# MANAGEMENT STRATEGIES AND POLICY INITIATIVES FOR BRIDGING GENDER GAP IN SCIENCE AND TECHNOLOGY EDUCATION IN NIGERIAN HIGHER INSTITUTIONS OF LEARNING

**T. L. Adepoju**

*Obafemi Awolowo University, NIGERIA*

**Abstract.** Education is an essential instrument for the empowerment of girls and women. In the same manner, quality education designed for women and girls' immediate and strategic needs, builds their capacities and prepares them to occupy positions and creates opportunities for them in the public and private sectors in every society. The Millenium Development Goals (2000), the Education for All (1990), Dakar (2000) and the Beijing Platform as well as the most recent Sustainable Development Goals (SDGs) have consistently placed emphasis on the importance of education in promoting gender equality and advancement of women. In Nigeria, as in many developing economies, there is a gender gap in science and technology education with girl-child and women at a disadvantage state; this has led successive governments to introduce some interventions to address the issue at the basic, secondary and tertiary levels of education. Although, Nigeria educational reform as stated in the National Economic Empowerment and Development strategy (NEEDs) document also shows considerable focus on girls' higher education but one can say that up till now, a lot of Nigerian girls and women unlike their male counter-

parts are still not enrolled at the tertiary level. The paper examined issues relating to gender disparities and participation in science and technology education with a view to developing a model towards reducing the observed gender gap in higher institutions of learning in Nigeria. The paper also proposes the management strategies and policy initiatives that can be adopted to bridge the existing gender gap in science and technology education in order to achieve gender equity.

*Keywords:* gender gap, science, technology, management strategies, higher institutions

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**Introduction**

In all countries, education is now recognized as a major vehicle for promoting and improving the status of women. It has been realized that sustainable human development is not possible if half of the human race remains ignorant and marginalized (Okojie, 2002).

Education is an essential instrument for the empowerment of girls and women. No doubt, quality education designed for women and girls' immediate and strategic needs, builds their capacities and prepares them to occupy positions and creates opportunities for them in the public and private sectors. The Millennium Development Goals - 2000, Dakar -2000, the Beijing Platform and the Sustainable Development Goals (SDGs) have consistently placed emphasis on the importance of education in promoting gender equality and advancement of women. In spite of the many World declarations aiming at making gender parity in education a reality, gender disparities have continued to persist throughout the education system and particularly in higher institutions of learning. For instance, research findings (UNESCO, 2006) have shown that, data on enrolment, retention and transition revealed that, in many countries, girls and women lag behind boys in early childcare throughout primary, sec-

ondary and higher education and in non-formal and literacy education programmes as well (Adelabu & Adepoju, 2009).

Government has the prime responsibility for citizens' education and its education policy and budget indicate its level of engagement and determination to achieve the international goals related to gender parity, equality and women's empowerment.

There is no doubt that education contributes to the growth of national incomes and individual earnings. There is a postulation that the higher one's educational status, the higher the earnings particularly, in both the public and private sectors. This means therefore, that higher education is a critical factor to one's earnings and development and beyond this to efficiency.

It is important to recognize that women engage with Science and Technology (S&T) in their daily lives in a way that although, experiential and non-formal is nonetheless based in scientific and technological knowledge and precepts. This is an area of S&T in national development that has been largely ignored. The influence of gender on students' achievement in science has for a long time been a concern to many researchers and science educators. Many of them sought to determine whether it is true that there is male superiority in science achievement or not. The results obtained are varied (Adesoji & Babatunde, 2005).

Research and analysis on the effects of development on women – specifically technologies for development – have found that gender biases exist in determining who receives technologies and who receives the education, credit and other resources for technologies. These decisions are influenced by a number of assumptions. They include a tendency of governments and development agencies to treat technologies as neutral, value-free tools without taking into account the social, environmental and economic effects of the technology being introduced. Additionally, the assumption is often made that adoption of technologies naturally leads to development, while women's technological skills and use of technologies are often overlooked. Finally, research

has demonstrated that women do not have equal access to development resources – including credit, training and information (Kettel, 1995).

The Gender Working Group of the UN Commission on Science and Technology for Development found in 1995 that, as a result of these gendered perceptions, women's overall position actually *declined* relative to men after decades of S&T interventions in development, and *women have become disproportionately poor* in relation to the men in their communities (Kettel, 1995).

Women's S&T activities in their daily work is overlooked:

i. They engage in 60-100% of agricultural production activities in the developing world.
ii. Women tend to be responsible for the gathering and use of energy for cooking, as well as for water and sanitation needs in their communities.
iii. They are holders of much of the world's indigenous knowledge about medicinal and agricultural uses of plants and seeds, as well as food and medicine processing.
iv. They are providers of family health care.
v. Women make up 2/3 of non-formal sector producers and traders. (Gender Working Group, 1995).

According to the World Education Report, WER, 1995, there has been a long-standing imbalance in participation of women in formal education. Corroborating this position, Onsongo (2006) argued that, the consequence of this trend is that the literacy rate of the world's women (71.2%) is significantly lower than that of men (83.6%). Nearly two-thirds of the worlds illiterate adults are women (565 million), most of whom live in Africa, Asia and Latin America. Most scholars on gender studies agree that the elimination of gender disparity in education is necessary for the meaningful economic, political and

social development of any society. Over the last decade, international concerns on the situation of women in the world has generated and intensified campaigns for more equitable distribution of the world's resources between men and women (Onsongo, 2006). The impact of gender disparity underlies the statement that 'for too long, it was assumed that development was a process that lifts all boats, that its benefits trickled down to all income classes- and that it was gender neutral in its impact. Experience teaches otherwise' (Akubue, 2001).

In the past 10 years, the global science community has seen the "gender issue" come onto the agenda. With the outputs of the UN Commission on Science and Technology for Development, Gender Working Group in 1995, the World Conference on Science in 1999, Beijing Platform, the World Summit on the Information Society (WSIS), as well as initiatives by the European Union and now the OAS, international science policy bodies are recognizing the importance of including women in the international science initiative as equal participants, implementers and shapers of S&T, as well as recognizing their right to benefit equally from the application of S&T.

The context for this trend is the recognition that "the world is changing at a rapid pace, driven by science and technology (IAC, 2004)," and that despite the increasing rate of accumulation of scientific knowledge, the lesser-developed countries are not seeing the same benefits from increased scientific knowledge as the richest countries. The focus of the Inter-Academy Council, IAC is on national capacity building in science, technology and innovation, an area which has been neglected till date, and where much remains to be done. Its message is that unless developing countries create the indigenous scientific capacity to understand, engage in and contribute to international scientific research and innovation, they will not gain the capacity to apply and adapt science and technology for national knowledge-based development. Nor can they expect to naturally benefit from scientific innovation in other parts of the world, as past experience of technology transfer agreements and current intel-

lectual property provisions demonstrate. Science and technology are increasingly important for economic growth, and there are concerns that the "lagging" countries will continue to fall behind (Inter Academy Council, 2004).

In Nigeria, as in many developing economies, there is a gender gap in science and technology education with girl-child and women at a disadvantage state; this has led various governments to introduce some intervention strategies to address the issue at the basic, secondary and tertiary levels of education. Although, Nigeria educational reform as stated in the National Economic Empowerment and Development strategy (NEEDs) document also shows considerable focus on girls' higher education. But one can say that up till now, a lot of Nigerian girls and women unlike their male counterparts are still not enrolled at the tertiary level.

Achieving gender parity in education is one of the aims of the Millennium Development Goals (MDGs) and it is also a primary objective of the 1990 World declaration on Education for All (EFA) as well as the Dakar framework of action (2000) and the SDGs. But till date, gender equality still remains elusive most especially, in science and technology education in Nigeria.

According to UNESCO report (2006), girls make up 60% of all out of school children and women represents two thirds of illiterate adults, the Founder (2007) indicates that girls usually perform worse than boys in schools and that in some countries, one in every four girls drops out before fifth grade. Roughly, 85 per cent of boys complete primary school compared to 76 per cent of girls. Statistics also show that Nigeria belongs to the region with widest gap in education, both at enrolment level as well as the level of attainment. The initial gap is on inheritance from the colonial period while overall levels of education were low and gender gap, were considerably high (Klasen, 2002). The World Bank also observed that Nigerian has hidden growth reserves in its people, but especially the potential of women, who now provide labour force

in the economy. However, women lack equal access to education and factors of production.

The paper examined issues relating to girl-child and women participation in science and technology education in Nigerian higher institutions of learning with a view to **developing a model towards reducing the observed gender gap**. The paper also proposes the management strategies that can be adopted to bridge the existing gender gap in science and technology education in order to achieve gender equity.

From the discussions so far, the following observations and recommendations about girl-child and women education in respect to science and technology education were made: (i) that, there is gender inequality in the enrolment of male and female students in higher educational institutions in Nigeria; (ii) that, female participation rate is very low in science and technology education but fairly impressive in education and Art-based/Humanities disciplines; (iii) that, there is the need to motivate and encourage girl-child and women to study science and technology education in Nigeria; (iv) that, educational managers, planners, curriculum experts and government should design some intervention strategies to bridge the existing gender gap in science and technology education; (v) that, higher institutions of learning should re-design the contents and context of their curricula to motivate and encourage the study of science and technology education by girl and women.

**The role of universities in bridging gender gap**

The role of education in sustainable development and in the empowerment of individuals and groups to improve the quality of their lives in knowledge or learning societies has been stressed by many scholars (Olakulehin & Ojo, 2006; Gachukia, 2002). When any society is confronted with a problem, it turns to its universities for solution because universities as citadels of learning are the 'think tank' of any nation and are relied upon by the government to provide both advice and manpower to manage key organs of socie-

ty, and industries turn to them to develop new products and efficient personnel who will be capable of managing production units. The World Conference on Higher Education – 2003, identified higher education as a key function in the enhancement and the participation of women in national development. The Conference recognised various socio-economic, cultural and political obstacles that continue to impede women's full access to and an effective integration in higher education. Article 4 of the World Declaration on Higher Education for the 21st Century is very explicit on its demand for the elimination of gender stereotyping in higher education. It emphasised an increase in female enrolment and the elimination of political and social barriers to women's effective participation in policy and decision making, both in higher education and the society at large. Beside their traditional roles of generating knowledge through research, and providing leadership in the development of high-level human resources through education and training, universities are expected to assume responsibility for the articulation of gender equality and subsequent empowerment of women. This will enhance the participation of women in leadership and the transformation of the society. Onsongo (2006) therefore identified four key areas in which the university may play a role in enhancing gender equality:

> **Access:** Universities are called upon to develop new regulations or initiatives aimed at increasing the percentage of women, students and staff;
>
> **Inclusion:** Universities can ensure that the content of teaching, learning materials and language is gender sensitive. They can incorporate gender issues into various disciplines and expand research on gender;
>
> **Promotion:** Universities need to promote women to the higher academic and administrative positions which give access to decision making; and

**Climate:** The university climate has often been described as being 'chilly', 'unfriendly', 'non supportive' for women. Universities can introduce initiatives that create an environment friendly to women employees and students.

**Global analysis of gender participation in science and technology education in higher institutions**

Analysis of tertiary-level enrolments in science, engineering and technology subjects sees further evidence of a gender gap. In many regions, the participation of women in bio and life sciences has increased and continues to increase. Judith Glover refers to the "feminisation" of the biosciences in Europe, where women make up over 50% (2001), while in the US, primatology is dominated by women, who make up over 80% of the profession (Schiebinger, 2000).

At the same time, women's level of representation in "harder" sciences (such as physics and engineering) is persistently low around the world. In the US, for every 5-6 men who graduate from an engineering program there is one woman, and while the percentage of women in chemical and agricultural engineering is slightly higher, in electrical and mechanical engineering there are fewer women – less than 14% (National Science Foundation, 2003b). Similarly, to the situation in Europe, while women earn more than half of the baccalaureate degrees in biosciences in the US, they earn 21% of undergraduate degrees in physics. The numbers for computer sciences are especially concerning: in the US and Canada, female participation in the technology sector is declining. In 1985, women received 37% of all U.S. computer science undergraduate degrees, and by 2000, that number had fallen to 28%. At the top US schools, the number is now below 20%.

**Table 1.** Women's participation in science and in engineering, manufacturing and construction in selected countries

| Country | Science (% women) | Engineering, Manufacturing and Construction (% women) |
|---|---|---|
| Costa Rica | 40 | 28 |
| Mexico | 46 | 24 |
| Bangladesh | 29 | 10 |
| Brunei Darussalam | 51 | 38 |
| Cambodia | 21 | 1 |
| Georgia | 67 | 27 |
| Israel | 45 | 24 |
| Japan | 25 | 13 |
| Lebanon | 47 | 21 |
| Korea | 45 | 28 |
| Turkey | 43 | 24 |
| Eritrea | 4 | 2 |
| Ethiopia | 23 | 5 |
| Madagascar | 37 | 20 |
| Mauritius | 54 | 19 |

***Source:*** *UNESCO Institute for Statistics, 2003*

In Europe, male graduates tend to outnumber women graduates in science, mathematics and computing programmes (except in Belgium and Spain), and in engineering programmes. The average percentage of women graduates in science, mathematics and computing in the EU is 35.7%, down from 41% in 2000. National percentages range from 25.5% in the Netherlands to 49.8 % in Portugal. Women made up 20.6% of engineering graduates, although in real terms there was a decrease in head count from 1800 in 2000 to an estimated 1200 women in 2001. Germany has the lowest proportion of women engineering graduates, with 11.8%, and Italy the greatest proportion, with 34.4% (European Commission, 2003).

In the "Associated Countries" of the EU, the percentage of science, mathematics and computing graduates shows wider variation, ranging from 9.1% in Norway (down from previous years), to 66.7% in Cyprus. Most countries are in the 40% range. For engineering, the percentages are lower, from 13.9% in Norway to 28.6% in Latvia and Israel (with Bulgaria and the Czech Republic close behind at 27%). In summary,

i. poverty is a major factor in countries with high level of gender disparity in school enrolments where the gaps are closing, have closed or are reversing, gendered perceptions and stereotypes continue to direct choices;
ii. when they have opportunities for education, women take advantage of them and perform well;
iii. low performance of boys in some countries indicates the negative effects of masculine gender roles [violence ref];
iv. as education systems move towards gender parity and improved quality, girls tend to perform better than boys;
v. learning approaches in science education which emphasis informal learning, extracurricular activity, holistic approaches about subjects relevant to students' lives, with interactive and hands-on texting and curricula will improve the educational experience for both girls and boys; and
vi. Despite gains made for women's enrolment in STEM subjects, horizontal gender segregation continues, with women predominantly represented in health and biosciences, and poorly represented in engineering and physics.

The emphasis of education for women should not be only on general education but on specific science and technology education that will enable them harness the natural and economic resources available to them. This is

exactly what United Arab Emirate is doing. Available evidence shows that Nigerian investment in science related courses as technology, Science and Mathematics is 41%. This did not only affect the bias in school enrolment but also the output of educational institutions. Comparison of share of tertiary enrolment as shown in Table 2 indicates that Nigerian tertiary educational institutions are not Science and Technology oriented. The Table 2 shows that share of tertiary enrolment in Science in Nigeria is 1.8% compared with 62% in Singapore.

**Table 2.** Share of tertiary enrolment in science (%) 2000

| Country | Share of Tertiary Enrolment in Science (%) |
|---|---|
| Singapore | 62.0 |
| Sweden | 30.6 |
| Thailand | 20.9 |
| Developing Countries | 27.6 |
| Nigeria | 1.8 |

**Source:** computed from Human developing report

**State of gender participation in science and technology education in Nigeria**

Education empowers women and it is believed that if you educate a woman, you educate a nation. This is because educating girls, carries with it, a wide range of benefits for girls and women, their families and societies in general. It reduces poverty, promotes sustainable development and ensures human rights of all citizens. A woman that is educated to a higher level in particular, is looked upon positively by her society and community. She is empowered not only socially but also economically and politically (Adelabu & Adepoju, 2009).

A lot of other benefits are attached to women education particularly, if the breadth (skills development) and height (length of training) of her educa-

tion are high, her productivity is increased so also her earnings and savings. A married woman has improved family survival rate, improved education of her children, improved health for the entire family and improved her empowerment and therefore take up better jobs, right to decision making positions and complete on merit and with less emotions with men (Adepoju, 2011).

Government has made efforts to reduce gender gap particularly in secondary education. There is government affirmative action on women education believing that this will pave way for them to achieve higher education. For instance, some of the unity schools owned by the Federal Government of Nigeria are girls only. Invariably, this development has reduced to some extent gender gap in education, particularly secondary education, which invariably will affect enrolment at the tertiary level.

In spite of government efforts, there are still gaps due to problems. Other reasons include lack of capacity to monitor and mainstream gender issues into education programme and most importantly, lack of fund. There is also socio-cultural problem which hinder the full participation of girls in school, when funds are limited in the family, preference is given to educating boys over girls while girls are used to run errand at home and as caregivers in the family. Other socio-cultural problems include harmful traditional practices that affect girls emotionally and cultural practices such as early marriage and, in some cases where religion constraints girls for aspiring into higher status as boys.

There are other issues such as unwanted pregnancies, which often lead to dropout among others. The high incidences of pre-marital sexuality have more negative impact on girls rather than boys and in most cases has had effects on girl's education. Generally, female adolescence tends to commence sexual activities earlier than boys (Olukoya & Elias, 1996) and these sexual activities often have critical consequences, which tend to be more serious for girls than boys. When sexual activity results in pregnancy, there are negative consequences for female than males. It is the girls that are expelled from

schools and often terminate their education and they also face the shame and social cost of seeking clandestine abortion. Puberty and sexuality no doubt, add another layer to the challenge of achieving gender equality in education, and especially so in contexts where school girls are vulnerable to sexual violence, to unwanted pregnancy, HIV/AIDS and sexually transmitted diseases. These among other reasons have limited girls to higher education allover the world.

One distinct fact about women education in Nigeria is that, fewer women apply for entry into universities as a result of fewer girls completing secondary education. Of importance to note again is the fact that a smaller proportion of women applicants (as compared with male applicants) succeed in gaining admissions is a reflection of girls' relatively lower success rates in the senior certificate examinations (UNESCO, 2003). Expectedly, observations have revealed that these two factors have a direct influence on the status of women in society in terms of the jobs they do and the roles they perform.

**Table 3.** Primary school enrolment trends by gender

| Zone | Male | Female | Male | Female | Male | Female |
|---|---|---|---|---|---|---|
| | 1999 | 1999 | 2000 | 2000 | 2001 | 2001 |
| N-W | 2,439,394 | 1,305,565 | 2,625,139 | 1,398,670 | 2,633,666 | 1,416,318 |
| N-C | 1,543,844 | 1,212,431 | 1,645,660 | 1,311,918 | 1,606,316 | 1,299,326 |
| N-E | 2,024,592 | 1,303,248 | 2,190,877 | 1,423,002 | 2,501,140 | 1,518,955 |
| S-W | 1,508,920 | 1,524,932 | 1,551,084 | 1,585,721 | 1,421,266 | 1,455,031 |
| S-S | 1,470,785 | 1,444,329 | 1,606,711 | 1,580,627 | 1,638,758 | 1,628,751 |
| S-E | 1,070,899 | 1,058,071 | 1,125,657 | 1,113,373 | 1,130,896 | 1,134,481 |
| Total | 10,058,434 | 7,848,576 | 10,745,128 | 8,413,311 | 10,932,042 | 8,452,862 |

**Source**: FME (2003)

**Table 4.** Primary school gender gap

| Year | Total GER Males | Total GER Females | Gender Gap |
|---|---|---|---|
| 2000 | 105.3% | 85.2% | 20.1% |
| 2001 | 100.4% | 82.6% | 17.8% |

**Source**: FME (2003)

**Table 5.** Primary school net attendance rate

| Variable | Total NAR % | Male NAR % | Female NAR % | Difference Male-Female | GPI Female-Male |
|---|---|---|---|---|---|
| Urban | 69.5 | 71.0 | 69.0 | 3.1 | 0.96 |
| Rural | 55.7 | 60.2 | 51.1 | 9.0 | 0.85 |
| Richest 20% | 82.9 | 82.9 | 82.8 | 0.1 | 1.00 |
| Poorest 20% | 40.4 | 45.0 | 35.7 | 9.3 | 0.79 |
| **Total** | 60.1 | 63.7 | 56.5 | 7.2 | 0.89 |

**Source**: FME (2003); GPI = Gender Parity Index

The gender gap that begins in the primary school becomes a gender gulf at the tertiary level. For instance, Tables 3, 4 and 5 have shown that the enrolment of male is consistently higher than that of the female in the primary schools from 1999 to 2001 and 2003 respectively. No doubt, this development is bound to have a multiplier effect on the transition rate of pupils from primary school to junior secondary school and from junior secondary school to senior secondary school.

**Table 6.** Senior secondary education showing enrolment and GER 1996-2001

| Years | Years Total Enrolments, in 000s (Percentages in brackets) | | | Gross Enrolment Ratios (GER) | | |
|---|---|---|---|---|---|---|
| | Males | Females | Males/Females | Males | Females | Males/Females |
| 1998 | 984 (56) | 783 (44) | 1,778 (100) | 29% | 22% | 25% |
| 1999 | 904 (54) | 756 (46) | 1,660 (100) | *NA | *NA | *NA |
| 2000 | 997 (55) | 829 (46) | 1,826 (100) | 26% | 23% | 25% |
| 2001 | 1,116 (55) | 905 (45) | 2,021 (100) | 29% | 24% | 26% |
| 2002 | 1,188 (55) | 965 (45) | 2,153 (100) | 29% | 25% | 27% |

**Source**: FME Baseline and other FME data); *NA. = Not available

The information in Table 6 clearly shows the picture of actual and percentage increase of male enrolment over their female counterparts in senior secondary schools from 1998 to 2002. The information presented in Tables 3, 4, 5 and 6 indicated that gender gap exists in primary and secondary schools in Nigeria.

**Table 7.** JAMB admissions, 2001

| Institution | Admission | | |
|---|---|---|---|
| | Males | Females | Males/Females |
| Universities | 57,993 | 37,206 | 95,199 |
| Polytechnics | 15,444 | 8,508 | 23,952 |
| Colleges of Education | 3,542 | 5,421 | 8,963 |
| Total | 76,979 | 51,135 | 128,114 |

WAEC and JAMB 2001 Reports

**Table 8.** Total university students' enrolment 2004/2005

| | | |
|---|---|---|
| MALE: - 466159 | FEMALE: - 258697 | TOTAL: - 724856 |

**Source**: NUC (2006)

Table 7 shows the admission figures into higher institutions in Nigeria in 2001 (Universities, Polytechnics and Colleges of Education). The figures revealed a steady increase of male gender particularly in universities and polytechnics over the female gender (Table 7). Table 8 shows the students' enrolment in Nigerian universities in 2004/2005 academic year. From the table, there is a wide gap between male and female enrolment figures. This scenario has confirmed the statement that the gender gap that begins in the primary school becomes a gender gulf at the tertiary level

This fact is more illustrated in the statistical reports by the Joint Admissions and Matriculation Board (JAMB, 2000/2001 academic year). For instance, the reports showed that 42.5% of applicants for admission into Nigeri-

an Universities (198,819 out of 467,490) were women. However, out of the 50,277 admitted, only 19,006 (37.8%) were women. Women applications were very low for Engineering Courses (12%), both relatively high for courses in Administration (49.6%). A relatively high proportion of women secured admissions into the Faculties of Arts (57.7%) and Education (55%). For the other Faculties, the percentage of women applicants securing admissions were; agriculture (42%), engineering (16%), law (39%), medical sciences (39%), the pure sciences (39%), and the social sciences (35%).

**Table 9.** Gender disparity in technology and science education

| Academic Year | Type of Institution | Male/Female participation (by Numbers and Percentages) | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| 2000/2001 | Technical Colleges | 73,239 (81%) | 16,799 (19%) | 90,038 |
| 2000/2001 | Polytechnics | 111,468 (60%) | 74,612 (40%) | 186,080 |
| 1999/2000 | Universities (Science and Technology enrolment) | 147,836 (73%) | 53,989 (27%) | 201,825 |

**Sources**: NUC and NBTE Statistics; Adelabu & Adepoju (2008)

Female participation is a major problem in technology and science education as shown in Table 9. The rate of participation which favour male gender as led the federal government to establish science and technical colleges for girls only in order to close the gender gap.

In 2000, the ratio of admission in technology/science to arts/humanities programmes was 47:53. Enrolment in remedial programmes in 2000 was 14,359 out of which females were 4,657 (32.4%), i.e., about 3% of the enrolment in degree programmes. Statistics from other years that might indicate a trend are not available. The total output of the universities in 2000 is as shown in Table 11.

**Table 10.** Enrolment by field of study in universities in 2000

| Programme | Total Enrolment in 2000 | | |
|---|---|---|---|
| | M | F | Total |
| 1. Technology and science-based programmes | 147,836 (73%) | 53,939 (27%) | 201,875 |
| 2. Arts/Humanities programmes | 134,456 (58%) | 97,590 (42%) * | 232,046 |
| Total | 282,292 (65%) | 151,529 (35%) | 433,821 |

**Source**: NUC Statistics, 2003.

**Table 11.** Total output (Degree, Diploma and Certificate) of Universities in 2000

| Programme | Total Enrolment in 2000 | | |
|---|---|---|---|
| | M | F | Total |
| 1. Technology and science-based programmes | 18,057 (79%) | 4,863 (21%) | 22,920 |
| 2. Arts/Humanities programmes | 30,533 (69%) | 13,572 (31%) * | 44,105 |
| Total | 48,590 (72.5%) | 18,435 (27.5%) | 67,025 |

**Source**: NUC Statistics, 2003; * The percentage has shown that women are mostly found in Arts/Humanities-based courses in the Universities.

The indication in Table 11 is that females compete more with males in their participation in the arts/humanities (30,533 or 69% males to 13,572 or 31% females) than in the technology/science programmes (18,057 or 79% males to 4863 or 21% females). Also, the output was more (67%) in arts/humanities than in technology and science (33%) in 2000.

In sum, the analysis in Table 12 shows that the ratio of admissions in technology/science to arts/humanities was approximately 43:57 in 2001, i.e., the prescribed ratio of 60:40 is yet to be attained. The proportion of females admitted for technology/science is 30% as against 46% in arts/humanities programmes. The causes of the age-long disparities between males and females, on one hand, and between technology/science and arts/humanities programmes, on the other, are both social and economic. In other words, the Nige-

rian higher institutions of learning particularly, universities have not complied with full implementation of NEEDs policy document in relation to women higher education instead, emphasis is on basic education.

**Table 12.** University admission statistics by gender and programmes for 2001

| Programme | Total Enrolment in 2001 | | |
|---|---|---|---|
| | M | F | Total |
| 1. Technology and science-based Programmes | 28,521 (70%) | 12,231 (30%) | 40,752 |
| 2. Arts/Humanities programmes | 29,472 (54%) | 24,975 (46%) * | 54,447 |
| Total | 57,993 (61%) | 38,206 (39%) | 95,199 |

**Source**: NUC, 2001; * Impressive participation

**Table 13.** University admission statistics by gender and programmes for 2019

| Programme | Total Enrolment in 2019 | | |
|---|---|---|---|
| | M | F | Total |
| 1. Technology and science based Programmes | 244,023 (58%) | 176,685 (42%) | 420,706 |
| 2. Arts/Humanities programmes | 55,634 (45.9%) | 65,684 * (54.1%) | 121,318 |
| Total | 299,657 (55.3%) | 242,369 (44.7%) | 542,026 |

**Source**: NUC, 2019; * Impressive participation

Table 13 shows the analysis of male and female participation in both technology/science and arts/humanities programmes in 2019.The increase in the number of admitted students over the previous years is not unconnected with the increase in the number of the newly established public and private universities in Nigeria. By 2022, there are 202 universities in Nigeria (49 Federal, 54 State and 99 Private universities. This development has also increased

the number girls participation in technology/science related disciplines. It should also be noted that most of the private universities approved by the NUC and currently in operation are technology/science-based hence, the total number of admitted students for the programmes has increased astronomically. Table 13 has clearly shown the difference. In the same vein, the number of male students in technology/science programmes was 244,023 (58%) more than the female students which was 176, 685 (42%). It could be observed that in 2019, there was an impressive participation of female in technology/science programmes over the previous years. The performance of female was also more than the male in Arts/humanities programmes in 2019 (45.9% Male and 54.1% female).

**The need for gender parity in higher education**

Achieving gender parity in education has been a prime factor or principal objective of the 1990 World Declaration on Education for All, the Dakar framework for Action, the United Nations Millennium Development Goals (MDGs) endorsed in 2000 and the SDGs. Yet, gender parity remains elusive, with girls making up 60% of all out-of-school children (UNESCO, 2003-2006) and women representing two thirds of illiterate adults.[1)] Roughly, 85% of boys complete primary school compared to 76% of girls. Yet, education has been shown to trigger a wide range of benefits for girls and women, their families, and society in general. Educating girls is an investment towards reducing poverty, promoting sustainable development and ensuring the human rights of all citizens.

Education is recognized as important for the holistic development of the full potential of an individual (Herz & Sperling, 2004). These benefits are as valid for girls as for boys, giving both genders the tools and opportunities to make decisions and choices that impact on their lives. Moreover, education helps society to view women positively, thus creating the conditions for their empowerment and full participation in public and private spheres.

Investing in female education has been shown to improve women's social and economic status; increase their productivity, earnings and savings, improving family planning; improve child survival rates; raise enrolment and school participation rates for children; lower the incidence of HIV and AIDS infecting for all; and propel more women to decision-making positions (IIEP, 2007).

In the past, barring of women from higher education was considered gladly reasonable in many countries; indeed, it was the women who insisted on access to higher education that were considered unreasonable.[2)] In many countries, women make up not more than 20% to 30% of undergraduate students, and in others, their participation is extremely low.

**The reform initiatives of the federal government of Nigeria for gender balance in higher education**

The National Economic Empowerment and Development strategy (NEEDs) is Nigeria's plan for prosperity. It is Nigeria's home-grown reform and almost a national creed. NEEDs no doubt, recognizes education as the vital transformational tool and a formidable inducement for socio-economic empowerment. In other words, education is critical to meeting the goals set by NEEDs.

In relation to higher education, NEEDs document focuses on:

i. Increase in the percentage of senior secondary school and senior secondary technical school graduates who go on to tertiary institutions to 20 percent.
ii. Increase in the adult literacy rate to 65 percent.
iii. Reduce the number of cases of examination malpractice in educational institutions by 40 percent.
iv. Ensure that all tertiary institutions establish sustainable programmes of physical development.

In relation to women empowerment, NEEDs seeks to fully integrate women by enhancing their capacity to participate in the economic, social, political, and cultural life of the country and some of the measures designed to achieve the objectives have been spelt out in the NEEDs document. These are: (1) implementation of the provisions of the United Nations' Convention on elimination of all forms of discrimination against women; (2) promotion of access to micro finance and other poverty alleviation strategies, with a view to reducing poverty among women; (3) reduction of women's vulnerability to HIV/AIDS and other sexually transmitted diseases by empowering them through sustained advocacy, education and mobilization; (4) establishment of scholarship schemes at the secondary and tertiary levels to expand education opportunities for female students where necessary; (5) expansion of adult and vocational education programmes that cater for women beyond formal school age; (6) increasing the access of women, youth, and children to information on key national issues; (7) provision of social security for unemployed women, youth, and children.

**Some observed challenges**

In relation to gender inequality in science and technology education in Nigeria, the following challenges have been observed. Some of these challenges have always placed female at the disadvantaged position vis-à-vis educational development.

Traditional belief that male child usually performs difficult tasks better than female child:

- Early marriage/ pregnancy of female child;
- Female vulnerability to HIV and AIDs;
- Financial constraints;
- Cultural practices;
- Low participation rate from primary and secondary schools;

- Lack of capacity to monitor and mainstream gender issues into education programme for a long period of time; and
- The problems created by COVID-19 pandemic which made female highly vulnerable.

All these variables according to Adelabu & Adepoju (2009) are the reasons why most girls and women could not find themselves in higher institutions of learning in Nigeria. There is no doubt that any of the variables mentioned above could lead to dropout of girls from school and prevent them from gaining admission into higher institutions.

**Management strategies and policy initiatives for bridging gender gap in science and technology education in Nigeria**

There is the need to address specific obstacles to gender disparity in science and technology education. Towards achieving this objective, the following strategies and policy initiatives are required.

*Gender support*

i. Improve the decision-making mechanisms within the science system to ensure clear articulation of gender-specific needs and goals of society by incorporating end-user options, both those of women and men. Use decision-making techniques, such as technology assessment and decision framework analysis, that make the gender implications of the decisions explicit.

ii. Encourage political parties and governments to be more explicit in their policy platforms about how they intend to use "science and technology" to meet the basic needs of both men and women equitably in society.

iii. Encourage public media to sponsor popular science programming including reports on the potentials of science to serve goals of

society and the basic needs of the people; promote reporting on the impact of science on people's lives and in particular the differential impact of science and technology on men and women.

iv. Support NGOs working at the interface of gender in science and technology for development.

*Gender role in management*

v. Encourage the effective protection and sharing of the benefits arising from the use of the knowledge, innovations and practices of women of indigenous and local communities

vi. Identify and promote environmentally sound technologies.

vii. Integrate/ mainstream a gender perspective in the design and implementation of resource management mechanisms and production techniques.

viii. Increase the number of women scientists and technical advisers involved on environmental planning and programming.

ix. Support research on gender impact of environmental degradation and hazards.

*Research and decision making*

x. Integrate women, including indigenous women, their perspectives and knowledge, on an equal basis with men, in decision-making regarding sustainable resource management and the development of policies and programmes for sustainable development, including in particular those designed to address and prevent environmental degradation of the land.

xi. Evaluate policies and programmes in terms of environmental impact and women's equal access to and use of natural resources.

xii. Ensure adequate research to assess how and to what extent women are particularly susceptible or exposed to environmental degradation and hazards, including, as necessary, research and data collection on specific groups of women, particularly women with low income, indigenous women and women belonging to minorities.

xiii. Integrate rural women's traditional knowledge and practices of sustainable resource use and management in the development of environmental management and extension programmes;

a. Strengthen or establish mechanisms at the national, regional and international levels to assess the impact of development and environmental policies on women.

b. Provide technical expertise in these sectors

xiv. Integrate the results of gender-sensitive research into mainstream policies with a view to developing sustainable human settlements.

xv. Promote knowledge of and sponsor research on the role of women, particularly rural and indigenous women, in food gathering and production, soil conservation, irrigation, watershed management, sanitation, coastal zone and marine resource management, integrated pest management, land-use planning, forest conservation and community forestry, fisheries, natural disaster prevention, and new and renewable sources of energy, focusing particularly on indigenous women's knowledge and experience;

xvi. Develop a strategy for change to eliminate all obstacles to women's full and equal participation in sustainable development and equal access to and control over resources;

xvii. Promote the education of girls and women of all ages in science, technology, economics and other disciplines relating to the natural environment so that they can make informed choices and offer informed input in determining local economic, scientific

and environmental priorities for the management and appropriate use of natural and local resources and ecosystems;

xviii. Develop programmes to involve female professionals and scientists, as well as technical, administrative and clerical workers, in environmental management, develop training programmes for girls and women in these fields, expand opportunities for the hiring and promotion of women in these fields and implement special measures to advance women's expertise and participation in these activities;

xix. Identify and promote environmentally sound technologies that have been designed, developed and improved in consultation with women and that are appropriate to both women and men;

xx. Support the development of women's equal access to housing infrastructure, safe water, and sustainable and affordable energy technologies, such as wind, solar, biomass and other renewable sources, through participatory needs assessments, energy planning and policy formulation at the local and national levels;

xxi. Ensure that clean water is available and accessible to all by the year 2000 and that environmental protection and conservation plans are designed and implemented to restore polluted water systems and rebuild damaged watersheds.

Adelabu & Adepoju (2009) in their study suggested the following measures and mechanisms of increasing gender equality in higher institution of learning.

- Changing societal attitudes in favour of girls' education by motivating them;
- Provision/enrichment of school infrastructure to make them more girl-friendly;
- Gender awareness training for teachers and teacher trainers;

- Guidance, counselling and assertiveness training for girls;
- Enhancing the gender sensitivity in curricula, teaching-learning materials, and classroom processes;
- Support for existing women in basic science-based courses (mathematics, science and technology);
- Educational managers, planners, curriculum experts and government should design some intervention strategies to bridge the existing gender gap in science and technological education;
- Higher institutions of learning should re-design the contents and context of their curricula to motivate and encourage the study of science and technological education by girl and women.

Apart from the above, there is also the need to targeting and mobilise supports in the geo-political zones where the gender gulf is very critical. Supports for girls and women in very difficult circumstances should not be left out. Also important is the need for the promotion of the employment of women by government and private sector (Adelabu & Adepoju, 2009).

Government should also increase the job opportunities for young female 'starters' - vocational training. Government affirmative action towards increasing massive support for access to and quality education for girls should continue. Closing the gender gap in science and technology education necessitates more government efforts in the area of establishing more science and technical colleges for girls only.

Finally, there is the need for full implementation of NEEDs policy document by government and higher institutions particularly those that affect girls and women in relation to science and technology -oriented disciplines.

It is hoped that if all the above strategies and policies as proposed in this paper are put in place by the concerned stakeholders, gender gap/gulf in science and technology education in Nigerian higher institutions would be reduced.

**Summary and conclusion**

This paper has addressed the issue of gender gap in science and technology education in Nigerian higher institutions of learning. The role of universities in bridging gender gap as well as global analysis of gender participation in science and technology education in higher institutions was discussed. The paper also discussed the state of gender participation in science and technology education in Nigeria. The need for gender parity in higher education was also stressed while the reform initiatives of the federal government in respect to gender balance were revisited. A list of some challenges facing gender equality in science and technology education was also highlighted. Finally, some management strategies and policy initiatives for bridging gender gap in science and technology education in Nigerian higher institutions of learning were discussed.

The paper concludes that there is gender gap in science and technology education in Nigerian higher institutions of learning. For this reason therefore, it is very expedient for the government and other stakeholders to ensure that this observed gender gap is addressed .

NOTES


1. Dakar, FFA (2000). – http://.www.unesco.org/education/efa

2. Federal Ministry of Education (2002). *Baseline 2001: A handbook of information on basic education in Nigeria*. Lagos: Federal Government Press.

3. Federal Republic of Nigeria (2003). National economic empowerment and development strategy (NEEDS) document. Lagos: Government Press.
4. Gender Working Group (1995). "Taking action: Conclusions and recommendations of the gender working group." In *missing links: Gender equity in science and technology for development*. Ottawa: International Development Research Centre.

5. International Institute for Educational Planning (2007). Newsletter UNESCO-Paris: Vol. X X X V, No1 (January – March)

6. JAMB (2001). Applications and admission into Nigerian tertiary institutions from 1990/1991 to 2000/2001

7. JAMB (2003). Applications and admissions into Nigerian tertiary institutions (2000/2001 to 2001/ 2002).

8. JAMB (2006). Total university students' enrolments for 2004/2005 academic session.

9. The West African Examinations Councils (2001). Statistics of results.

*10.* UNESCO (2002). *L' education pour tous-dossier d' information's. Paris- Unseco.*

11. UNESCO (2003a). A report on the 2003 FME/UNESCO/private sector round table on "Building momentum to eliminate gender gaps by 2005" Abuja Office UNESCO.

12. UNESCO (2003b). Higher education in Asia and the Pacific, 1998-2003. Regional report on progress in implementing the recommendations of the 1998 World Conference on Higher Education. Asia and Pacific Regional Bureau of Education. Paris.

13. UNESCO (2003). Women's participation in science and in engineering, manufacturing and construction in selected countries. *Unesco Institute for Statistics.*

14. UNESCO (2007). 'Higher education poverty and development'. IIEP Newsletter Vol. XXIV No. 4 (Dec) UNESCO-Paris.

15. UNDP (2002). Human development report (Sources from internet)

16. UNICEF (1995). The women's equality and empowerment framework: Training manual

17. NUC (2001). University admission statistics for 2001

18. NUC (2003). University admission statistics for 2003

19. NUC (2006). Reports of the graduate and postgraduate output by discipline in Nigerian universities.

20. NUC (2001). University admission statistics for 2019

21. Wrigley, J. (Ed) (1992) *Education and gender equality* London: The Falmer Press

22. www// women education and economic participation / Hilany lips,

23. www.un.org/ womenwatch / forums / review / education

24. http.// www pdhre.org / rights/women girl – child.html

25. http.// www. Ungei.org/infoby country /ghana-660.html.

26. http.//www.eye-net.org/features/ft-girlchild.html…

27. https://www.savethechildren.net/sites/default/files/libraries/state-of-the-worlds-fathers_12-june-2015.pdf

28. https://www.sites.radford.edu/~hlips/Addressestalks/nz/keyecon.htm

29. https://www.ojcs.siue.edu/ojs/index.php/ijaaas/article/view//66/133.

**REFERENCES**

Adelabu, M.A. & Adepoju, T.L. (2009). Women and higher education: implications for sustainable development. *East African J. Educ. Res. Policy, 1*, 15-36.

Adepoju, T. L. (2011). Managing non-formal education programmes towards improving employment rate in Nigeria. *J. Continuing, Open & Distance Education, 1*(2), 1-17.

Adesoji, F.A. & Babatunde, A.G. (2005). Expressive teaching behaviour: bridging the gender gulf in secondary school chemistry achievement. *Int. J. African & African American Studies, 4*(1),54-61.

Akubue, A.I. (2001). Gender disparities in third world technological, social, and economic development. *J. Tech. Studies*, *27*(2), 64-73.

FME [Federal Ministry of Education]. (2003). *Education sector status report* Abuja: Government Press.

Gachukia, E.W. (2002). The role of higher education in empowering women in eastern Africa - keynote address given at the regional training workshop for women and higher education management at the catholic of eastern Africa, Nairobi, 16 -22, June.

Herz, B. & Sperling, G.B. (2004). *What works in girls' education: evidence and policies from the developing world*. New York: Council of Foreign Relations.

IAC [Inter-Academy Council]. (2004). *Inventing in a better future: a strategy for building worldwide capacities in science and technology*. Amsterdam: Inter-Academy Council.

Kettel, B. (1995). *Missing links: key paths for science and technology*. Ottawa: International Development Research Centre.

Okojie, C.E.E. (2002). Gender and education as determination of household poverty in Nigeria. *World Institute for Development Economics Research and Discussion*. Paper No. 2002/37.

Olakulehin, F.K. & Ojo, D.O. (2006). Distance education as a women empowerment strategy in Africa. *Indian J. Open Learning*, *15*, 271-280.

Olukoya, A. & Elias, C. (1996). Perceptions of reproductive tract morbidity among Nigerian women and men. *Reproductive Health Matters. 7*, 56-65.

Onsongo, J.K. (2006). Gender inequalities in universities in Kenya (pp. 31-48). In: Creighton, C. & Yieke, F. (Eds.). *Gender inequalities in Kenya*. Paris: UNESCO.

Schiebinger, L. (2000). Has feminism changed science. *Feminisms Millennium, 25*, 1171-1175.

UNESCO (2003). *Women's participation in science and in engineering, manufacturing and construction in selected countries*. Paris: UNESCO.

UNESCO. (2006). *Global education database* (October). Paris: UNESCO.

WER [World Education Report]. (1995). *The education of women and girls; challenges to pedagogy; education for peace human rights and democracy*. Evans: Oxford University Press.

✉ T. L. Adepoju
Department of Educational Management
Obafemi Awolowo University,
Ile-Ife, Osun State, Nigeria
E-Mail: adepojutl@oauife.edu.ng