

# Factors Affecting Gender Equity in the Choice of Science and Technology Careers among Secondary School Students in Edo State, Nigeria

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## Abstract

The study investigated the factors affecting gender equity in science and technology among senior secondary school students. The study was carried out at the University of Benin Demonstration Secondary School in Benin City, Edo State, Nigeria. One hundred and fifty students of average age 15 years in their penultimate year were administered the questionnaires for the study. The data for the study was collected from a survey instrument titled, "Career Determinants. Analysis of the data revealed that sex, parental, peer influences, social and cultural stereotyping were the major factors affecting gender inequity in the choice of careers in science and technology among secondary school students. Less than 40% of the girls indicated interest in science and technology subjects even though they had the ability. More than sixty-five percent of the boys indicated interest in science and technology subjects even though they were not academically prepared for them. It was therefore suggested that gender equity in science and technology could be fostered by designing a training program in science to build confidence and assertive skills in students at the junior secondary school level. Recommendations were also made that seminars should be conducted for parents and teachers in primary schools to desensitize stereotyping acquired through socialization processes and cultural practices.

**Keywords:** gender equity, science, technology, students, secondary schools, Nigeria

## 1. Introduction

Science and technology have long been recognized as the driving force for economic development and for improving the well-being of individuals, their communities and nation (Schiebinger, 2010). Science can be regarded as the linchpin of industrial development and the link between technology and socioeconomic development. A country's ability to secure good health, fight diseases, protect the environment, produce food for its people and develop new industries and technologies is dependent on the scientific knowledge and skills of its people (Olahanpo, 2015). A country that neglects the provision of good quality science education will find itself to be a dumping ground of other people's innovations.

The awareness of the vital role of science and technology in national development has prompted the federal government to stipulate in the National Policy on Education that secondary school education should equip students to live effectively in the modern age of science and technology (Federal Republic of Nigeria, 2004). The proper teaching and handling of science and technology subjects in schools will result in the training of the minds of students in understanding the world around them, in acquisition of appropriate skills capabilities, competencies necessary for them to live and contribute to the development of their society (Oriahe, Uhumuavbi, & Aguele, 2010). Consequently, the government introduced the 6-3-3-4 system of education, where in the three-year junior secondary school education, pre-vocational and technical subjects are taught. Science and vocational subjects would be taught in the three-year senior secondary school.

Science and mathematics education can be construed as the determining factors of a country's intellectual contentment and strength. They stimulate advances in scientific research and industrialization which generates a varied and vigorous economy. Thus, science education is the key to economic development, especially in a developing country such as Nigeria. However, in Nigeria, there is a section of the citizenry that has not taken

advantage of the science and math education that the schools have provided. These are girls and women. It is well known in Nigeria that there is gender inequality in science, math and technology. This has affected the type of education girls and women receive even up to the tertiary institutions. The concern has focused progressively on the consequences of this gender gap for universal scientific literacy and for gender equity in the pursuit of science and technology careers.

Other studies which pertain to sex related differences in science and technology career enrolment indicate a low participation of girls in secondary school in science and technology subjects as well as low numbers of women who hold professional careers in science and technology (Lockheed, Thorpe, Gunn, Cassenlyn, & McAlovn, 1985). Boys are more oriented towards the hard sciences (physics, math, chemistry, engineering and others) while girls prefer the soft subjects such as human physiology, plant life, zoology and others (Entwisle & Duckworth, 1977). Secondary school is the foundation for the choice of careers for students, yet, there is paucity of research on gender valuation of science and technology among secondary school students in Nigeria. Hence, the authors embarked on this study to seek for strategies to promote gender equity in science and technology among senior secondary school students. This can be achieved through identifying internal and external factors that affect career choices in order to achieve the 60:40 sciences to humanities ratio in admission to higher institutions as stipulated in the National Policy on Education (Federal Republic of Nigeria, 2004). There is an urgent need for a study such as this, now and it will be followed up by academic advising and career counseling. The study was carried out at the University Demonstration Secondary School (UDSS) in Benin City, Edo State. The focus of the study was on the senior secondary school students. The junior secondary students are not considered for the study since at this level they are exposed to general education with little or no opportunity for subject choices.

Table 1. Undergraduate enrolment in percentage by sex at the University of Benin

	2000/2001		2002/2003		2003/2004		2004/2005	
	%		%		%		%	
	M	F	M	F	M	F	M	F
Total								
Enrolment	57	43	61.3	38.7	59.9	40.1	62	38
Engineering	82.3	17.7	91.4	8.6	89.1	10.9	90.6	9.4
Computer Engineering	-	-	83.	16.7	-	-	-	-
Medicine	62	38	73	27	66.9	33.1	70.8	29.2

Source: University of Benin Academic Planning Division 2006.

## 2. Science and Technology Education

The Federal Republic of Nigeria (2004) in its national policy on education emphasized science and technology as the main thrust of the nation's technological development. The policy further stated that science and technology are instruments per excellence for effecting national development, in particular, with regards to economic growth. Eboh and Isong (2000) conducted a study on the participation, achievements and setbacks of women in science from two institutions in Nigeria; Universality of Calabar and University of Uyo. They found that the percentage of women in science was far less than their male counterparts with only about 1.5 per cent. Okeke (1997) compared the number of girls and boys who enrolled in science in secondary schools as well as the number of girls in science and technology in tertiary institutions. She also found that female participation was very low. Alutu and Eraikhuemen (2004) found in their study from three Nigerian universities surveyed that the ratio of male to female mathematics lecturers was 16:1. The University of Benin current staffing data indicate that only 19% of its academic staff is female. Alutu (2001) observed that the major factors affecting female career choice in science was peer and parental influences as well as socio-cultural career stereotypes. Most researchers have shown the gross under-representation of females in institutions of learning from primary through secondary to higher education in Nigeria. To buttress this point, Table 1 shows the distribution of female enrolment in science and technology for some academic sessions. Students' enrollment at the University of Benin for 2000/2001 sessions was typical of this trend. Although the total female undergraduate students were

43%, there was a marked under-representation of females in engineering (17.7%) and medicine (38%). In 2002/2003 session, the total female undergraduate enrollment went down to 36.7%, a drop of 6.3% compared to the previous year. In engineering and computer engineering, only 8.6% and 16.7% were females, respectively. In medicine, females comprised 27% of the students. In 2003/2004 sessions, there was a slight increase in female enrollment as 40.1% of the total undergraduate was female. However, females in engineering were 10.9% while in medicine female enrollment was 33.1%. The 2004/2005 session had 38% as its total female undergraduates. The Faculty of Engineering female enrollment dropped to 9.4% while that of Faculty of Medicine was 29.2%. The general trend shows a marked under-representation of females in science and technology.

However, this data is an improvement on an earlier research by Ernest (1976) and Eiden (1976) which showed that only 2.2% of those who earned a degree in engineering were females. Even though there has been an increase in the number of women employed in scientific and engineering professions over the past 15 years, the participation of women in these careers still remain disproportionately low (Vockell & Lubonr, 1981). They also observed that parents and teachers have great influence in the choice of careers of students (both boys and girls) for those choosing careers in engineering and science than for those not choosing such careers. Goetz (1995) noted that the goal of gender equity could not be achieved if institutions are not changed to reflect and represent women and girls' interests. O'Connor (2001) during the African Congress of Girls in Science Education organized by United Nations Education and Scientific Organization (UNESCO) stated that education should be provided that ensures that all women whether engaged at the highest level of scientific excellence or striving to care for their families as peasant farmers should be empowered to use science to solve problems.

### 3. Research Questions

To carry out the study, the following questions were raised

- 1) What is the choice of subjects of senior secondary school students?
- 2) What percentage of females/males chose science careers?
- 3) What are the major factors that affect gender inequity in the choice of science and technology careers?

### 4. Method

The study was a case study survey which was carried out at the University of Benin Demonstration Secondary School (UDSS) in Nigeria. The school is mixed with both girls and boys. It is made up of Junior and Senior Secondary School sections. The senior secondary school section which consists of SS1, SS 2 and SS 3 was the target for this study. The sample for the study was drawn from all the SS11 students in their penultimate year. The average age of students in SS 2 was 15 years. The researchers' self-developed valuation questionnaire was used for the study. The instrument was face and content validated by experts in science education, measurement and evaluation, guidance and counseling. The questionnaires tagged, "Career Determinants" were administered to 150 SS 2 students by the researchers and two research assistants. The data collected were analyzed using descriptive statistics

### 5. Results and Discussion

In this section, first the findings for each of the three research questions of the study will be presented and then a discussion of the upshots will follow.

#### 5.1 Research Question 1

What is the choice of subjects of senior secondary school students?

The result in Table 2 indicated that 38.7% of senior secondary school students studied science and technology subjects while 61.3% studied Arts and Commercial subjects.

Table 2. Subject choice of senior secondary school students

Subjects	No. of students	Percentage (%)
Science and technology	58	38.7
Arts and Commercial	92	61.3

### 5.2 Research Question 2

What percentage of females/males study science and technology subjects in senior secondary school?

Table 3 indicated that 9% of females studied science and technology courses and therefore, want to pursue a career in science and technology while 81% of males studied science and technology courses and so want to pursue a career in the science and technology.

Table 3. Choice of science courses by gender in senior secondary school

Subject	Male	Female
Science and technology	81%	9%

### 5.3 Research Question 3

What are the major factors that affect gender inequity in career choice of science and technology in senior secondary school?

Table 4. Response of students by sex

Subscale	Male	Female
Interest	6.4	92.8
Funding	13.6	87.9
Peer	80.0	20.0
School factor	4.8	95.7
Teacher factor	11.9	88.6
Parental factor	10.8	89.1

Table 4 shows that 88.7% of females indicated lack of interest in science and technology while 10.3% of males indicated that they were not interested in science and technology. Eighty-seven and nine per cent of females indicated that funding hindered them from choosing a career in science and technology while 13.6% of males indicated that funding limited their choice of career in science and technology. Eighty per cent of males indicated that they chose science and technology due to the influence of their peers. On the other hand, 20% of females indicated that peer pressure influenced their choice of career in science and technology. Thus peer pressure has a more direct impact among males than females. With regards to school factor, 91.8% of girls indicated that their experiences with school science in the presentation of curriculum materials made the subject not interesting and relevant to them. They did not identify with what they experienced as school science identities such as illustrations, examples and applications presented are more familiar in general to the experiences and interests of males than to those of females. Eighty-eight and six per cent of females indicated that their teachers did not motivate them to choose a career in science and technology while 11.9% of boys indicated that their teachers did not motivate them to choose a career in science and technology. Teachers should therefore develop teaching approaches and work forms where girls with a variety of learning styles are motivated and feel secure to participate and develop their understanding. For example, collaborative work forms may be particularly important for many girls. Eighty-eight and seven per cent of females indicated that their parents did not support them to pursue a career in science and technology while 10.8% of males indicated lack of parental support. Ninety-eight and four per cent of females indicated that societal values hindered their choice of a career in science and technology while 2.7% males indicated that societal values affected them. People treat girls and boys differently from an early age, giving them different feedback and expectations. This study shows that there is strong evidence that the culture discourages girls even when they demonstrate exceptional talent from pursuing science and technology careers. Eighty-nine and two per cent of females indicated that the low technological development of the country was a disincentive in their choice of a career in science and technology while 5.7% males indicated that the low technological development limited their choice of a career in science and technology.

Most of the female respondents expressed lack of interest in science and technology. This attitude could be due

to the fact that the predominant pattern of teacher interaction with female and male students was established as girls received less of the teachers' attention in class. Female respondents indicated that they were under-involved in science lessons. All the respondents in this study indicated that their science and technology teachers have always been males. Thus, the lack of female science teachers as role models is another factor that inhibits female choice of career in science and technology. Career advice by parents can influence students' choice of science subjects. Female respondents in this study indicated that their parents had different expectations for them and their male children. Their parents did not encourage them to take science and technology courses but encouraged the boys to do so. Another significant finding that hinders female participation in science and technology is the gender biases built into society whereby societal expectations discourage females from choosing careers in science and technology. However, the sociocultural forces at play encourage males to pursue science and technology careers. The low technological development of the country did not encourage female participation in science and technology as it creates negative attitudes towards science and technology. The issue of funding was another finding that militated against female participation in science and technology as males were more favored to secure financial assistance to pursue careers in science and technology.

In order to achieve gender equity for girls in science and technology, it is suggested that a training program in science related subjects be designed and introduced at the junior secondary school level. Also science and technology subjects should be introduced early in the students' life. To this end, parents and teachers of primary school children should be exposed to regular seminars to familiarize them on the benefits of science and technology, the range of careers and jobs in these fields, de-emphasize gender bias in the choice of career and emphasize capability. Guidance and counseling should be introduced in secondary schools. The counselors are professionals equipped with adequate skills that will enable them to guide the students into appropriate and profitable career choices in science and technology. They are in a position to give the students balanced information on the correct subject combination for their future career with regards to their academic performance.

## 6. Conclusion

The study examined the choice of science and technology careers among senior secondary school students. The study found that the percentage of female students who wish to pursue science and technology careers is very low and this is as a result of a complex equation of self-doubt, stereotypes, discouragement, economics and sometimes just wrong perception of what math and science are all about. These were some of the factors identified as barriers to female pursuit of science and technology careers. Addressing the issue would require a mix of approaches at the secondary school level. Girls should be introduced to science and technology subjects in a way that makes it clear that they could be successful studying them. Scholarships especially for girls should be instituted by government to encourage girls who want to study science and technology and are hindered by the lack of funds. It would be necessary to provide arenas for personal interaction between secondary school students and tertiary students in science and technology. Such a meeting will be beneficial to secondary school girls. Also secondary school students should be given information on the broad range of science and technology professions available. There should be an improvement of student-teacher interaction in order to counter the stereotypic images of science that are still prevalent. Parents, teachers and other persons in touch with girls should be made aware of the important role they can play in girls' identity work and educational choice process with regards to science and technology careers. There is need for consistent and sustainable support from the government at both the federal and state levels for policies that will target directly the problems of gender inequity in science and technology in Nigeria.

## References

- Alutu, A. N. G. (2001). *Gender imbalance in the choice of science based courses among fresh students at the University of Benin*. An unpublished monograph presented during the orientation of fresh students at the University of Benin.
- Alutu, A. N. G., & Eraikhuemen, L. (2004). The shortfall of female mathematics lecturers in Nigerian universities: Strategies for promotion and retention of prospective female mathematics lecturers. *Journal of International Women's Study*, 5(5), 70-84.
- Eboh, L., & Isong, N. (2000). The publicity of women in science and technology: Problems and Prospects. *Journal of Women in Academics (JOWACS)*, 1(1), 147-153.
- Eiden, L. J. (1976). Trends in female degrees' recipients. *American Education*, 12(9).
- Entwistle, N., & Duckworth, D. (1997). Choice of science courses in secondary school: Trend and explanation.

*Studies in Science Education*, 4, 63-82. <http://dx.doi.org/10.1080/03057267708559846>

- Ernest, J. (1976). Mathematics and sex. *Journal of the Mathematics Association of Nigeria*, 25(1), 84-89. <http://dx.doi.org/10.2307/2319884>
- Federal Republic of Nigeria. (2004). *National Policy on Education* (4th ed.). Lagos: NERDC Press.
- Goetz, A. (1995). Getting institutions right for women. *IDS Bulletin, Susset*, 26(3), 23-29.
- Lockheed, M. E., Thorpe, M., Brooks-Gunn, J., Casserlyn, P., & McAloon, A. (1985). *Sex and ethnic differences in middle school mathematics, science, computer science*. ERIC, Princeton, NJ.
- O'Connor, J. P. (2001). *Girls participation in science, dismally low in sub-Saharan Africa*. UNESCO Education News. No. 2266.
- Okeke, A. O. (1997). Women and girls' participation in science, technology and mathematics. In G. A. Badmus, & L. O. Ochno (Eds.), *Science, Mathematics and Technology Education in Nigeria*. Lagos, Nigeria Academy of Education
- Olakanpo, A. (2015). *CSR children, Microsoft partner to advance science education for girls in Nigeria*. All Africa, October 1 Issue.
- Oriahi, C. I., Uhumuavbi, P. O., & Aguele, I. I. (2010). Choice of science and technology subjects among secondary school students. *J. Soc. Sci.*, 22(3), 191-198.
- Schiebinger, L. (2010). *Gender, science and technology*. UNESC, Paris France 28 September–1 October (pp. 1-35).
- Vockell, E., & Lubonr, S. (1981). Sex role stereotyping by high school females in science. *Journal of Research in Science Teaching*, 18(1), 209-219. <http://dx.doi.org/10.1002/tea.3660180304>

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