

# **SUSTAINING SCIENCE, TECHNOLOGY AND MATHEMATICS TEACHER EDUCATION THROUGH GENDER MAINSTREAMING**

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## **ABSTRACT**

Empowerment of women to ensure equality between women and men for achieving sustainable political, social, economic, educational, cultural and environmental development through Science, Technology and Mathematics Education is a global issue in the world today. From a teacher perspective, this paper attempts to explain the concepts of science, technology and mathematics education, sustainable development, and gender mainstreaming, and how gender mainstreaming of science, technology and mathematics teachers can bring about sustainable development.

## **KEYWORDS:**

## **INTRODUCTION**

The startling events of the past few decades world wide bear eloquent testimonies to the growing demands for sustainable development. At the international scene, the 1972 Rio Declaration of Environment and Development and the articulation of Agenda 21 plans of action for sustainable development, the 1990 Gointien Declaration on Education for all (EFA) by the year 2000, and the World Summit for Children's Goal and Development in the 90s are all initiatives to achieve sustainable development. The effort towards building sustainable development through science, technology and mathematics education and gender mainstreaming are also evident. The Fourth United Nations Conference for Women at Beijing in September 1995 and its emphasis in equalizing opportunities for men and women are firm acknowledgment that gender mainstreaming is one of the important ways to build sustainable, just and developed society. The Beijing document stated in clear term that "empowerment of women and equality between women and men are prerequisites for achieving political, social, economic, cultural and environmental security among all peoples" (Beijing, 1995).

At the local scene (Nigeria), a lot of initiatives have been put in place to among other things, remove:

- (i) inequality in economic structures and policies, in all forms of productive activities and access to resources;

- (ii) inequality between men and women and the sharing of power and decision making at all levels;
- (iii) stereotyping of women and inequality in women's access to and participation in all communication systems;
- (iv) gender inequalities in the management of natural resources and in the safe guarding of the environment;
- (v) inequalities and inadequacies in and unequal access to education and training; and
- (vi) persistent discrimination against and violation of the right of the girl child.

The imports of STME is building sustainable development have also been recognized. For instance, Harare Declaration on Science and Technology of 1982, and the National Policy on Education position on admission ratio of 70% science and 30% humanities for University and 60% science and 40% humanities for Colleges of Education are evidences. The policy also appreciates the importance of the teacher education in general and the science, technology and mathematics teacher in particular to sustainable development when it declares that, "no education system can rise above the quality of its teachers" (FRN, 1998).

This paper attempts to explain: (1) the concepts of Science, Technology and Mathematics Education, Sustainable Development, and Gender Mainstreaming; (2) how gender mainstreaming can bring about sustainable development in the specific areas of science, technology, and mathematics education; and (3) summary and conclusion.

### **CONCEPT AND SCOPE OF SCIENCE TECHNOLOGY AND MATHEMATICS, SUSTAINABLE DEVELOPMENT, AND GENDER MAINSTREAMING.**

The terms Science, Technology and Mathematics are now used generically in all fields of human endeavour. This is because, their study is fundamental to human existence and development. In the strict sense, Science refers to the acquisition of knowledge by systematic study of nature using observation, experimentation and formulation of descriptive generalization (why things happen). Technology on the other uses science to make things happen, and Mathematics (the Queen of Science) provides very concise and efficient language for science and technology.

Our numerous problems today such as poverty, hunger, unemployment, corruption and disease are known to have been alleviated by scientific and technological breakthroughs/innovations. In short, today's world economy is being driven by science and technology discoveries. The confines of Science, Technology and Mathematics are explicitly listed in the National Policy on Education (FRN, 1993).

The phrase "Sustainable development" has been as old as the cradle of civilization. It is the ability of a development process or a system to achieve a long-term stable gains in productivity while maintaining or even cowbanging the quality of resources base. Therefore in a more specific term, Anosike and Aiyepoku (1995) observed that sustainable development deals with "the management and conservation of the national resource base and the orientation of technological and institutional change ..." whose essence according to Ugwuanyi and Oluchukwu (1997) "... is to ensure the continued attainment and satisfaction of human needs without further destroying the world's finite resources without compromising the world's carrying capacity". It is a kind of process in which economic, trade, energy, agriculture, and industrial policies are all designed to bring about development that is economically, socially, and ecologically sustainable (UNDP, 1992). In other words,

sustainable development ensures that a society achieves its long-term objectives not only for the benefits of the current generation but also for future generations since continued productivity increase are largely a critical element of sustainable development. In most part of the world today, discussions are centered on how the entire world will attain sustainable development in all the sectors of human endeavour with the hope of ensuring that the world eco-systems are at peace with their environment.

From creation men and women were differentiated by the appearance of genital organs (basic biological difference). This basic biological difference is called sex. Based on this biological (sexual) differences, role plays shaped by ideological, historical, religious, ethnic, economic and cultural determinants. Moser, 1989) are assigned to either males or females, hence, the word "gender". Gender therefore, refers to the social relationship between men and women and the roles they play in society which are socially, not biologically constructed, manifested differently and change over time. Gender differs from sex because, while sex refers to the basic biological differences between male and female evidenced by the appearance of genitals, gender refers to the cultural categories of masculinity/femininity hinged upon the biological division. Even though, this difference exist, there is some interlinks between sex and gender. These interlinks give rise to gender identity (a person's self-concept) and gender role (societal expectations of one's role according to one's gender).

Gender disparity in all sectors in now well documented. Over the past one decade, gender issues have become major challenges for humanity. There are evidences of growing agitations for gender main streaming in all sectors of the world economy. The reason being that gender main streaming is since qua non to sustainable development.

Gender mainstreaming by definition is the process of assessing the implications for women and men of any planned action, including legislation, policies or programmes in all areas at all levels. It is strategy of making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programme in all political, economic and societal spheres so that women and men benefit equally, and inequality is not perpetuated.

From the foregoing, it is evident that gender main-

streaming is a gender approach which seeks to consider any aspect of development, any policy or any strategy from the position of both men and women. It is a very simple concept. All information, all statement, all statistics are gender dis-aggregated. Gender approach ensure that the aims and objectives of any service, programme or project are gender specific. Progress towards achieving the gender specific outcomes in monitored and evaluated in relation to both men and women. By gender mainstreaming, women are no longer "an added on" component or competing priority, but an integral part of all development initiatives.

**THE IMPORT OF GENDER MAINSTREAMING IN BUILDING SUSTAINABLE SCIENCE, TECHNOLOGY AND MATHEMATICS TEACHER EDUCATION AT THE N.C. E LEVEL.**

As earlier stated, gender disparity in all sectors is now well documented. Statistics on educational levels of males and females show an equally depressing picture. Numerically, the ratio between men and women is slightly in favour for women, yet women are poorly represented in many sectors especially, in science, technology and mathematics education. Many scholars argue that the disparity in access to educational opportunities is not accidental mismanagement, but is a component of the continued maintenance of the patriarchal system.

Patriarchal system according to Kamla Basin and Nighat Said Khan (1991) is a social system where "the father controls all members of the family, all economic resources and make all major decision ..., and the belief of the ideologist that men are superior to women that women are and should be controlled by men". Irrespective of whatever argument in favour of the persisting gender disparity in all sectors of our economy, the fact remains that the reasons for gender disparities are not clear.

The table 1 in the appendix gives some analyses of gender dispositions of enrolments in Colleges of Education in Nigeria in five fields of study, namely: Arts and Social Sciences, Languages, Vocational and Business, Science and Technology, and Education for 1997/98; 1998/1999; and 1999/2000 academic sessions. The analysis in table 1 shows that:

- (i) for the three years males dominated the females in science, technology and mathematics in the Colleges of Education;
- (ii) females participants were generally higher than that of their male counterparts in Languages, Vocational/Business, and Education; and
- (iii) female participation rates appear to be generally higher than that of the males.

**TABLE 1: SUMMARY OF STUDENTS' ENROLMENT IN THE COLLEGES OF EDUCATION IN NIGERIA IN FIVE AREAS FOR THREE YEAR**

School	YEAR/SEX								
	1997/98			1998/99			1999/2000		
	MF	F	FPR	MF	F	FPR	MF	F	FPR
Arts/Soc. Soc.	42191	20275	48.1	37544	18631	49.6	34522	17136	49.1
Languages	18198	10163	55.8	17480	10196	58.3	21875	12747	58.3
Voc/Bus.	18073	11439	63.3	22509	13846	61.5	29365	17011	57.6
Scs./Tech.	21750	9011	41.4	18605	8369	45.0	27885	12293	44.2
Education	8491	5062	59.6	10194	6103	59.9	12210	5793	47.4
Total	109703	55950	51.0	106332	57145	53.7	125857	64980	51.6

This picture is not true in the area of Science, Technology and Mathematics. The table 1 also shows that course offerings in Colleges of Education can be classified along the fourfold androgyny classification (See Fig. 1)

The concept of androgyny holds the idea that some people can simultaneously have both feminine and masculine characteristics. The idea of androgyny came from gender scheme theory - a challenge against the traditional notion of femininity and masculinity by psychologists to ascertain how people see gender in relation to their own personality and the relative balance

of their feminine and masculine characteristics (Bem, 1974; Spence, Helmreich, and Stapp, 1975).

From Fig. 1, two outcomes (masculine sex-typed and feminine sex-typed) represent significant differences in the proportions of masculine and feminine characteristics. Table 1 shows that Sciences and technology tend to belong to the masculine sex-typed. The other outcomes in fig. 1 in the appendix suggest a relative balance between masculine and feminine characteristics. Those who are relatively high on both scales are classified as androgynous; while those who are relatively low on both scales are classified as undifferentiated.

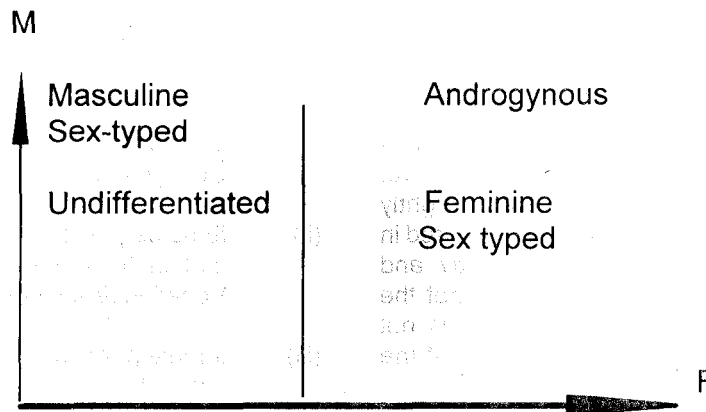


Fig 1: FOUR FOLD ANDROGYNY CLASSIFICATION

Table 3 in the appendix shows the relative ratios of the students admitted during the three years. We can deduce from the table that:

- (i) men are more represented (masculinity or masculine sex-typed) in Science and Technology;
- (ii) women are more represented (femininity or feminine sex-typed) in vocational/business;
- (iii) both men and women have low representation (undifferentiated) in languages and education; and
- (iv) both men and women have relatively high representation (androgynous) in Arts and social sciences.

Table 2 shows that the admission policy of 40% for Science/Technology and 60% for Humanities was never met for the three years for both male and females students.

Many reasons have been advanced for the persisting gender disparities in many sectors of our economy but it has been observed (Lassa, 1976) that these disparities in the specific areas of Sciences, Technology and Mathematics could be abridged now that:-

- (i) the decline of heavy industry requiring much physical strength in the work plan and with advances in technology requiring more of intellectual talents, aptitude and interest rather than brawn, biological sex seems to have diminished in the occupational world; and

**Table 3. AGGREGATE ADMISSION RATIOS IN THE FIVE SCHOOLS FOR THREE YEARS ACCORDING TO SEX**

	YEAR/SEX					
	1997/98		1998/99		1999/2000	
	%M	%F	%M	%F	%M	%F
Arts/Social Science	41.54	38.24	38.45	32.60	28.56	26.37
Languages	15.23	18.16	14.81	17.84	14.99	19.62
Voc/Bus.	12.58	20.45	17.61	24.23	20.29	26.18
Science/Technology	24.15	16.11	20.81	14.65	25.62	18.92
Education	6.50	9.05	8.32	10.68	10.54	8.91

**TABLE 2 : AGGREGATE ADMISSION RATIO IN HUMANITIES AND SCIENCES/TECHNOLOGY FOR THREE YEARS**

CLASSIFICATION	YEAR/SEX					
	1997/88		1998/99		1999/2000	
	MF	F	MF	F	MF	F
Sciences/Technology	21750	9011	18605	8369	27885	12293
Humanities	87953	46939	07727	48776	97972	52687
% Science/Technology	24.7	19.2	21.2	17.2	28.5	23.3

(ii) integrating a gender dimension into our programmes changes our perception of women's role play and makes us realize that social gender is not naturally given but could be learned.

**SUMMARY/CONCLUSION**

There is no doubt that if the issue of gender disparities in all sectors of our economy is not addressed properly in good time, its resultant effects could truncate national development. It is in line with this observation that this paper tried to address the matter as it affects Science, Technology and Mathematics Teacher Education at the NCE level and proffers the following recommendations.

- Provision of free education at least to the level of free tuition for intending STM female teacher educators;

- Provision of child care facilities to "free" girls and women who are undergoing S.T.M. teacher education programme;
- Provision of awareness programmes on the education of girls as S.T.M. teacher educators;
- Breaking the myth that women are not naturally cut out for the study and pursuit of a career in science, technology, and mathematics, usually grounded in cultural norms and unjustified prejudice and stereotyping;
- Our traditions, cultures, beliefs and orientation that strengthen sustainable development of S.T.M. teacher education should be maintained while those that mitigate against their survival should be reconsidered.

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