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Gender Difference in Achievement and Attitude of Public Secondary School Students towards Science

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Abstract
This research focuses on the gender difference in attitude and academic performance of students in selected public secondary schools in Akoko Land. The population for this study was made up of all the Junior Secondary Schools Three (JSS3) students in Akoko Land. Three hypotheses were raised to guide this study. 1626 student, (810 males, 816 females) were randomly selected for the study. Data on academic achievement was collected for this research through the classroom teachers' records. Attitude questionnaire was developed by the researcher to measure the respondents' scientific attitudes as well their attitudes toward science. Inferential statistical tool, i.e., t-test and correlation was employed in the analysis of the data. The result obtained revealed that there was a significant sex difference in the performance of students in science. A significant difference was also observed in the attitude of male and female students. A positive relationship was observed in the attitude and performance students in science. A positive relationship was also observed between attitude towards science and scientific attitudes of the respondentsConclusively, sex of learners is an important factor that must be considered in the teaching and learning of science. Both male and female developmental input are required for the development of science and technology in the society. The researcher recommends that a gender sensitive approach must be employed to bridge up the gender gap in the attitudes and performance of secondary school students in public schools.
Keywords: Public secondary school, Gender, Academic Performance, Attitude towards science, Scientific Attitudes

1.Introduction

Gender is a socially constructed concept. Gender is all around us (Gender spectrum 2014) **(**Harding, 1998); (Gauld.& Hukins, 1980).

It is actually taught to us, from the moment we are born. Gender expectations and messages bombard us constantly though upbringing, culture, peers, community, media, and religion, which influence the shape of our understanding of this, core aspect of identity. How we learn and interact with gender as a young child directly influences how we view the world today. Gendered interaction between parent and child begin as soon as the sex of the baby is known.

Like other social constructs, gender is closely monitored by society. Practically everything in society is assigned a gender—toys, colours, clothes and behaviours are some of the more obvious examples. Through a combination of social conditioning and personal preference, by age most children prefer activities and exhibit behaviors typically associated with their sex. Accepted social gender roles and expectations are so entrenched in our culture that most people cannot imagine any other way. As a result, individuals fitting neatly into these expectations rarely if ever question what gender really means. They have never had to, because the system has worked for them. Gender refers to the social attributes and opportunities associated with being male and female and the relationships between women and men and girls and boys, as well as the relations between women and those between men. These attributes, opportunities and relationships are socially constructed and are learned through socialization processes. They are context/ time-specific and changeable. (Gender Issues and Advancement of Women 2000). It determines what is expected, allowed and valued in a woman or a man in a given context. In most societies there are differences and inequalities between women and men in responsibilities assigned, activities undertaken, access to and control over resources, as well as decision-making opportunities. Brooks, (1997) cited the case of New Zealand in which although there has been increase in the number of women academic appointment into university post they observed that nature of post and level of appointment is disproportionate and in favour of men

We should not confuse the concept "Sex" with "Gender". While sex a biological quality. It refers to the biological and physiological characteristics that define men and women; which could be differentiated by genetic constitution, germ cell type and morphology.(Wallen, K. 2009) Gender refers to the socially constructed roles, behaviours, activities, and attributes that a given society considers appropriate for men and women. It is

common hear "masculine" and "feminine" as gender categories. Aspects of sex will not vary substantially between different human societies, but aspects of gender vary greatly, as depicted by globally accepted characteristics. (WHO 2014).

In some cultures some fields of studies/careers are regarded as masculine in nature, hence a no go area for girls. We have seen in the past three decades females who have developed positive attitudes to strong areas of science, technology and mathematics, through the possession of some attributes of scientific attitude such as; rationality, curiosity, open mindedness, aversion to superstitions, objectivity and intellectual honesty and suspended judgment. Bhaskara (1989) stated that the most useful scientific attitudes are open mindedness, critical mindedness, respect for evidence, suspended judgment, intellectual honesty, willingness to change opinion, search for truth, curiosity, rational thinking, and so on. According to Noll, (1933) Scientific attitude is really a composite of a number of mental habits, or of tendencies to react consistently in certain ways to a novel or problematic situation. These habits or tendencies include accuracy, intellectual honesty, open-mindedness, suspended judgment, criticalness, and a habit of looking for true cause and effect relationships. Scientific attitudes are normally associated with the mental processes of scientists. These habits are important in the everyday life and thinking, not only of the scientist, but of everyone. Attitudes are typically related to liking/disliking or with a positive/negative valence. They are more than personality traits, but linguistically used interchangeably if the traits are substantially broad or temperament-like.

A negative attitude is self defeating and will cause many problems in life. A negative attitude is caused by limiting beliefs and negative thinking. It is a frame of mind whereby a person is unhappy and sees that everything is unfair and is working against their overall happiness. Development of a negative attitude will naturally inhibit the development of scientific attitudes in learners Ebel, (1938). It is important to find out if the generally observed phenomenon in terms of gender will have any influence on attitude and performance in case study of Public Secondary School students.

1.1 Literature Review

Science as a process requires some measure of commitment, curiosity, and love for what scientists do; in order to be able to go through it successfully. A school of thought are of the opinion that males find it less worrisome to identify problem, gather facts about problems formulate hypotheses, experiment, observe and interpret, formulate generalizations, and application. A scientific attitude is an important aspect of a personality of someone who wants to be successful in the field of science. It requires rationality, inquisitiveness, and a need for creativity and flexibility (Wimsey, 1998)

National trends in United States of America revealed mixed results with regard to the gender gap in science achievement. (Amelink, 2009). According to this study it was observed that, in the coursework completed, females perform equal to male peers; however, in assessments geared to measuring mastery of contents, such as the National Assessment of Educational Progress, it was reveal that the differences between males and females in K-12 Education surfaced in elementary school and continued at the high school level Dalton, B., Ingels, S. J., Downing, J., & Bozick, R. (2007 According to these researchers, differences in science achievement at the K-12 level are attributed in part to fewer females attaining degrees in science, technology, engineering, and mathematics (STEM) fields (Hazari, Tai, & Saddler, 2007);(Madigan, 1997)

The term “science” includes engineering, chemistry, physics, biology, or psychology, among others, or a composite of any or all areas of scientific knowledge. Leslie, McClure, & Oaxaca, (1998) is of the opinion that gender gap should be reduced. The content as well as the format within a given science achievement test may influence the magnitude of any gender differences in test scores. The researchers measured Science achievement was using mean scores on nationally administered standardized assessment tools. They also measured achievement by the number and level of science courses students enroll in and the grade point average attained while enrolled in those courses. At the undergraduate level, science achievement was measured by the number and percentage of science degrees earned. Academic women did not hold senior posts in engineering, ,mathematics and dentistry.

According to Wijesundera, and Ramakrishna (1986) the issue of gender differences in achievement in school science is far from being resolved, and the inconclusiveness of studies conducted to date provides no solid basis on which changes can be made in teaching and learning. In many science, technology, engineering, and mathematics disciplines, women are outperformed by men in test scores, jeopardizing their success in science-oriented courses and careers. In studies held in advanced countries, New Zealand women were frustrated in trying to get promoted even with very good Curriculum vitae (Brooks, 1955).

In Britain, women were excluded from all universities until they were admitted to all scientific courses at University of Durham College of Science in new castle in 1981.(Rendel, 1980).

This study is delimited to secondary school level. Primary and post primary school are foundational, especially with regard to acquisition of knowledge in the area of scientific and technological studies. Secondary school is that which provides children with part or all of their secondary education. In Nigeria, the level of

education provided here is commonly referred to as Post Primary Education and children between the ages of 11-14 and 16-18, although with the advent of Pre-School system the age range has dropped to 8/ 9 to 14/15. It incorporates six years of three terms per school year after which students can choose to go to a higher institution such as the University or vocational schools to further their studies. (Wikipedia free encyclopedia). There also a host of primary and post primary institutions owned by private individuals as well as organization that were established in order to fill up some gaps as well as to achieve some purposes ranging from religious to profit. The history of modern education in Nigeria could be traced to the efforts of private organization especially the Christian mission. Ehigiamusoe, (2012).

1.1.1 **Statement of the Problem**

There is a noticeable underrepresentation of women scientists and engineers, and one begins to wonder what was responsible for their even lower numbers at higher levels in scientific and technological institutions

This study was motivated by the general opinion that some fields of study are masculine while others are exclusively for females. This has a way of affecting the attitudes of learners toward learning materials especially at the secondary school level. In schools and families the males are given much encouragement to go into science and science based careers while this is played down among the female gender. As a result, the researcher wants to find out if these will ducktail into variation in attitudes and performance of the respondents.

1.1.2 **Population for the Study**

The population for this study was made up of the entire male and female JSS 3 students in all the Public Secondary Schools in Akoko Land.

1.1.3 **Sample and Sampling Technique**

Purposive sampling technique was adopted in selecting the Public Secondary Schools as the type of schools to be used for the case study. Random sampling technique was applied in selecting the specific schools that participated in the study. Stratified sampling method was used to select male and female students. Finally, random sampling technique was used to bring out the sample that participated in the study

1.1.4 **Research Instrument**

The section A of the questionnaire was made up of the bio-data of the respondents while Section B was made up of questions on scientific attitudes directed to measuring the extent to which male and female students in Public Schools exhibit the under listed scientific attitudes. Respondents were instructed to rate their ability as Highly effective, Averagely effective, and Low effectiveness in applying scientific attitudes such as empiricism, determinism, scientific manipulation, skepticism, precision, suspended judgment, and willingness to change opinion, curiosity, objectivity, critical mindedness, open mindedness, inventiveness, risk-taking, intellectual honesty, humility and responsibility; during Integrated Science lessons and practical activities. (Rational Enquirer, 1990)

Section C, was made up of question items designed to find out the students' attitudes towards science. The following attitude items such as , thoughtfulness, emotional, and trusting, honesty, joy, love, calmness, critical-mindedness, pride; anger , blame, envy, greed, hatred, indifference, intolerance, pessimism, resentment, sadness were included.

1.15 **Research Questions**

(i). Will there be any significant sex difference in the performance of students in science?
(ii). Will there be any significant difference in the attitude of male and female students towards science?
(iii). Will there be any gender difference in scientific attitudes of the respondents?
(iv). Will there be any relationship in the attitude and performance students in science.
(v). Will there be any relationship between attitude towards science and scientific attitudes?

1.1.6 **Research Hypotheses**

(i). There will be no significant sex difference in the performance of students in science.
(ii). There will be no significant difference in the attitude of male and female students towards science.
(iii). There will be no gender difference in scientific attitudes of the respondents.
(iv). There will be no relationship in the attitude and performance of students in science.
(v). There will be no relationship between respondents attitude towards science and their scientific attitudes

1.1.7 **Results**

Table Title 1: t-test to determine sex difference in the performance of students in science

	1= mate, 2=female	N	Mean	Std Dev	Df	t-cal	t-table	P
Performance	1.00	810	17.6815	1.92176	1624	7.092	1.96	0.000
	2.00	816	16.8456	2.75426				

7.092>1.96 table value at 0.05 level of significance,(p>0.05), hence the stated hypothesis was rejected

Table Title 2: t-test to determine mean difference in the attitude of male and female students towards science.

	1= mate, 2=female	N	Mean	Std. Dev	df	t-cal	t-tab	P
Attitude of students towards science	1.00	805	17.7975	2.14406	1624	8.084	1.96	0.00
	2.00	821	16.7491	3.00534	.			

8.08>1.96 table value at 0.05 level of significance,(p>0.05), hence the stated hypothesis was rejected

Table 3: t-test statistics to determine gender difference in scientific attitudes of the respondents

	1= male gender, 2=female gender	N	Mean	Std. Dev	Df	t- cal	t-table	P
Scientific Attitude	1.00	805	17.7975	2.14406	1624	10.294	1.96	0.00
	2.00	821	16.4166	3.15910	.			

10.294>1.96 table value at 0.05 level of significance,(p>0.05), hence the stated hypothesis was rejected

Table 4: Correlation statistics to determine the relationship in the attitude and performance of students in science

		Attitude	Performance
Attitude	Pearson Correlation	1	0.612**
	Sig. (2-tail)		0.000
	N	1626	1626
Performance	Pearson Correlation	0.612**	1
	Sig. (2-tail)	0.000	
	N	1626	1626

** Correlation is significant at 0.05 of significant

Table 5: Correlation statistics to determine the determine the relationship in the scientific attitude and attitudes of students toward science

		attitude towards science	scientific attitude
attitude towards science	Pearson Correlation	1	.553(**)
	Sig. (2-tailed)		.000
	N	1626	1626
scientific attitude	Pearson Correlon	.553(**)	1
	Sig. (2-tailed)	.000	
	N	1626	1626

** Correlation is significant at the 0.05 level (2-tailed).

1.1.8 **Discussion**

The findings in this study are hereby discussed. In table one, it was observed that there was a significant sex difference in the performance of students in science. (p>0.05),This is in line with Kolawole (2007) who investigated into gender issues and academic performance of Senior School students in Mathematics computational tasks, in order to find out whether boys performed better than girls' The result of the study showed among other thing that students in single sex schools performed better than those students in mixed schools in Mathematical computation and boys in boys` schools did not perform significantly better than girls in girls` schools.

A significant mean difference in the attitude of male and female students towards science, was observed in table two (p>0.05). This conforms to SWE-AWE-CASEE ARP Resources where it was observed that Boys had more positive attitudes to science and greater levels of participation in scientific extra-curricular activities. They also reported better performance at school science than girls. A positive attitude to science was strongly positively related to having a father and mother who support science.

The study of Fatoba and Aladejana, (2014) who examined the effects of gender on students' attitude in Physics in senior secondary schools in Oyo State, Nigeria, was at variance with findings of this research. Gender was found to have no effect on Students' Attitude in that study, but there was slight difference in Attitude of the students in favour of females. Therefore, stakeholders should put differences in the Attitude of males and females into consideration in the development and implementation of curriculum.

Craker (2006), predicted that Nearly fifty percent of students may lose interest in science by the third grade, and the number of students preparing for a science-related career will decline. Several factors, including gender, expected achievement and previous science experiences could influence a student's attitude toward science.

In table three, a significance, gender difference was found in scientific attitudes of the respondents (p>0.05),

The findings as revealed in table four shows a positive relationship in the attitude and performance students in science. Craker (2006) analyzed the attitudes of students enrolled, at the entry-level general education courses at the University of Wisconsin-La Crosse toward science in the areas of personal confidence, usefulness of the subject, perception of the subject as a male domain, and perception of the teacher's attitude. Males were found to have more confidence than females, and females perceive science as a male domain more than men. Expected achievement and attitude toward science were shown to be strongly related. The number of science and math courses taken in high school has a direct impact on a student's attitude toward science. Olatunji and Etuk (2010) observed a positive relationship between the rate of learning, attitude to and achievement in science has been documented. This goes to support the findings in table five that there was a positive relationship in the attitude and performance students in science.

1.1.9 **Conclusion**

Conclusively, sex of learners is an important factor that must be considered in the teaching and learning of science. Both males and females developmental input are required for the development of science and technology in the society

1.1.10 **Recommendation**

The researcher recommends that a gender sensitive approach must be employed to bridge up the gender gap in the attitudes and performance of secondary school students in public schools.

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