

# Attitude of Female Students towards Learning of Chemistry In Selected Secondary Schools In Ikere Local Government Area of Ekiti State, Nigeria

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**ABSTRACT:** *This study investigated the attitude of female students towards learning of chemistry in selected secondary schools in Ikere Local Government Area of Ekiti State, Nigeria. The study was guided by four (4) hypotheses. The study adopted descriptive survey research method. The target population for the study was all the Chemistry students in senior secondary schools in Ikere Local Government Area of Ekiti State. A sample of four hundred and twenty (420) students was selected for the study. The instrument used for data collection was a structured questionnaire. The split half method of reliability was used to ascertain the reliability of the instrument using Pearson Product Moment Correlation statistical analysis. A reliability index of 0.99 was obtained. The hypotheses were tested using ANOVA. The analysis of result revealed that there is no significant difference in the female students' disposition of different age group towards the learning of chemistry; there is no significant difference in the perception of female students of different classes towards the learning of chemistry; there is significant difference in the interest of female students of different age group towards the learning of chemistry; and there is no significant difference in the attitude of female students of different classes towards the learning of chemistry. Based on the findings, appropriate recommendations were made.*

**Key Words:** *Attitude, female students, learning, chemistry, secondary school.*

## Introduction

Chemistry has always been earmark as crucial and essential branch of science subject that is being taught in the Senior Secondary Schools across Nigeria. Chemistry provide an opportunity for secondary school students to understand what happens around the world that surrounds them within where they live and its contributes to the improved quality of life on the planet earth. Chemistry curricula commonly assumed to have incorporated many abstract concepts, which are central to further learning in both chemistry and other sciences. Chemistry topics are generally related to or based on the structure of matter, and proved to be a difficult subject for many students (Najdi, 2017).

Attitude, motivation, and interest are very crucial for secondary school students to be successful in the subject. Attitude towards chemistry is essential; it denotes interests or feelings towards studying chemistry. Attitude and academic achievement are important outcomes of science education in secondary schools. Students' attitude and interest could play substantial role in students' decision to study science (Abulude, 2016). Students' attitudes towards learning chemistry fueled many study projects for a long time; in the late 1980s there was a significant decline in chemistry education, and towards the turn of the century, the issue of attitudes towards an interest in chemistry became an international concern (Hofstein & Mamlok-Naaman, 2011).

Attitude refers to predisposition to classify objects and events, to react to them with evaluative consistency. A person who shows a certain attitude towards something is reacting to his conception of that thing rather than to its actual state. Attitude are formed by people as a result of some kinds of learning experience if the experience is favourable a positive attitude is found and vice versa (Orunaboka, 2011). The attitude people hold can frequently influence the way they act in person and larger situation. For this reason, administrators, psychologists and sociologists are concerned with attitude development, how they affect behaviour and how they can be changed. Attitude does not only include the negative attitude such as prejudices, biases and dislikes, but also positive attitudes are sometimes called sentiment, which include our attachment and loyalties to person, objects and ideas. Attitude thus seems like a system of ideas with an emotional core or content.

Human beings are not born with attitudes, they learn afterwards. Some attitudes are based on the

peoples own experience, knowledge and skills and some are gained from other sources. However, the attitude does not stay the same. It changes in the couple of time and gradually (Olasheinde & Olatoye, 2014). Questions about attitude have been investigated by many educational researchers; Akdemir, Kaya & Akdemir (2016) mentioned that attitude to learn chemistry benefits all young students by fostering their chemical perceptive, which is the capability to recognize chemical concepts, define some key-concepts, identify important scientific questions, use their understanding of chemical concepts to explain phenomena, use their knowledge in chemistry to read a short article, or analyze information provided in commercial ads or internet resources.

Yara (2009) defined attitude in science (chemistry) as scientific approach assumed by an individual for solving problems, assessing ideas and making decisions. Salta and Koulougliotis (2011) identified the factors that could positively influence (female) students' attitude to learn chemistry; these factors could be organized into three main categories: teaching approaches, educational tools, and non-formal educational material and activities. Fasakin (2012) recognized attitude as a major factor in a subject choice. Attitude as a mental and natural state of readiness, organized through experiences exerting a directive influence upon the individual's responses to all objects and situation with which it is related. Attitude is tendency for individuals who organize thought, emotions, and behaviours towards psychological object (Sakariyau, Taiwo & Ajibare, 2016).

Attitude regarding students' learning has to do with the feelings or opinions that they have towards the subject as an organized body of knowledge. This can be positive or negative depending on their perception of problem-solving in chemistry. Yunus and Ali (2012) and Najdi (2013) showed that most chemistry students have negative attitude towards chemistry hence low attitude towards problems-solving in chemistry. In addition, investigation of the effect of gender on attitude towards science (chemistry) has also attracted attention of some researchers (Wan and Lee, 2017). Sofiani, Maulida, Fadhillah & Sihite (2017) stated that male students have always been attested to show more positive attitude towards science (chemistry) and chose chemistry-related career paths more often than the female. Meanwhile, Miller, Slawinski and Schwartz (2006) reported that female students were more interested in science (chemistry) than males and more often planned a chemistry-related field as their future career.

Students' attitude towards chemistry varies among the female students, depends on several factors. First, factors that are associated with the teacher, such as teaching methods, classroom management, and teachers' content knowledge and personality. Second, factors that are related to the environment, such as educational background of parents and parental expectations. Third, factors that come from student including students' achievement, anxiety, extrinsic motivation, and experiences (Hacieminoglu & Education, 2011). Chemistry teachers bear on their shoulders a huge responsibility of promoting and developing (female) students' positive attitudes regarding science as a school subject (Abulude, 2016). There is a relationship between attitude and methods of instruction, and also between attitude and achievement.

### Statement of the Problem

Learning brings about change in behaviour and it can take place consciously and unconsciously. Meanwhile for any meaningful learning to take place there must be will from the learner to receive instruction and passion to process it into active learning. This implies that perception, disposition and interest of students is crucial in predicting whether or not they will learn or otherwise. However, male students have been described to show positive attitude towards chemistry learning than female students, although some studies were of different opinion. Female students' attitude towards chemistry could be due to many reasons which include gender intimidation, society perception about available job opportunity, and teacher method of instruction, parental factor, and motivation among others. Hence, the threat that poor attitude of female students could have on their learning chemistry is too enormous. These include loss of interest in the subject, lack of motivation, negative disposition and perception about chemistry, poor learning and in overall poor academic performance in chemistry. It is in the opinion of this statement that the researcher intends to investigate the attitude of female students toward learning of chemistry in some selected secondary schools in Ikere local government area of Ekiti State.

### Hypotheses

The following hypotheses were tested in this study:

1. There is no significant difference in the disposition of female students of various ages toward learning of chemistry.
2. There is no significant difference in the perception of female students of various classes toward learning of chemistry.

3. There is no significant difference in the interest of female students of various ages towards learning of chemistry.
4. There is no significant difference in the attitude of female students in various classes toward learning of chemistry.

## Literature Review

### *Concept of Attitude*

A lot of students nowadays are losing interest in the science subjects such as chemistry. Attitudes of students could also be affected by the changing environment. Nowadays, young people all over the world are engrossed in computer gadgets and online social networking which may decrease their interest in learning science. Attitude is the feelings that can be either unfavourable or favourable, positive or negative, and are typically directed towards some specific object. Attitude implied a psychological construct which is inferred from responses to a given stimuli (Ayodele & Olatunbosun, 2015). There are six dimensions regarding attitudes: confidence, anxiety, value, enjoyment, motivation and expectations (Sofiani, Maulida, Fadhillah & Sihite, 2017).

An attitude is an expression of favour or disfavour toward a person, place, thing, or event. Attitude can be formed from a person's past and present. An attitude is an evaluation of an attitude object, ranging from extremely negative to extremely positive. Attitudes are formed with respect to situations, persons or groups with which individual comes in contact in course of the growth and development of his personality. Once they are formed, they put the pressure that the individual reacts in a specific or characteristics way to these or related situations, persons or groups (Deeksha, 2016).

Attitude denotes a functional state of readiness which determines the organism to react in a characteristics way to certain stimuli or stimulus situations. Ngogo (2014) defined attitude as the accumulation of information about an object, person, situation or experience which forms an individual's opinion about or predisposition towards that thing. Attitude can also be defined as a mental or neural state of readiness organized through experience influencing dynamically or directly the individuals' response to all objects and situations with which it is related. Elias, Smith and Barney (2012) defined attitude as an evaluative judgment, either favourable or unfavourable, that an individual possesses and directs towards some attitude object, which may be abstract or concrete.

Achieng (2012) defined attitudes as how one thinks and feels about an act towards objectives and ideas. It also defines attitude as positive or negative feelings that an individual has about objects, persons or concepts. Attitude is a concept, which arises from the attempt to account for the observed regularities in the behavior of individual persons, the quality of which is judged from the observed evaluative responses one tends to make. An individual can show positive or negative attitude towards a particular object, subject or idea. Achieng (2012) posited that positive or favourable attitude towards vocational education positively impacts on the learning and performance of students of vocational education. This is due to the fact that individuals are typically biased towards those attitude objects which they evaluate positively and against those evaluated negatively.

A study on the attitudes of the students towards a particular subject like chemistry has shown that achievement in that chemistry is determined by one's attitude towards the subject (chemistry) rather than one's attitudes being determined by one's achievement in the subject (Chepkorir, 2013). Miranda (2012) stated that attitudes of students towards a particular subject (chemistry) does not only encourage their involvement and commitments in the teaching and learning process but affect their performance as well. Research revealed that positive attitudes are conducive to good achievement in any subject (Senthamarai, Sivapragasam & Senthilkumar, 2015). Jain (2014) stated that attitudes are relatively lasting clusters of feelings, beliefs and behavior tendencies, directed towards specific persons, ideas, objects or groups.

Psychologists define attitude as learned tendency to evaluate things on certain ways including people, issues, objects and events (Cherry, 2015). Cherry (2015) reiterated that such evaluations are often positive or negative or uncertain at times. Han and Carpenter (2014) stated that attitudes consist of cognitive, affective and behavioral reactions that individuals display towards an object or the surrounding based on their feelings or interest. Han & Carpenter (2014) recapped that affections is person's emotions, feelings and moods towards object, behavioral is person's past and future activities towards object) whereas cognitive is person's thought and beliefs about object. Students' attitudes are intrinsic and it is developed over a period of time, it is as a result of experiences (Abdul Majeed, Darmawan & Lynch, 2013). If the students' experience with a subject like chemistry is negative and not successful, it is more likely that his/her attitude towards that subject will be negative and vice versa.

***Female Students' Disposition and Learning of Chemistry in Secondary Schools***

Attitudes in terms of disposition, like academic achievement, are important outcomes of science (chemistry) education in secondary school. The development of students' positive attitudes regarding chemistry as a school subject is one of the major responsibilities of every chemistry teacher.

Attitude through students' disposition towards chemistry is essential; it denotes interests or feelings towards studying chemistry. A disposition is a quality of character, a habit, a preparation, a state of readiness, or a tendency to act in a specified way that is inherited or may be learned. The National Council for Accreditation of Teacher Education (NCATE) (2019) conceptualized dispositions as the values, commitments, and professional ethics that influence behaviors toward students, families, colleagues, and communities that affect student learning, motivation, and development as well as the educator's own professional growth. Dispositions are steered by attitudes and beliefs related to values like caring, honesty, fairness, empathy respectfulness, responsibility, and thoughtfulness. Almerico, Johnston, Henriott & Shapiro (2015) defined dispositions as the personal qualities or characteristics that are possessed by individuals, including attitudes, beliefs, interests, appreciations, values, and modes of adjustments.

Almerico *et al.* (2015) further expressed disposition as a pattern of behavior exhibited frequently and in the absence of coercion, and constituting a habit of mind under some conscious and voluntary control, and that is intentional and oriented to broad goals. Heilbrunn (2010) in a study of an elementary school in Israel reported that pupils rated significantly higher on proactive disposition, preference for innovation and achievement motivation than pupils from a traditional school. In a subsequent study at secondary school level, Heilbrunn & Almor (2014) added valuable findings with regard to the role of the school and teacher support.

Unfortunately, research has revealed that much of what goes on in science (chemistry) classrooms is not particularly attractive to students across all ages. Across the globe, women comprise over 50% of the global population; however, they were marginalized in the economy; political and societal affairs. One of the major factors for such marginalization is society attitude towards female education. Female students have achieved low result in chemistry relative to male students in the same class. The presence of problems of poor learning and low achievement in chemistry has been conceived and grow and increasingly particularly over the decade (Guido, 2015).

As important as the subject is and in spite of the efforts of both the federal and state governments to encourage chemistry education, students still shun the subject (Woldeamanuel, Atagana & Engida, 2014). It has been observed that most students fear chemistry and hence they see chemistry as difficult to understand, which may be as a result of the abstract nature of chemistry and the method (lecture method) being used by most of the chemistry teachers. Students' anxiety for chemistry learning can also be attributed to students' perception about the difficult nature of chemistry, involvement of multitude of facts, and its disconnection from reality. Students' anxiety for chemistry learning leads to loss of interest in the sciences (Woldeamanuel *et al.*, 2014).

***Female Students' Perception and Learning of Chemistry in Secondary Schools***

Perception is a process of being aware of one's environment through the senses. How one perceives the world consequently determines how one reacts to it. Perception involves analyzing and interpreting items picked out by the senses in order to assign meaning to them (Kabui & Maalu, 2012). How one analyzes and interprets a sensory reception is determined by many factors which include cultural setting, memories, values, imaginations and past experiences. As such, different people will perceive the same object differently because the content and degree of these influences is different. Consequently perception is not external reality. Perception plays a critical role in attitude towards learning.

With dynamism of science (chemistry), an encouraging attitude through positive perception is necessary in chemistry, perception regulates the behaviour of the students in their availability, readiness for the subject and their interactive manner during the class (Adebisi & Ajayi, 2015). Better perception yield better attitudes and learning. Attitude is believed to be strongly connected to academic success. Attitudes are developed and can come from the environment e.g. parents, siblings, school, place of worship, among others. Academic skills are and should be the primary focus of instruction in school. Therefore, the perception of female students about chemistry is very crucial to how they respond to learning and eventual academic performance in chemistry.

However, researchers have suggested that student learning and achievement also depends on academic enablers such as perception (attitudes) and behaviours that allow a student to participate in and ultimately benefit from academic instruction in the classroom (Idika, 2017). While there are other factors such as teacher factor, laboratory inadequacy, non-coverage of syllabus, class-size and environment, the

place of attitude (perception) cannot be over-emphasized. The independency of boys pre-disposed them to excess time with which studies in chemistry is imperative; hardly do boys become so insulated that they would have no access to time enough for practice in chemistry. Idika (2017) further stated that boys do not involve in house chores (washing plates, sweeping the house, cleaning the kitchen, washing the mother, father and junior clothes, and/or baby dirtying). In fact cooking of food is not always assigned to boys in Nigerian homes. As preferred gender, the boy is the head of the family after the father; and thus, possesses most authorities of the father. While the male possess the air of total freedom for studies in chemistry, the girl-child cannot always boast of such time allowance for chemistry.

Salta & Tzougraki (2011) surveyed 576 high school students in Greece using an attitude scale with four subscales: the difficulty of chemistry course; the interest of chemistry course; the usefulness of chemistry course for students' future career; and the importance of chemistry for students' life. They found that female students had positive perception in attitudes regarding usefulness, and importance of chemistry.

On the previous facts, it is evident that chemistry is important for society. However, (female) students considered chemistry an unimportant and uninteresting subject (Broman, Ekborg & Johnels, 2011). One of the reasons can be that many of the concepts used in chemistry are abstract, and are inexplicable without the use of analogies or models. Similar ideas are described in the study of Turner, Ireson & Twidle (2010) wrote in their study the reasons why female students disliked chemistry in a more detailed form. To more frequent reasons belong: writing too many sheets of paper; too many words to learn; complicated experiments; room smells; hard homework. Also, the reasons why the chemistry is popular among students (for example, it is practical and fun). When students see chemistry as hard and not understandable, their learning and achievement in this subject deteriorates. Therefore, it is important to find out their perception of chemistry, because these findings show to researchers, why chemistry is uninteresting and unimportant for pupils. Anwer, Iqbal & Harrison (2012) found out that girls had more positive attitudes toward science (chemistry) in comparison with boys, but in the majority of cases, the boys had more positive attitudes toward science (chemistry) than girls. Khan and Ali (2012) found out relatively neutral attitudes of high school students toward chemistry. They showed, attitudes are strongly influenced by teachers and their methods of teaching.

### ***Female Students' Interest and Learning of Chemistry in Secondary Schools***

Interest could be defined as the focusing of the sense organs on or giving attention to some person, activity, situation or object. It is an outcome of experience rather than gift. It could either result or cause motivation. It could also be regarded as a pre-determinant of one's perceptions that is, what aspect of the world one is mostly likely to see always (Essien, Akpan & Obot, 2015). It could also be viewed as a condition in which an individual associates the essence of certain things or situation with his needs or wants. However, interest is defined and whether it be described as a cause of attention, an aspect of attention or as identical with attention, its special significance lies in its intimate connection with the mental activity or attention. Interest is the focusing of the sense organs on or giving attention to some person, activity, situation or object.

Interest specifies the quality of personal significance. The content taught without relevance to everyday life lead to the lack of interest. The experiments might be a significant tool for the development of more stable interests, which later influence the choices of courses, higher studies, and careers (Krapp & Prenzel, 2011). Students bring curiosity with them when they take their secondary school science (chemistry) courses. The delay or absence of fulfillment of curiosity may lead to decline in interest. It has been reported that male students' liking for chemistry laboratory work declines when they advance towards higher-grade levels (Tayyaba, Ayesha & Hamid, 2017).

Interest is the feeling that prompts one to spontaneous activity. Aggrawal (2010) stated that interest is a powerful dictator and motivator in the learning process. The implication is that, students are likely to pay attention to learn, remember, imagine and read more readily when their interest and emotions are positively provoked. Interest as a human sentiment, goes along with values, attitudes and other forms of human preferences. This means that interest motivates and compels attention (Kundu & Tutoo, 2007), operating at the realm of affective domain. Factors that affect interest include personal and socioeconomic/environmental factors. Personal factors, according to Aggrawal (2010) include students' physical, health and physical development, mental health and development, age, sex, pattern of instinctive behaviour, emotions and sentiments. The socio-economic status includes rearing practices in the family, cultural status, education, among other aspects. Interest therefore makes the students to feel alert, awake and excited at the delivery of learning instructions in the chemistry class.

Interest aroused to learn a particular subject should be sustained for more enduring learning.

Mazer, (2012), students' interest can be triggered in the moment by certain environmental factors such as teacher behaviours. Chang, Yeung & Cheng (2009) studied ninth graders' learning interests, life experiences and attitudes towards science (chemistry). A total of 942 urban ninth graders in Taiwan were involved in the study. Pearson correlation was used for data analysis. The results indicated that boys showed higher learning interests in sustainability issues and scientific topics than girls. However, girls recalled more life experiences about science (chemistry) than boys. The results also showed that there was high correlation between learning interests and life experiences related to chemistry, and in the perspective on attitudes towards chemistry. Researches focused on gender studies have indicated that attitudes toward science (chemistry) education differ between gender.

A declining interest in Chemistry and the under representation of females in the chemical science was found (Bitok, Lusweti & Waswa, 2017). Self-confidence toward Chemistry, the influence of role models, and knowledge about the usefulness of chemistry affect the decision of young female students about the study of chemistry. In the event of young female students finding difficulty in constructing knowledge of chemistry, self-confidence is lowered with subsequent alternation of attitudes toward chemistry as attitudes predict behaviours (Bitok *et al.*, 2017).

Research has revealed that students show different attitudes to chemistry in school (Spaull, Dickson & Boyes, 2013). Anxiety about chemistry laboratory influences students' performance. It has been observed that so many students fear chemistry laboratory activities, and such fear is characterized by disappointment among the students towards the subject (Jegade, 2007). Owojaiye & Zuya (2016) investigated the influence of some factors on the perceptions of secondary school students of chemistry on the basis of gender difference. The design was a survey approach. The sample size was 600 SSS1-SSS3 students, comprising of 300 male and female students each. This sample was drawn from central and western senatorial districts of Kogi State, Nigeria. The instrument used was a set of statements that sought the responses of the students about chemistry as a subject in school. The findings indicated psychological factors, motivational factors, teachers' teaching techniques and parental background significantly influenced students on gender basis. The male students showed much more positive attitudes than their female counter parts towards chemistry.

#### **Factors Influencing Female Students' Attitude towards Learning of Chemistry in Secondary Schools**

Positive attitude towards science can be promoted by instructional congruence specifically in chemistry practical work (MdZain, Samsudin, Rohandi & Jusoh, 2010). At the meantime, several studies indicated that secondary school students show positive attitudes towards chemistry (Sarjou, Soltani, Afsaneh & Mahmoudi, 2012; Yunus and Ali, 2013; Sakariyau, Taiwoand Ajagbe, 2016). However, Mavrikaki, Koumparou, Kyriakoudi, Papacharalampous & Trimandili (2012) revealed that secondary school students have neutral views about science (chemistry). On the other hand, the study of White and Harrison (2012) suggested that secondary school students see science (chemistry) as uncreative, and difficult. They do not recognize its study as important for developing transferrable skills such as technical competence, numeracy, analytical and problem-solving.

Study skills are those skills which are required for understanding and retrieving information; particular they are the link between comprehension and memorization (Al- Hilawani & Sartawi, 2013). Specific competencies of study skills include acquiring information, recording information, recording appropriate responses to the presented information, locating the required information, organizing and managing activities efficiently, synthesizing information to create meaningful patterns of responses, and memorizing and retrieving information on demand.

While positive study behaviors are important to student achievement, knowledge of the actual study behaviors and techniques utilized is rather limited (Elliot, Foster & Stinson, 2013). Scholars do however agree that students typically utilize a variety of studying techniques, while the actual techniques utilized are rarely documented. Self-regulated learners' proactive qualities and self-motivating abilities help to distinguish them from their peers. Research shows that self-regulated students are more engaged in their learning. These learners commonly seat themselves toward the front of the classroom (Labuhn, Zimmerman & Hasselhorn, 2010), voluntarily offer answers to questions (Elstad & Turmo, 2010), and seek out additional resources when needed to master content (Clarebout, Horz & Schnotz, 2010). Most importantly, self-regulated learners also manipulate their learning environments to meet their needs (Kolovelonis, Goudas & Dermitzaki, 2011).

Salta & Koulougliotis (2011) identified the factors that could positively influence (female) students' attitude to learn chemistry; these factors could be organized into three main categories: teaching approaches, educational tools, non-formal educational material and activities. The truth is that teachers' attitude and motivation towards chemistry play a critical role in the teaching and learning process and

generally influence students' attitudes towards the subject; they play a major role in shaping the classroom environment which has an impact on a student's self-efficacy which in turn influences a student's behaviour (Ogembol, Otanga and Yaki, 2015). Teachers' attitude also influence the ways they organize the content to teach and the teaching approaches they use in the classroom, but students' attitude towards chemistry is by far one of the most influential variables that determine achievement (Azuka, Durujaiye, Okwuoza & Jekayinka, 2013).

Students who have a strong belief that they can succeed in chemistry-related tasks and activities will be more likely to select such tasks and activities, and work hard to complete them successfully (Kurbanoglu, 2010). Alternatively, students who do not believe that they can succeed in chemistry-related activities will avoid them if they can and will put forth minimal effort if they cannot. When confronted with the typical challenges that science involves, they will be more likely to give up and to experience the stresses and anxieties that help ensure the erosion of their efforts (Kurbanoglu, 2010). Thus, self-efficacy is proposed to be an important factor influencing attitudes toward chemistry and chemistry laboratory anxiety.

## Methodology

The study used survey design of the descriptive type of research. This was considered as appropriate because the researcher would have the opportunity to gather data for collection through responses to questionnaire by the respondents. This research work was carried out in Ikere Local Government Area of Ekiti State.

The population of the study comprised of all secondary school female chemistry students in public and private secondary schools in Ikere local government area of Ekiti State.

A sample size of four hundred and twenty (420) female chemistry students was selected as respondents for the study. There are twelve (12) public and fourteen (14) private secondary schools in Ikere local government area of Ekiti State. Twenty (20) schools were selected for the study using simple random sampling technique to select ten (10) public and ten (10) private secondary schools. Twenty one (21) respondents were selected from each of the twenty (20) schools by using simple random sampling techniques. The selection cut across all the senior secondary classes 1, 2 and 3.

The instrument used for the study was self-designed questionnaire which was the instrument used for the study. To ensure validity of the instrument, the draft of the questionnaire was given to two (2) experts in the chemistry education for face and content validity. The corrections that were made by the expert were noted and corrected version of the instrument was submitted to the project supervisor for final correction and approval before final copies were produced.

The reliability of the instrument was established using split-half method of reliability. The researcher administered the instrument to ten (10) respondents from senior secondary schools which was not part of the schools considered for the study. The data collected from these respondents was subjected to inferential statistics of Pearson's Product Moment Correlation (PPMC) to determine the value of reliability coefficient ( $r$ ) at 0.05 level of significance. The reliability index obtained was 0.99.

The questionnaire was personally administered to students with the help of two (2) self-trained research assistants and the completed questionnaire was collected on the spot.

For analysis of data, the researcher used inferential statistics of ANOVA was used to test the hypotheses at 0.05 alpha level of significance. The analysis was done through computerized package of SPSS software.

## Results and Discussion

### Test of Hypotheses

**Hypothesis 1:** There is no significant difference in the disposition of female students of various ages toward learning of chemistry.

**Table 1: ANOVA of students' response in terms of age**

	Sum of squares	Df	Mean square	$F_{cal}$	$F_{tab}$	Sig.	Decision
<b>Between Groups</b>	2.65	2	1.324	0.24	3.0	0.787	NS
<b>Within Groups</b>	2303.74	417	5.525				
<b>Total</b>	2306.39	419					

$p < 0.05$  level of significance. NS = Not Significant

The result of the analysis in Table 1 shows there is no significant difference in the female students' disposition of different age group towards learning of chemistry. The analysis of variance revealed that  $F_{cal}$  (0.240) was less than  $F_{tab}$  (3.0) at  $p < 0.05$  level of significance. This means that there is no significant

difference in the female students' disposition of different age group toward the learning of chemistry, it was therefore upheld.

**Hypothesis 2:** There is no significant difference in the perception of female students of various classes toward learning of chemistry.

**Table 2: ANOVA of students' response in terms of class**

	Sum of squares	df	Mean square	F <sub>cal</sub>	F <sub>tab</sub>	Sig.	Decision
<b>Between Groups</b>	10.018	2	5.009	0.818	3.0	0.442	NS
<b>Within Groups</b>	2553.494	417	6.123				
<b>Total</b>	2563.512	419					

$p < 0.05$  level of significance. NS = Not Significant

The result of the analysis in Table 2 shows there is no significant difference in the perception of female students of different classes towards learning of chemistry. The analysis of variance revealed that  $F_{cal}$  (0.818) was less than  $F_{tab}$  (3.0) at  $p < 0.05$  level of significance. This means that there is no significant difference in the perception of female students of different classes toward the learning of chemistry, it was therefore upheld.

**Hypothesis 3:** There is no significant difference in the interest of female students of various ages towards learning of chemistry.

**Table 3: ANOVA of students' response in terms of age**

	Sum of squares	df	Mean square	F <sub>cal</sub>	F <sub>tab</sub>	Sig.	Decision
<b>Between Groups</b>	44.646	2	22.323	3.797	3.0	0.023	S
<b>Within Groups</b>	2451.666	417	5.879				
<b>Total</b>	2496.312	419					

$p < 0.05$  level of significance. NS = Not Significant

The result of the analysis in table 3 shows there is significant difference in the interest of female students of different age group towards learning of chemistry. The analysis of variance revealed that  $F_{cal}$  (3.797) was greater than  $F_{tab}$  (3.0) at  $p < 0.05$  level of significance. This means that there is significant difference in the interest of female students of different age group toward the learning of chemistry, it was therefore not upheld.

**Hypothesis 4:** There is no significant difference in the attitude of female students in various classes toward learning of chemistry.

**Table 4: ANOVA of students' response in terms of class**

	Sum of squares	df	Mean square	F <sub>cal</sub>	F <sub>tab</sub>	Sig.	Decision
<b>Between Groups</b>	0.846	1	0.423	0.036	3.0	0.965	NS
<b>Within Groups</b>	4918.116	417	11.794				
<b>Total</b>	4918.962	419					

$p < 0.05$  level of significance. NS = Not Significant

The result of the analysis in Table 4 shows there is no significant difference in the attitude of female students of different classes towards learning of chemistry. The analysis of variance revealed that  $F_{cal}$  (0.036) was less than  $F_{tab}$  (3.0) at  $p < 0.05$  level of significance. This means that there is no significant difference in the attitude of female students of different classes toward the learning of chemistry, it was therefore upheld.

## Discussion of Findings

The results of findings from hypothesis 1 indicated that there is no significant difference in the female students' disposition of different age group toward the learning of chemistry. This is in line with the assertion of Woldeamanuel et al. (2014) that female students' anxiety for chemistry learning leads to loss of interest in chemistry and influence their learning outcome in chemistry. The female students' disposition toward chemistry is influenced by the age of students which determined students learning outcome and academic performance. Attitude through students' disposition towards chemistry is essential; it denotes interests or feelings towards studying chemistry. Female students have achieved low result in chemistry relative to male students in the same class. The presence of problems of poor learning and low achievement in chemistry has been conceived and grow and increasingly particularly over the decade. It has reported that most students fear chemistry and hence they see chemistry as difficult to understand, which may be as a result of the abstract nature of chemistry and the method (lecture method) being used by most of the

chemistry teachers. Students' anxiety for chemistry learning can also be attributed to students' disposition about the difficult nature of chemistry, involvement of multitude of facts, and its disconnection from reality.

Hypothesis 2 revealed that there is no significant difference in the perception of female students of different classes toward the learning of chemistry. The findings supported the assertion of Escalona (2015) that student learning and achievement depends on academic enablers such as perception (attitudes) and behaviours that allow a student to participate in and ultimately benefit from academic instruction in the classroom. With dynamism of science (chemistry), an encouraging attitude through positive perception is necessary in chemistry, perception regulates the behaviour of the students in their availability, readiness for the subject and their interactive manner during the class. Better perception yield better attitudes and learning. Attitude is believed to be strongly connected to academic success. Attitudes are developed and can come from the environment e.g. parents, siblings, school, place of worship, among others. Academic skills are and should be the primary focus of instruction in school. Therefore, the perception of female students about chemistry is very crucial to how they respond to learning and eventual academic performance in chemistry. The findings also agreed with the report of Turner, Ireson & Twidle (2010) on the reasons why female students disliked chemistry and these were writing too many sheets of paper; too many words to learn; complicated experiments; room smells; hard homework. Also, the reasons why the chemistry is popular among students (for example, it is practical and fun). When students see chemistry as hard and not understandable, their learning and achievement in this subject deteriorates.

Hypothesis 3 revealed that there is significant difference in the interest of female students of different age group toward the learning of chemistry. This is in line with the findings of Chang, Yeung & Cheng (2009) that boys showed higher learning interests in sustainability issues and scientific topics than girls. However, girls recalled more life experiences about science (chemistry) than boys. It was also showed that there was high correlation between learning interests and life experiences related to chemistry, and in the perspective on attitudes towards chemistry. Researches focused on gender studies have indicated that attitudes toward science (chemistry) education differ between gender. Also, Aggrawal (2010) stated that interest is a powerful dictator and motivator in the learning process. The implication is that, students are likely to pay attention to learn, remember, imagine and read more readily when their interest and emotions are positively provoked. Interest as a human sentiment, goes along with values, attitudes and other forms of human preferences. Interest aroused to learn a particular subject should be sustained for more enduring learning. Students' interest can be triggered in the moment by certain environmental factors such as teacher behaviours.

Hypothesis 4 revealed that there is no significant difference in the attitude of female students of different classes toward the learning of chemistry. The findings concurred with the assertion of White and Harrison (2012) that secondary school students see science (chemistry) as uncreative, and difficult because they do not recognize its study as important for developing transferrable skills such as technical competence, numeracy, analytical and problem-solving. Many female students have poor attitude to chemistry learning because they have poor study habits skills which are required for understanding and retrieving information; particular they are the link between comprehension and memorization. Specific competencies of study skills include acquiring information, recording information, recording appropriate responses to the presented information, locating the required information, organizing and managing activities efficiently, synthesizing information to create meaningful patterns of responses, and memorizing and retrieving information on demand.

## Conclusions

Based on the result of findings in the study, the researcher concluded that:

Female students' disposition toward the learning of chemistry was not influenced by the different age group of female students. Perception of female students toward the learning of chemistry did not depend on the classes of students but could be influenced by factors like teachers' effectiveness, classroom management and control, classroom conduciveness among others. Age of female students influenced their interest toward the learning of chemistry. There was no difference in the attitude of female students of different classes toward the learning of chemistry and that some factors like teaching method, practical activities, school environment, peer groups among others.

## Recommendations

The following recommendations were suggested for action:

1. Chemistry teachers should continue to encourage female students to develop positive disposition

towards chemistry and process in other to make them maintain their disposition toward active learning and improved academic performance.

2. Also, female students' should have a change in their disposition and feeling about chemistry topics and methodology and rather see chemistry as subject that improves their learning skills.
3. More of female chemistry teachers should be employed to serve as motivation for female secondary school students in secondary schools towards developing good disposition about the subject.
4. Stakeholders in the chemistry education should organize seminars and programmes for secondary school students in other to make them uphold a positive and good perception about chemistry learning and methodology which invariably will tell on their attitude toward chemistry.
5. Also, chemistry teachers should help female students by giving them counsel and advice that will motivate them to study actively more on chemistry from their senior secondary one as this will later become habit for them in the future.
6. Chemistry teachers should encourage parents to provide basic necessities like textbooks, conducive environment, extra mural lesson, good parent-children interaction among others for achieving excellent performance in chemistry for female students in other to enable them maintain a positive interest toward learning of chemistry.
7. Chemistry teachers should show more interest in chemistry class through practical activities in order to improve and boost female chemistry students' interest in the subject.
8. State government should work with school administrator to make provision for the use of laboratory facilities, provide sufficient personnel (laboratory attendant), employed well trained and certified teachers, provide space for practice and improved method of teaching to enhance female students' positive attitude towards learning of chemistry.

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