

# Students Attitude Towards Chemistry And Their Academic Achievement In Selected Concepts In Chemistry Among Secondary School Students In Ibiono Ibom Local Government Area, Nigeria

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*Abstract: A variety of factors have been implicated to affect students' achievement in chemistry. Attitude exhibited by students towards chemistry impacts on achievement in different ways. This study investigated the influence of students' attitude towards Chemistry on academic achievement in selected concepts in chemistry in Ibiono Ibom Local Government Area of Akwa Ibom State. Correlation research design was adopted for the study. Three research hypotheses were formulated to guide the study. A total of one hundred and forty six (146) chemistry students from the population of nine hundred and fifty eight (958) senior secondary two in 2018/2019 academic session formed the sample size using simple random sampling technique. The instruments used were: Students' Attitude Questionnaire (SAQ) and Chemistry Achievement Test (CAT). The CAT was validated by two lecturers from the department of science education and one in test and measurement unit of the University of Uyo. The research hypotheses were tested using PPMC coefficient at  $p \leq 0.05$  level of significance. Major findings revealed that as students' attitude towards Chemistry improved, achievement in chemistry increased significantly. Findings also showed that as male and female students' attitude towards chemistry taken together reduced, their achievement in chemistry improved. In terms of school location, a reduced urban and rural students' attitude towards chemistry did not correspond to reduced chemistry achievement. Recommendations among others were that chemistry teachers and education ministries should take initiatives that encourage good students' attitude towards chemistry in order to foster better performance in the subject.*

**Keywords: Attitude, Academic Achievement, Gender, Location**

## I. INTRODUCTION

Chemistry is one of the core subjects for science students at the senior secondary school level in Nigeria. It forms a foundational basis for other science subjects like biology, basic science, physics, agricultural sciences, food science and geophysics. It is central to medical sciences and pivotal in industrial production of a range of household and pharmaceutical products. This is why Nigerian universities and other tertiary institutions do not admit students into Medical Sciences, Engineering, Agricultural Sciences, and other related courses without at least a credit pass in chemistry

as a pre-requisite. In terms of solving socio-economic problems, innovative application of Chemistry knowledge has proffered lasting solutions over the centuries. Adewunmi (2016) and Emendu (2014) believe that the knowledge of chemistry is very relevant to the modern society, contributing immensely as a veritable tool to both individual and national development. Chemistry being experimental has provided ample opportunity for students and teachers to learn and re-learn thus, enabling them solve their everyday problems (Wallas, 2016). Unfortunately, in Nigeria, in spite of the recognition given to chemistry, there have often been gaps between curriculum planner intention and what goes on in the

classroom, and over the years, students' performance in the subject has remained persistently low, discouraging and disturbing Ogunleye, (2012) in Ogungbesan, (2012). It has been observed that a lot of students nowadays are losing interest in the science subjects such as chemistry. This is alarming because chemistry being the basis for other science and technical subjects cannot be undermined, especially in a technologically underdeveloped nation such as Nigeria. From some research reports, it does appear students find the subject perhaps a bit or lots more abstract and difficult to understand. Edomwonyi-otu and Aava (2011), aired the view of students who noted that chemistry is too broad for them to learn in a short time. It is therefore obvious that students find it a bit difficult to learn chemistry because of its cramped syllabus. For instance, the Senior Secondary one chemistry syllabus in Nigeria requires nine chapters for the students to master before their examinations. A lot of chemistry teachers claimed that they have to make extra classes to cover all of the chapters in the syllabus. This issue is challenging to both students and teachers. Most teachers say they do not have enough time to teach and make the students fully understand the concept of chemistry during the normal school time. Thus, extra time and energy have to be given to teach chemistry to the students. Besides extra time and energy, it is equally important for the teachers to be innovative and evolving in the teaching approach. Students who really want to learn will have little problem grasping the concepts. However, weak and less enthusiastic students will find chemistry very dull and boring and these affect students' attitude toward chemistry. This brings in the question of students' attitude. Can a positive students' attitude towards chemistry result in better students' performance in the subject?

Attitude is characteristic behaviour of a person towards an issue or event. It's said to be a phenomenon that is attained through learning, which guides the behaviors of an individual and causes subjectivity (Aysem and Fatma, 2012). According to Norliana (2008), attitude is the way students behave and think. Kenyon (2018) believed that attitude is a complex word but the feelings can be reflected through their reactions and characteristics. Oluwatelure and Oloruntegbe (2009) reported that attitude is a concept, which arises from the attempt to account for the observed regularities in the behaviour 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. In a classroom, teachers can identify attitude of students by observing their behaviour. Students who always complete their homework and ask questions during chemistry classes are said to show positive attitudes in learning chemistry. The attitude of students in secondary schools towards chemistry has been noted to be poor (Abulude (2009) and can affect their academic achievement negatively. There should be an immediate remedy to this down turn. Researchers have agreed that in order to make students have more positive attitude in learning science, people around them, especially the teachers and parents, have to give opportunities and time to engage with the processes and the procedures of science (Pollard and Triggs, 2010; Ward, Roden, Hewlett, and Foreman (2005). This is important because the attitudes of the students towards certain

subjects can determine what they will become in future. In their meta-analysis of attitude related factors that predict future behaviours, Glasman and Albarracín (2006) concluded that there is a correlation between attitudes and future behaviours; that is, attitudes are a potential for predictors of future preferences, especially if there is a direct interaction between participants and the attitude object (for instance objects that relate to attitude like science lessons). Akinmade (1992) confirmed that students' attitude toward science are the basis for higher achievement in science.

However, studies that examined the correlation between attitude and academic achievement provide inconsistent results. Schibeci and Riley (1986) for instance, found a strong relationship between attitude and achievement. Shrigley (1990), on the other hand, argued that there is only moderate relationship between attitudes toward science and science achievement. A positive relationship was found among groups of learners who scored significantly high in science achievement test and also scored significantly high in attitude test (Hough and Peter, 1982). Gibbons, Kimmel and O'Shea (1997) opined that students' attitudes about the value of learning science may be considered as both an input and outcome variable because their attitudes towards the subject can be related to educational achievement in ways that reinforce higher or lower performance. This means that those students who do well in a subject generally have more positive attitudes towards that subject and those who have more positive attitudes towards a subject tend to perform better in the subject (Olatunde, 2009). There could be other factors that affect students' academic performance in chemistry other than attitudinal issues. Researchers have shown that school location have the potential to either facilitate or inhibit learning.

School location has been identified as one of the variety of factors that affect academic performance of learners in Nigeria where schools are distributed in rural, urban and semi-urban communities, with most private schools located only in urban areas. Notably, the distribution of educational amenities, and posting of qualified teachers is not equitable along this location divide. This has severely affected the academic performances of learners. There is generally a profuse research agreement to the negative influence of school location and its associated amenity distribution imbalances. Patrick (2012) posits that the availability of infrastructures, availability of teachers, location and finance, socio-economic, psychological and environmental factors affect academic performance of students. Specifically, location as a factor can either boost or deter the good performance of a student. Owwoye (2011) in a study on the location of schools as it relates to academic achievement of students in Ekiti state of Nigeria showed that students in urban areas had better academic achievement than their rural counterpart. In other words, students in urban locations have a very great advantage by learning in an urban environment, which apparently enriches their academic knowledge, despite the apparent disadvantage, as it were, of having to learn in large classes. He further corroborated that the geographical location of schools has influence on the academic achievement of students. Rural urban dichotomy in terms of academic achievement of students has been attributed to various causes through uneven distribution of resources,

poor school mapping, facilities, and problem of qualified teachers refusing appointment or not willing to perform well in isolated villages, lack of good roads, poor communication, and nonchalant attitude of some communities to schooling among others.

Beeby (1986) in Owoeye(2013) maintained that the socio-economic well-being of students' parents has a strong relationship with students' academic performance emphasizing that the urban/rural location of schools appear to outweigh this factor in fixing the performance of learners, whereas learning in an unconducive atmosphere cannot produce better academic achievement. Hallak (1977) and Kemjika (1989) agree that academic achievements of students in rural community differ from those in urban locations. Sander (1972) observed that teachers with the highest training are posted to large cities, and even more noticeably to the capital. This and more findings abound on the disparity in the quality of teachers in urban schools compared to those in rural areas, which consequently affect student's performances based on school location. Obe (1984) observed a significant difference in urban-rural performance of 480 primary six school finalist on the aptitude sub-test of the National Common Entrance Examination (NCEE) into secondary schools. In his study tagged scholastic aptitude test, he concluded that students from urban schools were superior to their rural counterparts.

Musibau and Johnson (2010) observed that many parents believe that the academic performance in urban schools is poor compared with academic performance of students in rural schools and therefore enroll their wards in the rural schools for Senior School Certificate Examinations (SSCE). It appears most of the public secondary schools cannot compete favorably with Government Colleges (State Unity colleges) in terms of students' academic performance as a result of their inefficiency. Onoyase (2015) maintained that, the reason why urban students' achieve better in academics than rural students is because, they do attract some amenities like pipe born water, electricity, good roads and well equipped schools. The reason is also because rural schools lack good educational facilities for effective teaching and learning. In the same vein, Mofon (2001) stressed that many rural schools are in terrible state of despair and lacking basic learning facilities. The poor environment and poor infrastructural facilities contribute immensely to poor teetering and poor academic achievement. There is however, a contrary view on this popular finding as found in Ajayi (1990) and Gana (1997) who accentuated in their different studies on the relationship between academic achievement and school location that, there was no significant difference between academic performance of students in urban and rural schools. Ajayi (1999) also found out that there was no significant difference between the academic achievement of rural and urban secondary school students. Gender is also one of the factors mentioned in literature to have considerable effects on students' academic performances especially in science subjects.

Gender is a term used to describe a person either as a man/boy or a woman/girl. It's also used to assign persons into two groups; those that act as male having male attributes and those that act as female having female attributes. According to Wikipedia (2019) gender is the range of characteristics

pertaining to, and differentiate between masculine and feminine. Depending on the context, these characteristics may include biological sex, sex-based social structures or gender identity. The importance of examining performance in relation to gender is based primarily on the socio-cultural differences between girls and boys. Some vocations and professions have been regarded as men's (engineering, arts and crafts, agriculture), while others as women's (catering, typing, and nursing). In fact, parents assign task like car washing, grass cutting, bulbs fixing, and climbing ladders to fix or remove things to the boys (Adigun, Onihunwa, Irunokhai, Sada and Adesina, 2015).

A study by Nnamani and Oyibe (2016) on gender and academic achievement of secondary school students in social studies in Abakaliki urban of Ebonyi state revealed that the achievement of female secondary school students was higher than the achievement of male students. Adigun et al (2015) found that male students had slightly better achievement compared to the female students in a study on Effect of Gender on Students' Academic achievement in Computer Studies in Secondary Schools in New Bussa, Borgu Local Government of Niger State. This better achievement was found to be pronounced in the private school which was shown to possess the best male brains found in the study area. Studies by Okeke (2010) and Maduabum (2016) clearly indicate the state of affairs at the secondary level of education in Nigeria which shows that a greater proportion of males enrolled and achieved higher than their female counterparts. Their study also showed that at all levels of education in Nigeria, females were grossly underrepresented in terms of enrolment, participation and achievement in science, technology and Mathematics education.

Therefore, gender is an important factor that contributes to academic achievement in chemistry. A comprehensive study on the Influence of Gender on Secondary School Students' Academic Achievement in South-West, Nigeria by Abdu (2017) showed that male and female students performed equally in English language. Males performed better than females in Mathematics, Science and Social Science while females also did better than males in Arts except in Yoruba. Gender difference has thus far been implicated in levels of academic achievement of male and female students in different subjects and discipline.

#### STATEMENT OF THE PROBLEM

The poor performance in sciences especially in chemistry has continued to be a major concern to the Government of Akwa Ibom State and other education stakeholders. This trend has been more pronounced in areas such as Ibiono Ibom Local Government Area. The poor performance in effect jeopardizes learners' chances for upward educational and social mobility. At the national level, poor performance has led to low transition into careers in science and technology. In an effort to reverse the trend, the government adopted a number of interventions targeting students, teachers and the overall teaching and learning environment. Despite these interventions, the poor performance of students in chemistry in Ibiono Ibom Local Government Area continues with lower mean than the national averages being recorded year after

year. The continued poor performance in chemistry has been attributed to a number of attitudinal factors including students' attitude towards chemistry, and poor teaching methodologies among others. However, it is not clear which of these factors are responsible for the poor performance of chemistry in Ibiono Ibom Local Government Area. The study therefore seeks to examine if students' attitude towards chemistry is responsible for students' poor performance in chemistry in Ibiono Ibom Local Government Area.

#### PURPOSE OF THE STUDY

This study is designed to investigate the influence of students' attitude towards Chemistry and their academic achievement in selected concepts in chemistry in Ibiono Ibom Local Government Area of Akwa Ibom State.

#### HYPOTHESES

Ho1: There is no significant relationship between students' attitude towards chemistry and their achievement in chemistry

Ho2: There is no significant relationship between male and female students' attitude towards chemistry and their achievement in chemistry

Ho3: There is no significant relationship between urban and rural students' attitude towards chemistry and their achievement in chemistry.

#### SCOPE OF THE STUDY

The study is delimited to the effect of students' attitude towards chemistry on academic performance in selected concepts (Introduction to chemistry, Particulate nature of matter, Separation techniques, and Chemical combination) in chemistry in Ibiono Ibom Local Government Area of Akwa Ibom State, Nigeria given their gender and the school location.

#### SIGNIFICANCE OF THE STUDY

The study will be significant to teachers who will have a sense of direction and device more ways to help students improve academically by finding ways to motivate them. It will help them to pattern their lesson plan to incorporate interesting attributes suitable to all students.

The study will be of immense significance to curriculum planners who will get to realize that students have different attitudes (positive and negative), and since the sole aim of the curriculum is to help students acquire knowledge to be productive and good citizens, they will come up with elaborate plan that will improve students' attitude and build interest in chemistry.

The study will be of significance to the school administrators in the management and planning of school activities bearing in mind students' attitude and devising ways to build their interest by also providing instructional materials that will aid in improving attitudes and academic performances.

The study will be of help to textbook publishers as it will expose them to the fact that students' attitudes can be improved upon by the nature of the text material when it is

made interesting and will incorporate same in publishing textbooks, workbooks and practical manuals that will cater for learning needs of students to enable them improve academically.

The study will be of significance to the Parents Teachers Association as its recommendations can serve as a guide to parents and teachers to pay key attention to their children/wards' academic needs, knowing that they need to encourage and motivate them to have a positive attitude towards chemistry and improved performance and innovative abilities.

## II. METHODOLOGY

### RESEARCH DESIGN

This study will use the correlation research design. The correlation research design is a type of non-experimental study. This design is deemed appropriate because it allows the collection and treatment of quantitative data to assess relationships without necessarily manipulating independent variables or randomly assigning participants to different conditions. Quantitative data was gathered using Students' Attitude Questionnaire (SAQ) and Chemistry Achievement Test (CAT).

### POPULATION OF THE STUDY

The target population of this study comprised all the senior secondary two (SS2) science students in the 12 public secondary schools in Ibiono Ibom Local Government Area of Akwa Ibom State. Nine hundred and fifty eight (958) students in the senior secondary two classes in the twelve public schools in Ibiono Ibom Local Government Area formed the population (Source: Local Education Committee, Ibiono Ibom).

### SAMPLE AND SAMPLING TECHNIQUE

Multi-stage sampling technique was employed for the selection of the respondents. In Ibiono Ibom, there are 9 clans.

In Stage 1: Simple random sampling was used to select 3 clans out of the 9 clans.

In Stage 2: Simple random sampling technique was employed in the selection of one public secondary school from each of the selected clans (One semi-urban and two rural schools).

In stage 3: Simple balloting was used in the selection of science students. A total of 3 schools and 146 science students who offer chemistry as a subject were selected.

### INSTRUMENTATION

The instrument used for the study comprises of two major parts viz: Students' Attitude Questionnaire (SAQ), and Chemistry Achievement Test (CAT). It was designed and used by the researcher to collect data on students' attitude towards chemistry and students' chemistry achievement respectively. It consists of three sections: A, B and C. Section A is students

Bio-data on Gender and Location. Section B is the Students' Attitude Questionnaire (SAQ) made of subsections to reflect the specific objectives (difficulty, interest, usefulness and importance) of chemistry. It consists of 15-items, with 4 point likert scale; Strongly Agree (SA)-4, Agree (A) - 3, Disagree (D)-2, Strongly Disagree (SD) -1. Section C is the Chemistry Achievement Test (CAT) which is a multiple choice question drawn from four concepts (Introduction to chemistry, Particulate nature of matter, Separation techniques, and Chemical combination) of the chemistry curriculum.

### RESEARCH PROCEDURE

The researcher obtained permission from the school principal and engaged the chemistry teachers in the schools as research assistants who assisted to administer the instruments after seeking the consent of the student and briefing them on what is expected of them. When they completed filling, the instruments were collected back to ensure high rate of return. The instrument was thereafter scored, recorded and data was subjected to analysis.

### METHOD OF DATA ANALYSIS

Pearson Product Moment Correlation coefficient was calculated between students' attitude toward chemistry and mean scores of students in Chemistry Achievement Test (CAT) to show whether a relationship exists and how strong or weak it is by location and by gender. The difference in the relationships between male and female students' scores in Chemistry Achievement Test (CAT) was represented statistically. Tables summarizing the relationship between the two variables by location and gender, together with the statistical values for the Pearson's Product-Moment Correlation coefficient were used.

## III. RESULTS

### HYPOTHESES TESTING

The hypotheses formulated to guide this study were tested using correlation analysis.

#### HYPOTHESIS ONE:

There is no significant relationship between students' attitude towards Chemistry and their achievement in Chemistry

		Attitude	Achievement
Attitude	Pearson Correlation	1	.835**
	Sig. (2-tailed)		.000
	N	146	146
Achievement	Pearson Correlation	.835**	1
	Sig. (2-tailed)	.000	
	N	146	146

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

Table 1: Correlation analysis between students' attitude towards Chemistry and their achievement in Chemistry

Table 1 shows the correlation coefficient of .835 (n=146) between students' attitude towards Chemistry and their achievement in Chemistry which indicates a high positive correlation which is also significant at 0.05. Therefore, the null hypothesis is rejected. This implies that there exists a significant relationship between students' attitude towards Chemistry and their achievement in Chemistry.

#### HYPOTHESIS TWO

There is no significant relationship between male and female students' attitude towards Chemistry and their achievement in Chemistry.

		Attitude	Achievement
Attitude	Pearson Correlation	1	.835**
	Sig. (2-tailed)		.000
	N	146	146
Achievement	Pearson Correlation	.835**	1
	Sig. (2-tailed)	.000	
	N	146	146
Gender	Pearson Correlation	-.452**	-.500**
	Sig. (2-tailed)	.000	.000
	N	146	146

\*\* Correlation is significant at the 0.05 level

Table 2: Correlation Analysis between Male and Female Students' Attitude Towards Chemistry and Their Achievement in Chemistry

Table 2 shows the correlation coefficient of -.452 (N=146) between male and female students' attitude towards Chemistry and their achievement in Chemistry. This indicates a low negative correlation which is also significant at 0.05. Therefore, the null hypothesis is rejected. This implies that there exists a statistically negative significant relationship between male and female students' attitude towards Chemistry and their achievement in Chemistry.

Variable	Gender	N	$\bar{X}$	SD
Achievement	Male	76	10.83	4.56
	Female	70	11.67	5.12
Attitude	Male	76	25.59	14.97
	Female	70	30.53	14.65

Table 3: Mean and Standard Deviation Scores of Students' Attitudes toward Chemistry and Students' Achievement in Chemistry with respect to gender

Table 3 shows that female students had mean score of 30.53 on attitude and mean score of 11.67 on achievement, while their male counterparts had a mean score of 25.59 on attitude and a mean score of 10.83 on achievement respectively. This indicates that female students had a better attitude towards chemistry and performed better in chemistry than their male counterparts.

*HYPOTHESIS THREE*

There is no significant relationship between urban and rural students' attitude towards Chemistry and their achievement in Chemistry

		Attitude	Achievement
Attitude	Pearson Correlation	1	.835**
	Sig. (2-tailed)		.000
	N	146	146
Achievement	Pearson Correlation	-.914**	1
	Sig. (2-tailed)	.000	
	N	146	146
	Pearson Correlation	-.914**	-.907**
	Sig. (2-tailed)	.000	.000
	N	146	146

Location

\*\*Correlation is significant at the 0.05 level

Table 4: Correlation Analysis between Urban and Rural Students' Attitude towards Chemistry and Their Achievement in Chemistry

Table 4 shows the correlation coefficient of  $-.914$  ( $n=146$ ) between male and female students' attitude towards Chemistry and their achievement in Chemistry. This indicates a low negative correlation which is also significant at 0.05. Therefore, the null hypothesis is rejected. This implies that there exists a statistically negative significant relationship between urban and rural students' attitude towards Chemistry and their achievement in Chemistry.

IV. DISCUSSION OF FINDINGS

Findings from the result on the relationship between students' attitude towards Chemistry and their achievement in Chemistry showed a high positive relationship which was significant. It indicates that as students' attitude towards chemistry improved, their achievement in chemistry increased. It could be attributed to enhanced students interest in chemistry concepts and corresponding increased content knowledge. This is because right students' attitude with the right learning technique and quality content influence students' achievement. Hence, there is an observed increase in chemistry achievement. The finding of the study is in line with that of Hairulliza, Noraidah, Hazura, and Tengku (2011) who found positive attitude towards chemistry on majority of students. In contrast to this finding, a research by Millar and Schau (2010) on assessing students' attitudes: the good, the bad, and the ugly however, showed that positive attitudes were still unable to influence students' academic achievement.

According to the descriptive statistics results in table 3, female students had mean score of 30.53 on attitude with a higher mean score of 11.67 on achievement, while their male counterparts had a mean score of 25.59 on attitude with an achievement score of 10.83. This indicates that female students had a better attitude towards chemistry and higher achievement in chemistry than male students. Correlation findings on the relationship between male and female students' attitude towards Chemistry and their achievement in

Chemistry indicated a low negative correlation which was significant. It indicates that as male and female students' attitude towards chemistry taken together reduced, their achievement in chemistry improved. The finding of this study is in line with that of Mari (2011) In Esther, (2013) and Okeke (2010) who showed that gender significantly affects students understanding and academic achievement. In contrast to this findings, Oludipe (2012) on gender difference in Nigeria in junior secondary students' academic achievement in basic science found that there is no significant difference between gender and academic achievement.

Findings on the relationship between urban and rural students' attitude towards Chemistry and their achievement in Chemistry indicated a high negative correlation which is also significant. It shows that a reduced urban and rural students' attitude towards chemistry did not correspond to reduced chemistry achievement. This could be attributed to additional efforts put in by urban and rural students in learning chemistry concepts. This finding implies that whether a student attends rural or urban secondary school it does not make a difference in terms of academic performance. The finding contradicts the decision of some parents that enroll their wards in rural areas on the basis of better academic performance. The finding of the study is in line with a research by Musibau and Johnson (2010) on the Influence of School Sex, Location and Type on Students' Academic Performance, which revealed that school location had no significant influence on students' academic achievement. Ajayi (1990) and Gana (1997) in their different studies on the relationship between academic performance and school location had a similar view that, there was no significant difference between academic performance of students in urban and rural schools.

RECOMMENDATION

Based on the findings of this study, the following recommendations were made:

- ✓ Teachers should endeavor to encourage students to develop high attitudes toward chemistry as this can foster high achievement in chemistry.
- ✓ The State Secondary Education board should endeavor to post suitably qualified teachers to the schools for effective teaching and learning to develop high attitudes in the students and improve achievement in chemistry.
- ✓ Ministry of education should device better means to help students acquire high attitude and achieve higher in chemistry.

SUGGESTION FOR FURTHER STUDY

- ✓ There should be investigation of the influence of attitude towards chemistry and achievement in chemistry with the use of other concepts in science.
- ✓ This data still does not adequately describe the realities of students in chemistry. Therefore, researchers should measure students using different methods and perspectives in collecting information.
- ✓ This study should be replicated in other Local Government Areas of Akwa Ibom State or in other states of the federation for possible generalization.

REFERENCES

- [1] Abulude, F. O. (2009). Students' attitudes towards chemistry in some selected secondary schools in Akure South Local Government Area Ondo State. <http://www.scribd.com/doc>. Accessed June 22, 2018
- [2] Adewunmi, M. B. (2016). Science Education: The Bedrock to Realistic, Scientific and Technological Development in Nigeria.
- [3] Paper presented at the 47<sup>th</sup> Annual Conference of Science Teachers Association of Nigeria.
- [4] Adigun, J., Onihunwa J., Irunokhai, E., Sada, Y., and Adesina, O. (2015) Effects of gender on students' academic performance in computer studies in secondary schools in Bussa, Borgu Local Government of Nigeria. *Journal of education and practice* 6 (3) 2015
- [5] Aiken, L. R. and Aiken D. R. (1969). Recent Research on Attitude According to Science. Guilford College and Western Guilford high school, Greensboro, North Carolina 27410. <https://doi.org/10>. Accessed April 12, 2019.
- [6] Ajayi, K. O. B. (1999). The relationship between instructional resources and socio-economic status in selected population of high school. *Dissertation Abstract International*, 25(2): 22-23
- [7] Ajayi, O. (1990) Unit Cost of Secondary Education and Students' Academic Achievement in Ondo State Nigeria (1991 – 1995). Ph. D Dissertation. University of Ibadan, Ibadan.
- [8] Akey, T. M. (2006). School context, student attitudes and behaviour, and academic achievement: an exploratory analysis. <http://www.mdrc.org/publications/419/full.pdf>. Accessed April 25, 2019
- [9] Akinmade, C. T. (1992). The swing away from science. The Nigerian Chapter. *Journal of the Science Teachers' Association of Nigeria*, 24 (122), 126-129.
- [10] Akpa, O. M., Bamgboye E.A., and Baiyewu O. (2015). The Adolescent Psychosocial Functioning Inventory (APFI): scale development and initial validation using Expository and Confirmatory Factor Analysis. *African Journal for the Psychological Study of Social Issues*, 18(1), 1-21.
- [11] Anderson, V. (2017). Criteria For Evaluating Qualitative Research, *Human Resource Development*. 28 (2), 32-45. <https://onlinelibrary.wiley.com> Accessed April 10, 2019.
- [12] Aysem, S. O. and Fatma, M.U. (2012). The effects of academic motivations of secondary school students on their attitudes towards the chemistry course. *Education Faculty, Hacettepe University, Ankara, 06800, Turkey*
- [13] Beeby, C., E. (1986). The States of Growth in Educational Systems. In S.P Heinemann and D.S. White (Eds). *Education and Economic Development* Washington, D.C. The World Banks, 37-44.
- [14] Burton, C. B. and Gullo, D. (2012). The effects of social class, class size and prekindergarten experience on early school adjustment. *Early Child Development and Care*, 88(1):43-51
- [15] Edomwonyi-Otu, L. and Aava, A. (2011). The Challenge of Effective Teaching of Chemistry: A Case Study. *Leonardo Electronic Journal of Practice and Technologies*, 10 (18), 1-8.
- [16] Bennett, J., Lubben, F., Hogarth, S., and Campbell, B. (2004). A Systematic Review of the Use of Small-Group Discussions in Science Teaching with Students Aged 11-18, and Their Effects on Students' Understanding in Science or Attitude to Science. *Research Evidence in Education Library*.
- [17] Cuomo, F., Serpico, M. And Balzano, E. (2017). Interpretation of gender differences: Science & Society – European Science Education Initiative. Permanent European resource Centre for Informal Learning (PENCIL): University of Naples “Federico II”
- [18] Emendu, N. (2014). The role of chemistry education in national development. *The international journal of engineering and science*. 3(3) 12-17
- [19] Gana, E., S. (1997). *Effects of Using Visual Designed Training Model on the Learning of Mathematics at J.S.S.* Ph. D. Thesis, Unpublished. University of Ibadan, Ibadan.
- [20] Gardner, H. (2015). *The unschooled mind: How children think, and how schools should teach*. New York: Basic Books.
- [21] Gibbons, S. Kimmel, H and O'Shea, M. (1997). Changing teacher behavior through development: Implementing the teaching and content standards in science. *School science and mathematics*, 97(6) 302-310.
- [22] Glasman, L. and Albarracín, D. (2006). Forming attitudes that predict future behaviour: a meta-analysis of attitude-behaviour relation. *Psychological bulletin*.132(5) 778-822.
- [23] Hodson, D. (2009). A critical look at chemistry practical in school science. *School Science Review*, 70, 33-40.
- [24] Hairulliza, M. J., Noraidah, S., Hazura, M., & Tengku Meriam, T. W. (2011). Students profile based on attitude towards statistics. *Procedia - Social and Behavioral Sciences*, 18, 266–272.
- [25] Hallak, J. (1977). *Planning the Location of Schools: An Instrument of Educational Policy*. Paris: UNSECO-IIEP, pp.13-14, 33-39.
- [26] Hofstein, A. (2017). The laboratory in chemistry education: Thirty years of experience with developments, implementation, and research. *Chemistry Education: Research and Practice* 5(3) 247-264.
- [27] Hough, L., W. and Peter, M. K. (1982). The Relationship Between attitude Towards Science and science achievement. *Journal of Research in Science Teaching*, 19(1) 33-38.
- [28] Hurd, P.D. (2013). State of Pre-college Education in science and mathematics. *Science education* 67(1) 227-234
- [29] Judith, B., Fred, L., and Sylvia, H. (2017). Bringing science to life: A synthesis of the research evidence on the effects of context-based and STS approaches to science teaching. *Science education*. 91 (3), 34-42.
- [30] Kakinda, D. (2017). *Inspiring science education for girls*. CHECK. Point e-Learning published by INFO bases GmbH: Berlin. [info@checkpoint-elearning.com](mailto:info@checkpoint-elearning.com)

- [31] Kemjika, O., G. (1989). Urban and Rural Differences in Creativity Talents among Primary School Pupils in Lagos state. *Lagos Education Review* 5 (1).
- [32] Kenyon, G.S. (2018). A conceptual model for characterizing physical activity. *Research Quarterly for Exercise and Sport*, 39, 39-109.
- [33] Koch, J. (2005). *Science stories: science methods for elementary and middle school teachers*. (3rd ed.). New York: Houghton Mifflin Company.
- [34] Maduabum, M.A. (2016). Strategies of improving the access of girls and women in Science, Technology and Mathematics (STM). University Education in Nigeria. *Journal of Science Education*, 1(1), 1– 12.
- [35] Millar, A. M., and Schau, C. (2010, September). *Assessing students' attitudes: the good, the bad, and the ugly*. Paper presented at 24th Mathematics Education Research, Budapest, Hungary.
- [36] Mari, J.S. (2001). *The effect of science process based instruction on formal reasoning*. Unpublished PhD Thesis, Department of Education. A.B.U. Zaria, Kaduna: Nigeria. In Esther, A., E. (2013). Effect of two problem-solving instructional strategies on students' achievement and science process skills in biology practical. *ir.library.ui.edu.ng*. Accessed September 30, 2019.
- [37] Menis, J. (1983). Attitudes towards chemistry as compared with those towards mathematics, among tenth grade pupils 9 aged 15) in high level secondary schools in Israel. *Research in Science and Technological Education* 1(1), 185-191.
- [38] Mofon, O. (2001). Relationship between performance in instructional medium and performance in selected school subjects in Tanzania Secondary Schools. Unpublished Ph.D Thesis, University of Dares Salaam, Tanzania.
- [39] Musibau, A. Y. and Johnson, T. A. (2010). The Influence of School Sex, Location and Type on Students' Academic Performance, *International Journal of Educational Science* 2(2) 81-85
- [40] Nnamani, S., A. and Oyibe, O., A. (2016). Gender and academic achievement of secondary school students in social studies in Abakiliki urban of Ebonyi state. *British journal of Education* 4 (8) 72-83
- [41] Norliana, G., S. (2008). Learner background and their attitudes towards studying literature. *Malaysian Journal of ELT Research*, 4, 1-17.
- [42] Obe, E., O. (1984). Urban-rural and sex difference in scholarstic aptitude on primary school finalist in Lagos state. *Education and Development*, 41(2):123-134
- [43] Oluwatelure, T. A. and Oloruntegbe, K. O. (2010). Effects of parental involvement On students' attitude and performance in science. *African Journal of Microbiology Research*, 4(1), 1-9.
- [44] Oludipe, D., I. (2012) Gender difference in Nigerian junior secondary students' academic achievement in Basic science. *Journal of education and social research*. 2(1)
- [45] Ogunleye, B. O. (2012). Evaluation of the environmental aspect of SSS chemistry curriculum in Ibadan Nigeria. PhD Thesis.
- [46] University of Ibadan. In Ogungbesan, O., T. (2012) Evaluation of the implementation of the Basic Science curriculum component of the universal basic education programme in South- South Nigeria. *ir.library.ui.edu.ng*. Accessed September 30, 2019.
- [47] Okeke, E.A. (2010). *Gender science and technology: A challenge for education*. The Bama Methal Lecture. Radcliffee College, February 2nd– 5th.
- [48] Owoeye, J., S. (2000). *The Effect of Integration of Location, Facilities and Class Size on Academic Achievement of Secondary School Students' in Ekiti State, Nigeria*. Ph.D. Thesis, Unpublished. University of Ibadan, Ibadan.
- [49] Olatunde, Y. P. (2009). Students' attitude towards mathematics and academic achievement in some selected secondary schools in Southwestern Nigeria. *European Journal of Scientific Research*, 36, 336-341.
- [50] Onoyase, S., O. (2015). The impact of school management environment on students' output quality in Oyo State secondary schools. Unpublished PhD Thesis, University of Ibadan, Nigeria.
- [51] Patrick, A. (2012). Motivational Packages and their effects on performance in the Ghana Education Service :A case study of Asante Akyem Senior High Schools, Ghana.
- [52] Pollard, A. and Triggs, P. with Broad foot, P., Mc Ness, E. and Osborn, M. (2010). *What Pupils Say: Changing Policy and Practice in Primary Education*. London: Continuum.
- [53] Russell, J. and Hollander, S. (1975). A biology attitude scale. *The American Biology Teacher*, 37 (5), 270-273.
- [54] Sander, B. (1972). Educational input factors in Brazilian schools. *American Educational Research Journal*. 9(4) 493-504
- [55] Schibeci, R. A., and Riley, J. P. II. (1986). Influence of student's background and perceptions on Science attitudes and achievement. *Journal of Research in Science Teaching*, 23, 77–87.
- [56] Shrigley, R. L. (1990). Attitude and Behaviour are Correlates. *Journal of Research in Science Teaching*, 27 (2) 90-106
- [57] Ssempala, F. (2015). Gender Differences in Performance of Chemistry Practical Skills among Senior Six Students in Kampala District. *Dissertation.com*. Boca Raton, Florida USA.
- [58] Wallas, A. (2016). *The Art Of thinking*. Watts London.
- [59] Ward H., Roden, J., Hewlett, C. and Foreman, J. (2005). *Teaching science in the primary classroom: A practical guide*. London: Paul Chapman Publishing.
- [60] Wikipedia (2019). Gender. <http://en.m.wikipedia.org>. Available at <http://en.m.wikipedia.org/wiki/Gender>. Accessed on October 10, 2019.