

Gender Inequality in Science Education in Nigeria: A Review

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Abstract

The importance of science and technology in the development of any human society in modern times cannot be overemphasized. It is the fulcrum for national development and social transformation. It is therefore supposed to be developed fully in all facets and among all citizens, both genders inclusive, in order to have the required achievements. In most African societies however, it is developed in an unequal basis, with the female gender being at the losing end. This paper examines the issue of gender inequality in science education in Nigerian educational institutions. It examines the various causes- psychological, societal etc. which engendered this. It examines this in enrolments of students by gender and academic staff appointments in the science-related departments of tertiary institutions, using official statistical data. It concludes by suggesting ways of ameliorating the impasse.

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Introduction

Education is the method by which a society transfers from one generation to the next its knowledge, culture and values. The nature and the expected functions of education reflect the importance of education in any society. Education serves the society in various ways, which includes, to preserve, rediscover and transmit knowledge. It is a catalyst for bringing some radical change to existing culture, and for preparing the student for the future. Education has been concerned with the promotion of individuals' development and social welfare for long. The full benefits of education can be derived only when there is no bias in the gender concept a society holds. The need for gender complementarity goes beyond mere lending of helping hands for effective contribution to national development. The nature of the concept of gender in any society determines the existence and way of life of the members in that society. For effective change to take place, females must be encouraged to develop interest in all disciplines, especially in science and technology which has been known for long as the realm of men alone. For effective social transformation therefore there is need for both formal and informal education to address the gender imbalance in society that prevents females from being at their optimum best in the development race.

Gender Equality as Essential criteria for Development

The World Conference on Education For All (EFA) convened in Jomtien, Thailand, in April 1990. It declared the goal of basic education. It was affirmed by the conference delegates that education is a fundamental right for people, both women and men, of all ages throughout the world. The National Policy on Education in Nigeria (1998) also emphasize equal educational opportunities to citizens irrespective of their gender, religion, social class and ethnic affiliation. It emphasizes the study of science and technology by prescribing, emphasizing admission ratio to be 60% for science and technology and 40% for liberal arts in Nigerian universities. This is to comply with the requirements of gender equity i.e. to remove impression on gender sensitive professions that limit females to some certain vocations. Researches have revealed that there is still low participation of females in science and technology education, compared to male students. With the urgent need for sustainable development in developing nations, importance of sound basic education as a foundation for scientific and technological literacy, as well as for self-reliant development can not be over

emphasized. Rathgeber (1995) authenticated the fact that fewer women specialize in engineering and technology. These are issues that are often neglected but which require serious attention, to enhance rapid development and higher standard of living. The issue of scientific and technological educational development of Nigeria requires the input of both genders, and there is a need to enhance science education at all levels of education i.e. primary, secondary and tertiary level. Nigeria is a country that is highly endowed with human resources, a neglect or gender disparity in science and technology education will certainly result to partial use of the resources available. According to Akilaiya and Ogbene 2000; and Josiah and Archy, 2001, it has been established by different researchers that gender disparity exists in the Nigerian Educational sector in the last two decades. The need for science education in the development of nations has to be emphasized, in view of its role in every sphere of human endeavour.

Recognition of In-built Ability of Individuals

Okeke (1987), in a research work, identified the factors responsible for few women participation in science in Nigeria to be due to the expected role of women in the home, school and individual communities. This, according to Agholor (1994) plays an important role in determining the choice of careers. The culture of regarding the men as the bread winner for the family (Mensah, 1991) hinder easy participation that women would have enjoyed, as they are expected to manage the home front i.e. to keep the home, cook for the family and bear children while men are occupied with their various economic activities. Women activities are believed not to require any formal school education to accomplish. Societal attitudes towards female participation in some professions hinder women from showcasing their in-built ability and this draws the hands of the clock of development backwards. Gender equality ensures that all human beings are empowered, are free to develop their personal abilities and free to make choices without any limitation(s) occasioned by prejudices, cultural beliefs, rigid gender role and stereotypes. The disparities that normally occur such as ethical, religious and cultural beliefs are major issues that challenge access, participation and achievement of women, in the on-going race of development. It has resulted to increase in poverty and consequently slowed down economic growth and sustainable development of the country. According to the ABC of Women Workers' Rights and Gender Equality, "*Gender equality means that the different behaviour, aspirations and needs of women and men are considered, valued, and favoured equally. It does not mean women and men have to become the same but that their rights, responsibilities and opportunities will not*

depend on whether they are born male or female.” There should be no “glass ceiling” in science education for women. Therefore promotion of gender equality has been accepted as a means of reducing poverty and a way of improving health and standard of living. Gender equality is a prerequisite and also a strategy for achieving sustainable development. The introduction of “National Gender Policy” published in 2006 in Nigeria is to help to eliminate all forms of barriers that are still in place in terms of traditions, customs, sexual stereotypes of social roles and cultural prejudice. Achievement of these will lead to full participation of women on an equal basis with men in national development.

Nigeria and Science Education

All over the world, education has been seen as a catalyst for national development. The Nigerian government has also shown their recognition of this fact in Nigeria’s “National Policy on Education.” According to the policy which was published in 1977 (revised in 1981 and 1990,) “education was set as the greatest investment that the nation can make” (1981:6). It was also modified in 1995 and 1998 to address the needs of the nation and to support the government development goals.

Nigeria has identified education as a fundamental human right and shown her full involvement in being a signatory to major conventions for the protection of the rights of children and women. The 1998 modification of National Policy of Education stresses the importance of education for all in her Philosophy with respect to primary education. This emphasized equal access to educational opportunities for all citizens, both inside and outside the formal school System as paramount. While the second point also reechoes the Universal basic education provided to all citizens. One of the main goals of primary education is *sound basis for scientific and reflective thinking*, and this is reflected in the primary education curriculum. In order to achieve the Education For All (EFA) Goals, year 2004 saw the enactment of Universal Basic Education. This consists of six years of primary education and three years of junior secondary education, which amount to nine (9) years continuous education. Table 1 below shows at a glance the situation of primary school enrolment in Nigeria by sex since independence in 1960 to 1995. It reflects the race so far and the involvement of women in the elementary level of education in Nigeria for good thirty five years. Still women are yet to be visible in the education development struggle. Though it shows that sizable numbers of female were partaking in the education, their impact is not felt. In actual fact it is more or else stagnant as it has started moving up and down between 1975

and 1994. Even with this percentage range (37.1 to 44.5) in place, one would have expected that the input of these female would have been better felt.

Table 1: Primary School Enrolment Nigeria by Sex (1960-1995)

Year	Total	Male	%	Female	%
1960	2,912,618	1,829,471	52.81	1,083,147	37.1
1965	2,911,742	1,791,563	61.5	1,120,179	38.5
1970	3,515,598	2,216,000	63.2	1,299,598	37.0
1975	6,165,547	3,540,486	57.4	2,625,061	42.6
1980	13,760,030	7,789,786	56.4	5,970,244	43.4
1985	12,914,870	7,182,552	55.6	5,732,318	44.2
1990	13,007,249	7,729,677	56.8	5,877,572	43.8
1991	13,776,854	7,741,897	56.2	6,034,957	43.8
1992	14,805,937	8,273,824	55.9	6,532,113	44.1
1993	15,870,280	8,930,600	56.3	6,939,680	43.7
1994	16,190,947	9,056,947	55.9	7,134,582	44.1
1995	15,741,078	8,729,421	55.5	7,134,682	44.5

Source: Statistics Branch, Federal Ministry of Education, Abuja

The question is how many women make it to a useful end or have flair for science. Fraser et al. 1999 in their research work made it known that interaction inside and outside the classroom has significant effects on interest and achievement in science. The cultural norms and values of society have their own effects on the choice of subjects for males and females.

Table 2: Secondary School Enrollment in Nigeria by Sex 1990-1995

	1990	1991	1992	1993	1994	1995
Total Enrollment	2,901,993	3,123,227	3,600,620	4,032,083	4,451,329	4,448,991
Total males	1,661,468	1,821,307	1,979,045	2,182,034	2,419,782	2,354,713
Enrolment	(57.25%)	(58.31%)	(54.0%)	(54.0%)	(54.0%)	(52.9%)
Total female	1,240,525	1,301,970	1,621,575	1,850,049	2,031,547	2,094,279
Enrolment	(42.75%)	(41.69%)	(46.0%)	(46.0%)	(46.0%)	(47.1%)

Source: Statistics Branch, Federal Ministry of Education, Abuja

Table 2 shows improvement in female participation in education. It also established that majority of those that registered for primary education proceed to secondary level of education and create a kind of consistency in the report presented in the table 1 and table 2. These do not reflect the subject combinations of female students' option. At this end it could be assumed that majority drop /terminate their education at this secondary school level. With a decrease in the number of those that made it to tertiary education level, as shown in Table 3 below, different areas of studies ranging from Arts to Education to sciences were indicated. But the determinant factors of areas of interest are yet to be addressed. The wrong notion that

science was for males need to be corrected. It is important to note that social positions ascribed to a child in the society, to some extent determine their areas of interest, even in terms of education. Home orientations have major effect on a child's choice of subject. In majority of African homes, anything that requires repair or need to be mended is known to be for the male child, while those ones that require cleaning or caring attention are seen as females' responsibilities. The girl child grows with the formation of societal expectations, which continue to dictate her way of life, nature of work she could do, areas she could be seen, what she could say in the public to reflect her decency, etc. In Nigeria a good woman must not be inquisitive or curious about any thing. Inquisitiveness is for men and this is one of the requirements of science. Therefore for effective participation, home orientations need to be refocused to current requirements for development to meet the challenges of the future. Whereas the 1995 population distribution projected 6,282,999 of female secondary school age children, only 2,094,279 of them could make secondary level education Those tables above present only account of those children in school, whereas 4,185,720 of girls were not benefiting from secondary school education in that particular year. Therefore looking at the data at surface level will not give the correct situation of things in the educational sector. There is a need for proper teaching and handling of science subjects in secondary schools that will result to training of minds of students, which will erase the initial doctrine of gender stereotypes from females and males mind, and grant them understanding of the world around them. This will make them to yearn for acquiring appropriate skills, capacities, and competencies necessary for national development. By so doing both females and males will contribute meaningfully to the development

Assessment of female participation in science education in tertiary institutions

The report below (table 3) shows the number and percentage of women participation in tertiary institutions in Nigeria as of 1986/1987. This period witnessed low female participation in science education. The efforts of government in terms of National Policy on Education, establishment of different ministries to address educational issues, and different regulations to guide implementation, may not be productive, if proper attention to address the social factors that discourage female students from participating in science education are not addressed. The creation of special science schools, polytechniques, colleges and universities of science and technology are necessary but not sufficient enough to encourage female participation in science education. Societal values play important roles in determining the nature of choice female students will make as it has direct effect on the behaviour of the

child. Education is the starting point for women’s advancement in different fields of human endeavour. Making science education gender friendly, will allow full participation of the whole society, especially when the underlining causes – such as early marriages, local beliefs, norms that have negative influence on girls’ education, harmful practices, poverty, etc are dealt with. The better will it be for rapid development in this science age. The effect of this is not minimal as it will enrich human resources in the areas of science and assist Africa to take her rightful position and also be relevant in the global development issues.

Table 3: Number of Male – Female in Nigerian Universities by Faculty 1986/87 Academic Year

Faculty	Male	Female	Total	% Female
Administration	7492	1373	8869	15.47
Agriculture	7469	1618	9087	17.81
Arts	13543	6712	20255	33.14
Earth and Mining Sciences	495	66	564	11.71
Education	17419	10759	28178	37.18
Engineering Technology	11708	847	12555	6.75
Environment Design	4693	678	5371	12.62
Law	6955	2136	9691	23.50
Medicine / Health Sciences	7423	2433	9856	24.69
Pharmacy	1398	597	1995	29.92
Social Sciences	14046	3342	18288	18.27
Natural Sciences	15785	5414	21199	25.54
Veterinary Medicine	1144	148	1292	11.46
Basic / Remedial Studies	3167	846	4013	21.08
Total	113645	36968	150613	24.55

Source: National University Commission annual Report, Abuja (1987, P. 27).

With 33.14% of female in Arts, 37.18% in Education and only 6.75% in Engineering Technology, and 11.71% in Earth and Mining Sciences course, it is obvious that females in tertiary institutions have more flair for Arts and Education courses than science courses. Background initiation into what society expected of females play hidden roles in the choice of programme they make at university level and it is still haunting the female students. Questions of “where will I work?” “How will I make a home?” which employer is ready to take female in male dominated professions in their establishments” “where will I market my certificate?” “It is a male domain female must not go there” etc. All these are part of the hidden factors that discourage the female gender from science oriented courses. With the consciousness of modern scientific demands, the Nigerian government could not but act to

see that more science oriented policies and programmes in education are in place to favour both females and males.

Science courses like Medicine and Pharmacy as shown in the table 3 above reflect a fair representation of female students, compared with other science courses. Like a student remarked during an interview session for scholarship that she like caring for others and this aroused her interest in the Medicine course she is studying. The care aspect of women responsibilities are carried to the choice of course of study. What ever be the reason, it is a welcome development.

Year Table 4: Number of Male-Female in Nigerian Universities by Faculty (2003/2004) Academic Year.

Faculty	Male	Female	% female
Admin/Management Sciences	56217	28551	33.68
Agriculture	27755	12152	30.45
Arts	48946	25214	33.99
Education	64739	33992	34.42
Engineering / Technology	48332	12607	20.68
Environmental Science	22813	6922	23.27
Law	20949	12097	36.60
Medicine	27198	14791	35.22
Pharmacy	4150	2067	33.24
Science	92065	44606	48.45
Social Science	72133	36387	33.53
Veterinary Medicine	2517	695	21.03
Dentistry	1560	840	35.00

Source: National University Commission Data Bank, Abuja.

The 2003/2004 academic year report from National University Commission Data Bank in table 4, shows a remarkable improvement in female participation in science from 6.75% to 20.68% in Engineering Technology courses. The believe that women have less aptitude for science/ limited innate ability does not hold, as research has shown that there is no convincing evidence to support this (Handelsman, et al 2005, US National Academics, 2006). A study carried out by Hyde and Linn 2006 also made it known that both genders have similar psychological traits and cognitive abilities. The table 5 below reflects the picture of the situation as of 1993, which still call attention to the need of involving and encouraging women in science so that the full potentials will be tapped for national development. Dr. Rita Colwell, Director of the USA National Science Foundation (1998 to 2004) in her 2002 speech titled “Rethinking the Rules to Promote Diversity” made it known that the effect will be “a disastrous investment strategy in economic terms alone” this can be termed to mean

that a half use of human resource potential available will yield half result. Women must be visible even as role models for other females to emulate.

Table 5 Academic Staff in Science Departments of 10 African Universities by Rank and Gender, 1993

Country	Professors		Senior lecturers		Lecturers	
	Male	Female	Male	Female	Male	Female
Botswana	7	0	15	1	47	1
Ghana	73	1	136	17	294	40
Kenya	111	3	139	15	289	40
Lesotho	9	0	15	1	22	2
Malawi	24	1	45	7	64	13
Nigeria	134	6	169	25	174	38
Swaziland	6	1	18	0	42	11
Tanzania	56	2	101	3	137	10
Zambia	26	3	36	0	178	21
Zimbabwe	35	2	70	10	181	38

SOURCE: Rathgeber, 2002

Tables 5 reflect the gender situation in the academic settings of 10 African Universities by rank and gender. The data on female academic employment in 10 African Universities shows comparatively low rates of female employment especially at the senior staff level. The data also recorded that across the African Universities' academic staff under study, an average of 10.48% constituted women with as low as 2.8% in some Universities in Africa.

Botswana and Lesotho universities under study as at 1993 had zero female professors, Ghana with 74 professors had just one as female, while Nigeria with highest professor of 140 had six as female professor on the list. Possibility of having no female scientist professor is high.

From the highest level of academia to the lowest level, men dominated all positions. Throughout the rankings, there is no place where we have sizable representation of women, not to talk of equal representation of the two genders. This confirms the level of participation of women in science and technology education both in Africa and Nigeria in particular. This accounts for very few women in leadership positions in the University, and few women to encourage other young ones. There is need to encourage younger females especially female scientists that despite the challenges involved in the profession they can succeed. Mentorship is another way to get female scientists developed. Senior female scientists at the peak of the profession should train and mentor those at the lower levels to keep the female on board.

The National Board for Technical Education (NBTE)

As part of the attempt to encourage science education, different programmes were put in place by the Nigerian government under the National Board for Technical Education (NBTE), which was established in 1985. Three technical institutions were established to meet the needs of the society. They are vocational schools, technical colleges and polytechnics/colleges of technology/colleges of education (technical). One of the major challenges faced by this board is the perception of the public that the programmes are of inferior quality compared to those of Nigerian universities.

Table 6 Female Enrollment in Vocational and Technical Education 1991/92 Programs

Institution	Total number of students	Female Students	Percentage of Female Students (%)
FCE (T), Akoka	641	251	39.16
FCE (T), Asaba	245	136	53.54
FCE (T), Bichi	305	46	15.08
FCE (T), Gombe	1845	183	9.19
FCE (T), Omoko	616	272	44.16
FCE (T), Potiskum	433	150	34.64
TOTAL	4085	1038	25.41

Source: NCCE 1994

Table 7 - Female Enrollment in Science for 1991/92 Programs

Institution	Total number of students	Female Students	Percentage of Female Students (%)
FCE, Abeokuta	114	57	50.00
FCE, Ilaro	89	23	25.84
FCE, Katisna	85	22	25.88
FCE, Kantagora	189	48	25.40
FCE, Yola	134	58	43.28
FCE, Oyo Special	229	115	50.22
Adeyemi, Ondo (COE)	549	119	36.25
Total	1389	442	31.82

Source: NCCE 1994

Even at vocational and technical education programmes, the story is not different. The total enrollments of female students for the new intake of both the vocational and technical education programmes at six Federal Colleges of Education (Technical) and seven Federal

Colleges of Education used for this study for the academic year 1991/92 was 25.41% and 31.82% respectively. These still fall far below expectation.

Strategies for Overcoming Gender Inequality in Science Education

With all the efforts mentioned above that the government of Nigeria even with collaboration with international agencies have put in place, Nigerian women still suffer some constraints that prevent them from benefiting from all the laudable goals and objectives of education. These constraints affect their personal development and national development at large. To be able to overcome these barriers, certain strategies need to be in place.

Involving Women in Curriculum Censoring Board and Educational Policy Formulation

Females should be highly involved in the formulation of curriculum. This will allow them to take care of any gender bias that may be included either consciously or not in the curriculum in terms of textbooks and course contents. Curriculum formulators in the past were men. This might have been responsible for gender biases in some of the textbooks used in schools. There is no way men could take care of women interest effectively as women will do. Therefore women involvement both the policy and curriculum formulation will result to policies that address needs that are pertinent and responsive to women's issues.

Gender Sensitization and Advocacy

There is a need for government to sensitize the public on gender issues. This will give room for effective change of attitudes of both the society and the teachers in particular. This will also remove gender stereotype attached to some subjects/courses which discourages female students from science education. The combined efforts of policy makers, traditional and religious leaders as well as continuous sensitization of communities will promote science education among female students.

Execution of National Policy on Education (NPE) to Letter

It is very important that the execution of the clauses in the National Policy on Education (NPE) relating to equal opportunities for all Nigerians be genuinely implemented for advancement of the nation.

Teachers impact on girls' science education

A functioning strategy need to focus on those variables that could yield immediate positive effect. Therefore targeting school as a variable for effective change is not only feasible but also realistic and effective. For improved participation of females to takes place in science education, teachers' skills need to be developed. Not only to teach alone but also to address and combat any form of gender stereotypes that imposes on the development of female education. In-service education of teachers should be employed to enhance capacity building, so that regularly they will be updating their knowledge, both in teaching methodology and in the core content of their courses. There is need for teaching science and technology effectively to meet the needs of the Nigerian society. In this case the relevance of the science and technology curriculum to accommodate the changes needed in the school environment and for national survival in the global economy is important.

Planning, supervision and monitoring mechanisms

With this in place for the entire education system, the problems of management affecting the success of projects that have been either supported by international development agencies or put in place by the federal government would be adequately monitored for improved quality and expansion and for the implementation of the policies.

Conclusion

In conclusion, the reality of the situation requires that more women should be encouraged into scientific careers as it serves more than just bridging the gender gap. According to Handelsman (2005) *"heterogeneous group design more innovative solutions to problems than homogenous ones and bringing a higher level of critical analysis to decisions"*. Though National Policy on Education since 1981 recognize the importance of science and technology in the process of development and has made Science and technology part of the policy, and Federal Government of Nigeria also in collaboration with international agencies such as UNCEF, DFID worked in accelerating girls education which leads to introduction of different programmes such Girls Education Project (GEP) to boost girls schooling in the Northern part of Nigeria, Junior Engineers, Technicians and Scientist (JETS) was put in place to encourage science education, and Technical Teacher Training Programme (TTTP) for teachers preparation for technical training, there is still a need to utilize the human resources Nigeria has in abundance, in order to accelerate progress towards the MDGs, especially with respect to gender equity. Science education should be emphasized at all levels of education as it is essential for the fulfillment of its purpose in the national strategy for development. Part of

what is required to improve that process is public pressure and awareness to encourage more Nigerians to study science and technology.

Other programmes similar in nature to Girls Education Project (GEP) that will address science education should be introduced in the areas where girls are already taking part in education. Removal of some obstacles, such as societal attitude that discourage female education especially in scientific careers, sex stereotyping and selection of subjects by gender, will surely increase participation of women in science. This will not only lead to more productive teams, improved efficiency and better scientific outputs, but also lead to full potentials being tapped. And importantly, positive attitudes towards women empowerment on the part of all Nigerians would accelerate the process and make life better for all.

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