Lafia Journal of Scientific & Industrial Research (LJSIR), Vol. 2(2), 2024
p-ISSN: 3026 – 9288 e-ISSN: 3027 – 1800 pages: 90 – 95
https://lafiascijournals.org.ng/index.php/ljsir/index ⇒ Published by the Faculty of Science,
Federal University of Lafia, Nasarawa State, Nigeria

Students' Attitude and Gender as Determinants of Colleges of Education Students' Academic Achievement in Chemistry

Iyiola B. F.* & Ezeh D. N.
Department of Science Education, University of Nigeria, Nsukka, Enugu State

Abstract

The study examined students' attitude and gender as determinants of Colleges of Education students' academic achievement in chemistry. Three research questions were answered and three hypotheses were also tested. A correlation survey research design was adopted for the study. The population for the study made up of all NCE III chemistry students (1,581) in the North East, Nigeria. A sample size of four hundred and twenty (420) NCE III chemistry students was obtained through multi-stage sampling procedure. An adapted structured questionnaire of Students Attitude Scale, SAS that made up of 2 clusters was used for data collection. A chemistry achievement tests (CAT) was also conducted. The instrument reliability test was done using Cronbach Alpha and index is 0.884 found to be valid and reliable. Data analysis was done using Pearson's product moment correlation and ANOVA to test the hypotheses at 5% level of significance. The findings showed a significant relationship between students' positive attitude to chemistry and their academic achievement in chemistry. The findings also showed that male students had a significant relationship on attitude towards learning chemistry that later influence their chemistry academic achievement above their female counterparts. It was on this note that, a recommendation was made among others factors that NCE chemistry lecturers should make their teaching approaches more stimulating and interesting as to produce a positive attitude from students to chemistry courses and towards their chemistry lecturers. Therefore, this will create a better learning ability in students for a high academic achievement in chemistry at Colleges of Education.

Keywords: Attitude, gender, academic achievement, chemistry, education

Article History

Submitted
January 21, 2024

Revised
April 19, 2024

First Published Online
July 1, 2024

Corresponding author
Iyiola B. F. ✉
talk2fbiyiola@gmail.com

doi.org/10.62050/ljsir2024.v2n2.298

Introduction

Chemistry is one of the science subjects offered by students at the senior secondary school level in Nigeria. Chemistry principally deals with the properties of substances, the changes they undergo and the natural laws that describe these changes [1]. That is, chemistry involves the study of matter, its structure, composition, properties and the changes it undergoes. Chemistry is offered as an elective subject to senior secondary school I – III science stream students, in which chemistry is a compulsory subject for pre-tertiary (College of Education, Polytechnic or University) science stream students. The importance of chemical education in the development of any nation cannot be over-emphasized. Thus, science teaching especially learning of chemistry should be an active and constructive process, which enables knowledge construction requires for an active participation on the part of the learners [2]. More so, chemistry teaching is supposed to be result-oriented and students-centered [3], this will be achieved when students are willing and lecturers are also favourably disposed by using the appropriate learning methods and resources in teaching the students.

However, Narmadha and Chamundeswari observed that the students' responses about the interesting nature of the chemistry class were neutral and this neutrality might be due to one way of teaching of chemistry by their teachers or lecturers [4]. This implies that when a lecturer combines two or more appropriate methods of teaching, the students tend to follow easily and grasp the content knowledge of the subject matter. In view of this, it becomes imperative that the chemistry learning in Nigerian schools especially at Colleges of Education must be given the emphasis it deserves for optimum academic achievement among students. Despite the importance of chemistry to mankind and the efforts of Government and her educational policymakers to improve on the teaching and learning of chemistry over the years, the outcome has not yet yielded a meaningful result. Studies have shown that both chemistry educators and researchers have been burdened on how some students that are majoring in chemistry students at Colleges of Education are graduating with low grades [5]. And with that, there is a persistent downward trend in students' academic achievement in chemistry.

Researchers have pointed out some factors that could be attributed to this students' poor academic achievement to include too much emphasis on the content coverage and abstract nature of the chemistry as a subject [6], fault in teacher preparedness and infrastructural factors [7], students' related variables and family type or cultural background [8] and overcrowded lecture rooms [9]. It was therefore, seems that a little attention is given to other students' related variables such as students' attitude and gender.

In the context of this study, students' attitude will be exploited from two perspectives. That is, students' attitude to chemistry and towards chemistry lecturers. Attitude is a hypothetical construct that indicates an individual like and dislike towards an item. It may positive, negative or neutral. Attitude is an approach, temperament, sensation or situation with regard to a person or thing; inclination or course especially that of the mind [4].

Attitude is an important concept in learning among the students, which could determines their interest or feeling towards studying a particular science subject. Studies have shown that students tend to spend more time in studying a particular subject when interest and aspiration were brought in as motivational factors [10, 11]. And this could possibly lead to a positive attitude exhibited in studying chemistry as a course to enhance a better understanding and performances. To Angela and Ugwuegbulan, there is a significant relationship between students' attitude to chemistry as a course of study and perception towards their chemistry lecturers or teachers due to inadequate teaching method of chemistry [12]. However, there may be some intervening factors that are seem to be associated with a positive attitude and high students' academic achievement in chemistry especially among the undergraduates but with a weak evidence statistically [13]. Studies have shown that attitude is not a permanent process or action neither a resistant to change but, it is noted that students' attitude do change with time either through direct or indirect learning, observation, experiences and the learning environment [11, 14].

Thus, students developing a positive attitude towards learning chemistry would be an essential component of motivation to chemistry learning, even when it seems to be somewhat hard or look confusing to them. The study of Brandriet, Xu, Bretz and Lewis reported that there is significant correlation between students' attitude and their academic achievement in chemistry at tertiary institutions' level but the strength of this association was weak statistically [15]. More so, the finding is contrary to that of Obadara which states that found no significant correlation between students' attitude and their academic achievement [16]. It is this contradiction in findings that this study attempts to fill the gap by ascertain the strength of relationship influence of students' attitude to chemistry and then on how it impacted their chemistry academic achievement at Colleges of Education. However, Ogembo, Otanga and Yaki noted an interacting effect between students' attitude towards their chemistry lecturers that is later directly or indirectly influenced their academic achievement in chemistry [17].

Moreover, lecturers as bridge builders play a significant role in the learning process as they can directly or indirectly influence their students' attitude towards learning of chemistry, which will in turn impact their students' academic performances. And some chemistry students do develop a negative attitude towards their chemistry lecturers. It was also noted that some lecturers lacked a grip firm of the content knowledge, thereby do present the chemistry courses to students in an uninteresting and abstractive [6]. Therefore, the heterogeneity nature of students' attitude to chemistry or towards their chemistry lecturers are perceived as intervening variable against students' high academic achievement in chemistry at Colleges of Education is also exploited in this paper. Additionally, gender is another important variable that significantly influences development of attitude among chemistry students. Gender differences have come to be among the critical and the most debating issues around the globe these days.

Therefore, nations are beginning to wake up momentarily to the move of gender equality but with the present stage in the world no country has yet attained this equality between women and men in all sectors such as science, education, agricultural or economic participation [18]. Gender role differentiation however, are sometimes pictorially illustrated in textbooks where males are usually portray as engineers, doctors or lawyers while the females are seen as nurses, cooks, a full housewife etc. [19] discovered that boys tend to have a natural and positive dispositional attitude to technical and science subjects while girls show negative attitude. The findings of Mohiuddin showed that male students have a significant effect on attitude towards learning chemistry that later influences their chemistry academic achievement above their female students [20] while the studies of Majere, Role and Makewa showed that female students have more positive attitude towards learning chemistry than their male counterparts [21].

It is against backdrop of inconsistence in findings that this current study seeks to identify the relationship influence between students' gender (male or female) and their chemistry academic achievement in Colleges of Education through a correlation coefficient. It was therefore, pertinent to find out the strength of relationship and the direction of relationship among the selected constructs for this study. Although, these selected factors are not directly taught explicitly in schools, but studies have established that schooling has a way of indirectly engaging them to improve students' level of academic achievement. Thus, the problem of this study was put in question form as to; what is the relationship between students' attitude and gender as determinants of Colleges of Education students' academic achievement in chemistry in the North East, Nigeria?

Research Questions

The following research questions guided the study:

1. What is the relationship between students' attitude to chemistry and their chemistry academic achievement in Colleges of Education?
2. What is the level of association between students' attitude towards their chemistry lecturers and their chemistry academic achievement in Colleges of Education?

3. What is the relationship between students' gender (male and female) and their chemistry academic achievement in Colleges of Education?

Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance as they guided the study.

H_{01}: There is no significant relationship between students' attitude to chemistry and their mean scores chemistry academic achievement in Colleges of Education.

H_{02}: There is no significant association between students' attitude towards their chemistry lecturers and their mean score chemistry academic achievement in Colleges of Education

H_{03}: There is no significant relationship students' gender (male and female) and their chemistry academic achievement in Colleges of Education

Materials and Methods

The study adopted a correlation survey design. The study was carried out in North-East Geo-political Zone of Nigeria. It is made up of six (6) states: Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe States out of the thirty-six (36) states of the Federal Republic of Nigeria. The region has (3) Federal and Nine (9) States owned Colleges of Education, which were all used for the study. The target population for the study was made up of 1,581 NCE III chemistry students. A multi-stage sampling procedure was adopted for this study. A total sample of 420 NCE III chemistry students was used for the study. The adapted instrument was used for data collection namely: Students Attitudinal Scale, SAS. It made up of 2 clusters (students' attitude to chemistry and students' attitude towards their chemistry lecturers) and Chemistry Achievement Test (CAT). A direct measurement of face and construct validity was used to reduce the commonalities among the students attitudinal scale (SAS) components from 40 to 18 item statements. The instruments were trial tested on 28 NCE III chemistry students at Federal College of Education, Eha-Amufu, Enugu State. The reliability test was done using Cronbach Alpha and reliability index of 0.884 is obtained. The copies of questionnaire were administered to each student present and retrieved back on the spot. Data analysis was done using Pearson's product moment correlation and a simple one way analysis of variance (ANOVA) to test the hypotheses at 5% level of significance.

Results and Discussion

Research Question One: What is the relationship between students' attitude to chemistry and their chemistry academic achievement in Colleges of Education?

Table 1: Analysis of Pearson's product on relationship between students' attitude to chemistry and their chemistry academic achievement in Colleges of Education

Model	R (r-value)	R^2	Adjusted R^2	Std. Error of the Estimate
1	.155[a]	.024	.022	16.74686

a. Predictors: (Constant), Attitude of students to chemistry

Hypothesis One: There is no significant relationship between students' attitude to chemistry and their mean scores on chemistry academic achievement in Colleges of Education.

Table 2: Analysis of One-way ANOVA on students' attitude to chemistry and their chemistry academic achievement in Colleges of Education

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	2903.580	1	2903.580	10.353	.001[b]
Residual	117231.182	418	280.457		
Total	120134.762	419			

a. Dependent Variable: Chemistry Achievement Test (CAT);
b. Predictors: (Constant), Attitude of students to chemistry

Research Question Two: What is the level of association between students' attitude towards their chemistry lecturers and their chemistry academic achievement in Colleges of Education?

Table 3: Analysis of Pearson's product on students' attitude towards their chemistry lecturers and their chemistry academic achievement in Colleges of Education

Model	R (r-value)	R^2	Adjusted R^2	Std. Error of the Estimate
1	.049[a]	.002	.000	16.93293

a. Predictors: (Constant), Attitude of students towards chemistry lecturers

Hypothesis Two: There is no significant association between students' attitude towards their chemistry lecturers and their mean score chemistry academic achievement in Colleges of Education.

Table 4: Analysis of One-way ANOVA on students' attitude towards chemistry lecturers and their chemistry academic achievement in Colleges of Education

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	284.019	1	284.019	.991	.320[b]
Residual	119850.743	418	286.724		
Total	**120134.762**	**419**			

a. Dependent Variable: Chemistry Achievement Test (CAT);
b. Predictors: (Constant), Attitude of students towards chemistry lecturers

Research Question Three: What is the relationship between students' location and their chemistry academic achievement in Colleges of Education?

Table 5: Analysis of Pearson's product on students' gender and their chemistry academic achievement in Colleges of Education

Model	R (r-value)	R^2	Adjusted R^2	Std. Error of the Estimate
1	.276	.076	.074	11.19105

a. Predictors: (Constant), Gender

Hypothesis Three: There is no significant relationship combined together among students' gender and their chemistry academic achievement in Colleges of Education

Table 6: Analysis of One-way ANOVA on students' gender and their chemistry academic achievement in Colleges of Education

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	4330.223	2	4330.223	34.576	.000
Residual	52350.119	417	125.240		
Total	56680.341	419			

a. Dependent Variable: Chemistry achievement test score; **b.** Predictors: (Constant), Gender

The findings of this study in research question one on Table 1 showed that students' attitude to chemistry contributed approximately R^2 of 2.4% of the total variance in students' achievement in chemistry at Colleges of Education while the remaining 97.6% could be as a result of factors and residuals in the model that were not considered in this study. Thus, relationship effect of students' attitude to chemistry made a predictive impact of about 2.2% (R^2 adjusted value of 0.022). It also shows that there is a positive but weak relationship (0.115) between students' attitude to chemistry and their chemistry academic achievement. This implies that students' attitude to chemistry is valid in predicting their academic achievement in chemistry at Colleges of Education. The hypothesis one on Table 2 was tested to further answer the research question one, as it posed that there is no significant relationship between students' attitude to chemistry and their mean scores on chemistry academic achievement in Colleges of Education in the North East, Nigeria. The result on Table 2 shows that ($F_{(1\text{-}418)}$=10.353, p=0.001< 0.05). Thus, the null hypothesis is rejected. This implies that there is positive significant relationship between students' attitude to chemistry and their chemistry academic achievement in Colleges of Education. Therefore, the findings agreed with the findings of Anwar and Bhutta that indicated a strong significant relationship between students' attitude to chemistry and their academic achievement in chemistry [2].

The result on Table 3 answered the research question two. The findings showed that students' attitude towards chemistry lecturers contributed approximately R^2 of 0.2% of the total variance of students' achievement in chemistry at Colleges of Education while the predictive impact at R^2 adjusted value is zero (0.000). This implies that there was no correlation between students' attitude towards chemistry lecturers and their chemistry academic achievement in chemistry at Colleges of Education. A corresponding hypothesis two was used to further answer the research question two, as it posed that there is no significant association between students' attitude towards their chemistry lecturers and their mean score chemistry academic achievement in Colleges of Education. The result on Table 4 shows that ($F_{(1\text{-}418)}$=0.991, p=0.320 > 0.05). Thus, the null hypothesis is retained. It implies that there is no significant level of association between students' attitude towards their chemistry lecturers and their mean scores of chemistry academic achievement in Colleges of Education. That is, the level of association is positively low as there is no significant relationship between students' attitude towards their chemistry lecturers and their mean scores chemistry academic achievement. This is in line with research findings of Edomwonyo-otu and Avaa ascertained that chemistry lecturers' attitude could not be isolated by mere focusing on modifying their own classroom practices but rather play a model role in enhancing the contexts of classroom conditions in the inseparable way [6]. This tends to facilitate students' positive attitude towards their chemistry lecturers by giving them opportunity to gain more from their lecturers' wealth of knowledge and experience for a better students' academic achievement.

However, the findings in research question three on Table 5 shows that students' gender difference contributed approximately R^2 of 7.6% of the total variance in students' achievement in chemistry at Colleges of Education while the remaining 92.4% could be as a result of factors and residuals in the model that were not considered in this study. The predictive impact at R^2 adjusted value is (.074). This implies that there is a positive relationship (.276) between students' gender and their chemistry academic achievement in chemistry at Colleges of Education. And hypothesis three was tested to further answer the research question three, as it posed that there is no significant relationship combined together among students' gender (males and females) and their chemistry academic achievement in Colleges of Education. The result on Table 6 shows that ($F_{(2\text{-}417)}$=34.576, p=0.000 > 0.05). The null hypothesis is rejected. This implies there is significant difference between male and female students in relation to their chemistry academic achievement in Colleges of Education. That is, these variables when combined together could relatively and positively impact on the students' academic achievement scores in chemistry. Though, the predictive level of these two variables is positive but at a negligence or no significant relationship among them.

This agreed with the findings of Mohiuddin that indicated male students having a significant relationship on attitude towards learning chemistry, which later influences their chemistry academic achievement above their female students [20] while the studies of Majere, Role and Makewa disagreed that female students have more positive attitude towards learning chemistry than their male counterparts [21]. Gender interaction on students' academic achievement is in relation with their performances as agreed on, in the findings of this study. Thus, students' academic achievement in chemistry could be relatively impacted on across the students' gender.

Conclusions

The study has established that students' attitude and gender exert potent and positive influence on students' academic achievement in chemistry in agreement with previous findings. These factors directly or indirectly pointed out the areas which have to be addressed in order to enhance the learning outcomes of students in chemistry. If the government and other stakeholders in education sector could improve on the learning facilities for both students and lecturers at Colleges of Education, it will facilitate a better disposition and learning output of chemistry achievement in chemistry. Furthermore, a better remuneration for lecturers and encouragement for further study or professional development courses at regular basis will most likely highly enhance student's achievement in chemistry at Colleges of Education in the North East, Nigeria. Based on the findings of the study, the following recommendations are made: Chemistry lecturers' attitude should be a motivational tool for arousing positive attitude in students during the teaching-learning process. Parents should be a source of encouragement to their children or wards by making them appreciate their course of study (chemistry), value of hard-work and focus in their pursuit of academic excellence by being a goal oriented person in life. Students should be motivated in learning of chemistry irrespective of their gender inclination as to engage in a deep and reflective thinking that promote a conceptual change for a high academic achievement in chemistry in their future careers.

Conflict of interest: The authors declare no conflict of interest whatsoever.

References

[1] Ojokuku, G. O. (2012). *Understanding Chemistry for Schools and Colleges*. Zaria: Press-on Chembooks.

[2] Lawrence. E. & Abraham. A. (2011). The challenge of effective teaching of chemistry: A case study. Retrieved October 21, 2011, from http://lejpt.academicdirect.org/A18/001_008.htm

[3] Adesoji, A. F. & Olatunbosun, M. S. (2008). Student, teacher and school environment factors as determinants of achievement in senior secondary school chemistry in Oyo State, Nigeria. *The Journal of International Social Research*, 1(2), 13-34.

[4] Narmadha, U. & Chamundeswari, S. (2013). Attitude towards learning of science and academic achievement in science among students at the secondary level. *Journal of Sociological Research*, 4(2), 114 – 124. http://dx.doi.org/10.5296/jsr.v4i2.3910

[5] Mendezabal, M. J. N. (2013). Study Habits and Attitudes: The Road to Academic Success. Open Science Repository Education, Online (open-access)

[6] Edomwonyi-otu, L. & Avaa, A. (2011). The challenge of effective teaching of chemistry: A case study. http://lejpt.academicdirect.org/A18/001-008.htm

[7] Nbina, J. B. (2012). Analysis of poor performance of senior secondary students in chemistry in Nigeria. *An International Multidisciplinary Journal*, 6(4), 324-334.

[8] Akomolafe, M. J. & Olorunfemi-Olabisi, F. A. (2011). The Input of family type on secondary school students' academic performance in Ondo State, Nigeria. *European Journal of Educational Studies*, 3, 481-487.

[9] Ali, H. O. (2013). Factor affecting students' academic performance in mathematical sciences department in tertiary institution in Nigeria. *US-China Education Review Journal*, 3(12), 905-913.

[10] Anwar, N. P. & Bhutta, S. (2010). *Students' attitude towards science: A study from rural areas of Sindh and Balochistan* (Unpublished research paper). Karachi, Pakistan:

[11] Xu, X., Villafane, S. M. & Lewis, J. E. (2013). College students' attitudes toward chemistry, conceptual knowledge and achievement: structural equation model analysis. *Chemistry Education Research and Practice*, 14, 188-200. doi: 10.1039/c3rp20170h

[12] Anglena. O. D. & Ugwuegbulan. N. C. (2011). Some correlates of students' attitude towards chemistry in Government Technical Colleges in Imo state. *International Journal of Psychology and Counseling*, 2(5), 90-95.

[13] Brown, S. J., White, S., Sharma, B., Wakeling, L., Naiker, M., Chandra, S., Gopalan, R. & Bilimoria, V. (2015). Attitude to the study of chemistry and its relationship with achievement in an introductory undergraduate course. *Journal of the Scholarship of Teaching and Learning*, 15(2), 33 - 41. https://doi.org/10.14434/josotl.13283

[14] Xu, X., Southam, D. & Lewis, J. E. (2012). Attitude toward the subject of chemistry in Australia: An ALIUS and POGIL collaboration to promote cross-national comparisons. *Australian Journal of Education in Chemistry*, 72, 32-36.

[15] Brandriet, A. R., Xu, X., Bretz, S. L. & Lewis, J. E. (2011). Diagnosing changes in attitude in first-year college chemistry students with a shortened version of Bauer's semantic differential. *Chemistry Education Research and Practice*, 12, 271-278.

[16] Obadara, O. E. (2008). Influence of teacher factors on academic performance of secondary school students in Ogun State, Nigeria. *African Journal for the Study of Educational*, 4(2), 236-242.

[17] Ogembo, J. O., Otanga, H. & Yaki, R. N. (2015). Students' and teachers' attitude and performance in chemistry in secondary schools in Kwale County, Kenya. *Global Journal of Interdisciplinary Social Science*, 4(3), 39-43.

[18] Hausmann, R., Tyson, L. & Zahidi, S. (2009). The global gender gap report. A report published by the world economic forum, Geneva, Switzerland. Retrieved from http://www.weforum.org/pdf/gendergap/report 2009.pdf on 12/02/2012

[19] Ogunleye, B. O. & Babajide, V. F. T. (2011). Commitment to science and gender as determinants of students achievement and practical skills in physics. *Int. J. of Educational Studies*, 5 (7), 145 – 148.

[20] Mohiuddin, G. (2015). A study on educational assessment of secondary and higher secondary teachers of Bangladesh. *World Scientific*, 16, 95 – 115.

[21] Majere, I. S., Role, E., & Makewa, L. N. (2012). Gender disparities in self-concept, attitude and perception in physics and chemistry. *Atlas Journal of Science Education*, 2(1), 61-69.

Citing this Article

Iyiola, B. F. & Ezeh, D. N. (2024). Students' attitude and gender as determinants of colleges of education students' academic achievement in chemistry. *Lafia Journal of Scientific and Industrial Research, 2*(2), 90 – 95. https://doi.org/10.62050/ljsir2024.v2n2.298