

Factors Influencing the Attitude and Disposition of Students towards Chemistry in Senior Secondary Schools in North-Central Nigeria

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ABSTRACT

The study was an assessment on the factors influencing the attitude and disposition of students toward chemistry in senior secondary schools in North-Central Nigeria. The descriptive research design of survey type was employed. The study population consists of science secondary school students, and a total of 400 students were selected using multi-stage sampling techniques. A structured questionnaire was used to collect data on the socio-demographic characteristics of the respondents, their attitudes towards learning chemistry, and the factors influencing their attitudes. The study findings revealed that gender is the only socio-demographic factor that significantly influences students' attitudes towards chemistry, while other factors such as educational background, quality of instruction, learning environment, motivation and engagement, and teachers' skills and qualification significantly influence students' attitudes and dispositions towards learning chemistry. The study recommends that educators and policymakers should consider these factors when designing science curricula and pedagogical approaches to foster positive attitudes towards chemistry among students, which could contribute to the development of a scientifically literate society.

Keywords: Attitude, disposition, chemistry, students, science

I. INTRODUCTION

Science remains the bedrock of development for every society. It remains one of the major strategies required for enhancing the growth of science and technology, and to focus on training children at the foundation stage, which means that more attention should be given to

science and technology at the primary and secondary levels of the educational system (Jacobson, 2010). Okeke (2007) argues that science and technology are crucial for the development and modernization of nations, and that countries that have achieved greatness have paid special attention to these fields. In order for a country to achieve development, it must prioritize the production of citizens with a strong scientific foundation, which can only be achieved through efficient and high-quality science education. Therefore, it is crucial to have effective and productive science education that can stimulate students' interest in science and prepare them for success in the future. Science education plays an important role in developing a person's rationality, independent thinking, and in dispelling various forms of superstitions that exist in society. Don-Phillips (2013) emphasized that science education, and indeed all education, should cultivate students' awareness of the problems facing society and their ability to contribute towards their solution. One of the major subjects in science that enhance development is chemistry.

Simply put, chemistry is a science that involves the study of material substances on earth and elsewhere in the universe. Holman (1995) defines chemistry as concerned with both the utilization of natural substances and the creation of artificial ones. In science education, chemistry has been identified as a crucial subject, and its importance in the scientific and technological development of any nation has been widely reported (Adesoji and Olatunbosun, 2008). Because of its recognition as essential to individuals and national development, chemistry was made a core subject among the natural sciences and other science-related courses in the Nigerian educational

system. Chemistry is a crucial subject in the secondary school curriculum as it is a foundation for higher education in science, engineering, and medicine. However, it is often considered a challenging subject by students due to its abstract nature, complexity, and the sheer volume of information that needs to be retained. More recently, several methods have been applied by teachers in enhancing effective learning and comprehension the science subjects and most especially in Chemistry (Abdullahi, Aminu, & Mubarak, 2021).

Despite the importance of chemistry education in fostering technological advancements and economic growth, students' negative attitude and disposition towards the subject have been a major concern in the education sector. The factors influencing students' attitude and disposition towards chemistry remain unclear, thus hindering effective teaching and learning of the subject. The attainment of the goal of chemistry education in Nigeria is not to some extent realized because of some factors which militate against it among which are poor methods of instruction, teacher's attitude, laboratory in-adequacy and poor science background. Furthermore, studies have also identified that students' negative attitudes towards chemistry may be influenced by their perception of the subject, its complexity, and abstract nature (FGN, 2014; Afolabi & Afolabi, 2015; Asogwa & Ifeanyieze, 2015). Authors have claimed that poor performance of students in Chemistry is largely due to their attitude towards learning Chemistry as well as insufficient instructional strategies and teaching aids (Khan & Ali, 2021). Many students dislike Chemistry because the old traditional teaching methods of chalk and talk are still being utilized by teachers while answering easy problems on the board. For the most part, their teachers only prepare them for exams without instilling the proper understanding of the topics.

In North-Central Nigeria, many secondary school students struggle with chemistry, leading to poor academic performance. Factors such as the teaching methods, curriculum, and teacher's attitude, among others, may contribute to this problem. The attitude and disposition of students towards chemistry have been identified as crucial factors that influence their academic performance in the subject. This study therefore aims to examine the factors influencing the attitude and disposition of students towards chemistry in senior secondary schools in North-Central, Nigeria. The specific objectives are to:

- i. investigate the socio-demographic factors influencing the attitude and disposition of students towards chemistry.
- ii. assess the factors in the learning environment that influences the attitude and disposition of students towards chemistry in senior secondary schools in North-Central, Nigeria.

II. LITERATURE REVIEW

Students' attitude towards science-based discipline has been researched by authors from different walks of life noting that science education plays a crucial role in shaping individuals' attitudes towards science. Hacieminoglu (2016) has emphasized that science education helps in developing a positive attitude towards science. Despite this fact, there has been a decline in students' enrollment in science subjects at the secondary level, which has negatively impacted the rate of students pursuing science-related careers (Awan & Sarwar, 2011). Studies have shown that students' attitudes towards science vary among different science subjects. For instance, students' attitudes are most favorable towards biology and least positive towards chemistry and physics (Awan & Sarwar, 2011; Cheung, 2009b). One factor that affects students' attitudes towards chemistry is their prior knowledge of the subject. Studies have shown that students with prior knowledge of chemistry have a more positive attitude towards the subject than those without prior knowledge (Sirisena & Waller, 2016; Wanjau, 2015). Furthermore, students' interest in the subject also plays a significant role in shaping their attitudes towards chemistry.

Another factor that influences students' attitudes towards chemistry is the teaching approach used by teachers. Research has shown that the use of inquiry-based teaching methods can improve students' attitudes towards chemistry (Gabel, 1999; Hackling & Garnett, 2004). The inquiry-based approach involves students in active learning and promotes critical thinking and problem-solving skills, leading to a more positive attitude towards the subject. The decrease in positive attitudes towards science and science-based careers among students is attributed to various factors. One of the significant reasons is students' ignorance of science-related careers (Osborne et al., 2003). Lack of relevant content and pedagogical approaches in schools has also been identified as a factor responsible for this decline (Hofstein & Mamlok-Naaman, 2011). Studies and reports conducted in the U.S. and Europe have corroborated these findings, indicating that there is a need for relevant content and innovative

pedagogical approaches to foster positive attitudes towards science among students.

Furthermore, students' attitudes towards chemistry are also influenced by the relevance of the subject to their daily lives. A study by Sirisena and Waller (2016) found that students who could relate chemistry to their daily lives had a more positive attitude towards the subject. Moreover, students' attitudes towards chemistry are influenced by their perception of the subject as difficult or easy. Studies have shown that students who perceive chemistry as difficult have a negative attitude towards the subject, while those who perceive it as easy have a more positive attitude (Sirisena & Waller, 2016; Wanjau, 2015).

Gender differences did not appear to play a significant role in this study, and there was a strong correlation between chemistry achievement and attitudes. A similar study conducted by Salta and Tzougraki (2004) investigated Greek students' attitudes towards chemistry in terms of difficulty, interest, usefulness, and importance. The results showed that the students had neutral attitudes towards chemistry, recognizing its importance in their lives, but not realizing its usefulness in their future lives. There was no difference in attitudes between boys and girls regarding interest, usefulness, and importance given to chemistry. However, in a study conducted in Tanzania by Seba et al. (2013), a difference was found between boys' and girls' attitudes towards chemistry in terms of anxiety, enjoyment, and confidence. Male students showed more confidence, better performance, and enjoyment in physics and chemistry than their female counterparts. As a result, boys had more positive attitudes towards chemistry and physics, and they tended to participate more in related activities than female students.

Furthermore, the use of technology in teaching chemistry has also been found to improve students' attitudes towards the subject. A study by

DeBoer et al. (2011) found that the use of computer simulations and animations in teaching chemistry improved students' attitudes towards the subject. Therefore, teachers should consider using technology to teach chemistry and make the subject more interactive and engaging for students. Despite the efforts made to improve students' attitudes towards chemistry, studies have shown that students still have a negative attitude towards the subject. A study by Oyeyemi et al. (2018) found that students' negative attitudes towards chemistry were due to the difficulty of the subject, lack of interest, and lack of relevance to their daily lives.

III. METHODOLOGY

The descriptive research design of survey type was employed in the study. It helps the researcher to effectively describe the condition of students as related to their interest in chemistry education and the factors influencing their interests. The population of the study consists of science secondary school students. A total sample of 400 students was obtained using the multi-stage sample technique. At the first stage, the purposive sampling technique was used to select 4 states from 6 states (Kwara, Kogi, Niger and Benue states), the purpose was because of proximity and financial constraints. At the second stage, random sampling technique was used to select 5 secondary schools from the state capital of each of the states making a total of 20 secondary schools in all. At the third stage, the stratified sampling technique was used in selecting 20 chemistry students from each secondary school while considering gender and age of the respondents. A well-structured questionnaire was designed which contains items to collect data on the socio-demographic characteristics of the respondents, attitudes and disposition towards learning chemistry and factors influencing their attitudes. Data was collected with the aid of 1 research assistant from each state. Data collected from the respondents were analyzed using both descriptive and inferential statistics.

IV. RESULTS

Table 1:

Student Mean Score on Attitude and Disposition towards Chemistry Based on the Socio-Demographic Characteristics of the Respondents

Variable	Items	f	%	Mean	SD
Gender	Male	234	58.5	32.7	2.611
	Female	166	41.5	27.9	3.481
Age	<12 years	33	8.25	29.6	3.016
	13 – 16 years	315	78.8	31.9	2.294
	> 16 years	52	13.0	30.5	1.862

Religion	Christianity	96	24.0	32.4	2.148
	Islamic	289	72.3	32.9	2.116
	Others	15	3.7	30.6	4.274

Survey, 2023

Results on the socio-demographic distribution of Chemistry students in North Central Nigeria revealed that 58.5% were male while 41.5% were female. It was as well shown that 78.8% were between 13-16 years of age, 13% were above 16 years of age while 8.25% were below 12 years of age. In addition, result shown on the table revealed that 72.3% were Moslems, 24% were Christians while 3.7% had other religions. It is obvious from the result that there were more male chemistry students than female students most of them were between 13-16 years of age and mostly

Moslems. Furthermore, it was revealed that the difference between the attitude mean score of male (32.7) is different from that of the female (27.9). Similarly, a slight difference is observed in the attitude mean score. This is also the case for that of religion as those that are Christians had a mean score of 32.4, Moslems had 32.9 while those having other religion score 30.6 which is the lowest. There is an obvious slight difference but this result does not show if the difference is significant.

Table 2:
ANOVA Table on Socio-Demographic Factors Influencing Attitude and Disposition of Students towards Chemistry

Variables	SS	df	MS	F	Prob.
gender	618.16	1	618.16	1.597	.016
age	17.28	2	53.644	.044	.622
religion	517.11	2	258.55	.668	.149
gender*age	115.62	2	57.81	.298	.316
gender*religion	206.17	2	103.01	.266	.611
age*religion	265.68	3	88.56	.228	.520
Error	5281.06	387	0.67		
Total	7021.08	399			

Result presented in Table 2 on the socio-demographic factors influencing attitude and disposition of student towards Chemistry revealed that out of the socio-demographic factors (age, gender and religion) identified in the study only gender has significant influence on the attitude and disposition of students towards Chemistry ($F(1, 387) = 1.597, p < .05$). However, age ($F(2, 387)$

$= 0.44, p > .05$), and religion ($F(2, 387) = 0.668, p > .05$) does not significant influence attitude and disposition of students towards Chemistry. In addition, it was revealed that gender, age and religion do not have interactive influence on attitude and disposition of students towards Chemistry.

Table 3:
Multiple Regression on the Factors influencing Attitude and Disposition towards Chemistry

Variable	Beta	Std. Error	T	p	F	Sig.
Educational Background	0.142	0.141	2.16	.041		
Quality of Instruction	0.277	0.554	6.189	.027		
Learning Environment	0.208	0.177	5.096	.014	4.72	.036
Motivation and Engagement Teachers'	0.362	0.129	3.967	.027		
	0.374	0.266	4.056	.012		

qualification/skills

Dependent Variable: Attitude and Disposition towards Chemistry

Regression result presented in Table 3 on the factors influencing attitude and disposition towards chemistry revealed that educational background ($t=2.16$, $p<.05$), quality of instruction ($t=6.18$, $p<.05$), learning environment ($t=5.09$, $p<.05$), motivation and engagement ($t=3.97$, $p<.05$), and teachers' qualification/skills ($t=4.06$, $p<.05$) significantly influence attitude and disposition towards chemistry. In addition, it was also revealed that these factors interactively influence attitude and disposition of students towards chemistry ($F=4.72$, $p<.05$).

V. DISCUSSION

Findings obtained in the study revealed that gender is the only socio-demographic factor influencing the attitude of students in the study area. This finding is in line with that of Seba et al. (2013) whose study found a significant difference between boys' and girls' attitudes towards chemistry in terms of anxiety, enjoyment, and confidence, which affected their participation in related activities. In contrast, Tzougraki (2004) found that the attitude of boys and girls towards studying chemistry tend to be different. There is an indication that the gender differences that occur in the interest and disposition of students towards chemistry could also have a link with the location and other external factors which are not related to the formal learning of the students. Some of these factors could include culture and belief system particularly towards the female gender. There is also evidence that female students tend to have lower percentage in chemistry subjects. However, it is clear that other socio-demographic variables like age and religion plays no significant role in influencing interest and disposition of students in chemistry.

In addition, it was revealed that other factors such as educational background, quality of instruction, learning environment, motivation and engagement, and teachers' skills and qualification significantly influence the attitude and disposition of students in learning chemistry. These findings are consistent with other studies which emphasize the importance of science education in shaping individuals' attitudes towards science and how positive attitudes towards learning the subjects are important (Awan & Sarwar, 2011; Wanjau, 2015). It was also revealed that these factors play interactive influence on either causing negative or positive attitude towards chemistry. In tandem with

this, studies have shown that the interplay between educational background, quality of instruction, learning environment, motivation and engagement, and teachers' qualification/skills can have a significant impact on students' attitudes towards chemistry (Hofstein&Mamlok-Naaman, 2011; Sirisena and Waller, 2016). Other studies have considered the possibility of other factors like the use of technology in teaching and general perception about the subject influencing students' attitudes.

VI. CONCLUSION AND RECOMMENDATIONS

The study specifically examined the socio-demographic factors influencing students' attitude and disposition towards learning chemistry in secondary school in North Central Nigeria. From the findings obtained, the study highlights the importance of various factors in shaping the attitudes and dispositions of students towards chemistry. While gender was found to be a significant factor, the study also revealed that other socio-demographic variables such as age and religion did not have a significant influence. In contrast, educational background, quality of instruction, learning environment, motivation and engagement, and teachers' skills and qualification were also identified as significant factors that interactively influence students' attitudes towards chemistry. These findings are consistent with previous research on the importance of science education and pedagogical approaches that promote active learning and critical thinking in shaping positive attitudes towards science subjects. Therefore, it is crucial for educators and policymakers to consider these factors when designing science curricula and pedagogical approaches to foster positive attitudes towards chemistry among students. By doing so, it can help to increase students' interest in science-related careers and ultimately contribute to the development of a scientifically literate society.

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