

*Original Paper*

Assessing Senior Secondary Students' Attitude and Experiences  
towards Science and Technology in Jalingo Metropolis, Taraba  
State, Nigeria

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Received: April 14, 2018

Accepted: April 24, 2018

Online Published: May 3, 2018

doi:10.22158/grhe.v1n1p32

URL: <http://dx.doi.org/10.22158/grhe.v1n1p32>

**Abstract**

*This study examined the attitude and experiences of secondary school students towards science and technology in Jalingo metropolis of Taraba state, Nigeria. The population included all senior secondary 2 (SS 2) science students in senior Secondary Schools in Jalingo Metropolis. A total of 350 students (161 females and 189 males) were selected through simple random sampling method. The study used a descriptive survey design. The research instrument was a modified Likert scale questionnaire. The data obtained was analyzed using statistical tools (mean and standard deviation). Results indicated that there is a positive attitude towards science and technology. The result generally showed that students have positive experiences towards science and technology. The results also showed that there is a meaningful difference between males and females points of views on attitude towards science and technology and their experiences. According to this result, males have lower average sum ( $M=54.24$ ) than the females with ( $M=55.52$ ). The results of this research provide important information about Jalingo students' attitude and experience towards science and technology and could be used by science educators for the development of science curricula and science text books.*

**Keywords**

*science and technology, experience, attitude, gender, science education*

## 1. Introduction

It is said commonly in Nigerian proverb that everything a man becomes in life, is a product of his attitude. Thus, the level of honesty, hard work, tolerance, team spirit, forbearance, humility, etc., which he possesses and exhibits, sets the limits of success or failure of the man through positive. This can be no less true in educational pursuits. Contrary to this view, experts in the field of education tend to place greater emphasis on the cognitive characteristics of the student when examining issues surrounding his academic attainment. This has often not produce the best results as there is not much that can be done in altering the cognitive components of an individual. On the other hand, the attitude of a person which belongs to the affective domain can be tinkered with to see if the cognitive component can produce optimal result.

Research on students' interest in science and technology increased from the 1960s (Osborne, Simon, & Collins, 2003). Studies aimed at increasing the education of hearing the "student voice" in education such as works by Flutter and Rudduck (2004), ESRC (2004), and Fielding (2004). Identifying and responding to the student voice may be seen as a means of reducing the alienation that some students feel from their schooling and thus of helping to overcome the associated problems. From this perspective, accommodating the student voice becomes a means of transforming schooling (Fletcher, 2003) and of making the curriculum more relevant to students' needs and interests. The investigation of students' attitudes towards studying science has been a substantive feature of the work of the science education research community for the past 40 years (Osborne et al., 2003). Students' increasing reluctance to choose science courses, and physical science courses in particular, in their final years of secondary education has important implications not only for the continuity of scientific endeavor but also for the scientific literacy of future generations. As a result, development of positive attitudes towards science, scientists, and learning science, which has always been a constituent of science education, is increasingly a subject of concern (Trumper, 2006). Students' learning interests and attitudes toward science have both been studied for decades. However, the connection between them with students' life experiences about science and technology has not been addressed much (Chang, Yeung, & Cheng, 2009).

One of the new researches on student's interests and their needs and experiences on science and technology is Relevance of Science Education (ROSE). Many researches like as TIMSS (Trends in Mathematics and Science Study) and PISA (Program for International Student Assessment) conducted to assess the students' abilities in science, however Rose questionnaire is not a test for assessing the conceptual understanding of students in science content, but it is an instrument for collecting data about emotional and attitude identity that students have in science and technology. Relevance of science argue that science and technology is one the important parts of life in all countries despite of their culture and level of development. It is argued that science and technology curriculum should be adjusted with needs of learners and between different groups of learners. It means that we cannot accept the curriculum approaches with global and culture—neutral views when we are talking about

kind of science and technology that is appropriate for all students and its goal is not only training the professionals in science and technology. For achieving to this goal we should hearing the “student voice” in science education (Schreiner & Sjoberg, 2004). The ROSE instrument focuses on aspects that are important about of student involving in science and technology at school and life. It uses the word relevance to embrace a range of factors in terms that can be described as affective. Its broad aim is to generate perspectives and empirical findings that can inform discussions about how best to improve science curricula and enhance students’ interest in science and technology in ways that: respect cultural diversity and gender equity; promote personal and social relevance, and empower the learner for democratic participation and citizenship (Jenkins & Pell, 2006).

Students’ attitudes/learning interests and motivation toward science have both been studied for decades. However, the connection between them with students’ life experiences about science and technology has not been addressed much (Chang et al., 2009). The general purpose of the study is to assess student’s attitude and experience towards science and technology in Jalingo Metropolis due to poor performances and interest in science and technology-based subjects. Specifically, the study sought to:

- i. Determine the attitude of students towards science and technology in Jalingo metropolis.
- ii. Examine the experiences of students towards science and technology with regards to their environment in Jalingo metropolis.
- iii. Determine the difference between the opinions of male and female students’ attitudes and experiences towards science and technology Jalingo metropolis.

To guide the study therefore, the following research questions were raised:

- i. What is the attitude of students towards science and technology?
- ii. What are the experiences of students towards science and technology with regards to their environment?
- iii. Is there any significant difference between male and female students’ attitude towards science and technology and their experiences?

### *1.1 Review of Related Literatures*

Relevance of Science Education study (ROSE) has been conducted in several countries by researchers of science education and its results have been published in recent years. In this section some research and findings of related works are pointed out.

Manninen, Miettinen and Kiviniemi (2005) examined conceptions of students about technology, environmental issues and school science. The results showed that girls show more concern towards environmental issues. The results also showed that both boys and girls believe in science and technology capacities and capabilities.

Anderson (2006) also investigated views of 1027 students from central region of Ghana about ROSE components. The results showed that the majority of students believed that science and technology are useful for society and can help to reduce poverty and famine in the world. The results also showed that boys are more interested in becoming scientists than girls.

Jenkins and Pell (2006) studied English students views on science and technology, school science and environmental issues. The sample of schools was drawn to reflect as far as possible the geographical distribution and type of secondary schools within the English education system. A total of 1,284 questionnaires were eventually received from 34 schools. The results showed that most students agree that science and technology are important for society and are optimistic about the contribution that these disciplines can make to curing diseases such as HIV/AIDS and cancer. They also results revealed that there was a lower level of agreement that the benefits of science are greater than its possible harmful effects, although a majority of both boys and girls hold this view. Only a minority of boys and girls agreed that science and technology will help to eradicate poverty and famine in the world. Students' positive views about science, technology and society are not reflected in their opinions about their school science education. While this is regarded as "relevant" and "important" by most students, most boys (and rather more girls) don't like it as much as other subjects. Most students did not agree that school science is a difficult subject. Most boys and girls disagreed that school science has made them more critical and skeptical, opened their eyes to new and exciting jobs or increased their appreciation of nature. Both boys and girls disagreed strongly that threats to the environment are not their business. However, such disagreement is not reflected in a corresponding general willingness to sacrifice many goods to solve or alleviate environmental problems. There was also, at best, only a moderate level of interest in learning about a range of environmental issues, save for the possible radiation dangers associated with mobile telephones and the protection of endangered species of animals.

The Icelandic students' views about science and technology and also school science was examined by Stefánsson (2006). The study revealed that students consider school sciences interesting, easy to learn and believe that everyone should learn science in school since it is useful in everyday life.

Trumper (2006) also investigated students' interests in physics based on the ROSE study. He studied the factors in students' ideas about science in school, out-of-school experiences in science and their attitudes towards science and technology. Results showed that in general, students' interests in physics are neutral (neither positive nor negative), however, boys were more interested in physics than girls.

Science Scholars such as Lavonen, Gedrovics, Byman, Meisalo, Jutti, and Uitto (2008) studied the interests and experiences of students in physics and chemistry based on the ROSE study in Finland. Their research conducted on 3626 secondary school students with average age of 15 years old. Based on their results, students have many experiences in and outside the school and were related to science and technology. However, they had little experience in using technology tools such as mechanical. These results showed diversity of science and technology experiences between students.

Chang, Yeung, and Cheng (2009) also investigated the attitudes about science and technology, learning interests and life experiences on 942 Taiwanese students. The results revealed that boys showed higher learning interests in sustainability issues and scientific topics than girls. However, girls recalled more life experiences about science and technology in life than boys.

Cavas, Cavas, Tekkaya, Cakiroglu, and Kesercioglu (2009) also examined Turkish students' attitudes toward the environment and their interest in learning about environmental protection with respect to gender with the help of data from the ROSE study. The study was conducted on 1,260 students in 9th grade in Turkey. The findings of this study revealed that Turkish students have favorable attitudes toward environmental issues, students are eager to find solutions to environmental problems and show optimistic trends about the future, students' interests in learning about environmental protection issues are moderate level, and statistically significant differences were found in environmental attitudes and interests in learning about environmental protection mean scores of students regarding gender.

More also, Gomleksiz (2012) conducted a study on students' perceptions of science and technology classes by gender in a Turkish elementary school context. Data for the study were collected through a 20-item, five-point Likert scale from a total of 1558 sixth-grade students at 20 different elementary schools in Turkey. The independent groups' test and Mann-Whitney U test were used to analyze the data where statistically significant differences were observed in the gender of the students. The findings of the study revealed that male students considered learning science and technology more necessary and important than female students did. They also found learning environment and teaching strategies more sufficient and effective than females did. Findings revealed that male students were not satisfied with what the teachers practiced in science classrooms.

The study by Edu, Okorn, Koko, and Bessong (2013) investigated the attitude of some secondary school science students towards the teaching of science in Nigeria. Two research questions guided the conduct of the work, while two null hypotheses were tested at 0.05 level of significant. The design of the work was survey, and the sample consisted of two hundred and ninety-eight students drawn from four secondary schools in Akamkpa Local Government Area of Cross River State, Nigeria. Cluster and simple random sampling techniques were used to select the sample. The data collected were analyzed using an independent t-test. Results indicated that male students showed more positive attitudes towards the teaching of science than their female counterparts.

The study by Sofeme and Amos (2015) also investigated the attitude of students toward science subjects in senior secondary schools in Adamawa state. Three objectives were raised and to these objectives one research question and two hypotheses were raised. The target population was all the Adamawa state government secondary school students. The study is survey type which used stratified random sampling technique to select a sample of 250 science students. These students responded to valid and reliable instrument known as Science Students Attitude Questionnaire (SSAQ). The data obtained were subjected to descriptive statistics as well as t-test and chi-square test. The results showed that students in Adamawa state have positive attitude towards science subjects and gender has significant effect ( $p < 0.05$ ) on their attitude. The results indicated that boys have more positive attitude toward science subjects than their girls' counterpart.

## 2. Method

This study seeks to assess the attitude and experience towards science and technology among secondary school students. The population of study was all SS 2 science students in Jalingo metropolis. The choice is based on the recognition that at SS2 most of the students would have reached the age of 17 years. At that age the students are more mature and hence more likely to have done more conscious reflections on their interest, priorities and attitudes to and comprehensions of science-related issues and schooling. The schools are coeducational (male and female students). The schools were purposively selected for the study due to their geographical spread which can represent the science and technology-oriented public secondary schools within Jalingo metropolis. A total number of 350 students (161 girls and 189 boys) were selected as sample of study. The instrument of study, made up of 18 items was a modified 4-Likert Scale questionnaire, Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The instrument was pilot tested using a school in a Local Government Area that was not included in the study but had similar characteristics as the sample schools. This ascertained the test reliability. The reliability coefficient was calculated using Cronbach's alpha to measure the internal consistency within a group of items. Cronbach's alpha coefficient was calculated for the 18 items at 0.79.

This research investigates the opinions of students in science and technology education from two aspects. Each of these aspects or components are examining students' attitude toward them and how they play important role in preparing information for curriculum planners to identify demands and needs of students in science education. These components are:

### *Attitude towards Science and technology*

Attitude towards science and technology provides important information on different aspects of students' understandings of the role and performance of science and technology in the society. Trust of learners to science and technology and also their interest in topics of science and technology were assessed within the items of this factor;

### *Students Experience*

This examines whether students have had relevant experiences in their environment with regards to science and technology. On the assumption that successful environmental actions require environmental empowerment, empowering young people to deal responsibly with environmental issues should be a principal concern of education. Empowerment may be described as encouragement for action and belief in one's possibility and ability to influence one's surroundings. It is important to understand the attitudes, beliefs and prejudices that might prevent individuals from recognizing and using their possibilities to act (Schreiner & Sjøberg, 2002).

### *2.1 Method of Data Analysis*

Statistical analysis tool was employed in analyzing the data collected during the study. Mean and standard deviation were adopted to analyze answers to the research questions.

Formula for mean (X)

$$X = \frac{\sum f_i X_i}{N}$$

Where:  $\sum$  = Summation

F = Frequency

X = Nominal Value of option

N = Number of respondents

$$\text{Mean} = X = \frac{4+3+2+1}{4} = 2.50$$

#### Decision Rule

Any item whose mean is equal or greater than 2.50 ( $X \geq 2.50$ ) will be regarded as agreed, while any item whose Mean is  $X < 2.50$  will be regarded as disagreed.

### 3. Results

Findings are based on an analysis of research questions. In each section, table of analysis and the statistical analysis of the data is presented.

Answering Research question 1: What is the attitude of students towards science and technology?

**Table 1. Mean Ratings and Standard Deviation of Students' Attitudes towards Science and Technology (Test Value=2.5)**

	Items on attitude of students towards S & T	SA	A	D	SD	X	Std. Deviation	N	Decision
1	I would like to take a job in technology	259	70	14	7	3.60	10.20	350	Agreed
2	Science and technology are important for society	238	105	7	0	3.70	10.10	350	Agreed
3	Thanks to science and technology, there will be greater opportunity for future generations	252	84	7	7	3.70	10.10	350	Agreed
4	Science and technology makes our lives better	273	77	0	0	3.80	10.00	350	Agreed
5	New technologies will make work more interesting	147	189	14	0	3.40	10.40	350	Agreed
6	The benefits of science and technology are better than the harmful effects	133	189	28	0	3.20	10.60	350	Agreed
7	Science and technology are helping the poor	70	245	28	7	3.10	10.70	350	Agreed
8	Science and technology can solve nearly all problems	63	203	84	0	2.90	10.90	350	Agreed
9	Science and technology are the cause of environmental problems	28	56	231	35	2.20	11.60	350	Disagreed
10	A country does not need science and technology to grow	14	7	105	224	1.50	12.30	350	Disagreed

11	School science is a difficult subject	28	77	154	91	2.10	11.70	350	Disagreed
12	School science is interesting	175	168	7	0	3.50	10.30	350	Agreed
13	School science is easy for me to learn	119	217	14	0	3.00	10.80	350	Agreed
14	The things I learn in science will be helpful in my everyday life	189	140	21	0	3.14	10.58	350	Agreed

From the results in Table 1, all items related to science and technology have average above ( $M=2.5$ ). The result shows that students have positive attitude towards science and technology. From all items, item No. 4 (science and technology makes our lives better) has the highest average ( $M=3.80$ ) and item No. 10 (a country does not need science and technology to grow) has the lowest average ( $M=1.50$ ). Answering Research question 2: What are the experience of students towards school science and technology?

**Table 2. Mean Ratings and Standard Deviation of Students' Experiences towards Science and Technology (Test Value=2.5)**

Items on students experiences towards S & T	SA	A	D	SD	X	Std. Deviation	N	Decision
1 Used a mobile phone	154	182	7	7	3.40	10.80	350	Agreed
2 I tried to find constellations in the sky	105	140	98	7	3.00	10.80	350	Agreed
3 Watched (not on TV) an animal being born	112	105	91	42	3.00	10.80	350	Agreed
4 Made compost of grass, leaves or garbage	49	105	147	49	2.40	11.36	350	Disagreed

The results in Table 2, shows that all items have average above ( $M=2.5$ ) except for item No. 4 (made compost of grass, leaves or garbage) which has an average mean of ( $M=2.40$ ). The result show that item 1 (used a mobile phone) has the highest average of ( $M=3.40$ ). The result generally showed that students have positive experience towards science and technology.

Answering Research question 3: What is the difference between male and female opinions on attitude towards science and technology and their experiences?

**Table 3. Mean Ratings and Standard Deviation of Male and Female Students' Attitude towards Science and Technology and Their Experiences (Test Value=2.5)**

Items on attitude of students towards S & T	Male	Female	Mean difference	Decision
	Mean(SD)	Mean(SD)	Male-Female	
1 I would like to take a job in technology	3.56(10.00)	3.76(10.12)	-0.2	Agreed
2 Science and technology are important for society	3.68(9.88)	3.60(10.28)	0.08	Agreed
3 Thanks to science and technology, there will be greater	3.84(9.72)	3.36(10.52)	0.48	Agreed



	opportunity for future generations				
4	Science and technology makes our lives better	3.80(9.76)	3.84(10.04)	-0.04	Agreed
5	New technologies will make work more interesting	3.44(10.12)	3.32(10.56)	0.12	Agreed
6	The benefits of science and technology are better than the harmful effects	3.28(10.28)	3.24(10.64)	0.04	Agreed
7	Science and technology are helping the poor	3.28(10.28)	2.84(11.04)	0.44	Agreed
8	Science and technology can solve nearly all problems	2.96(10.60)	2.92(10.96)	0.04	Agreed
9	Science and technology are the cause of environmental problems	2.36(11.20)	2.08(11.80)	0.28	Disagreed
10	A country does not need science and technology to grow	1.60(11.96)	1.60(12.28)	0.00	Disagreed
11	School science is a difficult subject	2.16(11.40)	2.08(11.80)	0.08	Disagreed
12	School science is interesting	3.48(10.80)	3.48(10.40)	0.00	Agreed
13	School science is easy for me to learn	1.96(11.60)	3.20(10.68)	-1.24	Agreed
14	The things I learn in science will be helpful in my everyday life	2.80(10.76)	3.48(10.40)	-0.68	Agreed
		<i>Mean total</i>	<i>Mean total</i>		
		(M=42.2)	(M=42.8)		
	<b>Items on experiences of students towards S &amp; T</b>				
15	Used a mobile phone	3.48(10.08)	3.24(10.64)	0.16	Agreed
16	I tried to find constellations in the sky	3.08(10.48)	2.88(11.00)	0.20	Agreed
17	Watched (not on TV) an animal being born	2.92(10.64)	2.44(11.44)	0.48	Agreed
18	Made compost of grasses, leaves or garbage	2.56(11.00)	3.92(9.96)	-1.36	Agreed
		<i>Mean total</i>	<i>Mean total</i>		
		(M=12.04)	(M=12.48)		
	Overall Mean Total	(M=54.24)	(M=55.28)		

To determine the differences in male and female opinions of the students' attitude (male=42.2; female=42.8) and experiences (male=12.04; female=12.48) towards science and technology. The average mean of all the items were summed up for both male and female students respectively, after

which the difference between the two groups was calculated. The result showed that male students had a mean total of (M=54.24) and the female students had a mean total of (M=55.28). This indicates that the female students have more positive attitude and experience towards science and technology than their male counterpart and there is a significant difference between them.

#### **4. Discussion**

The results of this study indicated that in general, students showed positive attitudes towards science and technology, science and the environmental issues. Student are interested in a job related to technology, they consider science and technology important to society, etc. (congruent with the results of Trumper (2006)). They believe that with science and technology, there will be greater opportunities for future generations and Science and technology makes our lives healthier, easier and more comfortable (corresponds with the results of Stefánsson (2006)). The results also showed that in the opinion of the students. The benefits of science are greater than the harmful effects it could have and with lower average than to other items, they believe that Science and technology will help to eradicate poverty and famine in the world and that science and technology are helping the poor. Despite these benefits, students believe that science and technology are the cause of the environmental problems and Science and technology benefit mainly the developed countries. Also the students showed a positive attitude towards the activities of scientists in science and technology. They believe that scientists are neutral and act without bias and always had to trust their words and follow the scientific method that always leads them to correct answers. These results mostly are in line with the results of Schreiner and Sjoberg (2005) that showed students in all studied countries, have a high degree of agreement on the following items: Science and technology are important for society; thanks to science and technology, there will be greater opportunities for future generations; new technologies will make work more interesting; and the benefits of science are greater than the harmful effects it could have. These results also are in line with Jenkins (2006) on student opinion in England about science and technology.

Results of the second component of school science, or the content of the science that are presented in schools showed that this component has a positive attitude. However, there were some items that suggest students' dissatisfaction with school science in some cases. They consider science as an interesting lesson and easy to learn (congruent with the results of Jenkins and Pell (2006) and Stefánsson (2006)) and with a high average they argued that school science is better than most other subjects. In view of other students, the science they learn at school will improve their career chances and will be helpful in their everyday life and that Science education has shown them the importance of science in their way of living. The results also showed some items of this component, school science plays an important role in increasing curiosity of students and made them more critical and skeptical and increases their appreciation of nature. More also, on students' experiences the result generally showed that students have positive experiences towards science and technology.

The results about the difference between male and female students' opinions in each components

showed that there is a significant difference between these two groups. Accordingly, the females generally showed more positive attitude and experiences towards science and technology than their male counterparts. This is in line with the results of Lavonen et al. (2008) whose results showed that, students have many experiences in and outside the school and were related to science and technology. However, they had little experience in using technology tools such as mechanical. These results showed diversity of science and technology experiences between students. This finding also agreed with previous study by Manninen et al. (2005) who examined conceptions of students about technology and environmental issues and school science. Their results showed that girls show more concern towards environmental issues. Their results also showed that both boys and girls believe in science and technology capacities and capabilities. But, Gomleksiz (2012) findings revealed that male students considered learning science and technology more necessary and important than female students. Other previous studies also indicated that male students showed more positive attitudes towards the teaching of science than their female counterparts (Edu et al., 2013; Sofeme & Amos, 2015).

The following conclusions were drawn, based on the findings of this study. In general the results showed that students have a positive attitude and experiences towards science and technology. The analysis of their responses indicated that the majority of boys and girls appeared to have opinions that has more to do with the belief in and widespread respect for science and technology (a number of mean score values > 3.0). The interests in science and technology among girls were almost the same level as boys and differences were not pronounced. In which way one interprets these findings, in a less developed country, like Nigeria, such empirical evidence that emerged from their responses becomes obvious. In a country, which is still faced with the challenges of underdevelopment, young learners would expect the application of science and technology to play a key role. One is likely to conclude that both males and females in this study have confidence in the influence of science and technology on society when mean values of responses are considered.

Based on the foregoing findings on attitudes of students towards science and technology, the following recommendations are made:

- 1) There is a need to imbibe the science and technology culture in every Nigerian so as to have the proper and prerequisite foundation on which to develop our science and technology which will in turn develop the country. This is why great emphasis should be put on effective science and technology education to help lay the needed foundation starting from the primary to, at least, the first year of the tertiary level for students.
- 2) The government should also design specific policies on science and technical education which must be implemented and sustained to promote science and technology curricula at each level of education. This, of course, must include increased funds which should be provided and properly utilized in the educational system.
- 3) One of the fields to achieving the desired curriculum is concerning the attitude and life experiences of students towards science and technology that is taught in schools. The Knowledge

and awareness of these areas would enable science curriculum planners to develop better and appropriate curricula.

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