Assessment of Female Students' Enrollment in Sciences and Mathematics in Federal University Kashere, Gombe State.

[1]Samuel Akinola OGUNDARE Ph. D
Email: Samogundare91@gmail.com, akinola.ogundare@fukashere.ed.ng
Tel: +2348035808537

[2]Abdullahi, Aisha ZAKARI
Email: abdullahiaishatu51@gmail.com
Tel: +2347039705914
[1]Department of Science Education, Federal University of Kashere, Gombe State Nigeria
[2]Masakare, Jimeta, Yola Adamawa State.

Abstract
This study examined female students' enrollment in science, mathematics and related disciplines in Federal University of Kashere, Gombe State. The study employed a descriptive survey design type. The population of the study consisted of all 7,374 students from the year 2015-2019 in the Federal University, Kashere, Gombe State. One thousand two hundred and nine (1209) science students at Faculty of Pure Science and Department of Science Education in Federal University of Kashere, Gombe State were selected for the study using purposive sampling technique because they were students admitted to study science and mathematics programmes during the study and the sample size was small and manageable. A structured Scale titled Students' Enrolment in Science and Mathematics Disciplines (SESMDS) was used as an instrument for collection of students' enrollment figure both from Department of Science Education and Faculty of Pure Science in the university. Two research questions were raised for the study. Data collected were analyzed with the use of simple percentage. The findings of the study revealed that female students' enrollment in science and mathematics disciplines was very low with 14% and 19% respectively. It was recommended that the universities can always invite female role models to give talks to the students as a means of creating awareness for female enrolment and participation in science and mathematics, among others.

Keywords: Science and Mathematics, enrollment, female.

Introduction

The importance of science and mathematics cannot be overemphasized to the society, with the potentiality to improve lives in a multitude of ways and advance national development. Having access to the fruits of science as individual and collective levels, nevertheless depends primarily on those endowed with scientific and mathematical knowledge and skills. Any nation that neglects the provision of good quality of science education may quickly find itself the dumping ground of other people's innovations, without the necessary human resources to sustain growth and compete in a global economy. According to (Akpan, 2018, p.10) science and mathematics education concern with science and mathematics curricula instructions through effective pedagogical endeavours for learners' acquisition of scientific and mathematical knowledge and skills. Science education in Nigeria concentrates on the teaching of science concepts, method of teaching and addressing misconceptions held by learners regarding science concepts. Many of the developed worlds were able to achieve much in science and technology because of science education. Over the years there has been low enrolment of science and mathematics education disciplines in our institutions as observed (UNESCO, 2010a).

Schools specifically play important role in female's access to science by the manner the school curriculum is implemented in Nigeria. Udeani (2012) remarked that sex, attitude and teaching approach of teachers' influences the attitude of female students, whom they believe view science to be more important to boys than girls. Hence, women remain under-represented in science and in mathematics, depriving humanity of a vital catalyst for shaping a better future for current and future generation. It should provide the trigger for all nations and institutions to find ways to really open the doors to this vast pool of talent. It should start with more encouragement, support and opportunities at school for girls to be engaged in the wealth of scientific and mathematical fields that will define all our futures. Sadker and Sadker (2016) observed that confidence of females is low such that their ability to study science subjects like mathematics is practically unconnected with their actual ability. Apart from general low enrolment in science and mathematics, subjects like chemistry, physics and mathematics are given masculine outlook by many people (Ndirika & Agommuoh, 2017). This trend is indicated in the teaching subject students' teachers selected in Table 1 (Ndirika & Agommuoh, 2017).

Table 1: Enrolment of Female and Male Students in College of Science, Information and Technology at Tai Solarin University

Subject	Males	No of Female	Percentage of females
Biology	92	259	73.8
Computer Science	285	210	42.4
ICT	162	97	37.5
Petrochemical Science	236	98	29.3
Health Education	105	224	68.1

Table 1 reveals higher percentage of female enrolment in biology and health education (73.88% and 68.1%) respectively, male have higher percentages in other science subjects. Besides, data of enrolment in Faculty of Engineering and Science in University of Lagos, Nigeria, 2020/2011 academic session indicates extremely lower percentage of female enrolment in physical sciences and technology related courses as indicated in Table 2 (Adapted form Ndirika & Agommuoh, 2017)

Table 2: Enrolment of Female and Male Students in Faculty of Engineering and Science, University of Lagos (2010/2011)

Faculty of Engineering	Males	Females	Percentage of Females
Chemical Engineering	258	81	24.1
PET. & Gas Engineering	175	27	7.1
Civi & Env. Engineering	250	25	9.1
Electrical Engineering	367	45	11
Computer Engineering	136	24	15
Mechanical Engineering	284	16	5.3
Met. & Mat. Engineering	216	21	8.9
Survey & Geoinformatics	197	25	11.3
Systems Engineering	197	25	11.3
Sub total	**2078**	**294**	**12.4**
Faculty of Sciences			
Biochemistry	151	148	48.6
Botany	123	145	54.1
Microbiology	133	195	59.5
Cell Biology & Genetics	154	178	53.6
Chemistry	233	125	34.9
Computer Science	242	65	21.1
Geophysics	66	13	16.5
Geology	69	9	11.5
Fisheries	18	17	48.6
Marine Biology	111	147	46.2
Mathematics	370	111	23.1
Physics	358	50	12.3
Zoology	103	117	53.2
Sub total	**2191**	**1315**	**37.5**

This should provide the trigger for all nations and institutions to find ways to really open the doors to this vast pool of talent. It should start with more encouragement, support and opportunities at school for girls to be engaged in the wealth of scientific and mathematical fields that will define all our futures. Over the past years the enrolment of female students in science, mathematics and related disciplines in our institutions continue to be dwindling (Ekine and Abay, 2013). Mathematics education is at the heart of every development in any country of the world. Unfortunately, in spite of the place of mathematics in the national development the enrolment of students particularly continues to be low from year to year (Onyemauche, 2013).

The role of women education and empowerment cannot be underestimated. When you educate a man, you educate a person, but when you educate a woman, you educate a nation. This is because the education of every child starts from the family and the mother is the first teacher. Throughout the world women continue to be under representing every sector of science and mathematics and men continue significantly to outnumber women in science and mathematical disciplines (UNESCO, 2010b). United Nations, (2014) remarked that Nigeria is classified as a low developed country in respect of equality in educational accessibility with female literacy rate (ages

15 and above). Although progress is being made to increase female participation in science and mathematics (UNESCO, 2010a,). Full and equal participation in science and mathematics for males and females can play a vital role in ensuring diversity in research, expanding the pool of talented researchers and bringing in fresh perspectives.

Mgware (2012) carried out a survey study on effective participation of females in science and mathematics education in senior secondary schools in Kenya, found out that females in science and mathematics education enrolment was low. Similarly, Dasgupta and Stout (2014) in the survey studies of girls and women participation in science, technology, engineering and mathematics found that girls and women interest and participation in science, technology, engineering and mathematics was at a low level as compare to their boys and men counterparts. Ndirika and Agommuoh (2017) investigated female enrolment in science and mathematics disciplines in Michael Okpara University of Agriculture, Umudike, Nigeria observed that female participation in science and mathematics was very low as compare to their male counterparts. Agommuoh and Ndirika (2017) in their studies of strategies for promoting gender equality In STEM education towards sustainable development in senior secondary schools in Umuahia Norh Local Government Area, Abia State observed that female participation in STEM was low and a wide gap between male and female exists. United Nations (2014) in a study of the probability for female students graduating with a Bachelor's degree, Master's degree and Doctorate degree in science-related field fourteen developing countries, the finding revealed that 18%, 8% and 2% respectively, while the percentages of male students are 37%, 18% and 6% respectively.

Aderemi et al. (2013,) carried a survey study on gender enrollment, graduation and staffing of science and technology education in Nigeria tertiary institutions found out that female enrollment was low generally compared to the trend in United Kingdom and United States. The study also revealed that in Nigeria, Southwest zones recorded the highest female enrollment in Science, Mathematics, Engineering and Technology because of awareness for female students to study science courses. The percentage was generally low in the Northern zones compared to Southern zones. Added to this, Akanwa and Kalu-Uche (2018) in the study of differences between enrollment and completion of students admitted into science, technology, engineering and technology based undergraduate courses in Micheal Okpara University of Agriculture, Umudike, Nigeria observed that there were significant differences between male and female students' enrollment in favour of male students, implying the enrollment of female students into science and related courses was low. Abe (2012) in a study on gender disparity in course of offering and graduate output in Nigeria reported that in the University of Lagos, girls concentrated much on liberal arts and very few of them enrolled in science, engineering, mathematic and medicine. Salma (2001) in an investigation into female enrollment in mathematics and science in University of Ilorin noted that female enrollment in science and mathematics was relatively to those of their male students. This study therefore assesses female enrolment in science, mathematics and related disciplines in Federal University of Kashere, Gombe State, Nigeria.

Education of female particularly science and mathematics related disciplines cannot be undermined. It is clearly stated in the National Policy on Education (FGN, 2014, p. 11) that every child in Nigeria shall have equal right and access to educational opportunities irrespective of any disabilities and according to his or her ability, yet gender differences in enrollment in sciences and mathematics still show a great disparity, with female persistent low enrollment (UNESCO 2010a; Abe, 2012).

UNESCO (2010a) estimates that only about 5% of all students enrolled in Science and Mathematics related fields are female. Frantic efforts have been made by the Federal Government of Nigeria in facilitating female access to study science and mathematics. Such efforts include promoting women and girls' enrolment and education, promoting gender education equality, constructive methods of teaching, incentives, among others (UNESCO, 2010b; Agommouh & Ndirika, 2017; Akpan, 2018). Despite progress in opening new doors of opportunities, women and girls continue to be underrepresented in the fields of science, technology, engineering and mathematics. This study therefore, assessed female students' enrollment in science and mathematics in Federal University of Kashere, Gombe State.

The purpose of the study is to examine female participation in science, mathematics and related fields in Federal University of Kashere, Gombe State.

Objectives of the Study

1. To assess female students' enrollment in Bachelors of science and mathematics education in Federal University, Kashere.
2. To assess female students' enrollment in Bachelors of (pure) Science and Mathematics (B. Sc.) in Federal University, Kashere.

Research Questions

1. What is the difference between male and female students' enrolment into Bachelors of Science and Mathematics Education in Federal University, Kashere?
2. What is the difference between male and female students' enrolment into Bachelors of Pure Science and Mathematics (B. Sc.) in Federal University, Kashere?

Methodology

Descriptive survey design was adopted for this study. The design enabled the researchers to describe, explain and validate the results on the sample studied. This study does not include any form of measurement, but studies data or facts that have already occurred and determined if there are relationships between the variable. Besides, it enabled the researcher to collect, analyse and interpret data about the existing situations on the female enrollment in science and mathematics disciplines in Federal University of Kashere, Gombe State, Nigeria.

The population of the study consisted of 2,372 students from the year 2015-2019 in the Federal University, Kashere, Gombe State. Faculties of pure science and education were purposely selected for the study because they were the faculties that admitted students into sciences and mathematics programmes for the period under study. All the 1209 students comprising of 514 male and female studying science and mathematics education disciplines in the Department of Science Education and 650 studying pure science and mathematics disciplines in the Faculty of Pure Science respectively were purposely selected. The reasons were because they the students admitted into science and mathematics programmes. Besides, the researchers were interested in the enrolment ratio of male-female students and their number was moderate to handle and easily accessible.

Secondary and existing data were used to determine the differences present in male and female enrollment in science and mathematics in the Faculty of pure science and in the Department of Science Education in the 2015 through 2019 academic years. According to Dillman, Smyth, and

Johnson, (Eds) (2015, p. 15) the use of secondary data in which the data from the faculty, department and students' file records had already occurred in the repositories, hence informed the use of the existing data in the study.

One research instrument was developed by the researchers and used for data collection in the study titled Students' Enrolment in Science and Mathematics Disciplines Scale (SESMDS). It was divided into two sections: Section A comprised seven items that collected students' enrollment figure from the seven programmes in the Department of Science Education, while section B consisted of four items that collected students' enrollment figure from the four programmes in the Faculty of Pure Science, Federal University of Kashere respectively from the year 2015-2019. The instrument was given to experts in Test and Measurement and Science Education Departments at Federal University of Kashere, Gombe State to ensure that it collected the expected data with the validity index response from the experts of 87%.

The reliability of SESMDP was ascertained through the use of test-re-test analysis, found to be 0.81 and was used for the study. The researchers sought permission from the head of respective departments to collect students' enrolment figure from year 2015-2019 in their departments. The validated SESMDS was given to each head of the department with assistance of each examination officer in the departments to fill the enrollment figure. The researchers went back after three weeks and retrieved the SESMDS back from the head of departments. The data collected were analysed using simple percentage.

Results

Research Question 1:

What is the difference between male and female students' enrolment into Bachelors of Science and Mathematics Education in Federal University, Kashere?

In order to answer the research question, the frequency and percentages of enrolment of male and female students were computed and result is presented in Table 3.

Table3: Female Students' Enrollment in Bachelors of Science and Mathematics Education in Federal University of Kashere, Gombe State.

Programs	Males	Percentage of males	Females	Percentage of females
Integrated science education	64	75%	21	25%
Biology education	91	65%	49	35%
Chemistry education	46	53%	21	47%
Physics education	49	81%	6	11%
Mathematics education	67	96%	3	4%
Computer education	82	85%	15	15%
Agriculture education	68	84%	13	16%
Total	467	83%	128	14%

Table 3 reveal the female participation in science and mathematics education in Federal University of Kashere, Gombe State. This table clearly indicates that female representation/enrolment was very low as compare to their male counterpart. Only 25% of female

enrolled for integrated science education, 35% of female students enrolled for biology education, 47% of female enrolled and participated in chemistry education, 11% in physics education, 4% in mathematics education and in computer education programme, 15% are female and 16% in agricultural science education. In summary, only 17% female students enrolled and participated in science education progrmmes from 2015 to 2018 academics sessions in Federal University of Kashere, Gombe State.

Research Question 2:
What is the differences in male and female students' enrolment into Bachelors of Pure Science and Mathematics (B. Sc.) in Federal University, Kashere?

In order to answer the research question, the frequency and percentages of enrolment of male and female students were computed and result is presented in Table 4.

Table 4: Female Students' Enrollment in Bachelors of Pure Science and Mathematics Disciplines in Federal University of Kashere, Gombe State

Programs	Males	Percentage of males	Female	Percentage of females
Mathematics/Comp. Science	313	90%	34	10%
Biological science	97	67%	48	33%
Chemical Science	85	69%	38	31%
Physics	66	83%	14	17%
Total	561	86%	134	19%

This revealed that enrolment of female students in science and mathematics disciplines was too low as compare to their male students' counterparts. Table 4 reveals that only 10% of female enrolled and participated, in biology while only 33% female in biology, in chemistry while 31% of female in chemistry, 88% of male enrolled in physics while only 17% of female enrolled and participated. In summary, only 14% female students enrolled in Faculty of Pure Sciences in Federal University of Kashere, Gombe State from 2015 to 2018 academic sessions. This implies that female students' enrollment and participation in science and related disciplines was very low.

Discussion of Findings

The findings of this study reveal that female enrollment and participation in science and mathematics and science related programmes in education was very low in Federal University of Kashere, Gombe State. This implies that few women would be science educators, scientists, technologists, engineers and experts in mathematics in the society and have limited access to jobs in these fields. The finding corroborates with the studies of Iwu and Azoro, (2017), Ndrika and Agommuoh, (2017), who found out that female enrollment and participation in Science and Mathematics education is still very low in Nigeria for sustainable development. This might be as result of inadequate awareness and enlightenment from the government and their communities on the of significance of science, engineering, technology, mathematics and related courses.

Besides, the findings of the studies indicated that female students' enrolment in pure science and mathematics discipline was very low and not encouraging in Federal University of Kashere, Gombe State. The findings support the studies of Agommuoh and Ndirika (2017) that girls and women participation in STEM as a result of not exposing female students to their female

STEM experts, peers, fostering collaboration between STEM students (both boys and girls) and science museums that could create informal learning environment after school activities. The findings of this study also supported those of Dasgupta, Hunsinger & Scircle (2014) that undergraduate women enrolment and involvement in STEM programmes was low as a result of dearth of women role models that serves as professional motivation for girls and women in schools. May be female perceived science, mathematics and related disciplines to be challenging and tagged them to courses meant for male.

Conclusion

Based on the findings of this study, it is therefore concluded that girls and women enrollment to study science, mathematics and related disciplines in Federal University of Kasshere, Gombe State, Nigeria was low. This calls for concerted efforts on enlightenment of parents and society on change of attitude of females and challenge them to enroll into science, mathematics and related programmes that are termed as male professions.

Recommendations

Based on the findings, the following recommendations were made:

1. The society should be enlightened on the need to change attitudes on gender roles and capability the need to initiate affirmative actions for females in science and mathematics
2. The universities should be gender responsive, gender roles and the need to initiate affirmative actions for females in science and mathematics. The universities can always invite female role models to give talks to the students as a means of creating awareness for female enrolment and participation in science and mathematics.

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