An Investigation Of The Scientific Attitude Among Science Students In Senior Secondary Schools In Edo South Senatorial District, Edo State.

Dr. Utibe C. Ataha[1]   Augustine E. Ogumogu[2]

1. Department Of Educational Psychology And Curriculum Studies, Faculty Of Education, University Of Benin, P.M.B 1154 , Benin-City Nigeria.
2. Department Of Educational Psychology And Curriculum Studies, Faculty Of Education, University Of Benin, P.M.B 1154, Benin-City Nigeria.
*E-mail of the corresponding author: excellent.ogumogu@uniben.edu

Abstract

This study investigated the scientific attitude among science students in senior secondary schools. The survey research design was used to carry out the study. A sample of 250 science students from S.S.3 were randomly drawn from 10 sampled public schools. These 10 sampled public schools were randomly drawn from the public schools in two Local Government Areas from Edo south senatorial district, Edo State. The research instrument used for data collection was the Inventory of Scientific Attitudes (ISA) which was a slight modification of the one developed by Emina (1986). Two research questions and one hypothesis were raised to guide the study. The data collected were analyzed using the mean statistics and t-test of independent samples. It was revealed from the study that the level of scientific attitudes among science students in senior secondary school was average and this level of scientific attitude was not significantly influenced by sex. Based on these findings, it was recommended among others that continuous experimentation and laboratory activities are urgently needed; hence the dichotomy between theory and experimentation should be stopped in the texting of science in secondary schools.

Keywords: Science, Scientific Attitudes, Science Students, Sex.

1.   Introduction

Science is not a new thing in this world. It is the intellectual heritage of man which has come down to us. Since man became aware of his surroundings and started pondering over the natural phenomena in which he found himself engulfed. This knowledge of physical world not only change his environment but also his outlook and approach to the problems that he faced in his everyday life. Up to the middle ages, science started taking quick strides, while it was mostly the product of intellectual, interest of gifted individuals who worked almost independently in their fields. Scientific knowledge in those days exerted little influence on the common man, but since the turn of this century; even the man in the street becomes aware of the impart of science on the society and new age of science (Pitafi & Farooq,2012). Nigeria is one of the developing countries in the world, Science education is very important for her to face the challenges of the time. For any scientific and technological revolution to take place, Nigeria needs a considerable number of scientists in agriculture, industries, research and other related scientific institutions.

The development of science knowledge, science process skills and scientific attitudes in individuals exposed to science courses are the major goals of Science Education, however the assessment of scientific attitude (Affective domain) is not as simple as compared to that of the scientific knowledge (cognitive domain) and science process skills (Psychomotive domain) and this scientific attitude is one of the important aspects of today's science throughout the globe(Khan, Shah, Mahmood & Zareen, 2012).

Often times Science Teachers in Nigeria find the assessment of scientific attitudes as a no go area. Flegg and Hukins (2010) argued that the assessment of scientific attitudes has been generally omitted in the evaluation of student progress in science classrooms. The lack of assessing students scientific attitudes may be a factor responsible for the poor scientific orientations among science students which are thus made manifest in various facets and aspects of their daily activities; some of which include declining productivity, haphazardness of development, disorderliness in the society, non-functioning utilities due to inadequate maintenance, distorted values and so on (Oloruntegbe & Omoifo, 2005). Thinking in same line Ivowi (1984) in Akpan (1999) submitted that in most part of African today, we are turning out school learners without those attributes we claim Science Education can provide ; such as patience, honesty, humility, respect for logic, consideration for consequence and understanding causal relationship, all these attributes can be seen as scientific attitudes.

Having said all these, there is the need to explain the meaning of scientific attitude for a clear understanding. Different writers see scientific attitude from different perspective, for instance Moore and Sutman (1970) defined it as an opinion or position taken with respect to a psychological aspect in the field of science. Singh (1979) in

Oyakhiromen (1996) see scientific attitude as a condition of mind, showing how one is disposed towards certain things, ideas or persons and the environment around. He further stated that developing scientific attitude is a potential means of eliminating intolerance, superstitions, gullibility and other patterns of thought like obscurantism. Scientific attitude do have various components and several authors have attempted to classify these various components (Emina, 1986; Pitafi and Farooq,2012; Hukin and Gauld, 1980; Richard, 1976). Huskin and Gauld (1980) classified these into 3 groupings; firstly is the general attitude towards ideas and information (such as curiosity, open-mindness, skepticism, humility, anti-authoritarianism and creativity). Secondly is the attitude relating to evaluation of ideas and information (such as critical mindedness, objectivity, intellectual honesty and exercising caution when drawing conclusions). Thirdly, is the comment to particular scientific beliefs (such as loyalty to truth, belief in the existence of natural cause and effect relationships and aversion of superstition). Emina (1986) classified the various components of scientific attitude into five:

- Rationality: These includes commitment to rationality in problem solving, seeking for natural causes of events and identification of cause-effect relationship, belief in science as a means of influencing environment, awareness of fallibility of human effort, challenge of authority.
- Curiosity: These include desire for new knowledge or ideas, desire for additional information, seeking for evidence to support conclusions made from scientific materials, expression of interest in scientific discoveries and the desire for explanations.
- Open-Mindedness: These include willingness to subject data and opinion to criticism and evaluation to others, willingness to consider new evidence, rejection of singular and rigid approach to people, things and ideas.
- Objectivity: These include preference for statements supported by evidence over unsupported ones, sensitivity to accuracy of data, preference for scientific generalization that have withstood the test of critical review.
- Aversion to superstition: These include rejection of superstitious beliefs, and preference for scientific explanations.

This researcher sees scientific attitudes as the characteristics, traits or attributes of a good scientist. Helping to develop scientific attitudes in student should be an important task on the part of the science teachers, as learning should not lie solely on cognitive and psychomotive domains but also on the affective domains (scientific attitudes) of the students. Since the scientific attitudes of the students haven't been directly assessed in the classroom by science teachers and not much study have been done to show the level of scientific attitudes among science students. Hence, this study is an attempt to investigate the scientific attitudes of science students in secondary schools.

2.   Purpose of the Study
In view of the issues raised in the background, this study is aimed at:
- Investigating the level of scientific attitudes possessed by science students in secondary schools.
- Finding out if the level of scientific attitude of science students differ by sex

3.   Research Questions
The following questions were raised for this study:
1)   What is the level of scientific attitudes possessed by science students in secondary schools?
2)   Does sex significantly influence the acquisition of scientific attitudes among science students in secondary schools?

4.   Research Hypothesis
Only research question 2 was hypothesized for this study:
1)   There is no significant difference between the scientific attitude acquired by male and female science students in secondary schools.

5.   Research Methodology
The survey research design was adopted for this study, this design involves collecting information from respondents (students) used to answer the research questions and also to test the hypothesis raised for this study.

The population of this study comprised of all the senior secondary school three (SS 3) science students in all the public senior secondary schools in Ovia-North East Local Government Area of Edo State. Ten schools were randomly selected from the public schools in the Local Government Area used for the study, twenty-five (25) science students in S.S.3 were also randomly selected from the 10 sampled schools. Thus a total of 250 science students were sampled for this study. From these 250 sampled students, the researcher ensured that 150 were male and 100 were female students.

The Instrument used for data collection was an Inventory of Scientific Attitudes (ISA) which was a slight modification of the one developed by Emina (1986). This instrument have two sections: A and B. Section A was used to obtain personal information of respondents, while Section B contains 45 items (Statements)

concerning scientific attitudes.   These 45 items (statements) were drawn from five categories.   These five categories and the number of items are as follows:

Rationality   -   15 items
Curiosity   -   12 items
Open-Mindedness   -   8 items
Objectivity   -   6 items
Aversion to Superstition   -   4 items

This instrument was a Likert scale with four levels as Strongly Agree (4), Agree (3), disagree (2) and Strongly Disagree (1).   The instrument was validated by two experts, one from Science Education and the other from Measurement and Evaluation both in the Department of Educational psychology and Curriculum Studies, University of Benin.   The reliability was done using 20 science students in S.S.3 who were not part of the main study. A reliability coefficient of 0.62 was obtain using the Crobach Alpha technique, by this value the instrument was considered to be reliable and was subsequently used for the collection of data.   The statistics used for analysis of the data obtained were the mean statistics and the t-test of independent samples.

6.   Results

The data collected were carefully analyzed and the following findings were deduced:

Research Question 1:   What is the level of scientific attitudes possessed by science students in secondary schools?

A summary of the mean score of science students scientific attitude is presented in the table 1 below:

Table 1: Mean Score of Science Students Scientific Attitudes

	N	Minimum	Maximum	Mean	S.D	Decision
Scientific Attitude	250	113.00	180.00	141.25	10.90	Average Scientific Attitude

The level of scientific attitudes possessed by science students was determined using the following range of mean scores:

(i)   150 - 200 for high level
(ii)   100 - 149 for average level
(iii)   50 - 99 for low level

 Table I above shows that the mean score obtained was 141.23 which fall into the average level category. Therefore it will be concluded that the level of scientific attitude possesses by science students is average.

Research Question 2 was hypothesized to hypothesis I which was further tested at 0.05 level of significance.

Hypothesis I: There is no significant difference between the scientific attitude acquired by male and female science students in secondary schools.

A summary of the results of the t-test statistics is presented in table 2 below:

Table 2: t-test analysis on the Scientific Attitudes of Students based on Sex

Sex	N	Mean	SD	Mean Diff.	Df	t value	Sign.	Decision
Male	150	141.65	11.84	0.99	248		0.086	Not Significant
Female	100	140.66	9.82					

$\alpha = 0.05$

Table 2 above shows that the mean score and Standard Deviation of the scientific attitudes of male and female students were 141.65, 11.84 and 140.66, 9.82 respectively.   The t-test was used to find out if there is a significant difference between the two means.   A t-value of   was obtained which is significant at 0.086.   Since the significant value of 0.086 is greater than the α-value of 0.05, it simply means that the null hypothesis will be retained which implies that the difference between the means is not significant. Therefore, it will be concluded that there is no significant difference between the scientific attitudes acquired by male and female science students in secondary schools.

7.   Discussion of Findings

This study revealed that science students possess in secondary schools average level of scientific attitudes.   This finding is in agreement with the finding of Pitafi and Farooq(2012) which reported that the scientific attitudes of science students in Pakistan secondary schools was moderate but however this finding is in disagreement with that of Oyakhiromen (1996) who in her study discovered that science students in secondary schools in Edo State, Nigeria have low level of scientific attitudes.   The improvement from low level to average (moderate) level of scientific attitudes may be as a result of improvement in science and technology over time and also government

contributions towards the advancement of science education in the country; such contribution includes the stipulation of the policy ratio of 60%:40% Science-Arts admission ratio, the establishment of Education Trust Fund (which thus assist in the provision of facilities, equipments and instructional materials towards the teaching and learning of science in schools), the provision of scholarship to students to carry on with sciences and so on. These may be responsible for the movement from the low level of scientific attitudes to average level of scientific attitudes possed by science students in secondary schools. However, the average level of scientific attitudes possess by science students is not enough to provide the needed scientists that will be capable of making the Nigeria society to be scientifically and technologically developed(strong) in other to compete with other developed nations, hence there will still be the need to develop programmes that will increase the scientific attitude of science students in secondary schools.

This study also reveals that the scientific attitude possessed by science students in secondary schools is not significantly influenced by sex. In order words sex does not play a significant role in the acquisition of scientific attitudes among secondary school students. This finding is in agreement with the finding of Oyakhiromen (1996) who reported that both male and female science students in secondary schools have the same level of scientific attitude.

8.   Conclusion and Recommendations

This study have revealed that the level of scientific attitudes among science students in secondary school is average and the level of scientific attitudes among science students in secondary schools is not significantly influenced by sex. Based on these findings, the following recommendations were made:

There is the need for science teachers to make science students to be aware of the role that personal characteristics play in the acquisition of scientific knowledge. Science students should be made to understand that scientists are normal human beings, fallible, emotional and rational; by doing this we are humanizing science and thereby developing in the student proper appreciation of science. To do this science students should be given the opportunity to perceive scientist as normal, actively and occasionally fallible human beings, students should have access to literature that reveals the extent to which the subjective side of the scientist influence his or her work.

The present practice of experimentation and laboratory activities at the end of the year in most secondary school is having a negative effect on the acquisition of scientific attitudes among science students. Thus the continuous experimentation and laboratory activities are urgently needed; hence the dichotomy of theory and experimentation should be stopped. Doing this will help to increase the level of scientific attitude among science students as they will be able to see how theory meets with practice; how scientists work and also the qualities and attributes that a scientist must have in order to carry out his work.

Scientific attitudes can be developed among science students by a purposeful preparation of scientific activities; like involving them in scientific discussion and designing an interesting experiment in a novel manner. Emphasis should be laid on the teaching of science along with homemade cheap materials for different experiments. Students should be encouraged to construct new equipment for these experiments.

 Scientific attitudes can be improved among science students by the organizing of science exhibitions, science fairs, science quizzes, science debates and the likes.Science or JET clubs should be re-activated in schools or introduced in schools were these clubs do not exist before. Modern scientific magazines, journals and films should be provided in school for science students to use.

The use of innovative scientific teaching methods should be used to teach sciences as against the lecture method, so as to make the science subject interesting to the students.

Science students overall attitudes towards science need to be improved upon, especially in developing students' self-concept in science and increasing their awareness of their participation in scientific activities in the future .Thus the learning of   science should focus more on activities that support students culture and experiences in order to relate it to their day to day lives; by doing this, students will feel that their ideas are important and valued, this will uplift their self-concept in science.In other for this to happen teachers need to consider that learning science needs to have more emphasis on making connection between science and students 'life.

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