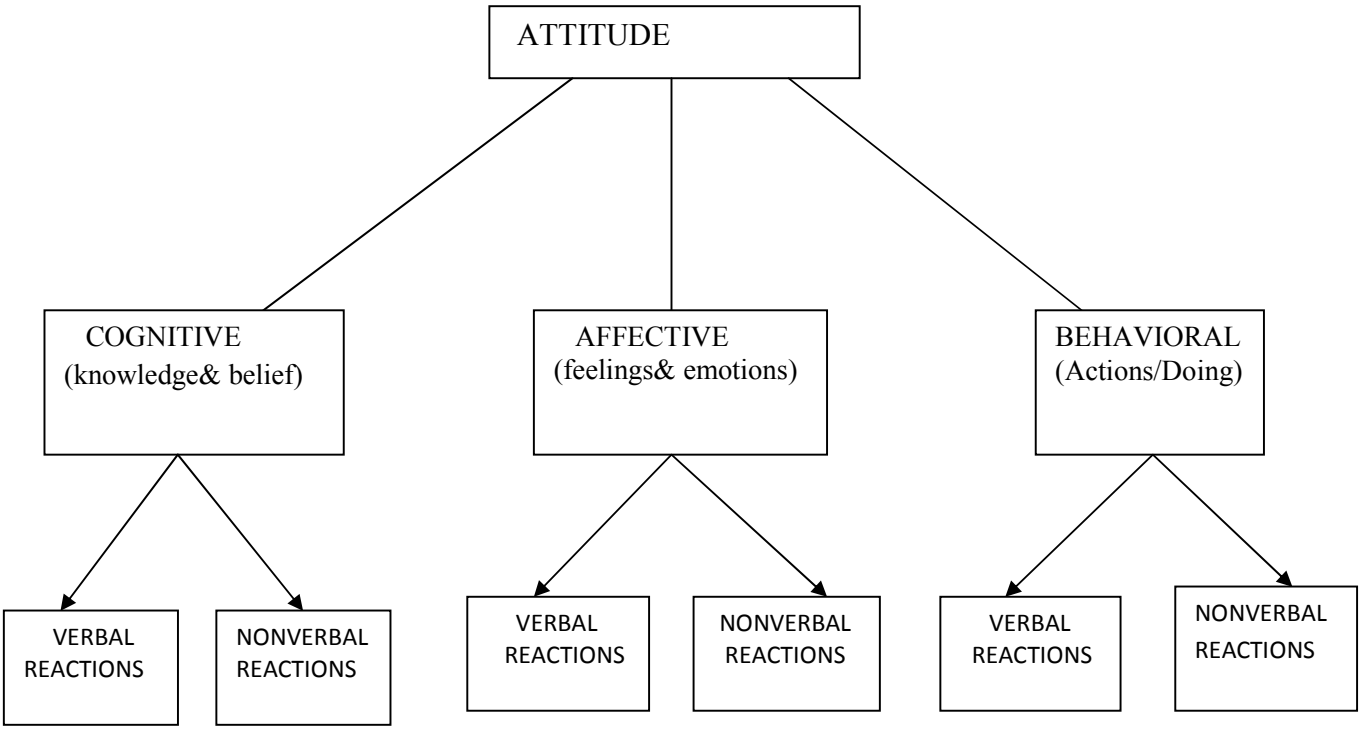

Figure 1: Hierarchical model of attitude adopted from Rosenberg and Hovland (1960).

Therefore, it can be concluded that any reaction whether cognitive, affective or conative, whether verbal or non-verbal reflects a positive or negative disposition of an individual towards an attitude object. In this model, the three components are defined independently, and yet comprise of the single construct of attitude as follows-

- Cognitive component- cognitive component of attitude refers to the individual's knowledge and thought towards the attitude object.
- Affective component- this refers to the individual's feelings and emotions towards the attitude object.

- Behavioral component- it is also referred to as conation. This consists of the individual's action with respect to the attitude object. The ways an individual act upon a certain attitude object reflect their attitude.

The implication of this model of attitude to this study is that, the three components (cognitive, affective and conative/behavioral) reflect the attitude of biology teachers towards inquiry instruction through non-verbal responses (self-report questionnaire).

Therefore, the present study relates to the hierarchical model of attitude as it intended to evaluate whether biology teachers have attitude of positive or negative feelings towards inquiry instruction in public senior secondary schools in Kano Municipal Educational Zone, Kano state.

2.2.2 Theory of planned Behavior (Ajzen, 1991)

Critics have indicated that the theory of reasoned action is not considered as a general theory of behavior. Rather, it is considered to be a theory of immediate cause of voluntary action that explains the link between attitude and behavior. Because of this criticism, Ajzen (1991), proposed an alternative theory of planned behavior which is an extension of theory of reasoned action that is, Fishbein & Ajzen model. Ajzen (1991) introduced the theory of planned behavior by adding a new component "perceived behavioral control", thereby extending the theory of reasoned action to cover non-volitional behaviors for predicting behavioral intention and actual behavior when an individual need to take control over needed resources in order to act. In the theory, control is taken into account as a variable that is, the "perceived behavioral control", which is a person's perception of how easy or difficult it would be to perform the action. Perceived behavioral control refers to the degree to which an individual believes that they control any given behavior. According to Ajzen (1991), perceived control affects behavior in two ways-

- It influences the intention to perform the behavior.
- It may have a direct impact on the behavior itself.

The theory postulated three conceptually determinants of intention which guide human action as follows-

- Attitude towards the behavior- this refers to the degree to which the person has a favorable or unfavorable evaluation of the behavior in question.
- Subjective norms- this refers to the perceived social pressure to perform or not to perform the behavior.
- Perceived behavioral control- this refers to the perceived ease or difficulty of performing the behavior which is assumed to reflect past experience as well as anticipated impediments and obstacles.

Therefore, The theory of planned behavior states that, attitude towards behavior, subjective norm, and perceived behavioral control, together shapes an individual's behavioral intentions and behavior. This can be illustrated in the diagram below:

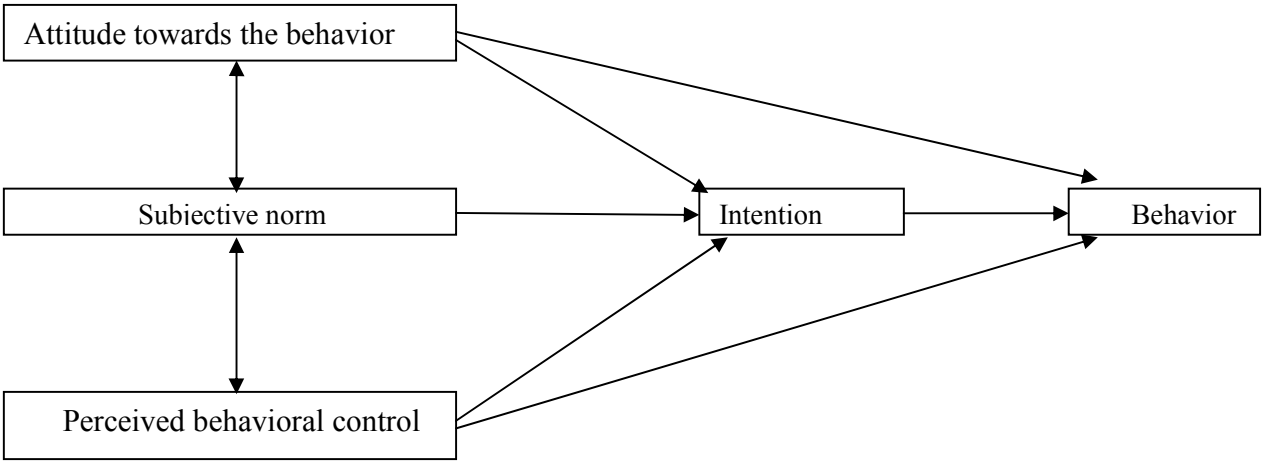

Figure 2: Theory of planned behavior (1991).

The theory of planned behavior predicts an individual intention to engage in a behavior at a specific time, place and context. The theory of planned behavior is a theory wherein the individual's behavior is best predicted by one's intention. Intentions are in turn predicted by attitude about the behavior, the subjective norms (a person's perception of important others beliefs that he or she should or should not perform the behavior) and the individual's perception of their control over the behavior (Cameroon, Ginsburg, Westhoff & Mendez, 2012). The theory defined intention as the trying to perform a given behavior rather than in relation to actual performance. Intentions are assumed to capture the motivational factors that influence a behavior and also indications of how an individual is willing to perform the behavior. Therefore in theory of planned behavior model, the central factor is the individual's intention to perform a given behavior.

Also, the degree of an individual to successfully perform a behavior depends not only on intentions, but also on non motivational factors like availability of requisite opportunities and resources such as time, skills, cooperation, and knowledge. These factors collectively represent the individual actual control over the behavior. Therefore, the addition of perceived control to the theory applies to behaviors that require skills, resources and other inputs that are not available merely because individual decides to act. The theory of planned behavior also deals with perceived, rather than actual behavior control. Perceived behavioral control may not be particularly realistic in many situations especially when an individual has relatively little information about this behavior; when requirements or available resources have changed; or when new and unfamiliar elements have entered into the situation. Therefore, the measure of perceived behavior may add to accuracy of behavioral prediction.

Ajzen (1991) added that Attitudes is a general and lasting positive or negative opinion or feeling about some person, object, or issue which occurs through either direct experience or the persuasion of others or the media. In addition, Ajzen suggested that attitudes may be created out of psychological needs (motivational foundation); social interactions (social foundations); genetics (biological foundations); emotions; and logic or thinking which can happen through sensory reactions; values; operant/instrumental conditioning; classical conditioning; semantic generalization; evaluative conditioning; or mere exposure. Ajzen (1991) concludes that, both the theories of reasoned action and the theory of planned behavior provide direction to the study of the prediction of behavior; Ease or difficulty to perform the behavior and perceived impediments and obs1tacles to carry out a task or perform the behavior, especially when attitudes are concerned. Therefore, this theory support the present study with respect to prediction of biology teacher's attitude; perception of factors affecting (difficulty) the use of inquiry teaching that shapes teacher's intention to practice inquiry teaching in classroom (behavior).

2.2.3 Theory of Perception

Williams (2017), defined perception as the way an individual respond and react to a certain situation with the given information. It is an individual's view point of a situation. Williams identified two types of theories of perception of an individual's own behavior. They are as follows-

- Cognitive dissonance theory- the theory involves an individual having two thoughts that contradicts each other. The theory accounts for attitude change when individual's behaviors are inconsistent with their original attitudes which are clear and important to them.

- Self perception theory- it is the perception of self. This is when an individual come to know or better understand their own attitudes, emotions and other internal states mostly by concluding them from observing their own behavior or situation in which the behavior occur. According to Tice (1993), the self-perception theory is significant in interpreting one's own attitudes and other personality traits.

According to Pall (2014), the difference between self-perception theory and cognitive dissonance is that cognitive dissonance attempt to account for observed functional relations between current stimuli and responses by postulating a hypothetical process within the organism while self-perception theory seeks to account for observed functional relations between current stimuli and responses in terms of the individual's past training history. The researcher will adopt the self-perception theory for this study.

2.2.3.1 The Self-Perception Theory (Bem, 1965)

The theory was developed by Bem (1965). Bem proposed that individual come to know their own attitude, emotions and other internal states partially by inferring them from observations of their own overt behavior and the circumstances in which this behavior occurs. The theory was initially proposed as an alternative to explain the experimental findings of the cognitive dissonance theory (Woodyard, 1973). The theory is counterintuitive in nature, as the conventional wisdom is that an attitude comes prior to behavior. The theory suggests that, individual develop attitudes and opinions by observing their own behavior and drawing conclusions from it. Therefore, the individual analyze his own behavior much as an outside observer might and, as a result of this observation, make judgements about why they are motivated to do what they do. According to Paul and Guido (2001), perception referred to as individual view point about a phenomena or situation whereas, self-perception can referred to as

self-report or self-judgement of cognitive aspects (attitudes, standard, and attribution); and Somatic aspects (sensations, arousal, physical symptoms and emotion) of self. Self-perception theory is about how experience arise and the nature of these experience, that is, that experience that an individual can and do tell us about (Laird & Bresler, 2015). It offers an explanation for the connection between self expressed behaviors and attitude where an individual describe their attitude regarding an event, relate event to prior behavior to infer current attitudes (Wang, Huang & Sun, 2009). According to Gale (2008), Bem self-perception theory consist of two basic claims as follows-

- The theory claims that individual come to know their own attitude, belief and other internal states by inferring them from their own behavior and the circumstances under which they occur.
- The theory also claims that, when internal cues are weak, the individual is in the same position as an outside observer who must rely upon the external cues of their behavior to infer their own inner characteristics

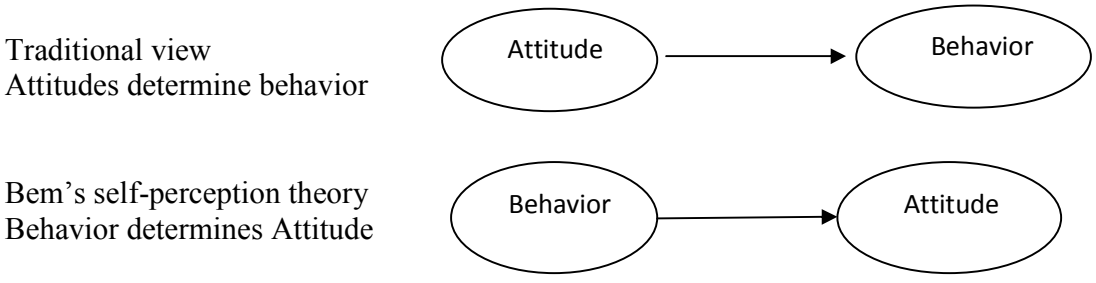

Figure 3: Bem's Self-perception Theory (1965).

From figure 3, the traditional view is that attitudes determine behavior. However, Bem stood conventional logic on its head when he proposed that behavior determines (or causes

individual to draw inferences about) their attitudes. That is individual do infer their attitudes from their behavior through self perception. Thus, individuals simply use their behavior and the circumstances in which it occurs to infer their own beliefs and attitude. The essential features of Bem's theory is that, individual form beliefs about themselves on the basis of their past decisions and the environment in which those decisions were made (Otto, 2006). According to Adunyarittigun (2015), individual use to make self-perception judgment about their own abilities from four major sources- performance accomplishment; vicarious experience; verbal expression and physiological arousal which has an impact on individual choices of activities; effort expenditure; perseverance in the face of difficulty and expectations of eventual success. Therefore, self perception refers to the self evaluation of individual self attributes; internal states and dispositions towards a situation or event. In which the self perception theory is an influential theory for expressing, reporting and understanding individual's action, feeling, attitude and behavior through observing their own behavior. The researcher will therefore, adopt the self perception theory for biology teachers to infer and report about their own attitude, perception and factors affecting the use of inquiry teaching in biology classroom by analyzing themselves through responding to a self report questionnaire.

2.2.4 Gender Schema Theory (Bem, 1981)

Gender schema theory was formally introduced by Sandra Bem in (1981) as a cognitive theory to explain how individuals become gendered in society, and how sex-linked characteristics are maintained and transmitted to other members of a culture (Bem, 1981).It is a cognitive backbone for how gender stereotypes may continue to be maintained in current society in the psychology of gender (Starr & Zurbriggen, 2017). Gender-associated information is predominantly transmuted through society by way of schemata, or networks of information that

allow for some information to be more easily assimilated than others. West (2015) refer gender schema theory as the process where the schemas are active, facilitating a relationship between the individuals thoughts, behavior, and in turn shaping the development of their gender and attitudes towards the self.

West (2015) added that the manner in which individual become sex-typed is through gender- schematic processing. Bem (1981) argued that there are individual differences in the degree to which people hold these gender schemata. These differences are manifested through the degree to which individuals are sex typed, thereby linking the notion about sex typing to the concept of gender schemata. This typing can be influenced by the childs agents of socialization (parents, schools, media) and other forms of cultural transmission. Bem (1981) refers to four categories in which an individual may fall:

i. Sex-typed: individuals process and integrate information that is in line with their gender.
ii. Cross-sex-typed: individuals process and integrate information that is in line with the opposite gender.
iii. Androgynous: individuals process and integrate traits and information from both genders.
iv. Undifferentiated: individuals do not show efficient processing of sex-typed information.

The gender schema theory being a theory of process and not content help in explaining some of the process by which gender stereotypes become so psychologically ingrained in the society. Specifically, gender schemata provides a filter through which individual process incoming stimuli in the environment, which in turn leads to an easier ability to assimilate information that is stereotype congruent, hence, solidifying the existence of gender stereotypes. While within adolescent development, Bem hypothesizes that children must choose among a

plethora of dimensions, but that gender schemas lead to the regulation of behaviors that conform to the cultural definition of what it means to be male or female. According to Pankin (2013), Gender schema theory states that children develop gender schema based on their experiences and the gender attributes of their culture.

Bem also assert that there is a heterosexuality subschema, which likely encouraged the development of gender schemas. Most societies treat exclusive heterosexuality as the benchmark or norm for proper masculinity and femininity. Furthermore, the heterosexuality subschema asserts that men and women are supposed to be different from one another. Bem hypothesized that this is why cross-sexed interactions are likely to be sexually coded. And sex-typed individuals have a general readiness to invoke the heterosexuality subschema in social interactions, behaving differently towards individuals or the opposite sex that they find attractive or unattractive.

According to West (2015), Bem (1981) also reasoned that self-esteem (that is, self-evaluation) is implicated with gender schemas because children learn to compare themselves against their gender schema, evaluating their preferences, attitudes, behavior, and personal attributes. The theory therefore adds to the explanation of men and women behavior, attitude, perception and attribute in the workplace. Lemon and Parzinger (2007): Ifegbesan (2010), examine gender schema of men and women in information technology and mathematics, they reported that there is a significant difference in beliefs, attitude, perception and practice of male and female teachers. For instance, male biology teachers could prefer teaching that involves students activities as a male responsibility while female teachers could prefer to teach using conventional method as the later is time consuming from their own point of view. This contrasting distribution of social role ascribed to male and female led to the generation of the

concept of gender stereotypes developed by Bem which affects teachers attitude and perception towards carrying out a particular task as well as the choice of profession and subject especially science related subjects in our society (Koenig & Eagly, 2014).

Therefore, this theory relates to the present study, as it intends to investigate if gender difference between male and female ascribed by culture and in the society reflects gender difference in biology teachers Attitude and perception towards inquiry teaching in Senior Secondary Schools of Kano Municipal Educational Zone, Kano State. This is because, Teachers gender difference reflects their attributes, behavior, attitude, perception, impression, competence and effort in any field. For instance, male teachers were perceived as more skillful and could develop more positive attitude and perception than women (Deaux and Emswiller, 2004). Also it was reported that male teachers perceptions were consistent with gender-differences which is related to teacher's gender role stereotypic beliefs and attitude towards the subject (Tiedemann, 2002). These can lead to gender difference behavior thus, making gender schema theory a useful framework for examining male and female teacher's attitude and perception of inquiry teaching.

2.3 Conceptual Framework

The following concepts were reviewed for the study.

2.3.1 The Concept of Biology.

Biology is the science of living world and the nature of life. It is one of the branches of science concerned with human life and his way of doing things (Ododo, 2014). Biology is anything covered by the definition of life, consisting of a complex biological systems that is richly endowed with capacities such as reproduction, metabolism, replication, regulation, adaptation, growth, evolution, and biopopulation (Ernst, 2004). It is one of the compulsory

science subject taught at secondary school level of education because of its importance to living being (Mathew, 2013) and also a pre-requisite to entry into professional courses in higher education level like medicine, nursing, pharmacy, physiotherapy, microbiology, biochemistry, agriculture, biology education, botany and other biology-related courses (Danmole, 2012). According to Wasmann (1910), Biology as the science of life embraces all living creatures and may be compared with a lofty tree having branches and sub-branches. It is developed as a result of research and thinking of some great scientist like Aristotle, Carl Linnaeus, Charles Darwin, Gregor mendel, Alfred Wallace and many others, (Muttaqui, Banu, Abdul Hasan and Ahmed, 2009). They further divided biology into the following branches and sub-branches:

Main branches of biology which are essential components of the natural environment

- Botany- deals with the study of plants.
- Zoology- deals with the study of animals.

Basic branches of biology that influences human life in various ways as follows-

- Microbiology- study of microorganisms.
- Ecology- effects of environment of living organisms and communities and also the interactions between them.
- Cytology- study of structures and functions of cells.
- Histology- study of structures and functions of tissue.
- Morphology and Anatomy- deals with external and internal structures of organism.
- Physiology- deals with activities of living things like growth, respiration, excretion, photosynthesis, and other biological activities.
- Genetics- deals with the study of inheritance of characters.
- Taxonomy- involves the identification, nomenclature, and classification of plants and animals.
- Evolution- deals with origin and successive transformations of living organisms.

Applied branches of biology include Agriculture, medical science, forestry and horticulture, fishery, animal husbandary; Other special branches of biology include phylogy, mycology, virology, bacteriology, helminthology, entomology. Biology plays a significant role in social, economic and national development. Mills (2017), identified the following importance of biology to man as follows:

- Biology explains how nature really works.
- It explains changes in human bodies.
- Biology shapes different careers and professions concerned with the concept of life.
- Biology provides answers and treatment to large-scale global and environmental problems like pollution and diseases.
- Biology teaches basic concepts and ideas about life and how human lives.
- Biology provides answers to how life comes to existence.
- Biology paves way for human beings to carry out new scientific research through scientific method.

Biology as a subject affects attitude and perception. Some researches reported positive attitude towards biology (Haddock, 2014) while some reported negative attitude towards biology (Ufuophi, 2012). Likewise perception**,** Some reported positive perception towards biology (Abiodun, Taiwo, Aderonke & Durojaiye, 2013) while some reported negative perception towards biology (Uwineza, Rubagiza, Hakizima & Uwamahoro, 2018). This indicates that biology can alter attitude and perception.

2.3.2 The Concept of Biology Education

Biology is a pivotal knowledge component of meeting humankind's requirement and thereby contributing to sustainable development, which can only be achieved through well planned and executed educational programmes in school (Kim & Diong, 2012).

Education is the systematic procedure for the transfer and transformation of culture, through formal and informal training of people in a society mentally, physically, psychologically, intellectually and socially (Patrick, 2007). Olawaiye (2013), described it as the process of acquiring knowledge, skills, attitudes, interest, abilities, competence and cultural norms of a society by people and to transmit this life to the coming generations so as to enhance perpetual development of the society. Education promotes economic growth, national productivity, innovation and sustainable development as the goal of any developing nation (Ali, Rehman. Saeed, Hussain and Tanzeela, 2010). They added that members of the society learn the skills to enrich, transmit and transform cultural heritage, social and scientific knowledge for the advancement and development of the society and nation at large.

Biology Education is the acquisition of biological knowledge through the educational setting. It is a discipline that develops biological knowledge based on discovery, experiments,

and research activity through educational setting (AL-zahrani, 2015). According to Edward and Joel (2013), Biology Education is meant to expose learners to biological nature, principles, process, skills and attitudes and their application to real life situations.

Okenyi (2015), outlined the following major objectives of biology education in Nigeria-

- To provide the youth with sound knowledge of the basic principles and techniques of biology.
- To produce knowledgeable, highly motivated, professional and effective teachers of biology who will be able to develop students an appreciation and understanding of biological processes and principles.
- To develop confidence in biology teachers and enhance the ability to adopt to the changing situation in science and the technological oriented society.
- To view biology as a process of inquiry into the living world.
- To analyze the activities of living things in their environment.
- To demonstrate practical skills in handling scientific apparatus.
- To demonstrate excellence and professional competence in teaching secondary school biology.
- To include positive scientific attitudes and value in the society and promote positive disposition towards biology, science and the scientific enterprise.
- To apply concepts and methods acquired in new areas of study and in everyday situation.

The objectives of secondary school biology curriculum according to the National Policy on Education (FRN, 2014) are to prepare student to acquire:

- Adequate laboratory and field skills in biology,

- Meaningful and relevant knowledge in biology,
- Ability to apply scientific knowledge to every day's life in matters of personal and community health and agriculture,
- Reasonable and functional scientific attitude.

Biology education curriculum emphasizes the ability to make students to be productive, creative, innovative and effective (Rohayati, Diana & Priyandoko, 2018). The content of secondary school biology curriculum taught and discussed in greater complexity and depth throughout the years of senior secondary course include

- Concepts of living
- Basic ecological concepts
- Plant and animal nutrition
- Variations and variability
- Evolution
- Genetics (FME, 2014).

Biology education plays a significant role in social and economic development. It enables individuals to tackle effectively personal, interpersonal and societal problems through science process skills and scientific methods (Salome, 2017). It enables biology graduates to be self employed and employers of labour and provide a wide range of biology-based ventures like teaching, fishery and horticulture (Aina, 2013). Society of biology (2014) added that, it provides to students the opportunity to apply a range of inquiry approaches to investigating and exploring the living world. In fact, biology education shapes the way the individuals and communities understands the biological basis and functions of life. Despite its importance to the society,

biology education faces many problems. Okenyi (2015), identified the following problems and prospects of biology education as follows-

- Security- issues like insurgences of boko haram, kidnapping, bomb explosions and gunshots, infrastructure vandalization made Nigerians to live in fear of the uncertainty of death which has resultant effects on biology education and education in general.
- Corruption- today in Nigeria, appointments, admission, infrastructure supplies, employment, teaching appointment is based on neptotism, favouritism, or whom you know as godfather and no longer on merit or what you know which is affecting the biology education in Nigeria.
- Teacher- lack of teacher's knowledge; unqualified professional biology teachers; lack of teaching methods; and lack of in-service training are problems to the development of biology education.
- Lack of proper curriculum development- biology education has not been given appropriate place in the Nigerian school curriculum. This is because the curriculum is imported from other developed countries. Therefore it is necessary to have a curriculum reform to enhance quality biology teaching.
- Inadequate funding- there is no adequate fund for the provision of conducive and enabling environment to facilitate the effective teaching and learning of biology process as well as research.

Okenyi (2015) concluded that the prospect of biology education is very slim because poor governance is significantly slowing progress towards biology education and undermining the quality of biology education services. Therefore, to develop biology education and acquisition of biological knowledge for the improvement of the teaching and learning of biology

in schools, the government should provide funds and adequate resources and materials; adequate and qualified biology teachers; biology teachers' utilization of effective teaching strategies; conducive biology classroom learning environment; as well as standardized biology curriculum to secondary schools.

2.3.3 Teaching of Biology in Secondary Schools.

The Teaching and learning of biology is a complex activity in any educational setting which involves teachers, students, and resources as well as their roles to play during the process of teaching and learning. Biology teaching is part of a whole that comprises the teacher, the learner, the disciplinary content, the teaching and learning process, and the evaluation of both the teacher and learner (Benjamin & Emmanuel, 2017). According to Taiye (2016), effective teaching of biology is a process by which a biology teacher adopts all the possible method used in teaching in the classroom to make sure that students understand biology and be able to respond positively during assessment or to produce a good result. Therefore, the biology teacher is at the center, guiding and supporting students while the students actively participate to a good teaching and learning to take place. The biology teacher therefore has many opportunities to make the subject more interesting for students, thus contributing to the formation of students' positive attitude towards biology (Kubiatko, Torkar & Rovnanova, 2017).

Biology is taught through two components, these are the theoretical aspect which is the abstract presentation of biological nature (facts, principles, and concepts), and biological processes. While the other aspect is the practical aspect which is the real and actual aspect of doing science through discoveries, experiments and experiences. According to Osinem (2006), biology is a practical oriented subject that involves active participation of students in the learning process and be able to see relationship between what is taught in school and its application in life

outside the school. Therefore, practical aspect of teaching biology should be activity-oriented, student-centered and student-directed. This engages students to hands-on and mind-on activities. Nzewi (2008) asserted that, practical activities are strategy adopted by teachers to make their teaching activities more real. Teachers should therefore plan activities that both the teachers and students can use during learning, providing the basis for observation, collection, experiment and analysis of phenomena.

Biology teaching in secondary schools also requires the use of available and easily accessed resources and facilities for better understanding of the subject matter. For biology lessons to be effectively taught, biology teachers are encouraged to use instructional materials to resources of virtual laboratory, realia (specimen, exhibits, models, phenomenal materials and manipulative materials), audio, visual, and audio-visual stimulants in a collaborative learning environment, for students to engage into inquiry, hands-on methods of learning biological processes (Mwangu & Sibanda, 2017). The use of resources in teaching biology brings about fruitful learning and stimulates student's sense of motivation (Olagunju & Abiona, 2008). Therefore, all facilities should be provided to the school for the students' better, concrete, and real experiences (Musa & Umar, 2017).

Teaching of biology can be conducted in classrooms, well-organized and well-equipped outdoors and laboratories settings (indoor and outdoor) essential for easy and effective learning of biological concepts. According to Enohuean (2015), the teaching of biology can be conveniently carried out in a laboratory which is a place designed and equipped with materials for teaching and learning of biology concepts. Biology teachers should also create an enabling environment that is effective and student-centered for learning biology. According to Rabiu, Barzani and Ekhwan (2014), the teaching of biology as a subject in secondary school is faced

with many problems like unavailability of laboratories and other teaching facilities and learning resources; students attitude towards biology; teachers attributes; influence of parent education and parental occupation; parents educational qualification; economic status; family background; inadequate supply of teaching and learning resources; irregularity related to teacher of biology such as irregularly in administration of practical, class discussion, teachers not allowing students to ask questions, teachers not making biology subject interesting, teachers not conducting inquiry activities etc. Galvia and Grady (2015) stated that, to acquire accurate biological knowledge, effective and evidence-informed pedagogic practices are needed and required by both teacher and students. Muhammad (2017), suggested that the teaching of biology should be inquiry-based that demand for practical activities; enabling students to acquire skills and experience, leading to increase in their academic performance and permanent learning. As the goal of science is to understand how the universe works, biology focuses on the understanding of life (both living and non-living). Therefore, to gain scientific particularly biological knowledge about nature (physical and biological phenomena), scientist use a particular approach called scientific inquiry.

2.3.4 Inquiry Method of Teaching.

There are varying definitions of inquiry which takes so many meaning in science education. According to National Research Council (1996), Inquiry is a pedagogical approach that helps students to achieve science understanding through reasoning and thinking skills, this enables them to describe objects and events, ask questions, construct and test explanation using evidence and communicate ideas. It is student-based exploration of an authentic problem using the processes and tools of the discipline, proceeding from identification of a problem, to reporting findings which serves as a primary source of science process skills development, (Wilke & Straits, 2005). Inquiry based learning can be defined from both a learner and teachers

perspectives (Guido, 2017). To Guido, Inquiry-based learning from student's perspective focuses on investigating an open question or problem, use evidence-based reasoning and creative problem-solving to reach a conclusion. While from teachers perspective, Inquiry-based teaching focuses on moving students beyond general curiosity into the realms of critical thinking and understanding, encourage students to ask questions and support them through investigation process.

National Research Council (2000) identified five essential features of inquiry as follows:-

- Scientifically oriented questions that will engage the students;
- Evidence collected by students that allows them to develop and evaluate their explanations to the scientifically oriented questions;
- Explanations developedby students from their evidence to address the scientifically oriented questions;
- Evaluation of their explanation, which can include alternative explanations that reflect scientific understanding; and
- Communication and justification of their proposed explanations.

Student's best learn science through an inquiry-oriented teaching approach, which is a teaching approach used to communicate scientific knowledge to students and allow them to construct their own knowledge, as opposed to an educational outcome that students are expected to learn about and learn how to do(Lederman, Lederman & Antink, 2013). They perceived inquiry in three different ways as follows;-

- A set of skills to be learned by students and combined in the performance of scientific investigation.
- As a cognitive outcome that students are to achieve, and

- Use of inquiry in reform documents relates strictly to pedagogy.

Martin- Hansen (2002), identified four types of inquiry as follows

- Open or full inquiry- this method reflects the way scientist work. It is a student-centered approach that begin with a student's question, followed by student (or in group) planning, designing, and conducting an investigation or experiment using materials and evidence, record and analyze data, and communicate result. It requires higher-order thinking and usually requires students to work directly with the concepts, materials and equipments.
- Guided inquiry- theteacher helps students to develop inquiry investigation in classroom, by posing question, assisting and providing applicable scientific data from a variety of sources for the teacher and students to use in investigation of a phenomenon. It is a natural lead-in to open inquiry.
- Coupled inquiry- this approach is of guided inquiry generated by teacher followed by open inquiry results in students generated question that closely relate to the standard from the first investigation of guided inquiry. The concept could be learned in a didactive way that allows students to connect their concrete experiences to abstract concepts in a learning-cycle approach.
- Structured inquiry- it is a directed, guided inquiry in which students follow teacher directions to come up with a specific end point or product. This approach is appropriate to use in the classroom but has limited student's active engagement to follow teacher's instruction. Therefore, structured inquiry does not include much true inquiry.

Justice, Warry, Cuneo, Inglis, Miller, Rice, and Sammon (2002), involved in inquiry-based learning developed a model of the inquiry process as shown in the figure below

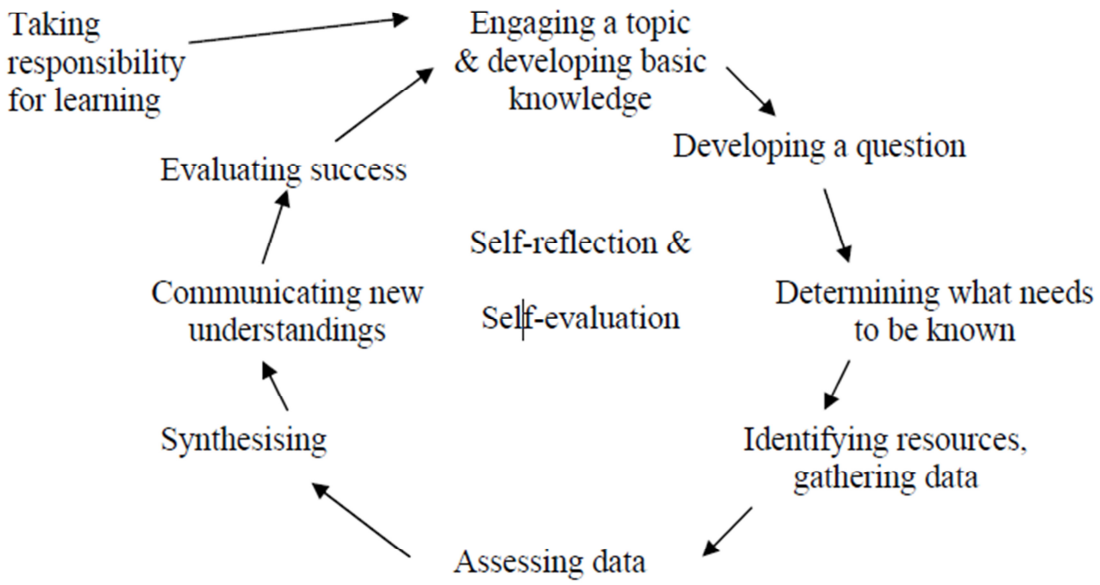

Figure 4: *Model of the inquiry process (Justice, Warry, Cuneo, Inglis, Miller, Rice & Sammon., 2002:1)*

According to Justice, Warry, Cuneo, Inglis, Miller, Rice and Sammon (2002), the model describes the process of inquiry and instructional implications in which students become engaged in science and other programs. The model has the following stages of inquiry:

i. Take active responsibility for understanding course processes and their role as collaborative learners.
ii. Gain a significant theoretical and substantive understanding of the course's topical focus and its personal significance (engage with the topic).
iii. Develop a good question.
iv. Determine the information needed to explore the question.
v. Access the required information effectively and efficiently.
vi. Evaluate information and its sources critically (and incorporate selected informationinto their knowledge bases and value systems).

vii. Synthesize understandings and critical assessments of information.

viii. Communicate the products and processes of their inquiries effectively to others.

ix. Evaluate their success at progressing through the inquiry process.

x. Core to the process is an attitude of self-reflection and evaluation, which are seen as both a product of the inquiry process and an enabler of success at every stage.

The inquiry process model relates to the present study as it investigates biology teachers perception on the use of inquiry process model for successful inquiry teaching in biology classrooms. Roster (2006) further identified the examples of inquiry method being used in classrooms and laboratories which ranges from teacher-initiated inquiry in the laboratory, to teacher-initiated inquiry in classrooms to student-initiated inquiry in the lab in group learning. They include-

1. Experimental project- it involves students to engage in long-term experimental project as how scientists think, work, and acquire skills and knowledge. It enables students to be more actively involved in their own learning.
2. Problem-based learning- in problem based learning, the instructor presents students with a problem, query, or puzzle that the learner wants to solve.
3. The learning cycle method- it consist of three phases (exploration, concept introduction and concept application), five phases (Engagement, exploration, explanation, elaboration, evaluation) and seven phases (Elicit, Engagement, exploration, explanation, elaboration, evaluation, extension)
4. Scientific inquiry method- refers to the diverse ways in which scientists study the natural world and prose explanations based on the evidence derived from their work.

Inquiry plays a significant role in teaching and learning of biology. Yakar and Baykara (2013), opines that inquiry is thought to promote scientific literacy; arouse curiosity; improve teachers and students thinking skills; improve understanding of science (biology); promotes engagement through logical and critical thinking, and problem-solving skills; ability to associate knowledge gained to their daily life experience; and develop attitude and skills in order to generalize the knowledge. To design inquiry instruction in classroom, it requires both an understanding of inquiry and abilities related to inquiry (Biological Sciences Curriculum Study :BSCS, 2007). Inquiry will therefore help teachers and students to develop both the abilities to do and understanding about inquiry. Teachers are therefore encouraged to develop and implement inquiry strategy in their classroom that engages their students and assist them to think scientifically. Experts from Exploratorium (1998) suggested that inquiry approach requires a different mind-set and expectations on the part of the teacher. In an inquiry approach, the teacher serves as a facilitator and guide. it requires a different teacher "mindset" and classroom culture for creating a learner-centered environment (Llewellyn, 2010). According to Reynold (2014): Hoepper (2014) in Preston, Harvie and Wallace (2015), the teacher plays a central and essential role in engaging and directing students towards inquiry learning, that involves explicit teaching and direct instruction which enables students to develop knowledge, as well as investigative and thinking skills.

2.3.5 Factors that influence the enactment of inquiry instruction into classroom teaching Practice.

Inquiry in science education is a teaching approach that engages students into many activities and thinking processes that scientist follows to solve problems and produce new knowledge using logic and evidence (Abdi, 2014). Inquiry-based approach is of great

significance in the teaching and learning process. It is crucial for developing systematic and critical thinking skills; problem-solving capabilities; develop creativity of students; develop and strengthens scientific exploration skills; develop reasoning and decision-making skills; develop communication skills; increases students interest and learning motivation; enable students to become active learners; enabling students to learn in a real-world situations; and also allow students to interact with materials, models, manipulate variables, discover and explore phenomena (Avsec and Kocijancia 2014: Cox, Maxwell and Lambeth,2015: Abdelraheem & Asan, 2006). Yet the approach is not widely implemented by teachers (Veikoso, 2010). Van couver (2004), identified four major obstacles affecting teachers to enact inquiry instruction into their classroom practice as follows:-

- High-stakes exams- the pressure and tension to cover wide range of topic, concepts and principles of subjects in order to prepare students for final exams is a factors that impedes inquiry implementation in classroom.
- Insufficient time- many teachers reported insufficient time to be an obstacle to inquiry implementation. As inquiry-based activities requires sufficient time to be carried out successfully.
- Students' expectations and abilities- many students expect their teachers to provide all the necessary information and guidance for them to learn. Also some students might feel lost when conducting inquiry activities, because inquiry involves collaboration of students with different abilities.
- Fear of the unknown- some teachers had no inquiry experience from their training schools which results to fear of the unknown.

Other researchers identified teachers lack of instructional content knowledge and skills; lack of experience; inadequate resources, facilities, equipment, materials and infrastructure; lack of support and collaboration; lack of funding or poor funding; insufficient time; low quality professional development; class size; teachers judgement and assessment; students prior knowledge; students motivation; limited resources; exam-driven education system; lack of good learning habits in students; lack of class control; pupils age; meeting the needs of the students; lack of teachers confidence; inadequate training; teachers lack of commitment; lack of students interest; teachers beliefs; teachers attitude; teachers perception (Adofo, 2017):(Thomas, 2013): (Panjwani, 2013): (Dai, Gerbino, and Daley, 2011): (Sporea and Sporea, 2014): (Drabkin, 2016): (Mugabo, 2012): (Melesse and Jirata, 2015): (Veikoso, 2010): (Barkatsas and Malone, 2005): (Chin, 2014): (Mansour, 2008): (Boujaoude and Saad, 2012) to be the constraints towards the enactment of inquiry-based instruction into teachers classroom practice.

In fact, Alhendal (2013) categorized the barriers to inquiry implementation into three groups as follows:-

- Personal factors- this includes teachers' belief and attitude, skills and background about the use of inquiry.
- Social factors- principals, colleagues' collaboration and support of schools, and National policies. Influences the enactment of Inquiry instruction in classroom.
- External factors- like availability of resources, time, class size, fund and ease of use.

All are factors that influence and affect the use of inquiry-based instruction by teachers in classroom and schools. This relates to the present research study as it intends to explore the

personal, social and external factors affecting a successful inquiry teaching in biology classroom in senior secondary schools of kano municipal educational zone, kano state.

2.3.6 Biology Teacher in Secondary Schools.

A biology teacher is qualified personnel that teaches the concepts, principles and theories of biology to students in the classroom by the use of teaching methods (Milan, Gregor & Lenka, 2017). He is an indispensable human resource who has a vital role to play in the selection and use of resources for teaching biology, have knowledge of biology subject matter and understanding of biology curriculum content (Okafor, 2014). The common goal of a biology teacher wherever he is, is to make biology lesson presentation vitally fresh, stimulating and testing for their students through the use of instructional materials (Effiong & Igiri, 2015). Because biology teachers style of teaching biology, his teaching methods and technique influences students' learning in biology (Cimer, 2012). The secondary school biology teachers' mastery of the unique nature of biology is essential in providing explanations of biology concepts and theories to students; eliminate student's misconceptions and alternative conceptions, and enhance meaningful learning to the students (Adegboye, Ganiyu & Isaac, 2017).

Silver (2018) stated some of the qualities of a biology teacher which include-

- Personality- biology teachers should be enthusiastic, positive, understand personal preference of students and encouraging.
- Physical attributes- should be physically fit.
- Biology teachers should be dynamic, patient, understanding, caring and have sense of humor.

- Knowledgeable- biology teachers should have knowledge of general biology; they should be lifelong learners and keep current, latest discoveries and research about the natural world.

Ajewole and Okebukola (2000) added that, it is necessary for biology teachers in secondary schools to have knowledge about many solutions to biological problems and to encourage students to freely express their mind, ask questions and initiate talking during biology lesson. Shulman (1986) in Wingschitl (2004) stated that, biology teachers should possess the following aspects of knowledge as follows-

- General pedagogical knowledge- understanding how to moderate discussions, design group work, organize materials for student use, utilize text and media.
- Content knowledge- understanding of a domain's concepts, theories, laws, principles, history, classic problems, and explanatory frameworks that organize and connect its major ideas.
- Pedagogical content knowledge- knowledge of how students understand the subject matter, what theories of natural phenomena they hold and how these may differ from scientific explanations; knowledge of the types of ideas appropriate for learners of different ages to explore; knowledge of ideas that are prerequisites for students' understanding of target concepts; understanding how to select representations, analogies, and activities that help learners conceptualize science ideas; knowledge of how to scaffold students' reasoning processes (e.g problem-posing, distinguishing theory from evidence, adjudicating between rival hypotheses, etc.) and skills of various kinds related to scientific work (e.g planning investigations, working with data, communicating

findings, constructing arguments, etc); understanding of scientific-specific assessment strategies.

- Disciplinary knowledge- understanding the purposes of science inquiry; knowledge of domain-specific methods of investigation; understanding the nature of relationships between scientific models and data; knowledge of standards for evidence and argument held in various fields of science; and recognizing reputable sources of information and distinguishing them from pseudo-science, commercial reports, secondary sources, etc.

According to Daworiye, Alagoa, Enaregha and Eremasi (2015), The quality teaching of biology is characterized by the teacher having an adequate knowledge of subject matter; encouraging inquiry and hands-on approach to learning for students; and recognizing individual students as active learners, as the teacher builds on learners strengths rather than trying to stampout their weaknesses as well as providing support. Inquiry teaching in biology classrooms needs the biology teacher to therefore act as a facilitator and provide the needed coaching and support that will enable students harness such learning opportunities. Therefore, investigating into the extent biology teachers perception and attitude of inquiry teaching of biology concepts with respect to gender is the concern of this present study. It relates to the present study as it will use biology teachers to determine their perception of inquiry teaching in biology classroom.

2.3.7 Teachers Attitude towards Biology.

One of the most studied and important construct in psychology is Attitude because of the critical role it plays in guiding everyday choices and behavior towards a person, object, or issue indicating the extent of likeness or dislikeness (Petty, 2012). They are set of beliefs an individual hold about an object, person, thing, event or situation.(Search for the definition of attitude by someone and add here). Attitudes are formed from individual subjective evaluation, influenced

by affective, emotional responses and related beliefs individual holds about the attitude object (Roger, 2005). Roger also stated that Attitudes are specific to an object, while beliefs are more generic, stable and relate to a wider world-view. Eventhough Attitude are considered to be relatively stable and enduring, it is subjected to change over time when exposed to new information and or experiences leading to change in individuals attitude (Bizer, Barden & Petty ,2003). Ajzen (1993) defined Attitude as a multidimensional and hypothetical construct consisting of cognition; affection; and conation as verbal and non-verbal indicators, which cannot be accessed through direct observations, but can be inferred from measurable reactions towards the attitude object. To Ajzen, these reactions reflect favourable or unfavourable, positive or negative kinds or responses. Rosenberg and Hovland (1960) in Ajzen (1993) demonstrated different types of responses from which attitude can be inferred as shown in the table below:

Table 2.1: Rosenberg and Hovland (1960) analysis table from which attitudes can be inferred.

Response mode	**Response category**		
Verbal	Cognition	Affect	Conation or Behavior
	Expression of beliefs	Expression of feelings	Expression of intentions
Non verbal	Perceptual reactions	Physiological reactions	Motor responses

Allport (1935) stated that, the positive or negative attitude scale of an individual should be regarded only as the roughest approximations of the way in which attitude actually exist in the mental life of individuals. Kroenung and Eckhardt (2011) identified three classes of attitude used to evaluate attitude as follows-

- Affective type- this consist of individuals emotions, feelings or moods towards certain attitude object or situation.
- Cognitive type- they are individual's thoughts, beliefs or ideas about the attitude object or situation.
- Behavioral type- these are overt actions and intentions an individual perform in relation to the attitude object.

According to Eaton and Visser (2008), attitudes are practically and theoretically important because they have predictable and very powerful effect in determining individual's behavior under certain circumstances. Katz (1960) in Banaji and Heiphete (2009) proposed four functions of attitude as follows-

- Utilitarian function- Utilitarian attitude are those that help an individual obtain rewards and avoid punishment.
- Knowledge function- this allows an understanding of the situation in which one founds him or herself.
- Ego-defensive- it protects individual from psychic threats, and lastly
- Value-expression function- these are attitudes that help individual express their core value or foundational aspect of themselves or expressing one's core values.

Bohner and Dickel (2011) stated that, researchers use the following to measure attitude as follows:

- Implicit Attitude- these are individual's attitude that are measured by implicit procedures for example the Implicit Association Test (IAT) and the evaluative printing task. While

- Explicit Attitudes- are attitudes measured by self-report instruments like Questionnaire, which directly ask respondent to evaluate their attitude towards an object by checking a single or multiple item responses.

According to Jeffery (2005), Perception is closely related to Attitude and also relate to human behavior, because Attitude are individuals mindset of personality, beliefs, values, and behaviors that help an individual define how he sees a situation as well as how he behave towards the situation, while perception is the way an individual confront, interprete and organize situations based on experiences, thereby affecting individuals existing beliefs, Attitude and personality.

However, the definition of the concept of attitude towards science (biology) is vague and ambiguous which affects course and career choices of individual (Ahmad & Asghar, 2011). Teacher's attitude towards biology is the feeling, beliefs and values the biology teacher holds about biology in general. Osborne, Simon and Collins (2003) stated that attitude towards science (biology) consist of a range of sub-constructs all of which contribute in varying proportions towards individual's attitude towards science (biology). They include

- The perception of the science teacher.
- Anxiety towards science.
- The value of science.
- Self-esteem at science.
- Motivation towards science.
- Enjoyment of science.
- Attitudes of peers and friends towards science.
- Attitudes of parents towards science.
- The nature of the classroom environment.

- Achievement in science and
- Fear of failure on course.

Attitude therefore is an essential measure of individual's expressions and feelings towards an object which however, may be related to the behavior an individual actually exhibits. This arouse and led researchers like Ajzen and Fishbein (1980) to develop the theory of reasoned action which is concerned fundamentally with predicting the relationship between attitude, intention and behavior of an individual. Therefore, assessing the extent teacher's attitude towards inquiry teaching in teaching of biology in kano state is of interest to this study. Therefore, this study aims to assess biology teacher's attitude towards inquiry teaching in kano municipal educational zone, kano state.

2.3.8Teacher's Perception towards Biology.

Perception is the way an individual interprete and ascribes meaning to object, thing, event or situation. Perception shapes the mind of individual by specifying the contents of what the mind apprehends and also a significant source of structural information for the mind about an object (Bueno, 2013). Yurdakul (2015) asserted that, Perceptions are created when an individual attributes meaning to stimuli, be it an object, event, or phenomena, and match the stimuli to what is known. Lewis (2015) identified the following as the fundamental elements of perception-

- Perceiver (experiencing person)-: the perceiver is the person that ascribe meaning to the perceived object or issue. The characteristics of the individual perceiver like attitude, interest, motives, experience, expectations, personality, motivation, and gender, influences and modifies individual perception.
- Perceived (object, person, issue, or situation)-: the perceiver perceived object or subject and categorized them based on their physical characteristics (that is physical appearance

like size, intensity, contrast and novelty) and dynamic characteristics (like motion, repetition, and the arrangement of the target).

- The context of the situation in which the object or subject or issue are perceived. The context or situation such as cultural context, social situation, location and time have influence on how object or issue are perceived by the perceiver, thus influencing individuals thought and behavior.
- The perceptual process-: this ranges from stimulus experience by the senses through observation and selection of focus (perceiver, perceived object or subject, in situational context, to the formation of percepts.

Teacher's perceptions towards biology refer to how biology teachers perceive biology, or teacher's thought or views about biology in general, biology teaching and learning as well as the importance of biology. Teacher's perception of biology sought to reveal the teacher's opinions, as biology teachers, about general biology, aims of biology, a field of profession and its role to the society (Ozcan, 2003). According to Simon (2016), teacher's perception plays a key role on students learning, attitudes and skills. There are factors that affect and influence teacher's perception towards biology (Ogheneochuko, 2009), as follows-:

- Internal Factor- individuals need, personality, experience, self-concept, expectation, and belief influences what an individual perceive about an object or situation.
- External factors- some aspect of the social and physical world such as size, intensity, frequency, motion, status, and contrast.
- Or the combination of both internal and external factors.

According to Dawn (2003), teacher's perception is an important and primary topic of consideration. This is because, teacher perception have a great effect on the successful implementation of quality education, as well as teaching and learning in schools (Dagnew & Asrat, 2016). Teacher perception towards biology is the teachers view, feeling and perceived ability of being prepared to carry out the responsibility of a task effectively (Lowe, 2012). Therefore, it is of interest to establish teacher's perception of their own effectiveness and explore the factors that influence teacher's perception of their own effectiveness (Ko, Sammons & Bakkum, 2014). Jean-Baptiste (2014), stated that, teachers attitude and perception are significant and teachers interaction with students affect teachers teaching behavior with students, and also teachers beliefs and feelings about the curriculum and subject matter influences their behavior and classroom instructions. Therefore, in this present study, the researcher intends to determine biology teacher's perception of the use of inquiry teaching as a construct that influences teacher's behavior in classroom.

2.3.9 The Concept of Classroom Practice.

Li and Oliveira (2015) refer classroom practice as a system and process which are manifested in diverse formats and structures, involving multiple agents and their interactions that can be influenced by internal and external factors. Classroom teaching practice is the process of teaching that involves the utilization of different teaching strategies and materials or equipment, as well as teacher-student and student-student interactions in the classroom. Classroom practices provide the opportunity for students to not only create their own goals, but also structure their own goals and construct the means of accomplishing those goals, in relation to the pattern of social interactions both between teachers and students as well as students themselves (Saxe,

Gearhart & Seltzer, 1999). Alber (2015) outlined five highly effective classroom practices as follows-:

- Teacher clarity- teachers should clarify the purpose and learning goals to students.
- Facilitate collaboration among students;
- Give students control over their learning process;
- Enable students to reflect what and how they learn;
- Adopt explicit skill-instruction (problem-solving) and;
- Allow students to do their own task.

It is therefore, a clue that these effective classroom practices listed above reflects that of inquiry as students should be actively engaged in establishing knowledge through experiential learning process that involves cooperation, collaboration and problem-solving skills. Saxena (2013) stated that, classroom practices in student-centered classroom requires extensive learning and practice on the part of the teacher which if successful will make the teacher to be true facilitator and a guide towards learning, hence empowering students to be actively engaged and have control over their own learning. Extensive learning and practice of classroom teacher can be acquired through teacher professional development programs and activities. The professional development activities enhance classroom practices. Organization for Economic Co-operation and Development :OECD (2017) stated that, for teachers to develop effective and essential use of classroom instructional practices, they need to support their work with components or features of professional development activities such as active learning; extended time period (duration); collective participation of learning activities; and collaboration with colleagues or peers. Therefore, in this present study the perception of the use of inquiry teaching will reflects the classroom practice of inquiry teaching which requires students to be actively engaged in

establishing knowledge through inquiry and experiential learning process that involves cooperation, collaboration and problem-solving skills.

2.3.10 Attitude and Preference for Instructional Strategies

Attitude is the feeling towards an object which affects how a person thinks and acts (David, 2013). There are three constructs of attitude which include affective, cognitive and behavioral. According to the theory of attitude developed by Rosenberg and Hovland (1960), individual's attitude influence how an individual act or behave towards an attitude object or situation (behavioral component). That is people behave according to their attitudes. Ndegwa (2005) stated that teachers attitude is concerned with the way they value, appreciate and act in various situations which involves established methods and techniques. Speculations have been made concerning the relationship between teachers preference of instructional strategy or teachers methodology and attitude (Gabrielatos, 2000).

According to Witt (2002), teaching methods are influenced by the teachers attitudes and competence in regard to the subject matter. For instance, it can be agreed that a teacher with favourable attitude towards biology and students centered methods will allow students to learn on their own through student centered methods and only gives help when necessary (like in inquiry teaching methods). Also, a teacher would use teacher centered method, which allows full control of the class as well as allows a great deal of information to be passed to the learners. Therefore, teachers attitude are also examined in connection to teaching method because the behavior patterns of teachers choice of teaching method, which are in affected by teachers attitudes, are important to teacher effectiveness. Other factors like availability of teaching and learning materials, class size, teachers knowledge and experience, mastery of content, teachers motivation influenced the choice of teaching method (Jebet, 2018). Aynalem, Abebe, Guuadie

and Bires (2015) also argued that the choice of teaching methods is due to specific characteristics like perception and attitude.

2.3.11 Perception and Preference for Instructional Strategies

Allport (1968) described perception as the way people judge others with whom they are in contact. Perception is a complex phenomenon within psychology that has to do with individuals view point of a phenomenon. Teachers perception are the perceived ability to perform required teaching professional and organizational task and regulate relations involved in the process of teaching students. According to Amoo and Rahman (2004), teacher's perception of instructional strategy could influence teacher's choice and use of teaching method. People perceive their environment and events within it in terms of their ability to act (Witt, 2011).

Teachers perception had a strong influence on the use and integration of instructional strategy in classrooms (Inan & Lowther, 2010). Therefore perception plays a significant role in teacher's preference and use of teaching method. for instance, teachers with positive perception of student centered methods tends to be able to foster a supportive learning through the use of student centered methods and would also be approachable to use student centered methods than those with negative perception. Dauda, Jambo and Umar (2013) stated that the way teacher perceive a methodology determines their success or failure to enact the method of teaching into practice in classrooms. They added that, a teacher who is rated high on these indices in the perception of preference of instructional strategy is likely to enjoy the confidence of using or enacting that method of teaching in teaching and vice versa. Therefore, teachers perception of the significance of students centered method particularly inquiry method will encourage teachers to use inquiry method to teach in their subject.

2.3.12 The Concept of Gender

The gender of the teacher is an important variable to consider in this present research study. Various authors have defined gender on social and cultural basis. Gender is described as the self representation, social and cultural views of male and female (Liu & Mager, 2016). Gender is the properties that distinguish individual organism on the basis of their reproductive roles as male or female sex (Abubakar & Uboh, 2010). Kark, Wiasmel & Shamir (2012) juxtaposed gender as contemporary perceptions that preferably attach feminine and masculine characteristics as an entity with blended instrumental traits rather than biological traits of sex to a position. Ghosh (2015) defined gender as one's own identification as male or female which is based on legal status; social interactions; public persona; personal experience and psychologic setting. According to Tim (2018), the word sex is not interchangeable with the term gender, as sex refer to the distinguishing classification of male and female on the basis of their physiological characteristics; reproductive organs and function, while gender refers to the social and cultural distinction associated with a given sex and the division of people into various categories according to their biological sex, with each having associated roles, clothing, stereotypes known as gender role.

Gender difference has continued to be an issue of interest and concern to educators and researchers worldwide. The contemporary issue of gender differences could therefore be categorized as differences in science learning ability (achievement) and differences in attitude towards science. Some studies revealed that gender influences academic achievement as males' outperformed females in achievement Abubakar & Kamar (2018): Ukamaka (2014) and Opara (2011)while other studies reported opposite that females outperformed male Shaheen & Kayani (2015): Ibe (2013) and Okeke,2018). Some studies on other hand disclosed that there was no

significant gender difference in the students' academic performance in various science subject Ajaja (2013): Donatus & Agusiobo (2017) and Dania (2014).The difference in gender could be linked to the viewing science, technology and mathematics to be masculine whereas language, art and writing to be regarded as feminine (Simmon, 2010:Ogunleye & Babajide, 2011). Also, some studies shows that gender influences attitude towards sciences as reported by Desy, Peterson & Brockman (2011): koros (2015), male had positive attitude towards science than female. while report indicates positive attitude in favour of females Erdamar, Tufan, Nilay, & Zeynep (2016). Studies of Agarwal & Shukla (2017) and Sakariyau, Taiwo & Ajagbe (2016) indicated that there was no significant gender difference in attitude towards science. Jacob &Linus (2017) asserts that the method of teaching adopted by teachers in a way that appeals to different learners, and active participation of students by providing learning materials irrespective of gender, could improve students' achievement regardless of gender. Inquiry method of teaching is one of the methods endorsed by National Research Council (2000) that provides students the opportunity to be active learners irrespective of gender difference.

Therefore, this present study intends to determine the influence of gender on biology teachers' perception and Attitude towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State.

2.3 Review of Related Empirical Studies.

Adofo (2017) investigated the teachers' perceptions about inquiry in science education in Eastern Finland. The study employed a case study research design. Three research questions were formulated for the study. The population of the study consisted of all science teachers in Joensuu and student teachers in the school of applied educational science at university of Eastern Finland, as the specific number of teachers' in the population was not stated. Purposeful

sampling was used to select a sample of seventeen participants including seven teachers and ten student teachers. Data was collected using the questionnaire instrument. The reliability index of the instrument was not stated in the study. Manifest content analysis and descriptive statistics were the tools used for data analysis. The findings of the study revealed that both teachers and student teachers shared similar views about the use of inquiry and perceived inquiry as a useful teaching and learning strategy that promotes understanding of scientific concepts; enhances memory trace; and active participation in science classroom. Result also identified time; curriculum; large class size; teachers own and judgement; inadequate resources and equipment to be the limitations to an effective implementation of inquiry-based learning in science lessons. He recommended that teachers may need staff development programmes to be abreast with the changing dynamics of teaching science, Also teachers must be taken through the appropriate ways of successfully using inquiry in science classroom.

The reviewed study used science teachers while the present study used biology teachers as participants for the study. The reviewed study explored teachers perceptions and factors affecting the use of inquiry teaching while the on-going study also determined teacher's attitude towards inquiry teaching. Also, the location in which the reviewed study was conducted in Eastern Finland differs with the location of the present study conducted in Kano municipal Educational Zone, Kano state, Nigeria.

Drabkin (2016) conducted a study on Ontorio mathematics teacher's perception of, and strategies for, implementing inquiry-based teaching and learning in Toronto. A qualitative research design was adopted. Five research questions were formulated for the study. The population of the study was not stated as the participants were volunteering to participate in the study. Purposeful sampling technique was used to select a sample of three experienced Ontario

intermediate mathematics teachers. They were interviewed for the study using face-to-face interview instrument. The reliability of the instrument was conducted by reviewing the interview instrument by the researcher. Data collected was analyzed by coding using vivo coding. Findings showed that meeting the needs of the students; lack of knowledge and assessment to be the challenges associated with the implementation of inquiry-based approaches in mathematics classroom. The result also showed that teachers implement inquiry-based lessons by activating student's prior knowledge through collaboration. The researcher recommend that more resources should be provided for teachers; also ongoing professional development should be offered in the school boards to provide more training for inquiry-based mathematics and also teachers should be provided with the opportunity to share ideas of inquiry tasks.

The reviewed study did not specify the population for the study while the present study specified the population for the study. The reviewed study used interview as the instrument for collecting data, while the present study used questionnaire. The reviewed study used qualitative research design while the present study used descriptive survey design. The reviewed study used mathematics teachers while the present study used biology teachers as participants for the study.

Sporea and Sporea (2014) investigated Romanian teachers' perception on inquiry-based teaching. The study addresses the perception of pre-school teachers in relation to their inquiry practices in the classroom in Bucharest, Romania. The study adopted a descriptive survey research design. The study was guided by three research questions. The population for the study comprised of all pre-service teachers' volunteering to participate to the i-BEST project in Bucharest, Romania. The specific population number of pre-school teachers was not stated in the study. Purposeful sampling technique was used to select a sample of six pre-school teachers volunteering to participate in the study. A questionnaire of thirty-eight questions called "self-

reflection tool for teachers used for judging the implementation of inquiry-based teaching through self-analysis of classroom practices" was used to collect data. The reliability coefficient of the instrument was not stated in the study. Percentage was used to analyze the data collected. The result of the study showed that most of the pre-school teachers are not able to follow the basic steps of an inquiry during science lessons. Teachers perceive lack of time and resources as well as the age of pupil to limit the implementation of inquiry based science education practice in school. They recommended the continuation of their research.

The reviewed study determines the teacher's perception of inquiry teaching and factors affecting the use of inquiry, while the present study finds out teachers perception and attitude as well as factors affecting the use of inquiry teaching. The reviewed study did not specify the population and reliability index of the instrument while the on-going study did. Also the location in which the reviewed study was conducted in Romania differs with the present study that was conducted in Kano Municipal Educational Zone, Kano State, Nigeria.

Sikko, Lyngved and Pepin (2012) conducted research on working with mathematics and science teachers on inquiry based learning approaches: teachers' belief. A survey research design was adopted to investigate Norwegian teachers' beliefs with respect to inquiry based learning, as well as the main obstacles to the use of inquiry based learning pedagogies in their day-to-day teaching. Two research questions guided the study. The population for the study comprised of all Norwegian teachers who volunteered to take part in the PRIMAS PD course of developing inquiry knowledge and classroom practice. The specific total number of Norwegian teachers' population was not stated in the study. Clustered sampling technique (region specific was used to select a sample size of seventy five teachers to participate in the study. The instrument used is a four-likert type questionnaire developed by PRIMAS partners to collect data with reliability

value of 0.73. Mean, standard deviation, percentage and frequency was used for data analysis. The study revealed that teachers in Norway would like to use more inquiry based learning strategies in their day-to-day teaching. Result also showed that Norwegian teachers had a positive attitude towards inquiry based learning oriented pedagogies. They identified shortage of time to be the main obstacle to the implementation of inquiry based learning. Researchers recommended that teachers need to be given more time to implement inquiry-based learning in their classroom. And more time to collaborate with their colleagues and in the curriculum.

The reviewed study used mathematics and science teachers while the present study used biology teachers as participants for the study. The total population of the study was not stated in the study reviewed while the present study stated the total population for the study. The reviewed study was conducted in Norway while the present study was conducted in Kano Municipal Educational Zone, Kano State, Nigeria.

Panjwani (2015) investigated teacher's views on inquiry-based learning in science: a case study from Trondheim international school in Norway. A case study research design was adopted for the study. Three research questions were formulated for the study. The population of the study comprised of all teachers' in Trondheim international school in Norway but, the specific number of teachers' population was not stated in the study. Samples of five teachers were purposefully selected for the study to reveal their own teaching practices in line with inquiry-oriented teaching. Interview was the instrument used for data collection. Reliability coefficient was not stated in the study. A qualitative software ATLAS version 4.2 was used for data analysis. The result revealed that the teachers considered collaborative planning among teachers in a school as more supportive for enacting inquiry-based learning from the professional development courses. It also showed those students' autonomy and content knowledge of

curriculum as the most prominent in their perceptions of inquiry-based approaches to science teaching. It also revealed that curriculum; time management; students' prior knowledge; students motivation; class size and limited resources as the main constraints that impacted their enactment of inquiry-based learning in classroom. He recommended that school authorities should have and provide sufficient collaborative planning time in the teachers' schedule and have mentor to support the teachers in improving their teaching practices through qualitative feedbacks. Also suggested that teachers' views in any project or workshop should be considered to increase success and improve the teaching practices so as to have a link between the teachers, researchers and professional development leaders.

The reliability index of the instrument was not stated in the reviewed study while the on-going study stated the reliability index of the instrument. The reviewed study examines teacher's perception towards inquiry teaching as well as factors affecting the use of inquiry. While the present study finds out teachers perception and attitude towards inquiry teaching and the factors affecting the use of inquiry teaching. The reviewed study used interview as instrument for data collection while the present study used questionnaire as instrument for data collection.

Binns and Popp (2013) explored the experience of a cohort of pre-service science teachers learning to teach science in their student teaching placements in Charlotte, United States. A mixed method design was employed. Four research questions guided the study. The targeted population for the study comprised of fourteen placement students. Convenience sampling technique was used to select a sample of seven participants. Open-ended surveys and interview were the instruments used to collect data. The reliability coefficient of the instrument was not stated in the study. A constant comparative approach was used for data analysis. The result of the study revealed that participant held a favorable view of inquiry instruction. They

also showed that the use of inquiry instruction in their classroom remained limited due to certain obstacles like meeting the curriculum requirement; time available for a given lesson; teacher's lack of experience with inquiry instruction; administrative pressure and student's capabilities. They recommend further research using other method of sampling, larger population and other method of data collection.

The reviewed study used pre-service teachers while the present study used biology teachers. The reviewed study used small sample seven (7) for the study, while the on-going study used larger samplesixty-two (62) that is the entire population for the study. The present studyalso finds out the attitudes of teachers towards inquiry teaching while the reviewed study did not.

Kang & Keinonen (2016) examine the factors affecting implementation of inquiry based learning in Finland andSouth Korea. Comparative study design was adopted for the study. Three (3) research questions and one (1) research hypotheses guided the study. The population for the study comprised of sixty-three (63) countries with six hundred and twenty four (624)finland science teachers from one hundred and fifty two (152) lower secondary schools and two hundred and two (202) korean science teachers from one hundred and fifty (150) lower secondary schools. Convenience sampling was used to select a sample of four hundred and ninty six (496) teachers in one hundred and thirty five (135) schools in Finland and one hundred and eighty four (184) teachers in one hundred and forty seven (147) schools in South Korea. Questionnaire was the instrument used in collecting the data for the study with reliability index of 0.73 and 0.81 respectively. Mean, standard deviation and correlation coefficient were the tools used to analyze data for the study. The findings of the study indicates that lack of teaching resources, lesson plans and instructional materials, lack of teachers confidence, lack of access to professional development programs, class size were indicated as barriers to implementing inquiry-based

learning in Finland and South Korea. The study recommends for further research by designing a survey using stratified and clustered sampling for teachers, so that teacher samples can be representatives of populations and show a cluster effect.

The study reviewed examine the factors affecting the use of inquiry based learning in Finland and South Korea while the present study explored the factors affecting the use of inquiry based learning in Kano Municipal Educational Zone, Kano State,Nigeria. The reviewed study used comparative study design while the present study used descriptive survey design. Also the present study determined the attitude and perception of teachers towards inquiry teaching which the reviewed study did not find out.

Haddock (2014) carried out study on comparison of teacher's belief of the use of inquiry teaching, knowledge and students achievement international and non-international Baccalaurate in Florida. Descriptive survey design was adopted for the study. Four research questions and four research hypotheses addressed the study. The population for the study included eight (8) schools with a number of 124 teachers. The entire population was used as the sample size for the study. Questionnaire and test were the instruments used in collecting data with reliability coefficients of 0.88 and 0.90 respectively. Mann whitney U and Kendall tau were the statistical tools used to analyze data for the study. The item analysis of teacher's beliefs about inquiry teaching shows a very strong belief and high level of importance in planning, enactment and reflection of inquiry teaching. The study recommends further studies using different method and variables in regard to inquiry teaching and students motivation in achievement and self-efficacy.

The reviewed study investigated teacher's belief to the use of inquiry while the resent study investigated teacher's attitude towards inquiry teaching. The present study also

investigated the factors affecting the use of inquiry teaching which the reviewed study did not investigate. Also, the reviewed study used Mann whitney U and Kendall tau as tools for analysis while the presents study used Mean, Standard deviation and Mann whitney as tools for data analysis.

Cathleen (2003) carried out a study on the effect of teacher's attitude, experience and background knowledge on the use of inquiry method teaching in the elementary classroom, in Dallas Area, United States. A survey design was employed for the study. Three (3) research questions addressed the study. The population for the study comprised of forty (40) 4^{th} grade kindergarten teachers. A sample of 14 teachers was drawn for the study using simple random sampling technique. Questionnaire was the instrument used for gathering data for the study. The reliability estimate of the instrument is 0.721. Percentages and frequencies were the tools used for data analysis for the study. The research findings revealed that teachers had favourable attitude towards science and inquiry. The respondents identified lack of sufficient time, insufficient materials and supplies, unstructured curriculum and resources, classroom management and inadequate collegial support as barriers to effective inquiry teaching. The researcher recommends for the further studies.

The study reviewed used small sample for the study while the on-going study used the entire population as larger sample. Also, the study reviewed used percentages and frequencies as tools for data analyses while the on-going study used mean, standard deviation and T-test as tools for data analysis. The present study also finds out the influence of teacher's gender on attitude and perception towards inquiry teaching. Also, the location in which the reviewed study was conducted differs from the present study.

Gatt & Zammit (2017) carried out a study on the challenges of implementing inquiry science in primary schools in Malta. A case study design was adopted for the study. Three (3) research questions guided the study. 2 schools were purposively selected from a population of 8 schools in. interview, observation and inventories were the instruments used in collecting data for the study. The data for the study were analyzed by recording and coding. The result of the study revealed that both schools were struggling in implementing inquiry. Constraints such as the curriculum to be covered and assessment processes hamper inquiry implementation. The study recommends inquiry to be supported with adequate training and resources as well as support from school management.

The study reviewed investigated the challenges of implementing inquiry while the on-going study investigated the factors affecting the use of inquiry as well as teacher's attitude and perception towards inquiry teaching. The study reviewed differs with the present study as the reviewed study was conducted using primary schools while the present study used secondary schools.

Sari and Basarir (2016) held a study on analyzing teacher's perception of female teachers and male teachers within traditional gender roles in Nevsehir, Istanbul. A phenomenological design was adopted for the study. Three (3) research questions guided the study. The population for the study comprised of 103 teachers. The entire population was used for the study. Questionnaire was the instrument used to collect data for the study with reliability coefficient of 0.90. Content analysis technique was used for data analysis of the study. Findings of the study indicate that there is no significant difference between the perception of female and male teachers towards ole of women in society. The researchers recommends for further studies using different design and instrument.

The reviewed study investigated the gender difference in teacher's perception within traditional gender role, while the present study investigated the gender difference in teacher's perception towards inquiry teaching. The reviewed study used content analysis technique to analyze data gathered while the present study used mean, standard deviation and T-test to analyze data.

Desy, Peterson & Brockman (2011) conducted a study on gender difference in science-related attitudes and interest among middle school and high school students in school district in South West Minnesota, United States. The study adopted a survey design for the study. The population for the study comprised of students in six (6) school districts in southwest Minnesota with a total of 1299 students in the six schools. The entire population was used for the study. Questionnaire was the instrument used to gather data for the study with reliability index of 0.93.mean, standard deviation and multivariate analysis of variance was the tool used to analyze the data gathered. The result revealed that students had unfavourable attitude towards science. The study also indicated that significant gender differences were found among students in favour of female students. The study recommends that further research should be carried out by focusing on gender difference in attitude towards science.

The study reviewed used students to find out the influence of gender on attitude to science while the present study used teachers (biology) in determining the influence of gender on teacher's attitude to science. The reviewed study used multivariate analysis of variance to analyze data collected on the influence of student gender on attitude while the on-going study used T-test to analyze data on the influence of gender difference to teacher's attitude.

Holloway (2015) held a study on teacher's level of inquiry-based chemistry and student's attitude about high school chemistry in State of Florida. A cross-sectional design was used for the study. The study was guided by three (3) research questions and two (2) research hypotheses. The population for the study involves all chemistry teachers in two district with a total number of fourteen (14) chemistry teachers. Convenience sampling technique was used to select a sample of nine (9) teachers for the study. Questionnaire and interview were the instruments used for data collection. The Reliability value of the questionnaire is 0.914. ANCOVA, Coding and transcribing were the tools used to analyze data for the study. The results of the study reported that time, resources, professional development, teacher's prior experience, teacher initiatives and lack of fund to affect teachers use of inquiry instruction in classrooms. The study recommends the replication of the study with more teachers population as well as gender factors of the teachers, as gender was not examined in the statistical analysis.

The on-going study determined the influence of teacher's gender on attitude and perception towards the use of inquiry teaching while the reviewed study examined the factors affecting the use of inquiry teaching. The population used in the reviewed study is small for generalization, while for the present study, the researcher used the entire population.

Xie, Talin, and Sharif (2014), investigated the relationship between teachers" knowledge on nature of science, attitude and beliefs towards inquiry teaching with the implementation of inquiry-based learning in China. The study adopted a quantitative research method design. Three research questions and three research hypotheses guided the study. The population of the study consisted of the science teachers teaching in primary schools of Zhengzhou, China. But the specific number of teachers' in the population was not stated. Two-stage cluster sampling was used to select a sample of seven hundred and twenty eight in-service primary teachers. The

instrument used for collecting data is questionnaire. The reliability co-efficient of the instrument was not stated in the study. Descriptive statistics used to answer the research questions and inferential statistics (one-way ANOVA and Pearson correlation) were used to analyze data using SPSS Version 21. Findings of the study revealed that the level of teachers" knowledge of nature of science, teachers attitude and belief towards inquiry teaching and the implementation of inquiry-based learning are at medium level. Findings also revealed that teachers' attitude towards inquiry teaching has a significant and positive relationship with inquiry teaching. Also the study revealed that, there is no significant difference in the implementation of inquiry-based learning according to the years of experience. Also there are significant relationship between teachers" knowledge on nature of science, attitude and beliefs towards inquiry teaching, with the implementation of inquiry-based learning. They recommended that research location should be widened; a study should be carried out in other levels of school like secondary school level; also further research could find other variables that may have relationship with the implementation of inquiry- based learning such as teachers' content knowledge and teacher's qualification, using different tools.

The reviewed study investigated teachers knowledge and belief of inquiry teaching while the present study finds out teachers attitude and perception towards inquiry teaching. The present study also explored the factors affecting the use of inquiry teaching which the reviewed study did not. Also, the reviewed study was conducted in China while the present study was conducted in Kano, Nigeria.

Boujaoude and Saad (2012), investigated the relationship between teachers knowledge and belief about science and inquiry and their classroom practices in Beirut, Lebanon. Mixed method research design was adopted for this correlation study. Three research questions and one

research hypotheses were formulated for the study. The population of the study comprised of teachers' in the schools of Beirut as the specific number of the population of teachers' was not stated. Two-stage probability sampling technique was used to select the sampled schools. The sample used for the study consisted of thirty-four teachers drawn randomly from schools in the city of Lebanon. A questionnaire and classroom observation was the instrument used for the collecting data. The reliability co-efficient of the instrument was not stated. But the researchers reported that the pilot study showed that all questions were comprehensible and suitable for teachers. Mean, standard deviation and correlation coefficient was used to analyze the data collected. Findings of the study showed that most teachers had restricted views of the nature of science and unfavourable beliefs and attitude about inquiry. Moreover, no consistent relationship existed between teacher's beliefs, views of the nature of science, and their classroom practice. The researchers recommended that future research should investigate the relationship between teachers beliefs and attitude and their classroom practices with other variables like factors that impedes inquiry implementation; years of experience and content matter background. They also recommend that pre-service teachers should learn about inquiry and experience it and become more comfortable in doing it, while in-service teachers need to receive continuous professional development and support to increase the possibility of implementing inquiry.

The reviewed study employed mixed methods design while the present study adopted the descriptive survey design. The present study investigated the factors affecting the use of inquiry teaching which the reviewed study did not explore and recommends for its investigation. Also the location in which the reviewed study was conducted in Lebanon differs with the location in which the present study was conducted in Kano, Nigeria.

Alhendal (2013) conducted an examination of factors influencing Kuwait science teacher's use of inquiry-based instruction. The study investigated the beliefs, attitudes, and perceptions of teacher's use of inquiry-based instruction and not their actual practice. A quantitative research design was used for the study. Four research questions were formulated to guide the study. The population for the study included all the science teachers from all the public primary schools in all six educational districts of Kuwait with a total of four hundred and ninety-six (496). Purposeful sampling technique was used to select a sample of two hundred and forty-eight (248) government primary schools for the study. Three schools were selected randomly for pilot testing while the remaining was used for the study. Questionnaire was the instrument used for the study with reliability coefficient ranging from 0.73 to 0.93. Exploratory factor analysis (EFA) using SPSS version 19.0 and standard multiple regression were the statistical techniques used for analyzing data. Results indicated that teachers attitude towards using inquiry-based instruction significantly influenced their practice of inquiry-based instruction lessons in classroom. Also teachers held positive attitude towards the implementation of inquiry-based instruction. It was recommended that school administrators work closely with teachers to address their belief and concerns about their classroom practices and provide them with the required support for the successful implementation of inquiry-based instruction.

The study reviewed used science teachers from primary schools as participants for the study while the present study used biology teachers in senior secondary schools as participants for the study. The present study also determined the gender difference in perception and attitude of biology teachers towards inquiry teaching which the reviewed study did not investigate.

Dai, Gerbino and Daley (2011) investigated on inquiry-based learning in China: Do teachers practice what they preach, and why?. A structured survey was adopted. Three research

questions guided the study. The targeted population for the study comprised of all schools in Shanghai, Beijing, Hebei, Fujian and Hainan regions of China as the specific number of teachers' population in the region was not stated. Purposeful sampling was used to select a sample of sixteen (16) cities and nine (9) provinces to represent in the survey. Questionnaire was the instrument used for data collection with reliability coefficients of 0.73, 0.84, 0.72 and 0.71 respectively. Percentages and frequency was used to analyze data collected. The result showed that Chinese teachers are receptive to inquiry-based pedagogy but find practical constraints in fully implementing it. Exam-driven education system; lack of abilities, knowledge, good learning habits in students; class size; content coverage; limited time and control; lack of infrastructural building were identified as obstacles towards inquiry implementation in classroom. Also, there is no effect of years of teaching. The researchers recommended that teachers should be given opportunity for professional development that not only prepare teachers theoretically for the reform but also develop their practical skills in implementing the inquiry pedagogy. They also recommended that school leaders should pay attention to infrastructure building; providing special personnel and technological support; and provide multiple resources in and outside of school for inquiry-based learning.

The reviewed study was conducted in China while the present study was conducted in Kano State, Nigeria. The present study also determined the gender difference in perception and attitude towards inquiry teaching which the reviewed study did not explore. Also, the reviewed study used percentages and frequency as tools for data analysis while the present study used mean, standard deviation and Mann whitney U as tools for data analysis.

Asgharheidari and Tahriri (2015) conducted a research on teacher's attitude towards critical thinking instruction in Iran. The study employed a qualitative exploratory research

design. Three research questions guided the study. The population of the study comprised of all teachers' in twelve different institutes in Abbasabad and Tonekabon, Iran. Simple random sampling was used to select a sample of 30 Englishas a foreign language (EFL) instructors in 12 different institutes in Abbasabad and Tonekabon, Iran. The instrument used for the study is a questionnaire with reliability coefficient of 0.72. Descriptive statistics through SPSS Software was used to analyze the data. The result revealed that teachers had a positive attitude. The researchers suggested that a similar study using a larger sample with different degrees of experience or teachers of different subject matters to provide better and more comprehensive information. Also schools should provide teachers with the required time and resources necessary for professional development to occur.

The reviewed study investigated teachers attitude towards critical thinking instruction while the on-going study determined teacher's attitude towards inquiry teaching. The reviewed study was conducted in Iran while the present study was carried out in Kano, Nigeria.

Tatar (2012) investigated inquiry-based science laboratories: an analysis of pre-service teachers' beliefs about learning science through inquiry and their performances in Turkey. A case study design was adopted to investigate the effects of inquiry based instruction on pre-service teachers' beliefs concerning learning science through inquiry and their performance to apply a scientific inquiry process. 2 research questions addressed the study. A sample of two pre-service teachers' from a population of forty-one teachers who were taking science and technology in their previous science education were purposefully selected. Data were collected for the study using interviews, observation and written document instruments with an agreement score of 0.81. Descriptive analyses and content analysis was used to analyze data collected. The result of the study showed that past experience of pre-service teachers are

effective in developing their beliefs concerning learning science through inquiry and increase their ability to apply a scientific inquiry process. Also the findings of the study showed that, one sample teacher showed negative beliefs about teaching science through inquiry, while the other showed positive beliefs towards teaching science through inquiry instruction. Tatar recommended that future studies on pre-service teacher's beliefs to be analyzed through different dimensions by identifying different variables (attitude towards science and content knowledge, which could affect the shaping of their beliefs. Also recommended the use of different data gathering tools for future studies that could also analyzed development in pre-service teachers.

The reviewed study used pre-service teachers while the present study used biology teachers. Also, the reviewed study used a small sample of two pre-service teachers while the on-going study used a larger sample of the entire population. The reviewed study used interview, observation and written documents as instruments used for data collection while the present study used questionnaire to collect data for the study.The reviewed study employed case study design while the present study used descriptive survey design.

Lin (2017) investigated teacher's views of inquiry teaching, understanding of and attitudes towards program for international student assessment PISA in Ireland. Survey design was adopted for the study. Three research questions and one research hypotheses guided the study. The targeted population used for the study consisted of three hundred and nineteen junior high school science teachers from two administrative regions of central Taiwan. Simple random sampling was used to select a sample of twenty-nine teachers for the study. Questionnaire was the instrument used to collect data for the study with reliability coefficient of 0.87 and 0.89 respectively. Mean, standard deviation and ANOVA were the tools used to analyze the data for the study. The findings of the study indicated that teachers had more positive attitude and more

supportive views of inquiry teaching. The researcher recommended that improving teachers understanding PISA and views of inquiry teaching would promote more teachers to accept PISA-type items integrated into school assessment.

The reviewed study investigated teacher's views of inquiry teaching, understanding and attitude while the present study investigated teacher's attitude, perception and factors affecting the use of inquiry teaching. The reviewed study used random sampling technique in selecting the sample for the study, while the on-going study used the entire population as the sample for the study.

Kim and Tan (2011) held a study on rethinking difficulties of teaching inquiry based practical work in Korea. The study employed a survey design. Three (3) research questions address the study. A sample of thirty eight (38) was randomly selected for the study from the population of 163 3rd year university students majoring in science teaching. Interview was the instrument used to collect data for the study. The data gathered for the study were analyzed by coding and transcribing. The findings of the study shows that factors like time limitations, resource scarcity, lack of supporting conditions in school teaching, science teachers content knowledge, attitude and teaching abilities hinders inquiry practical work. The study recommends that providing inquiry stimulated questions for students, balancing science practical work, teaching and adapting inquiry-based teaching into the existing teaching environment is crucial.

The reviewed study explore the difficulties or factors affecting the use of inquiry teaching, while the present study investigated factors affecting the use of inquiry teaching in addition to the attitude and perception of teachers towards inquiry teaching. Also the location in

which the study was conducted differs, as the reviewed study was carried out in Korea, the present study was conducted in Kano Municipal Educational Zone, Kano State, Nigeria.

Chan (2010) conducted a research on how do teachers beliefs affect the implementation of inquiry-based learning in the PGS curriculum in Hong Kong. Qualitative case-study design was employed for the study. Eight (8) research questions guided the study. The population for the study comprised of 2 schools with a total number of eight (8) teachers. Convenience sampling was used to select a sample of four (4) teachers for the study. Interview was the instrument used to gather data for the study. Data collected were analyzed using coding and transcription. The result of the study indicates that different teachers held diverse beliefs about inquiry-based learning which was found to impact on teacher's implementation of inquiry-based learning. The study recommends about the importance of teachers reflection, arrangement of resources, preparation of teachers and students. Also in-service training should be made to teachers, school administrations and local authority.

The study reviewed differs with the present study as the reviewed study was conducted in Hong Kong while the present study was carried out in Kano municipal Educational Zone. Kano State, Nigeria. Also the reviewed study used a small sample for the study, while the present study used a larger sample for the study.

Erdamar, Aytac, Turk & Arseven (2016) held a study on the effects of gender on attitudes of pre-service teachers towards the teaching profession in Turkey. Meta-analysis was the design used for the study. The study was guided by three (3) research questions. The population of the documented studies is 60. Criterion technique was used to select a sample size of thirty five (35) documented studies that met the inclusion criteria for meta-analysis within the context of gender.

Documents of written sources were the instruments used to gather data for the study. The reliability index for the instrument was 0.95. Mean, standard deviation and Kendall's coefficient were the tools used for data analysis of the study. The result of the study showed that female teachers display more positive attitude than male teachers on ATTP. The researcher recommends further research using other variables like marital status and working place.

The reviewed study carried out its study using per-service teachers while the on-going study used biology teachers. The reviewed study also investigated the effect of gender on attitude towards teaching profession which differs from the present study as it finds out the influence of gender on attitude and perception towards inquiry teaching. The reviewed study used Meta-analysis design while the present study used descriptive survey design.

Agarwal & Shukla (2017) held a study of in-serviceteachers attitude towards gender issues in Delhi. The aim of the study was to find the difference between male and female teacher's attitude. Descriptive survey was the design employed for the study. Six (6) research questions and 3 research hypotheses guided the study. The population for the study comprised of fifty two (52) schools. The total number of teachers in the population school was not stated in the study. Multi-stage sampling technique was used to select a sample of three teachers from each school giving a total number of 312 teachers as sample for the study. Questionnaire was the instrument used for the study with reliability index of 0.76. Percentages, mean, standard deviation and T-test were the tools used for data analysis. The finding of the study indicates positive perception among teachers and however, there is no significant difference found between attitude of male and female teachers towards gender issues. The study recommends the teacher educators to hold discussions about how to reduce the impact of stereotypical texts or images, discussion on learners.

The reviewed study used in-service teachers to determine the influence of gender on attitude while the present study used biology teachers to determine the influence of gender on attitude towards inquiry teaching. Also the location in which the study was conducted differs with the present study. As the reviewed study was conducted in Delhi, India, the present study was conducted in Kano, Nigeria.

Abedalaziz, Chin & Siraj (2013) conducted a study on gender and cultural differences in attitudes towards schooling usage and personal usage of computers: A study of Malaysia and Jordan. Survey design was employed for the study. Three (3) research questions and three (3) research hypotheses guided the study. A total of 369 malaysian and 342 jordanian teachers. The entire population was used for the study. Questionnaire was the instrument used to collect data for the study with reliability coefficient of 0.91. Mean, Standard deviation and T-test were the tools used to collect data for the study. The result for the study showed that both male and female have high levels of perceptions towards usage of computer. The study recommends for further studies in different countries.

The study reviewed investigated the influence of gender and attitudes of teachers towards usage of computers while the on-going study determined the influence of gender and teacher's attitude towards inquiry teaching. Also, the location in which the present study was conducted in Kano State, Nigeria differs with the reviewed study conducted in Malaysia and Jordan.

Badri, Alnuaimi, Mohaidat, Yang & Alrashedi (2016) conducted research on perception of teacher's professional development need, impacts and barriers: the Abu Dhabi case, Turkey. Survey design was employed for the study. Six (6) research questions guided the study. The population comprised of 200 schools with a total of 4941 teachers. Simple random sampling

technique was used to select a sample of 20 teachers from each school. Questionnaire was the instrument used to collect data for the study. The reliability index of the instrument was 0.71. descriptive statistics, ANOVA and MANOVA were the tools used for analyzing data for the study. The result of the study indicates that there is no significant difference in the perception of male and female teachers regarding professional development activities. The study recommends further studies to consider teachers teaching experience, subject taught, school size and location.

The reviewed study explored the difference in gender and teacher's perception regarding professional development activities while the on-going study explored the difference in gender and teachers perception regarding inquiry teaching. Also the location in which the study was conducted differs. The reviewed study was conducted in Abu Dhabi, Turkey while the on-going study was conducted in Kano, Nigeria.

Yamtinah, Ashadi & Shidiq (2017) investigated gender difference in student's attitude towards science: An analysis of student's science process skill using testlet instrument in Jawa Tengah, Indonesia. The study adopted a survey design method. Two (2) research questions and one (1) research hypotheses guided the study. The population comprised of three (3) schools in Jawa Tengah, Indonesia with a total population of 226 students. The entire population was used for the study. Testlet instrument was used to collect data for the study with reliability index of 0.74. Percentages and frequency were the tools used to analyze data for the study. The findings of the study revealed that male and female students show similar attitude towards science. The result also showed that both female and male students do not have high science process skills. The study recommends for further research in this area using other forms of instrument in different location.

The study reviewed investigated gender difference in attitude towards science while the present study investigated gender difference in attitude towards inquiry teaching. The study reviewed used students as participants for the study while the on-going study used teachers as participants for the study. The reviewed study used testlet instrument to gather data while the present study used questionnaire to gather data for the study.

Ahmad and Asghar (2011) conducted a study on attitude towards biology and its effect on students achievement in Isfahan. The study adopted a survey design. Three (3) research questions guided the study. The population for the study was not stated. Simple random sampling technique was used to draw a sample of 185 grade 12 students from secondary students of Isfahan. Questionnaire was the instrument used to collect data for the study with reliability index of 0.85. pearson correlation coefficient, regression analyses and T-test were the tools used to analyze data for the study. The findings of the study revealed that no significant difference between girls and boys in attitude towards biology. The study recommends the implementation of fun materials, text and instructional methods and emphasizes on aspect of attitude towards biology.

The study reviewed investigated the gender difference in attitude towards biology while the present study investigated the gender difference in attitude and perception towards inquiry teaching. The reviewed study used students while the present study used teachers. The location in which the reviewed study was conducted in Isfahan which differs with the location in which the present study was conducted in Kano state. The reviewed study did not specify the population of the study while the present study specified the population for the study.

Ramnarain and Hlatswayo (2018), investigated teachers beliefs and attitude about inquiry-based learning and their classroom practice in a rural school district in South Africa. A mixed method research design was adopted for the study. Three research questions and one research hypotheses guided the study. A population of eighteen schools as the actual number of teachers' population in the schools was not stated. Purposeful sampling technique was used to select a sample of eleven teachers for the study. The instruments used for data collection are questionnaire and interview. The reliability value of the questionnaire is 0.72, 0.81 and 0.74 respectively. Descriptive statistics and correlational analysis was used to analyze the questionnaire while the interview was coded and later transcribed. The results of the study showed that teachers had a positive attitude towards inquiry in the teaching and learning of physical science; also teachers are less inclined to enact inquiry-based learning in their classroom lessons. The teachers also claimed that lack of laboratory facilities and teaching materials; time to complete the curriculum and large class size were the difficulties which create tension in their willingness to implement inquiry-based learning. They recommended that future research be pursued in investigating the efficacy of the predict-observe-explain (POE) approach to inquiry at such schools.

The reviewed study used mixed method design while the present study used descriptive survey design. The study reviewed employed small sample (11 teachers) while the on-going study used larger sample of the entire population. The study reviewed was conducted in South Africa while the present study was conducted in Kano, Nigeria.

Leon (2012) conducted a research on the introduction of inquiry-based science teaching in Rwanda lower secondary schools: teacher's attitudes and perceptions. The study adopted a mixed method research design. Five research questions were formulated for the study. The

population for the study consisted of all science teachers at lower secondary school in Rwanda. The specific number of the teachers' population was not stated in the study. Purposeful sampling technique was adopted to select a sample of two hundred science teachers at lower secondary school in Rwanda. Data was collected by means of a survey questionnaire; interview and observation. The reliability value of the instrument was not stated in the study. Data from the questionnaire was subjected to a descriptive statistical analysis while data from interview was subjected to analysis involving transcribing, reading, coding, categorizing, identifying and interpreting interview transcripts. Findings of the study showed that teachers displayed varying understanding of what inquiry-based science teaching is; also teachers had a positive attitude towards the introduction of inquiry; for their practices, traditional classroom activities were more frequently used than inquiry-based activities. The study further identified shortage of time; lack of teaching resources and lack of confidence associated with inadequate training negatively influence the way teachers implement inquiry in their classroom. Leon recommended that an adequate professional development programme and provision of resources because they constituted the key pillars for effective inquiry-based science teaching implementation.

The study reviewed was conducted in Rwanda while the present study was conducted in Kano, Nigeria. The study reviewed used mixed method design while the present study adopted the descriptive survey design. Also, the reliability index of the instrument used to collect data for the study was not stated in the study reviewed while the present study stated the reliability index of the instrument.

Breslyn and McGinnis (2011) conducted a study on science teachers understanding and practice of inquiry-based instruction in Uganda. Multi-case exploratory design was adopted for the study. Four (4) research questions guided the study. The population for the study comprised

of 21 twenty one public high schools. Purposive sampling was used to select a sample of 2 schools. Interview, observation and document analysis were the instruments used in gathering data for the study. Data for the study was analyzed using qualitative data analysis using open coding. The findings of the study revealed that teachers had insufficient understanding of inquiry-based learning and also held a common misconception of inquiry. The result of the study shows that teacher's attitude and experience are intrinsic factors influencing understanding and practice of inquiry based learning. Lack of motivation, lack of infrastructure, limited time, content coverage, class size, mode of assessment, inadequate inservice training, support from peer teachers are external factors influencing understanding and practice of inquiry based learning. The study recommends further research involving teachers of physics and biology disciplines.

The reviewed study used science teachers while the on-going study used biology teachers. The location in which the reviewed study was carried out in Uganda differs with the location of the present study as it used biology teachers in Kano Municipal Educational Zone, Kano State. Also, the research reviewed used interview, observation and document as instrument used for data collection, while the present study used questionnaire as the instrument used for data collection.

Wanderi (2015) held a study on assessment of teacher's attitudes and their commitment to inclusive educational settings in Bahati sub-county, Kenya. The study aimed at establishing the attitude and perception of teachers towards inclusion and influence of gender and other variables. A survey design was used for the study. Three (3) research questions guided the study. The population for the study comprised of eighty two (82) teachers of four public schools that offer inclusive education in Bahati. The entire population was used as sample for the study.

Questionnaire was the instrument used to collect data for the study with reliability index of 0.713 and 0.753. Descriptive and inferential statistics using SPSS version 21 software was used to analyze data. The result of the study revealed that teacher's attitude and perception had high positive and there is no significant difference on gender in teacher's perception. The study recommended that the school management teams should put in place mechanisms that improve teacher's attitude towards inclusive learning.

The reviewed study carried out research on teachers attitude and perception and influence of gender towards inclusive education while the present study finds out teachers attitude and perception and influence of gender towards inquiry teaching. The present study also explored the factors affecting the use of inquiry teaching which the reviewed study did not explore. Also location differs; the reviewed study was conducted in Bahati, Kenya, while the on-going study was carried out in Kano, Nigeria.

Uwineza, Rubagiza, Hakizimana & Uwamahoro (2018) carried out a study on Gender attitudes and perceptions towards mathematics performance and enrolment in Rwandan secondary schools. The study employed mixed methods design. Three (3) research questions and two (2) research hypotheses guided the study. The population for the study consisted of 4 high schools in Rwanda as the specific total population was not stated in the study. Purposive sampling technique was used to select a sample of 150 students. Questionnaire, interview and observation were the instruments used to collect data for the study. The reliability index of the questionnaire instrument was 0.775. Mean and standard deviation were the tools used to analyze the data for the study. The findings of the study indicated that both boys and girls manifest negative perception towards mathematics. The researcher recommends the studies particularly

focusing on teachers classroom gender related practices, attitudes, beliefs with their impact on students performance can provide more generalisable findings.

The study reviewed investigated the gender attitudes and perception towards mathematics performance while the present study determined gender attitudes and perception towards inquiry method of teaching. Also the reviewed study used students as his participants for the study while the on-going study used teachers as participants. The study reviewed adopted mixed method design while the present study employed descriptive survey Design. Also the population for the study was not state in the study reviewed while the present study stated the total population for the study.

Sofiani, Maulida, Fadhillah & Sihite (2017) conducted a research on gender differences in students attitude towards science in Bandung, Indonesia. The study employed a cross-sectional survey design. Three (3) research questions and one (1) research hypotheses guided the study. The population for the study comprised of all secondary school students in Bandung, as the actual total population for the study was not stated. A sample of 77 students was selected randomly in cluster from various schools of Bandung. Questionnaire was the instrument used to collect data for the study. The reliability index of the questionnaire was 0.73. Mean, standard deviation and Mann whitney U test were the tools used to analyze data for the study. The result of the study shows that students show positive attitude towards science and also there is no statistical significant difference in attitude towards science between female and male students. The study recommends for the teachers to improve the students attitude towards science moreover motivation. Also the teacher should not be gender-biased when teaching science subject.

The reviewed study carried out research on gender difference in attitude towards science while the present study investigated gender difference in attitude towards inquiry teaching. The study reviewed used students as participants for the study while the on-going study used teachers as participants for the study. The population was not stated in the study reviewed while the present study stated the population for the study.

Nalina (2012) carried out a study on gender difference in attitude towards science teaching and learning among adolescents in Thiruvallur district, India. The study employed a survey method design. Nine (9) research questions and nine (9) research hypotheses guided the study. The population for the study comprised of 3892 students. Stratified sampling technique was used to draw a sample of three hundred (300) students. Questionnaire was the instrument used to collect data for the study with reliability coefficient of 0.8956. Critical ratio and pearson correlation co-efficient were the tools used to analyze data gathered for the study. The findings of the study revealed that gender has a significant impact on attitude towards science teaching in favour of male students.

The reviewed study used stratified sampling technique to draw the sample for the study while the present study used the entire population for the study. The study reviewed carried out the study on gender difference in attitude towards science while the on-going study finds out the gender difference on attitude towards inquiry teaching. The reviewed study used students as participants for the study while the on-going study used teachers as the participants for the study. The reviewed study used critical ratio and pearson coefficient correlation as tools for analyzing data gathered for the study while the present study adopted mean, standard deviation and Mann whitney U test to check for gender difference.

Darko, Yuan, Opoka, Ansah, Liu & Ansah (2016) held a study on gender difference in attitude towards the learning of agricultural science in senior high schools in the Assin South district of central region, Ghana. The study employed a descriptive survey design. Four (4) research questions and three (3) research hypotheses address the study. The population for the study comprised of 200 students. Convenience sampling technique was used to select a sample of 188 students and their respective 10 teachers. Questionnaire was the instrument used to collect data for the study with reliability index of 0.72 and 0.81 respectively. Percentages, mean, standard deviation and independent sample T-test will be used to analyze the data collected for the study. The findings of the study revealed that there is no statistical significant difference between male and female attitude towards agricultural science in senior high schools in the Assin south district of the central region of Ghana. The researchers recommend that students especially females should be encouraged towards building positive attitudes in learning of agricultural science to take up major future roles related to the field.

The study reviewed conducted the study on gender difference in attitude towards agricultural science while the present study carried out a survey on gender difference in attitude towards inquiry teaching. The reviewed study used students as its participants for the study while the on-going study used teachers as the participants for the study. In the study reviewed, convenience sampling technique was used to select the sample for the study, while the present study used the entire population for the study.

Mgeni (2013) conducted a research on teacher's perceptions of effective teaching methods for large classes in Tanzania. The study employed a descriptive survey design. Three research questions guided the study. The population for the study comprised of forty-five (45) teachers simple random sampling was used to select a sample of thirty (30) teachers as

participants for the study. Questionnaire was the instrument used to gather data for the study with reliability value of 0.75. Mean, frequency tables and percentages using SPSS were the tools used to analyze data for the study. The findings indicated that teachers perceived methods that involve active learning as the most effective methods. While at the same time, teachers found it difficult to implement such methods due to challenges like large class size and time factor. The study recommends further research in different location.

The reviewed study investigated teacher's perception of effective teaching methods. As inquiry teaching method is one of the effective teaching methods that involves students active participation, therefore, the on-going study investigated teachers perception of inquiry teaching. The on-going study also finds out teachers attitude towards inquiry teaching. The reviewed study used frequency tables and percentages as tools for data analysis while the present study used mean, standard deviation and Mann whitney U-test as tools for data analysis. The reviewed study was conducted in Tanzania while the present study was conducted in Kano, Nigeria.

Ufuophu (2012) conducted a study on gender and the attitude of teachers towards the teaching of English language sounds in Ughelli South L.G.A, Delta State, Nigeria. The study employed survey design method. Two (2) research question and one (1) research hypotheses guided the study. The target population for the study comprised of all public secondary school teachers in Ughelli, as the specific total number of teachers population was not stated for the study. Simple random sampling technique was used to draw a sample of 200 teachers from public secondary schools in Ughelli. Questionnaire was the instrument used to collect data for the study with reliability index of 0.81. Mean, standard deviation, Percentages and T-test were the tools used to analyze data gathered for the study. The findings of the study revealed that teachers have negative attitude and that there is no difference between the male and female

teacher's attitude. The study recommends the organization of seminars and workshops to motivate teachers.

The reviewed study investigated the influence of gender on attitude of teachers towards the teaching of English while the on-going study intends to investigate the influence of gender on attitude of teachers towards inquiry teaching. The reviewed study also used simple random sampling to select the participants for the study while the present study used the entire population for the study for generalization.

Oluwatelure (2015) carried out a study on gender difference in achievement and attitude of public secondary school students towards science in Akoko land, Ondo State, Nigeria. Case study design was employed for the study. Five (5) research questions and five (5) research hypotheses were raised to guide the study. The population for the study comprised of all public junior secondary school students in Akoko land. The specific total population for the study was not stated. Purposive sampling technique was adopted in selecting the public secondary school and random sampling technique was used to select the sample of 1626 students. Questionnaire and classroom teachers achievement records were the instruments used for gathering the data for the study. Mean, standard deviation, pearson correlation and T-test were the tools used to analyze data for the study. The findings of the study revealed that boys have more positive attitude to science than girls. Also, there is a significant difference observed in the attitude of male and female students. The study recommends that gender sensitive approach must be employed to bridge up the gender gap in the attitudes and performance of secondary school students in public schools.

The study reviewed used students to determine the gender difference in attitude to science, while the on-going study will use teachers (biology) to determine the gender difference in attitude towards inquiry teaching. Also the study used case study design while the present study adopted the descriptive survey design. The study reviewed employed purposive sampling technique and random sampling technique for sample while the present study used the entire population for drawing generalization.

Sakariyau, Taiwo & Ajagbe (2016) investigated on secondary school students attitude towards science in Ogun State, Nigeria. The study adopted a survey design. Two (2) research questions and two (2) research hypotheses guided the study. The targeted population for the study comprised of all senior secondary two science students in Odeda L.L.A of Ogun State. As the actual total number of the population was not stated in the study. Tratified random sampling technique was employed to select five (5) senior secondary school and a sample of 200 students. Questionnaire was the instrument used o collect data for the study witg reliability index of 0.73. Frequency, percentage and T-test was used to analyze data for the study. Result of the study indicates that attitude of students towards science is positive. Also the result shows that there was no significant difference between the attitude of male and female students towards science. The study recommends that female students should not be avoided from choosing and offering science.

The study reviewed investigated gender difference in attitude towards science while the present study will investigate gender difference in attitude towards inquiry teaching. The reviewed study used science students as participants for the study while the on-going study used biology teachers as the participants for the study. Also the location in which the present study

was carried out in Kano, Nigeria differs with the location of the reviewed study which was carried out in Ogun State, Nigeria.

Imasuen & Omorogbe (2016) conducted a research on the influence of gender on junior secondary school students attitude towards mathematics in Ovia North East L.G.A of Edo State. Descriptive survey design was adopted for the study. Two (2) research questions and two (2) research hypotheses guided the study. The population for the study comprised of all the junior secondary school III students with a total of 3690 in 12 public junior secondary schools in Ovia North east L.G.A of Edo State. Simple random sampling technique was used to select a sample of 150 students. Questionnaire was the instrument used to collect data for the study. The reliability coefficient of the study was 0.75. Mean, T-test and Analysis of variance was used to analyze the data collected for the study. The finding of the study revealed that attitude of students towards mathematics was positive. Also the study shows that there is a difference between the attitude of male and female students in mathematics in favour of male students. The study recommends that for effectiveness in student's performance in mathematics, teachers (science teachers in general) have to improve on his/her interaction with students in the classroom through workshops, talk-show and conferences.

The study reviewed carried out the study on the influence of gender on attitude towards mathematics while the present study investigated the influence of gender on attitude towards inquiry teaching. The reviewed study used junior secondary school students as participants for the study while present study used secondary school biology teachers as participants for the study.

Oba and Lawrence (2014) held a study on attitude to physics in secondary schools in Oyo State, Nigeria. Experimental design was adopted for the study. Two (2) research questions and two (2) research hypotheses guided the study. The population for the study comprised of four (4) schools. Purposive sampling technique was used to select a sample of 160 secondary school II students. Attitude scale questionnaire was the instrument used to gather data for the study. The reliability index of the instrument is 0.88. ANOVA was the tool used to analyze data collected for the study. The result of the study shows that gender was found to have no effect on student's attitude but there was slight difference in attitudes of the students in favour of female. The study recommends stakeholders to put difference in the attitude of male and female into consideration in the development and implementation of curriculum.

The study reviewed explores the influence of gender towards attitude in physics while the present study explored the influence of gender towards attitude in inquiry teaching. The study reviewed used secondary school students while the present study used secondary school teachers as participants for the study. The reviewed study employed an experimental design for the study while the present study employed descriptive survey design for the study.

Kayode & Olatoye (2014) conducted a study on the comparison of male and female senior secondary school students learning outcomes in science in Katsina State, Nigeria. Descriptive survey research design was employed to carry out the study. Three (3) research questions and three (3) research hypotheses guided the study. The population for the study comprised of 12 private and public schools and all the students in senior secondary school II in katsina state. Simple random sampling was used to draw a sample of 204 students. Questionnaire and achievement test were the instruments used to collect data for the study. The reliability index of the two instruments is 0.827 and 0.862 respectively. T-test was the tool used to answer the

research questions. The result of the study shows that there were no significant difference between male and female students in attitude to science and their achievement. The researchers recommended that among others that teachers should evoke instructional strategies that will sustain the gender equality in students learning outcome in science.

The study reviewed explores the gender difference in attitude to science while the present study finds out gender difference in attitude to inquiry teaching. The reviewed study involved students as the participants for the study while the present study involved teachers as participants for the study.

Abiodun, Taiwo, Aderonke and Durojaiye (2013) explored science teacher's perception of effective science teaching and their classroom practice in junior secondary schools in Lagos State, Nigeria. Descriptive survey design was adopted for the study. Four research questions were formulated to guide the study. The targeted population comprised of basic science teachers in junior secondary school in Lagos, as the specific total number of teachers' population was not stated in the study. Samples of eighty nine teachers were drawn from the population using purposive sampling technique. Questionnaire was the instrument used for collecting data with reliability value of 0.83. Descriptive statistics was the tool used to analyze data collected. The findings of the study revealed that the science curriculum used in schools was overloaded with content to be memorized by learners for examination purposes and that most science teachers engage students mostly in explanation and demonstration, whole class discussion and note copying. The result of the study also revealed that effective science teaching is characterized by student-centered activities associated with students being attentive, reading notes, doing homework, asking to responding to questions and engaging in regular hands-on practical inquiry-

based activity and carrying out their own observation among others. They recommended for the improving science teaching for Junior Secondary schools in Lagos State to be proffered.

The reviewed study explored teachers perception of effective teaching while the present study explored teacher's perception of inquiry teaching. The study reviewed used basic science teachers in junior secondary schools as participants for the study while the present study used biology teacher's in senior secondary schools as participants for the study. The location in which the reviewed study was conducted in Lagos State, Nigeria differs with the present study that was conducted in Kano State, Nigeria.

Joseph and Orim (2017) investigated the attitude of science teachers towards teaching in Calabar metropolis, Nigeria. Survey design was adopted for the study. Four research questions address the study. The targeted population consisted of one hundred and six science teachers in Calabar metropolis. Stratified random sampling technique was adopted in selecting a sample of fifty teachers of science subjects from fifteen secondary schools. Questionnaire was the instrument used to collect data with reliability value of 0.74. Descriptive statistics and independent T-test were the tools used to analyze data. The findings of the study revealed that science teachers had a significant negative attitude towards teaching of science subject in the research area. They recommend that government should make budgetary provisions to accommodate the employment and posting of trained science teachers prevalent in our schools and also teachers renumeration should be improved upon and emphasis be placed on science subject.

The reviewed study investigated the attitude of science teachers towards teaching while the present study will investigate the attitude of biology teachers towards inquiry teaching. Also,

the location in which the reviewed study was conducted in Calabar differs with the present study that was conducted in Kano, Nigeria.

2.4 Implications of the literature Reviewed to the Present Study.

This research study have reviewed various key points and variables, ranging from the concepts of biology, biology education, teaching of biology, inquiry teaching, factors affecting the use of inquiry teaching, biology teacher, teacher's attitude, teacher's perception, classroom practice, and gender to theories of attitude, theory of planned behavior, self-perception theory and gender schema theory. The researchers have also highlighted related empirical studies in different locations and different disciplines both foreign and non-foreign based. While the researches reviewed showed that teachers have varying attitudes. Some established teachers to have positive attitude and perception while others showed they have negative attitude and perception. Teachers can have positive attitude when they take responsibility; are curious; focus on the good; being hopeful; visualizing their success and achievement towards their goals; optimistic about situations, interactions and individual self as well as see the best even in difficult situations that allows the teachers to approach uncertainty situations in teaching with a positive attitude. Teachers can also have positive perception when they have positive thoughts about or towards a situation. Also, teacher's perception to the use of inquiry instruction in their respective classrooms in order to meet the goals of science education initiatives and reforms may be limited to certain factors or difficulties. Also some researchers reported that there is significant gender difference in attitude and perception while some researchers reported that there was no significant gender difference in attitude and perception.

The review of literature showed gaps in teachers that have not been fully explained from previous studies. Firstly, most of these studies reviewed on teachers' perception and attitude

towards inquiry teaching and factors affecting the use of inquiry teaching were conducted in areas of science discipline by Adofo (2017); Leon (2012); Sporea and Sporea (2014), Breslyn and McGinnis (2011), chemistry discipline by Holloway (2015), mathematics discipline by Drabkin (2016); Sikko, Lyngved and Pepin (2012) and physics discipline by Ramnarain and Hlatswayo (2018) disciplines but few in biology are. Therefore, the researcher intends to find out biology teacher's perception and attitude towards inquiry teaching and factors affecting the use of inquiry teaching in Kano Municipal Educational Zone, Kano State, Nigeria. As recommended by Lee, Song, and Huang (2013) that future research should investigate whether variations in beliefs and attitude could be subject-specific.

Furthermore, most of the literature reviewed on teacher's perception and attitude towards inquiry teaching to the influence of gender has not been examined. Gathering information on teacher's perception and attitude towards inquiry teaching based on gender in biology may be useful, which is an aspect that cannot be ignored in studies like the present study. Also, the location of a study area is crucial as what is generalisable in one area may not be applicable in another area due to differences in certain characteristics of the study area. Most of the studies reviewed on teacher's perception and attitude towards inquiry teaching are foreign. Therefore, from the reviewed literature it is quite clear that no research has been conducted on biology teacher's perception and attitude towards inquiry teaching and factors affecting the use of inquiry teaching and the influence of gender in Kano Municipal Educational Zone, Kano State, Nigeria and warrants investigation to assess it.

The present study therefore, intends to bridge these gaps by investigating biology teacher's attitude and perception towards inquiry teaching, explore the factors affecting the use of inquiry teaching, determine the difference between male and female perception towards

inquiry teaching and determine the difference between male and female attitude towards inquiry teaching in Kano Municipal Educational Zone, Kano State, Nigeria.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter examines the methodology and procedures used in carrying out the research study. It was presented under the following subheadings:- research design, population of the study, sample size and sampling technique, instrumentation, validity, reliability, data collection procedure and data analysis procedure.

3.2 Research Design

The study is a survey research design. According to Cohen, Manion and Morrison (2007), a survey research design is a type of quantitative research in which investigators administer a survey to a sample or to the entire population of people to determine the attitudes, opinion, behaviors or characteristics of the population that cannot be observed directly. The study therefore adopted a survey design in which data was collected by distributing a questionnaire to secondary school biology teachers in kano municipal educational zone, kano state. This research study intends to survey the perception and attitude of senior secondary school biology teachers towards inquiry teaching in Kano Municipal Educational Zone, Kano State.

3.3 Population of the Study

The population of the study is homogenous which comprised of all public senior secondary schools where biology is taught as a subject in Kano Municipal Educational Zone, Kano State. It comprises of two Local Government Areas, Tarauni and Kano Municipal. There are forty-six (46) public senior secondary schools in Kano Municipal Education Zone of Kano state. Out of the 46 public senior secondary schools, based on gender, there are twenty two (22) boys' public senior secondary schools and twenty-four (24) girls' public senior secondary schools. The total

population of biology teachers in the 46 schools is sixty-two (62) comprising of thirty-seven (37) male teachers and twenty-five (25) female teachers respectively based on gender. The total number of the population of public senior secondary schools in Kano Municipal Education Zone and their respective biology teachers is shown in Appendix H.

3.4 Sample Size

Since the number of schools and number of biology teachers from the schoolsin Kano Municipal Educational Zone are not many, the researcher used the entire population of schools (46 schools), and the entire population of biology teachers which comprised of 62 biology teachers. According to Gay, Mills and Airasian (2009), to select a sample size of a smaller population for survey research, the researcher should survey the entire population.

3.5 Sampling Technique

Purposive sampling technique was employed to select all the schools and all the biology teachers in Senior Secondary Schools of Kano Municipal educational Zone, Kano State. The schools and their respective biology teachers for the study. A purposive sampling involves all members or participants within the target population of interest to get deeper insights into the phenomenon of interest as well as reduce the risk of missing potential insights from members that are not included (Laerd, 2018). A total population of 62 biology teachers in kano municipal educational zone was therefore selected as sample for the study.

3.6 Instrument for Data Collection

Questionnaire was the instrument used to gather data for the study which was adapted from Ramnarain and Hlatswayo (2018) titled: Promoting Inquiry-based Learning in Mathematics and Science Education (PRIMAS) Questionnaire. The PRIMAS Questionnaire was later

renamed as Biology Teachers' Perception and Attitude towards Inquiry Teaching Questionnaire (BTPAITQ). Ramnarain and Hlatswayo (2018) stated that, the PRIMAS questionnaire is a survey instrument that was developed for a large scale survey on inquiry-based learning and teaching across 12 European partner countries. The BTPAITQ questionnaire comprised of three sections/constructs scale as well as the number of items per scale as shown in the table below:

Table 3.1: Scales and No. of items from BTPAITQ questionnaire

SCALE	No. of items per scale
Teachers Attitude	11
Teachers Perception	11
Factors affecting inquiry teaching	15
TOTAL ITEMS	37

The questionnaire comprises of 37 item statements to which the biology teachers will respond on a four-point rating scale ranging from SA=Strongly agree (4 points); A=Agree (3 points); D=Disagree (2 points); SD=Strongly disagree (1 point). A positively worded item statement of the questionnaire was scored 4,3,2,1 for the responses of Strongly Agree, Agree, Disagree, and Strongly Disagree respectively. While negatively worded item statements was scored 1,2,3,4 for the responses of Strongly Agree, Agree, Disagree, and Strongly Disagree respectively.

In taking decision of rejecting and accepting item statement, the mean response score for each item and scale was determined as follows 4+3+2+1=10, 10/4= 2.50. Therefore, 2.50 was used as the average benchmark for decision making. A score of 2.5 or above 2.5 was accepted, and was taken that a respondent agreed with the opinion and therefore had a positive attitude and perception towards the given item; scores below 2.5 indicates disagreement with the item score of the instrument and so not positive (Negative) attitude and perception towards this specific criterion tested.

The BTPAITQ item statements for the study was based on the constructs of teachers perception, teachers attitude and factors affecting the use of inquiry based learning. Also, the BTPAIT Questionnaire briefly described inquiry-based teaching as introduction for respondents to have a common understanding of what inquiry instruction entails.

3.7Validity of the Instrument

The Biology Teacher's Perception and Attitude towards Inquiry Teaching Questionnaire (BTPAITQ) was subjected to face and content validity by four (4) senior lecturers in the Department of Science and Technology Education at Bayero University, Kano. The validators were asked to check for the appropriateness of the statement items and also check whether they were undoubtedly fitted for the constructs of the study. However, the advice, suggestions and recommendations of the senior lecturers helped to delete and modify the set of items (1, 5, 8, 9, 11, 14, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 37) for the study and were incorporated in the final draft of the BTPAITQ Instrument as shown in Appendix F.

3.8 Reliability of the Instrument

A pilot study was conducted to determine the reliability of the Biology Teachers' Perception and Attitude towards Inquiry Teaching Questionnaire (BTPAITQ) instrument. The pilot test was carried out with a group of twenty (20) teachers from Public Senior Secondary Schools in Dala Educational Zone, Kano State, which is near the study area and comprise of subjects having similar characteristics of the population which were not part of the sampled population. The BTPAITQ was administered to the twenty (20) biology teachers. The administered questionnaire was collected immediately after the items were completed. The data obtained from the pilot study was analyzed using Spearman-brown coefficient through split-half method, to obtain the internal consistency of the instrument. The reliability index of the

BTPAITQ was 0.87. A reliability coefficient above 0.70 is considered acceptable (George & Mallery, 2003).

3.9Data collection Procedure

The researcher obtained an introductory letter from the Department of Science and Technology Education, Bayero University, Kano. The introductory letter from the department was taken to the Kano State Senior Secondary Schools Management Board to obtain permission to go to Municipal Zonal Education for necessary assistance to the researcher. The board issued another letter to the researcher which was taken to Kano Municipal Zonal Education Directorate to seek permission to carry out the present study in the schools in Kano Municipal Educational Zone. The zonal education directorate approved the request and issued another introductory letter in respect of the researcher to all principals of Senior Secondary Schools in Kano Municipal Educational Zone (See Appendix A, B &C). The researcher had visited all the targeted schools and then introduced herself to the school principals and later to the biology teachers seeking permission to conduct the study.

The researcher then administered the BTPAITQ to the biology teachers of the schools with the help of research assistants in each sampled schools. The researcher asked the biology teachers to identify and comment on items that they regarded as being unclear for the researcher to clarify them instantly. In some schools, the researcher waited for the respondents to finish filling and retrieved the questionnaires on the spot and also, the researcher revisited some schools to obtain the Questionnaire to ensure a 100% return rate.

3.10 Data analysis Procedure

The data collected for the study were analyzed as shown in the table below:-

Table 3.1: Data Analysis Procedure

Research Questions& Hypotheses	Research objective	Analysis Procedure
R.Q 1	Teachers' perception.	Frequency, Mean & standard deviation
R.Q 2	Teachers' attitude.	Frequency, Mean & standard deviation
R.Q 3	Factors affecting the use of inquiry.	Frequency, Mean &standard deviation
R.Q 4	Difference in perception of male and female biology teachers.	Frequency, Mean &standard deviation
R.Q 5	Difference in attitude of male and female biology teachers.	Frequency, Mean &standard deviation
H_{O1}	The difference between male and female teachers perception of inquiry teaching.	Mann Whitney U-Test
H_{O2}	The difference between male and female teachers attitude towards inquiry.	Mann Whitney U-Test

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter presents the results and discussion of the research findings on Biology Teachers' Perception and Attitude towards Inquiry Teaching in Senior Secondary Schools of Kano Municipal Educational Zone, Kano State, Nigeria.

4.2 Results Presentation

Data was collected in reference to research questions and research hypotheses and analyzed using a computer statistical program known as statistical package for social sciences (SPSS) version 20.0 for windows using mean, standard deviation to answer the research questions and Mann Whitney U-Test for research hypotheses.

4.2.1 Answers to Research Questions

Data collected on this aspect were analyzed using mean scores and standard deviation. A criterion mean of 2.50 was set for Decision making. Therefore, a mean score of 2.50 and above was classified and regarded as accepted (positive), and a mean score below 2.50 was classified and regarded as rejected (negative) using likert four point scale.

Research Question One: What is the Perception of Senior Secondary School Biology Teachers towards Inquiry Teaching?

In order to answer research question one, mean and standard deviation was used and is presented in Table 4.1.

Table 4.1: Mean Rating of Biology Teachers' Perception towards Inquiry Teaching

S/No	Item Statement	N	X	SD	Decision
12.	Inquiry teaching helps learners to learn by doing exercise	62	3.6	0.49	Accepted
13.	Inquiry teaching always begins with easy questions and work up to harder question	62	3.4	0.56	Accepted
14.	Inquiry teaching encourages students to work collaboratively in pairs or small groups	62	3.4	0.61	Accepted
15.	There is the opportunity to explain own ideas in inquiry teaching	62	3.4	0.62	Accepted
16.	There is the opportunity to discuss the topics in inquiry teaching	62	3.3	0.55	Accepted
17.	Inquiry teaching has to do with practical activities	62	3.3	0.59	Accepted
18.	Inquiry helps in drawing conclusions from an experiment conducted	62	3.2	0.63	Accepted
19.	Inquiry teaching guides for doing experiment by following instructions	62	1.5	1.04	Rejected
20.	Inquiry teaching involves learning to design one's own experiment	62	1.7	0.91	Rejected
21.	Inquiry teaching has to do with investigation to test ideas	62	1.7	0.78	Rejected
22.	Inquiry teaching gives the opportunity to work with little or no guidance	62	3.2	0.88	Accepted
	Grand Mean		2.88	0.69	POSITIVE

The result in table 4.1 indicates that, item 19, 20 and 21 has a mean of 1.5, 1.7 and 1.7 and standard deviation of 1.04, 0.91 and 0.78 respectively which is below the average mean of 2.50. All other item means of perception of inquiry teaching are above average mean of 2.50 and standard deviation ranging from 0.49 to 0.91. The Grand mean of teacher's perception towards inquiry teaching is 2.88 and standard deviation of 0.69 which is above the average mean. This tends to indicate decision of agreement showing that senior secondary school biology teachers in Kano municipal educational zone have positive perception towards the use of inquiry teaching.

However, the result indicated that inquiry teaching helps learners to learn by doing exercise with a higher mean of 3.6, but the statement that it is not suitable for doing experiment had the lowest mean of 1.5. Also, all biology teachers agreed based on their responses that inquiry teaching helps learners to learn by doing exercise with a lowest standard deviation of

0.49, showing that their responses are close to the mean average. But they disagreed based on their responses that inquiry teaching guides in doing experiment by following instructions with the highest standard deviation of 1.04, which shows that their responses are deviated from the average mean.

Research Question two: What is the attitude of senior secondary school biology teachers towards inquiry teaching?

Mean and standard deviation as a form of descriptive statistics was used to answer research question two and is presented in Table 4.2

Table 4.2: Mean Ratings of Biology Teachers' Attitude of Inquiry Instruction.

S/N	Item Statement	N	X	SD	Decision
1.	Implementing more inquiry practices in the lesson	62	3.5	0.56	Accepted
2.	Inquiry is important for current teaching practice	62	3.4	0.52	Accepted
3.	Successful inquiry requires students to have extensive content knowledge	62	3.2	0.82	Accepted
4.	Inquiry is not effective with lower achieving students	62	1.71	0.78	Rejected
5.	There is no need to use inquiry approach	62	1.71	0.73	Rejected
6.	Inquiry is well suited to overcome problems with students motivation	62	3.2	0.79	Accepted
7.	Inquiry provides materials for fun activities	62	2.9	0.93	Accepted
8.	Inquiry method is used a great deal	62	2.5	1.02	Accepted
9.	More support is required to integrate inquiry into classroom lessons	62	3.4	0.61	Accepted
10.	Inquiry is well suited to approach student with learning problems	62	3.3	0.66	Accepted
11.	Inquiry should be used for doing projects with students	62	2.5	0.95	Accepted
	Grand Mean		2.85	0.76	POSITIVE

The result in table 4.2 indicates that statement items 1 had mean of 3.5 and standard deviation of 0.56, item 2 had mean of 3.4 and standard deviation of 0.52, item 3 had mean of 3.2

and standards deviation of 0.82, item 6 had mean score of 3.2 and standard deviation of 0.79, item 7 had mean score of 2.9 and standard deviation of 0.93, item 8 had mean score of 2.5 and standard deviation of 1.02, item 9 had mean score of 3.4 and standard deviation of 0.61, item 10 had mean score of 3.3 and standard deviation of 0.66 and item 11 had mean score of 2.5 and standard deviation of 0.95. All these items had means equal to and greater than the average mean of 2.50 indicating agreement. Except for item 4&5 that a mean score below the mean value was obtained. In item four a mean value of 1.71 and standard deviation of 0.78 was obtained while in item five a mean value of 1.71 and standard deviation of 0.73 was obtained. The entire scale of teacher's attitude towards inquiry teaching had a grand mean of 2.85 and standard deviation of 0.76 which is above the average mean of 2.50. This clearly indicates that the Senior Secondary School Biology Teachers in Kano Municipal Educational Zone admit that they have positive attitude towards inquiry teaching.

However, the result indicated that teachers had mean score of 3.5 on their predisposition to use inquiry method. But findings revealed that the method is not suitable for lower achieving and no need to use the inquiry method with the lowest mean of 1.71. However, based on the biology teachers' responses, their agreement indicated that the method is more important for current teaching practices with a lowest standard deviation of 0.52.But all biology teachers disagree based on their responses that inquiry method is used a great deal with the highest standard deviation of 1.02.

Research Question Three: What are the factors affecting the use of inquiry teaching in senior secondary schools in Kano Municipal Educational Zone, Kano State?

In order to answer research question three a descriptive statistics in form of mean and standard deviation was used and is presented in Table 4.3:

Table 4.3: Mean Ratings of Factors Affecting The Use of Inquiry Teaching.

S/N	Item Statement	N	X	SD	Decision
23.	The curriculum does not encourage inquiry method of teaching	62	2.32	0.94.	Rejected
24.	There is no enough time to prepare for inquiry teaching	62	3.27	0.71	Accepted
25.	There is no adequate teaching materials	62	3.34	0.63	Accepted
26.	Inquiry is not included in textbooks being used to teach biology	62	2.11	0.81	Rejected
27.	There is no access to professional development programs involving inquiry teaching.	62	2.47	0.86	Accepted
28.	I don't have access to professional development programs involving inquiry	62	3.27	0.63	Accepted
29.	students discipline is being more difficult in inquiry-based lessons	62	2.18	0.74	Rejected
30.	There is no feeling of confidence with inquiry teaching	62	3.08	0.68	Accepted
31.	students get lost and frustrated in inquiry based lesson	62	3.15	0.67	Accepted
32.	Many teachers do not support inquiry instruction	62	2.95	0.82	Accepted
33.	group work is difficult to manage in inquiry teaching	62	1.85	0.67	Rejected
34.	The curriculum does not give enough time to teach using inquiry method.	62	3.44	0.67	Accepted
35.	There is no sufficient resources such as computers and laboratory apparatus to teach using inquiry method	62	3.31	0.67	Accepted
36.	students have to take assessment that does not reward inquiry	62	2.18	0.95	Rejected
37.	The number of students in class is too big for inquiry instruction to be effective	62	3.50	0.62	Accepted
	Grand Mean		2.83	0.74	AGREE

The result in table 4.3 showed that item 24, 25, 28, 30, 31, 32, 34, 35 and 37 mean score were above the average mean of 2.50 and item 23, 26, 27, 29, 33 and 36 mean score were below

the average mean of 2.50. Item 37 had the highest mean of 3.50 and item 33 had the lowest mean scores.

Item 24 had mean score of 3.27 and standard deviation of 0.71,item 25 had mean score of 3.34 and standard deviation of 0.63,item 27 had mean score of 2.47 and standard deviation of 0.86,item 28 had mean score of 3.27 and standard deviation of 0.63,item 30 had mean score of 3.08 and standard deviation of 0.68,item 31 had mean score of 3.15 and standard deviation of 0.67,item 32 had mean score of 2.95 and standard deviation of 0.82,item 34 had mean score of 3.44 and standard deviation of 0.67,item 35 had mean score of 3.31 and standard deviation of 0.67 and item 37 had a mean score of 3.50 and standard deviation of 0.62. All these items are greater than the average mean of 2.50. While item 23 had the mean score of 2.32 and standard deviation of 0.94,item 26 had mean score of 2.11 and standard deviation of 0.81,item 29 had mean score of 2.18 and standard deviation of 0.74,item 33 had mean score of 1.85 and standard deviation of 0.67 and item 36 had mean score of 2.18 and standard deviation of 0.95. All these items are less than the average mean of 2.50 indicating ten agreements against five disagreement -more or less a split. The grand mean of the scale of factors affecting the use of inquiry teaching have 2.83 and standard deviation of 0.74 which is above the average mean of 2.50. Therefore, there is a strong indication that Senior Secondary School Biology Teachers view lack of time; lack of materials and resources; curriculum; class size; lack of management; lack of support; lack of confidence; assessment method and lack of access to professional development programs to be the factors affecting the use of inquiry teaching in biology classrooms.

However, the result revealed that one among the factors affecting the use of inquiry method is the number of students is too large for inquiry teaching to be effective, meaning that, the students ratio and the overcrowded classroom cannot give way to implement inquiry

practices in the teaching with a highest mean of 3.50. But, biology teachers believe that group work is not difficult to manage using this method with a lowest mean of 1.85. In addition, all biology teachers responses were inline of overcrowded classroom could evenly affect the use of inquiry method with a lowest standard deviation of 0.62. But, all biology teachers disagreed based on their responses with students having to take assessment that does not reward inquiry with the highest standard deviation of 0.95.

Research Question Four: Do male and female biology teachers differ in their perception of inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State?

The research question four was answered using mean and standard deviation which is shown in Table 4.4

Table 4.4 Mean scores of Male and Female Biology Teachers' Perception of Inquiry Teaching

Gender	N	Mean (X)	Std. deviation	Mean difference	Remarks
Male	37	32.22	2.27	1.10	No Significant difference
Female	25	31.12	2.73		
Total	62				

Table 4.4 indicated that the mean perception scores of male biology teachers is 32.22 which is the highest with standard deviation of 2.27, while that of female biology teachers is 31.12 which is the lowest mean with standard deviation of 2.73. The male teachers had a low standard deviation of 2.27 indicating that the responses of the male teachers are consistent and are close to the mean scores, while the female teachers had highest standard deviation of 2.73 showing that the responses of the female teachers to this scale are not consistent that is they are scattered and not close to the mean. The mean difference between male and female biology teachers perception towards inquiry teaching is 1.10. Therefore, the result shows that there is no gender difference in the perception of biology teachers towards inquiry teaching.

Research Question Five: Do male and female biology teachers differ in their attitude towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State?

The research question four was answered using mean and standard deviation which is shown in Table 4.5

Table 4.5 Mean Scores of Male and Female Biology Teachers Attitude Towards Inquiry Teaching

Gender	N	Mean(X)	Standard deviation	Mean difference	Remarks
Male	37	31.00	3.04	0.52	No significant difference
Female	25	31.52	3.40		
Total	62				

Table 4.5 indicated that the mean attitude scores of male biology teachers is the lowest with a mean score of 31.00 and standard deviation of 3.04, while that of female biology teachers is the highest with a mean score of 31.52 and the standard deviation of 3.40. The male teachers had a low standard deviation of 3.04 indicating that the responses of the male teachers are consistent and are close to the mean scores, while the female teachers had high standard deviation of 3.40 showing that the responses of the female teachers to this scale are not consistent that is they are scattered and not close to the mean. The mean difference between male and female biology teachers attitude towards inquiry teaching is 0.52 and the result shows that there is no gender difference in the attitude of biology teachers towards inquiry teaching.

4.2.2 Hypotheses Testing

The null hypotheses formulated for the purpose of this research were tested at 0.05 Level of significance.

Hypothesis One

H_{o1} There is no significant difference between male and female biology teachers perception of inquiry teaching in Senior Secondary Schools of Kano Municipal Educational Zone, Kano State.

Mann Whitney U-test was used to show if any difference exist between male and female biology teachers attitude towards the use of inquiry teaching. The findings of the analysis was shown as in table 4.6:

Table 4.6: Mann Whitney U-test for Mean Scores of Male and Female Biology Teacher's Perception of Inquiry Teaching.

Group	N	Mean(X)	SD	Z-cal	P-value	Decision
Male	37	32.21	2.27	1.665	0.096	Retained
Female	25	31.12	2.73			
Total	62					

Table 4.7 Mann Whitney U-test analyses for perception mean scores of male and female biology teachers perception towards inquiry teaching, the observed p-value is 0.096 which is greater than 0.05, therefore the null hypothesis is hereby retained because the observed p-value (0.096) is greater than the significant level p-value (0.05). Hence, There is no significant difference between male and female biology teachers perception towards inquiry teaching. (Z-cal = 1.665, p=0.096>0.05).

Hypothesis Two

H_{o2} There is no significant difference between male and female biology teachers Attitude towards inquiry teaching in Senior Secondary Schools of Kano Municipal Educational Zone, Kano State.

Mann Whitney U-test using SPSS version 20.0 was established to show if exist any difference between male and female biology teachers attitude towards the use of inquiry teaching. The findings of the analysis were shown as in the table below:

Table 4.7: Mann Whitney U-test for Mean Scores of Male and Female Biology Teachers Attitude Towards Inquiry Teaching.

Group	N	Mean(X)	SD	Z-cal	P-value	Decision
Male	37	31.00	3.04	0.895	0.371	Retained
Female	25	31.52	3.40			
Total	62					

Table 4.7 shows the Mann Whitney U-test analyses for attitude mean scores of male and female biology teachers attitude towards inquiry teaching, the observed p-value is 0.371 which is greater than 0.05, therefore the null hypothesis is hereby retained because the observed p-value (0.371) is greater than the significant level p-value (0.05). Hence, there is no significant difference between male and female biology teachers perception towards inquiry teaching. (Z-cal = 0.895, p=0.371>0.05).

4.3 Summary of the Major Findings of the Study.

Based on the outcome of the analysis, the following are the major findings from the study.

i. The findings showed that senior secondary school biology teachers show positive perception towards the use of inquiry teaching in teaching of biology.

ii. The findings indicated that senior secondary school teachers have favorable attitude towards inquiry teaching.

iii. The findings revealed that lack of materials and resources; curriculum; class size; lack of management; lack of support; lack of confidence; assessment method and lack of access to professional development programs were identified by teachers as factors that hinder use of inquiry method of instruction in secondary schools in kano.

iv. The findings showed that there is no significant difference between male and female biology teachers perception towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State.

v. The study revealed that there is no significant difference between male and female biology teachers attitude towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State.

4.4 Discussion of Findings of the Study.

The result indicates that the biology teachers agreed with eight items of the aspects of biology teacher's perception towards inquiry teaching showing high means in those aspects. The respondents agreed that inquiry teaching helps learners to learn by doing exercise, the respondents perceive inquiry teaching to always begin with easy questions and work up to harder questions. The respondents also expressed that inquiry teaching encourage students to work collaboratively in pairs or in small groups; it provides the opportunity to explain ideas, to discuss about the topic as well as do practical activities by working with little or no guidance. All these responses with the exemption of 3 had means greater than the average mean of 2.50 indicating that majority of biology teacher had positive perception towards inquiry teaching. However, the biology teachers disagreed on 3 aspects of perception. The respondents disagreed that inquiry teaching guides in doing experiment by following instructions from the teacher, it does not involves learning to design one's own experiments and does not have to do with investigation to test one's own ideas.

However, the result indicated that inquiry teaching helps learners to learn by doing exercise with a higher mean of 3.6, but the method indicated that is not suitable in doing experiment with the lowest mean of 1.5. Also, all biology teachers agreed based on their responses that inquiry teaching helps learners to learn by doing exercise with a lowest standard deviation of 0.49, showing that their responses are close to the mean average. But they disagreed based on their responses that inquiry teaching guides in doing experiment by following instructions with the highest standard deviation of 1.04, which shows that their responses are deviated from the average mean.

The mean for the perception scale is 2.88 with standard deviation of 0.696 which is greater than the average mean of 2.50. As such, it was observed that the biology teachers had positive perception towards Inquiry teaching meaning that, they were highly committed towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State. The result of the study is in accordance with the studies of Agarwal & Shukla (2017), Adofo (2017), Panjwani (2015), Abedalaziz, Chin & Siraj (2013), Breslyn & McGinnis (2011), Drabkin (2016), and Mgeni (2013) in which it was observed that teachers had positive perception. And the present study contradicts with the findings of Sporea & Sporea (2014) and Uwineza, Rubagiza, Hakizima & Uwamahoro (2018) in which it was observed that teachers had negative perception to the use of inquiry teaching, as teachers are not able to follow inquiry process in science classroom. Therefore, teachers had positive perception of the use of inquiry method in teaching biology.

The findings also show that, it is clear that the biology teachers record high values on nine aspects of teacher's attitude towards inquiry teaching with the means greater than the average mean of 2.50. The respondents agreed that inquiry teaching is important for current teaching practice; it provides materials for fun activities and is well suited to overcome students learning problems and motivation; there is the need to implement more inquiry practice in the lessons; successful inquiry requires students to have extensive content knowledge; inquiry is used a great deal; more support is required to integrate inquiry in lessons; and the respondents agreed that inquiry should be used for doing projectswith students. Yet the respondents disagreed on other two aspects of teacher's attitude towards inquiry teaching. The respondents disagreed that inquiry is not effective with lower achieving students and there is no need to use inquiry

approaches. The two aspects recorded low means in their responses indicating disagreement with the aspects.

However, the result of biology teacher's attitude indicated that inquiry method was implemented more in lesson with the highest mean of 3.5. But findings revealed that the method is not suitable for lower achieving and no need to use the inquiry method with the lowest mean of 1.71. However, based on the biology teachers' responses, their agreement indicated that the method is more important for current teaching practices with a lowest standard deviation of 0.52.But all biology teachers disagree based on their responses that inquiry method is used a great deal with the highest standard deviation of 1.02.

The scale of teacher's attitude has a mean of 2.85 and standard deviation of 0.76. As such, the findings indicated high level of agreement (positive) with the aspects of teacher's attitude towards inquiry teaching. This finding is in accordance with the studies of Alhendal (2013), Haddock (2014), Lin (2017), Xie, Talin & Sharif (2014), Dai, Gerbino & Daley (2011), Sikko, Lyngved & Pepin (2012), Ramnarain & Hlatswayo (2018), Leon (2012), Binns & Popp (2013)and Cathleen (2003) as it was observed that teachers had positive attitude. While the study contradicts with the studies of Saad & Boujaoude (2012), Ufuophi (2012), Desy, Peterson & Brockman (2011) and Chan (2010) observed that teachers had negative and diverse attitude.

Biology teachers were asked about their perception of factors affecting the use of inquiry teaching in biology classrooms. On this scale, nine items were responded as agree while six responded disagreement to the aspect. From table 4.4, it can be seen that the majority of biology teachers agreed that specific external factors will affect their use of inquiry teaching in biology classrooms, such as inadequate materials and insufficient resources. The biology teachers also

perceive class size to be too big for inquiry teaching with a mean greater than the average mean of 2.50. Respondents also felt that factors as like lack of time in the curriculum and for preparing inquiry; Assessment method; lack of access to professional development programs; lack of confidence also affects the use of inquiry teaching in biology classrooms. Respondents also perceived that lack of support from colleagues on inquiry teaching and teachers getting worried about their students getting lost and frustrated in their learning affect the use of inquiry teaching in biology classrooms. The above nine items have means greater than the average mean of 2.50.

However, the result revealed that one among the factors affecting the use of inquiry method is large class size that makes it difficult to plan and manage inquiry activities. The students overcrowded classroom factors had the highest mean of 3.50. But, biology teachers believe that group work is effective in conducting inquiry teaching with a lowest mean of 1.85. In addition, all biology teachers responses were inline of overcrowded classroom could evenly affect the use of inquiry method with a lowest standard deviation of 0.62. But, all biology teachers disagreed based on their responses with students having to take assessment that does not reward inquiry with the highest standard deviation of 0.95.

The scale of factors affecting the use of inquiry teaching have a mean of 2.83 and standard deviation of 0.74 indicating that teachers agreed with these items in the aspect of teachers perceived factors affecting the use of inquiry teaching in biology classrooms. This is in accordance with the studies Alhendal (2013); Holloway (2015); Garcia (2003), Ssempala (2017); Gatt & Zammit (2017), Kim & Tan (2011), Panjwani (2015); Dai, Gerbino & Daley (2011); Sikko, Lyngved & Pepin (2012); Sporea & Sporea(2014), Drabkin (2016); Ramnarain & Hlatswayo (2018); Saad & Boujaoude (2012), Leon (2012) and Kang & Keinonen (2016). However, the respondents show disagreement on six items, biology teachers disagree with the

assertions that the curriculum does not encourage inquiry teaching; inquiry is not included in the textbooks being used to teach biology; the discipline of students being more difficult in inquiry teaching; group work is difficult to manage as well as students taking assessment that does not reward inquiry, with their means below the average mean of 2.50 indicating disagreement.

Therefore, it can be concluded that biology teachers in senior secondary schools of kano municipal educational zone perceived lack of time; inadequate of materials and insufficient resources; curriculum; class size; lack of management; lack of support; lack of confidence; assessment method and lack of access to professional development programs as the factors affecting the use of inquiry teaching in biology classrooms. The teachers identified some factors that affects the use of inquiry method. Therefore, it hinders the teachers to effectively use inquiry method of instruction to teach biology in Secondary Schools of Kano Municipal, Kano State.

From the findings, it was observed that both male and female biology teachers were more positive in their perception of inquiry teaching. To determine whether there is significant difference in perception of male and female biology teachers, U-test on gender and teacher's perception was used to establish that there is no significant difference on the influence of gender on biology teacher's perception. The result shows that the P-value of 0.096>0.05. Therefore, gender is not significant in determining teacher's perception of inquiry teaching. As such, it can be concluded that there is no significant difference between male and female biology teachers perception towards inquiry teaching in senior secondary schools of Kano municipal educational zone, kano state. The study is in line with the studies of Wanderi(2015), Sari &Basarir(2016), and that of Badri, Alnuaimi, Mohaidat, Yang and Alrashedi(2016)as it was observed that gender difference is not significant in explaining teachers perception of inquiry teaching and contradicts with the study of Milan, Gregor&Lenka(2017) and Uwineza, Rubagiza, Hakizima &

Uwamahoro (2018) which was observed that significant difference exist that female had a more positive perception than male. The male and female teachers had positive perception of the usefulness of inquiry teaching because, they know it would enhance their teaching and make them efficient in teaching of biology.

The findings indicated that there was no difference in the attitude of biology teachers towards inquiry teaching between two genders of male and female. Both portrayed positive attitudes towards inquiry teaching. The U-test statistics from table 4.4 is statistically significant at 0.05 levels. Since the P-value 0.371>0.05, it can be concluded that the males and females teachers had no significant difference in attitude towards use of inquiry in teaching. Therefore, this showed that biology teacher's attitude towards inquiry teaching does not vary based on gender. The study is in line with the studies of Agarwal & Shukla (2017), Nalina (2012), Kayode & Olatoye (2014), Oba and Lawrence (2014), Sakaritau, Taiwo & Ajagbe (2016), Sofiani, Maulida, Fadhilla&Sihite(2017) and that of Uwineza, Rubagiza, Hakizima&Uwamahoro(2018) as it was observed that gender is not significant in explaining attitude. While the present study contradicts with the studies of Oluwatelure (2015), Desy Peterson & Brockman (2011), Imasuen & Omorogbe (2016), Yamtinah, Ashadi, &Shidiq (2016) and Erdamar, Aytac, Turk, &Arseven (2016) as they indicated that significant gender difference was observed in the Attitude of male and female. The positive attitude of both male and female biology teachers towards inquiry method was as a result of the perceived significance of inquiry method of instruction to enrich students understanding of biological concepts in the classroom.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

After the data collected was analyzed in form of both descriptive and inferential statistics, a summary of the major research findings was compiled. Conclusions were drawn from the summary of the study findings. Finally, pertinent recommendations were put across in line with biology teachers' perception and attitude towards inquiry teaching as well as gender factors and factors affecting the use of inquiry teaching in senior secondary schools of kano municipal educational zone, Kano State, Nigeria. This chapter ends with suggestions for further studies in the area of inquiry instruction. This chapter generally shows the summary of the whole research work, as well as conclusions and recommendations.

5.2 Summary

The study investigated biology teacher's perception and attitude towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State, Nigeria. The study also investigated the factors affecting the use of inquiry teaching as well as gender disparity in attitude and perception of male and female biology teachers. Evident researches have revealed that the performance of students in biology is still not encouraging as teachers prefer to use direct instruction to teach which is ineffective. This is associated with the teaching method adopted by biology teachers and their attributes like Attitude, Belief, Perception, Knowledge, Utilization and gender role among others. Also studies on gender difference in attitude and perception towards the use of inquiry teaching is limited. Based on this, the present study tried to investigate the perception and attitude of biology teachers towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone.

The literature related to the study reviewed Theoretical frameworks including the theories hierarchical model of attitude (Rosenberg and Hovland, 1960) which postulated that attitude can be inferred from cognitive, affective and behavioral responses to the attitude object; the theory of planned behavior (Ajzen, 1991)which postulated that individual attitude towards a behavior, subjective norm and perceived behavioral control are the determinants of intention which guides human actions; the Self-perception theory (Bem, 1965) which posed that the perception of one's own attitude, emotions and other internal states partially by inferring them from observations of one's own overt behavior and the circumstances in which the behavior occurs; and the Gender Schema theory (Bem, 1981) as a cognitive theory that explain how individuals become gendered in society. Theses theory reflects the present study.The literature also reviewed conceptual frameworks including the concepts of biology; biology education; teaching of biology in secondary schools; inquiry method of teaching; factors affecting the use of inquiry teaching in classroom; biology teacher in secondary schools; teachers attitude towards biology; teachers perception towards biology and the concept of gender. The literature also reviewed related empirical studies to the present study on teacher's attitude towards inquiry teaching; teachers perception of inquiry teaching; factors affecting the use of inquiry teaching; gender difference and attitude; as well as gender difference and perception. The review ended with a critique and implications of related studies on teachers perception, attitude and factors affecting the use of inquiry teaching in biology, gender difference on attitude and perception and other subject areas. Certain gaps have been identified in the process of reviewing the literature, this include that most study reviewed on teachers perception and attitude towards inquiry teaching used science teachers, physics and chemistry, while the present study intends to use biology teachers; also the location in which the present study was carried out in Kano State,

Nigeria differs as there seems to be limited literatures compared to foreign literatures. Also, studies on the influence of gender on teachers perception and attitude towards inquiry teaching is limited which the present study filled these gaps.

The design for the study was survey. The population of the study comprised of all biology teachers in forty six (46) public senior secondary schools of kano municipal educational zone, Kano State with a total number of sixty two(62) biology teacher (37 males & 25 females). The entire population was used as sample for the study. Biology teacher perception and attitude towards inquiry teaching questionnaire consisting of Three (3) construct scales of attitude, perception and factors was the instrument used to collect data. Reliability index of 0.84 was obtained using Split-half method through SPSS version 20.0.

The data collected were analyzed using descriptive and inferential statistics in Statistical package for social sciences (SPSS version 20.0). The result and findings obtained with the discussions of the result were presented in chapter four tables 4.2 and 4.3 showing teachers' perception and attitude. While tables 4.4, 4.5 and 4.6 shows the result of factors affecting use of inquiry teaching, comparison of the perception of male and female biology teachers as well as the comparison of the attitude of male and female biology teachers respectively. The findings of the study revealed that Senior secondary school biology teachers show positive perception towards the use of inquiry teaching in teaching of biology; Senior secondary school teachers indicate favorable attitude towards inquiry teaching; Senior secondary school biology teachers in kano municipal educational zone perceive lack of time; lack of materials and resources; curriculum; class size; lack of management; lack of support; lack of confidence; assessment method and lack of access to professional development programs to be the factors affecting the use of inquiry teaching in biology classrooms; There is no significant difference between male

and female biology teachers perception towards inquiry teaching in senior secondary schools of Kano Municipal Educational Zone, Kano State; There is no significant difference between male and female Biology Teachers Perception towards Inquiry Teaching in Senior Secondary Schools of Kano Municipal Educational Zone, Kano State.

5.3 Conclusions

The following conclusions were drawn based on the findings of the research study:

1. The findings of the study revealed that the biology teachers have positive attitude towards the use of inquiry teaching. As positive attitude towards inquiry teaching promotes positive intention which is essential to help biology teachers change to the use of inquiry teaching in teaching of biology in classroom.
2. The biology teachers have positive perception of which is an indication that they use inquiry in teaching biology.
3. The biology teachers identified lack of time; class size; lack of materials and resources; curriculum; class size; lack of management; lack of support; lack of confidence; assessment method and lack of access to professional development programs as factors that hinder use of inquiry method of instruction in secondary schools in kano state.
4. There is no difference between male and female biology teacher's perception in the use of inquiry teaching method.
5. There is no difference between male and female biology teachers' attitude towards the use of inquiry teaching.

Therefore, the use of inquiry teaching required the attention of biology teachers' attitudes and perception and factors affecting its usage. Biology teachers need to be supported in becoming

more confident, competent, skilled and effective in using inquiry teaching in their teaching of biology.

5.4 Contributions to Knowledge of the Study.

The findings of the study has added more literature on the existing knowledge on teachers attitude, perception and factors affecting the use of inquiry teaching for further references and research

1. The study established that the perception of senior secondary school biology teachers is positive towards the use of inquiry teaching in Kano Municipal educational zone, Kano State [mean score = 2.88>2.50, SD=0.69].
2. The study has also established that secondary school biology teachers have positive attitude towards inquiry teaching in Kano Municipal educational zone, Kano State [mean score of 2.85>2.50, SD= 0.76].
3. The findings has also established that the biology teachers perceived some factors affecting the use of inquiry teaching [mean score of 2.83>2.50, SD= 0.74].
4. The study also established that there is no significant difference in perception of male and female biology teachers [P-value of 0.096>0.05].
5. The study also established that there is no significant difference in attitude of male and female biology teachers [P-value of 0.371>0.05].

5.5 Recommendations

1. The study revealed that teachers had positive perception of inquiry teaching. It is therefore important for principals of schools to encourage teachers to continue using

inquiry teaching as well as improvise the unavailable and inadequate materials and resources for teaching biology using inquiry method.

2. From this study, it was clear that biology teachers had positive attitude towards the use of inquiry teaching. In this regard, educational agencies such as National Teachers Institute should coordinate efforts and encourage teachers to engage more in inquiry teaching activities as long as they still teach.
3. Principals and government should device the means of overcoming the factors affecting the use of inquiry by providing the necessary needs for effective inquiry teaching to take place.
4. Teachers indicated time as one of the factors that hinder them from using inquiry method to teach biology. Therefore, Educational planners and curriculum developers should allocate adequate time for designing, planning and carrying out a successful inquiry teaching in biology lessons.
5. It was observed from the study that there is no significant difference between male and female teachers perception of inquiry teaching. Therefore, Educational Stakeholders should provide adequate funding and support to both male and female teachers to effectively carryout inquiry activities.
6. It was also observed that there is no difference in attitude towards inquiry teaching between msale and female teachers. It is therefore important for school administrators to support and encourage both male and female teachers to have access to professional development programs particular those concerned with inquiry activities.

5.6Limitations of the study

1. A sample of sixty two (62) biology teachers in Kano Municipal Educational Zone, Kano State was used for this study. It may be possible to obtain different result if a larger sample size were used. The findings of the study using the small population may not be generalizable to biology teachers in Kano State at large. Therefore, there is the need to widen the scope of the study.
2. The sample of forty six (46) Public Senior Secondary Schools in Kano Municipal Educational Zone were used for the study which is a small sample compared to the number of public and private schools in Kano State. Therefore, the findings of the present study may not be generalizable to the entire schools in Kano State.

5.7 Suggestion for Further Studies

The following suggestions are made for further investigation:

1. Gender difference in teacher's perception and attitude towards inquiry teaching and factors affecting the use of inquiry teaching in other locations and with other subject area related to science should be investigated.
2. Researches should be carried out on teachers' knowledge, teacher's competence and actual practice of inquiry teaching in classroom.
3. The effect of inquiry teaching method on student's performance, their perception and attitude towards inquiry based learning should be researched.

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APPENDICES A

INTRODUCTORY LETTER FROM THE DEPARTMENT

APPENDIX B

INTRODUCTORY LETTER FROM KSSSSMB

APPENDIX C

INTRODUCTORY LETTER FROM MUNICIPAL ZONAL EDUCATION ZONE

APPENDIX D

BIOLOGY TEACHERS PERCEPTION AND ATTITUDE TOWARDS INQUIRY TEACHING QUESTIONNAIRE

Inquiry is described as a student-centered way of learning content, strategies and self-directed learning skills. Students' develop their questions to examine; engage in self-directed inquiry (diagnosing problems-formulating hypothesis-identifying variables-collecting data -documenting their work-interpreting and communicating the result) and collaborate. (PRIMAS, 2011:38). Against each statement, there are possible options SA (Strongly Agreed), A (Agreed), U (Undecided), SD (Strongly Disagreed) and D (Disagreed), please tick the statement that best expresses your option.

Gender: Male ☐ Female ☐

	ITEM STATEMENTS	SA	A	D	SD
	Teachers Attitudes				
1	Implementing more inquiry practices in the lessons				
2	Inquiry is important for current teaching practice				
3	Successful inquiry requires students to have extensive content knowledge				
4	Inquiry is not effective with lower achieving students.				
5	There is no need to use inquiry approaches				
6	Inquiry is well suited to overcome problems with student motivation				
7	Inquiry provides materials for fun activities.				
8	Inquiry method is used a great deal.				
9	more support is required to integrate inquiry into the lessons.				
10	Inquiry is well suited to approach students learning problems				
11	Inquiry should be used in doing project with students				

	Teachers Perception	SA	A	D	SD
12	Inquiry teaching help learners to learn by doing exercise				
13	Inquiry teaching always begin with easy questions and work up to harder questions				
14	Inquiry teaching encourages student to work collaboratively in pairs or small groups.				
15	There is the opportunity to explain own ideas in inquiry teaching				
16	There is the opportunity to discuss about the topics in inquiry teaching				
17	Inquiry teaching has to do with practical activities.				
18	Inquiry helps in drawing conclusions from an experiment conducted				
19	Inquiry teaching guides in doing experiment by following instructions				
20	Inquiry teaching involves learning to design one's own experiments.				
21	Inquiry teaching has to do with investigation to test ideas				
22	Inquiry teaching gives the opportunity to work with little or no guidance.				

	Factors affecting the use of inquiry teaching	SA	A	D	SD
23	The curriculum does not encourage inquiry method of teaching				
24	There is no enough time to prepare for inquiry teaching				
25	There is no adequate teaching materials				
26	Inquiry is not included in textbooks being used to teach biology.				
27	It is difficult to assess inquiry learning				
28	There is no access to professional development programs involving inquiry.				
29	Students discipline is being more difficult in inquiry-base lessons				
30	There is no feeling of confidence with inquiry teaching.				
31	Students get lost and frustrated in their learning when using inquiry teaching				
32	Many teacher colleagues do not support inquiry instruction.				
33	Group work is difficult to manage in inquiry teaching lesson.				
34	The curriculum does not give enough time to teach using inquiry method				
35	There are no sufficient resources such as computers and laboratory apparatus.				
36	Students have to take assessment that does not reward inquiry.				
37	The number of student in class is too large for inquiry instruction to be effective.				

APPENDIX E
REQUEST FOR VALIDATION LETTER

Department of Science
and Technology
Education,
BayeroUniversity,Kano
P.M.B 3011, Kano
Kano State, Nigeria

…….
…….
…….

Request for Validation of Biology Teachers Questionnaire

I am a postgraduate student of the above mentioned institution undergoing a study on **An Investigation of Biology Teacher's Perception and Attitude Towards Inquiry Teaching in Senior Secondary Schools of Kano Municipal Educational Zone, Kano State, Nigeria.**

I request for your assistance in validating my research instrument as your professional correction and modification will help to authenticate the instrument.
Attached are photocopies of the topics to be covered for the purpose of the study, Objectives of the Study, Research Questions, Research Hypothesis, and the Biology Teachers Questionnaire.

Yours faithfully,

Hadiza Lawal

APPENDIX F
VALIDATORS REPORT

S/N	NAME/ INSTITUTION	OBSERVATION	ACTION
1	Prof. Muhammadu Abdullahi Department of science and technical education, Bayero University, Kano.	1. Check the English construction of the item statements. 2. Reconstruct item 34 and 35. 3. Use words like I do not/ does not and not words like I don't/doesn't.	The observations and suggestions were taken into consideration.
2	Dr. Usman Yunusa Department of science and technical education, Bayero University, Kano.	1. Indicate gender (male and female). 2. Write the meanings of SA, S, D and SD in full. 3. Check and rewrite the English construction of the item statements.	The observations and suggestions were taken into consideration.
3	Dr. Suwaiba Sa'id Department of science and technical education, Bayero University, Kano.	1. Recast the items in perception scale. In form of perception statements.	The observations and suggestions were taken into consideration.
4	Mal. Samira Department of science and technical education, Bayero University, Kano.	1.Check items that are not relevant to inquiryteaching.	The observations and suggestions were taken into consideration.

APPENDIX G

SPSS OUTPUT FOR RELIABILITY INDEX OF BTPAIT QUESTIONNAIRE

Reliability

Scale: BTPAITQ

Case Processing Summary

		N	%
Cases	Valid	20	100.0
	Excluded[a]	0	.0
	Total	20	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Part 1	Value	.775
		N of Items	19[a]
	Part 2	Value	.662
		N of Items	18[b]
	Total N of Items		37
Correlation Between Forms			.770
Spearman-Brown Coefficient	Equal Length		.870
	Unequal Length		.870
Guttman Split-Half Coefficient			.844

a. The items are: Q2, Q4, Q6, Q8, Q10, Q12, Q14, Q16, Q18, Q20, Q22, Q24, Q26, Q28, Q30, Q32, Q34, Q36, Q1.

b. The items are: Q1, Q3, Q5, Q7, Q9, Q11, Q13, Q15, Q17, Q19, Q21, Q23, Q25, Q27, Q29, Q31, Q33, Q35, Q37.

Scale Statistics

	Mean	Variance	Std. Deviation	N of Items
Part 1	43.4000	39.411	6.27778	19[a]
Part 2	45.1000	20.411	4.51780	18[b]
Both Parts	88.5000	103.526	10.17479	37

a. The items are: Q2, Q4, Q6, Q8, Q10, Q12, Q14, Q16, Q18, Q20, Q22, Q24, Q26, Q28, Q30, Q32, Q34, Q36, Q1.

b. The items are: Q3, Q5, Q7, Q9, Q11, Q13, Q15, Q17, Q19, Q21, Q23, Q25, Q27, Q29, Q31, Q33, Q35, Q37.

APPENDIX H

POPULATIONS OF PUBLIC SENIOR SECONDARY SCHOOLS IN KANO MUNICIPAL EDUCATIONAL ZONE, KANO STATE AND POPULATION DISTRIBUTION OF MALE AND FEMALE BIOLOGY TEACHERS IN THE SCHOOLS.

S/N	SCHOOL CODING	SCHOOLS BASED ON GENDER	MALES BIOLOGY TEACHERS	FEMALES BIOLOGY TEACHERS	Total number of biology teachers
1	School AA	Boys	1	1	2
2	School AB	Boys	1	1	2
3	School AC	Boys	1	0	1
4	School AD	Boys	0	2	2
5	School AE	Boys	0	1	1
6	School AF	Boys	1	0	1
7	School AG	Boys	1	0	1
8	School AH	Boys	1	1	2
9	School AI	Boys	1	0	1
10	School AJ	Boys	2	0	2
11	School AK	Boys	0	2	2
12	School AL	Boys	1	1	2
13	School AM	Boys	1	0	1
14	School AN	Boys	1	0	1
15	School AO	Boys	0	1	1
16	School AP	Boys	0	1	1
17	School AQ	Boys	0	2	2
18	School AR	Boys	0	1	1
19	School AS	Boys	1	0	1
20	School AT	Boys	1	0	1
21	School AU	Boys	1	0	1
22	School AV	Boys	0	1	1

23	School AW	Girls	1	1	2
24	School AX	Girls	2	0	2
25	School AY	Girls	1	1	2
26	School AZ	Girls	1	0	1
27	School BA	Girls	1	0	1
28	School BB	Girls	0	2	2
29	School BC	Girls	1	0	1
30	School BD	Girls	1	1	2
31	School BE	Girls	2	0	2
32	School BF	Girls	1	0	1
33	School BG	Girls	1	1	2
34	School BH	Girls	1	0	1
35	School BI	Girls	0	1	1
36	School BJ	Girls	1	0	1
37	School BK	Girls	1	0	1
38	School BL	Girls	1	0	1
39	School BM	Girls	1	0	1
40	School BN	Girls	1	0	1
41	School BO	Girls	0	1	1
42	School BP	Girls	0	1	1
43	School BQ	Girls	1	0	1
44	School BR	Girls	1	0	1
45	School BS	Girls	1	0	1
46	School BT	Girls	1	1	2
		TOTAL	37	25	62

Source: Municipal Zonal Education Directorate, Audu Bako Secretariat. May, (2018)

APPENDIX I

SPSS OUTPUT FOR DATA ANALYSIS

ANALYSIS OF TEACHER'S ATTITUDE TOWARDS INQUIRY TEACHING

```
DESCRIPTIVES VARIABLES=Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q4r Q5r
  /STATISTICS=MEAN STDDEV MIN MAX.
```

DescriptiveS

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Q1	62	2.00	4.00	3.4516	.56329
Q2	62	2.00	4.00	3.3871	.52338
Q3	62	1.00	4.00	3.2258	.81822
Q4	62	1.00	4.00	3.2903	.77644
Q5	62	1.00	4.00	3.2903	.73300
Q6	62	1.00	4.00	3.2097	.79211
Q7	62	1.00	4.00	2.8710	.93184
Q8	62	1.00	4.00	2.5000	1.02029
Q9	62	2.00	4.00	3.3871	.61016
Q10	62	2.00	4.00	3.2742	.65710
Q11	62	1.00	4.00	2.4839	.95371
Q4r	62	1.00	4.00	1.7097	.77644
Q5r	62	1.00	4.00	1.7097	.73300
Valid N (listwise)	62				

ANALYSIS OF TEACHER'S PERCEPTION TOWARDS INQUIRY TEACHING

```
GET
  FILE='C:\Users\ENGR. ISMAIL SAMINU\Documents\raw data for teachers
perception.sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
DESCRIPTIVES VARIABLES=Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22
  /STATISTICS=MEAN STDDEV MIN MAX.
```

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Q12	62	3.00	4.00	3.5968	.49455
Q13	62	2.00	4.00	3.4194	.55952
Q14	62	2.00	4.00	3.3710	.60690
Q15	62	2.00	4.00	3.4194	.61533
Q16	62	2.00	4.00	3.2742	.54830
Q17	62	2.00	4.00	3.3387	.59900
Q18	62	1.00	4.00	3.2097	.63082
Q19	62	1.00	3.00	1.5484	.59168
Q20	62	1.00	4.00	1.7097	.71028
Q21	62	1.00	3.00	1.6935	.61641
Q22	62	1.00	4.00	3.1935	.88408
Valid N (listwise)	62				

ANALYSIS OF TEACHER'S PERCEPTION OF FACTORS AFFECTING THE USE OF INQUIRY TEACHING IN BIOLOGY CLASSROOMS TOWARDS INQUIRY TEACHING

```
DESCRIPTIVES VARIABLES=Q23 Q24 Q25 Q26 Q27 Q28 Q29 Q30 Q31 Q32 Q33 Q34 Q35
Q36 Q37 Q23r Q24r Q25r Q26r Q27r Q28r Q29r Q30r Q31r Q32r Q33r Q43r Q35r Q36r
Q37r
  /STATISTICS=MEAN STDDEV MIN MAX.
```

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Q23	62	1.00	4.00	2.6774	.93693
Q24	62	1.00	3.00	1.7258	.70523
Q25	62	1.00	3.00	1.6613	.62577
Q26	62	1.00	4.00	2.8871	.81190
Q27	62	1.00	4.00	2.5323	.86304
Q28	62	1.00	3.00	1.7258	.63166
Q29	62	2.00	4.00	2.8226	.73605
Q30	62	1.00	4.00	1.9194	.68469
Q31	62	1.00	3.00	1.8548	.67379
Q32	62	1.00	4.00	2.0484	.81838
Q33	62	1.00	4.00	3.1452	.67379
Q34	62	1.00	3.00	1.5645	.66827
Q35	62	1.00	3.00	1.6935	.66748
Q36	62	1.00	4.00	2.8226	.94996
Q37	62	1.00	3.00	1.5000	.62068
Q23r	62	1.00	4.00	2.3226	.93693
Q24r	62	2.00	4.00	3.2742	.70523
Q25r	62	2.00	4.00	3.3387	.62577
Q26r	62	1.00	4.00	2.1129	.81190
Q27r	62	1.00	4.00	2.4677	.86304
Q28r	62	2.00	4.00	3.2742	.63166
Q29r	62	1.00	3.00	2.1774	.73605
Q30r	62	1.00	4.00	3.0806	.68469
Q31r	62	2.00	4.00	3.1452	.67379
Q32r	62	1.00	4.00	2.9516	.81838
Q33r	62	1.00	4.00	1.8548	.67379
Q43r	62	2.00	4.00	3.4355	.66827
Q35r	62	2.00	4.00	3.3065	.66748
Q36r	62	1.00	4.00	2.1774	.94996
Q37r	62	2.00	4.00	3.5000	.62068
Valid N (listwise)	62				

ANALYSIS OF PERCEPTION SCORES OF MALE AND FEMALE BIOLOGY TEACHER'S PERCEPTION OF INQUIRY TEACHING

Mann-Whitney Test

Statistics

Perception

Male	N	Valid	37
		Missing	0
	Mean		32.2162
	Median		32.0000
	Std. Deviation		2.27468
	Skewness		-.058
	Std. Error of Skewness		.388
	Kurtosis		-.914
	Std. Error of Kurtosis		.759
Female	N	Valid	25
		Missing	0
	Mean		31.1200
	Median		31.0000
	Std. Deviation		2.72825
	Skewness		.091
	Std. Error of Skewness		.464
	Kurtosis		.306
	Std. Error of Kurtosis		.902

Ranks

	Group	N	Mean Rank	Sum of Ranks
Perception	Male	37	34.61	1280.50
	Female	25	26.90	672.50
	Total	62		

Test Statistics[a]

	Perception
Mann-Whitney U	347.500
Wilcoxon W	672.500
Z	-1.665
Asymp. Sig. (2-tailed)	.096

a. Grouping Variable: Group

ANALYSIS OF ATTITUDE SCORES OF MALE AND FEMALE BIOLOGY TEACHER'S ATTITUDE TOWARDS INQUIRY TEACHING

Mann-Whitney Test

Statistics

Attitude

Male	N	Valid	37
		Missing	0
	Mean		31.0000
	Median		31.0000
	Std. Deviation		3.03681
	Skewness		.214
	Std. Error of Skewness		.388
	Kurtosis		-.398
	Std. Error of Kurtosis		.759
Female	N	Valid	25
		Missing	0
	Mean		31.5200
	Median		32.0000
	Std. Deviation		3.40490
	Skewness		-.446
	Std. Error of Skewness		.464
	Kurtosis		-.618
	Std. Error of Kurtosis		.902

Ranks

	Group	N	Mean Rank	Sum of Ranks
Attitude	Male	37	29.82	1103.50
	Female	25	33.98	849.50
	Total	62		

Test Statistics[a]

	Attitude
Mann-Whitney U	400.500
Wilcoxon W	1103.500
Z	-.895
Asymp. Sig. (2-tailed)	.371

a. Grouping Variable: Group