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RESEARCH PAPER

Gender Issues in Science and Technology: A Study

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ABSTRACT

Science and Technology are veritable tools for the development of any nation. However, the presence of women in the fields of Science and Technology remains significantly lower than for men. This paper focuses on gender participation in the teaching and learning of Science, Technology and Mathematics. It also considers factors militating against female's participation in Science and Technology. Intervention strategies to salvage the situation are stated in order to encourage gender equality for nation building.

Key words: *Gender Issue, Science, Technology*

INTRODUCTION

Science is a body of empirical, theoretical and practical knowledge about the natural world, produced by scientists who emphasize the observation, explanation and prediction of real world phenomena. Technology deals with how man manipulates the natural world to improve his way and quality of life. It constitutes the totality of the use and application of his knowledge, skills, tools and materials. Technology plays a fundamental role in wealth creation, improvement of the quality of life, real economic growth and transformation in any society. For example, the United Kingdom and France benefited tremendously from the industrial revolution in the 19th century, and the United States emerged from an agrarian economy into an industrial superpower in the 20th century. Taiwan and Korea became industrialized countries by exploiting advances in silicon microelectronics from the early 1960's. Most recently, China and India have emerged as industrial leaders in manufacturing and information technology respectively. All of these countries invested quite heavily in people and factories, and their successes are based on carefully designed plans and strategies. Unfortunately, in many, if not all, of the underdeveloped countries, technology is viewed as a consumable item, not something that can be produced or created. Technology is the primary engine of economic growth and provides the key to unlocking any country's potential. Hence, countries that want to develop must invest significantly in Science and Technology. This is achieved by developing the talent, the human capacity required to compete in globally competitive world.

GENDER PARTICIPATION IN THE TEACHING AND LEARNING

Gender Issues in the teaching of Science, Technology and Mathematics relates to under representation of females in the professions (Balogun 1994). There are sex-related differences in the teaching and learning of Science, Technology and Mathematics (Kelly 1978, 1981; Osibodu 1985, Amara 1985 and Marangu 1985) Studies have shown that more boys than girls are favourably disposed to Science and Mathematics (Balogun 1985) and that there is larger representation among boys than girls in the science based programmes including Agriculture and Zoology, whereas both sexes appear to be better represented in medicine (Balogun 1987). With respect to technical subjects, boy's preferences included electronics, auto mechanics, technical drawing in that order –with local crafts and wood work ranking last. The order for girls was technical drawing, local crafts, electronics, woodwork and auto mechanics (Balogun 1984).

At the university level, Nigerian men dominate the Science and Technology fields, most especially in Agricultural and Forestry Engineering, Mechanical Engineering, Petroleum Engineering and

Veterinary medicine. Women are mostly in Nursing and Human nutition (Balogun 1985, 1987). Williams (1987) and Yoloye (1990) have also showed that enrolment in Engineering / Technology courses in Nigerian Tertiary Institutions is generally low.

In the report of Yoloye (1989), it was stated that the percentages of females participating in Natural Science, Mathematics, Applied Science and Technical subjects are lower than those of males except in Home Management, Food and Nutrition and Health Education. In achievement, for Natural Sciences, performance is generally in a descending order for Chemistry, Physics and Biology. In general, Elementary Mathematics is one of the three poorest subjects in terms of performance, followed by Biology and Health Science. For Applied Science, Home Management and Food and Nutrition recorded the best performance followed by Agricultural Science while Health Science had the poorest. Males consistently perform better than females even in the so-called 'female subjects'. Performance is poorest in Technical drawing. In the year 1983 that there were female individuals in woodwork and metal work, the performance of females was better than that of males in these so-called "masculine" subjects. In technical drawing, however, the performance of males was consistently better than that of females Performance at secondary school level obviously determines to a large extent the pool of women candidates for Science and Technology in higher institutions as well as in employment. Participation and achievement are therefore, closely interwoven and intervention strategies have to address both issues (Yoloye 1994).

Akinde (1994) carried out a study on the participation of women in the teaching of science and technology-related subjects at the secondary school level. It was revealed that women are under-represented in the teaching of science and technology subjects. They constitute a mere 12.3% of the total number of science teachers. The proportion is lowest for technical subjects (1.7%), followed by Physics (6.7%), then Mathematics (10.3%) and Chemistry (15.2%). The teaching of technical subjects, Physics, Mathematics and Chemistry appears to be more male-dominated than Biology, where 23.6% are women. In other words, there appears to be a greater representation of women in Biology teaching.

FACTORS MILITATING AGAINST FEMALES PARTICIPATION IN SCIENCE AND TECHNOLOGY

Socialization process which women undergo from infancy affects their interest in science and technology related subjects and career. In a culture where girls are protected and discouraged from explorative and risky activities and boys are encouraged to be assertive and challenge their mental powers, certain personality characteristics would be regarded as masculine or feminine. These personality characteristics affect the attitude of girls towards science and technology –related subjects and career.

Duncan (1989) as cited in Balogun (1994) proposed a conceptual model which attempts to show how gender –typing affects science performance. The model suggests that gender-typing of school science influences achievement indirectly and predicts that girls who are high on masculine gender-tying of science tend to perceive it as difficult, and thus may show little or no appreciation for its relevance to their future lives. Duncan found that gender-typing of science and school science has a small but identifiable indirect influence on science achievement and participation for both boys and girls. Generally, the impact is negative and small for girls, while it is positive and large for boys. On the whole, boys and girls model show linkages between gender-role and ideology, gender-typing of science, science attitudes and science performance (achievement and participation). Duncan suggested that other factors such as the amount of work girls are expected to undertake at home, aspects of school organization, curriculum content, attitudes, expectation, classroom behaviour, as well as societal expectations of men and women might also influence science achievement and participation.

The print media could contribute a lot to encouraging or otherwise, female's participation in science and technology. According to Lambo (1994), several research findings in Nigeria and abroad show that the print media is dominated by the male class that had authority in the society. An analysis of the different categories of print media, quiz, school texts and weekly magazines in Nigeria also reveal male domination and thus the patriarchy ideology. The implication is that the powerful nature of the print media has been used to the advantage of those who control the society economically and politically.

The school and home play an important role in female's participation in science and technology. Erinosho (1994) considered the profile of the woman scientist in her study the findings suggest that a woman scientist is of a certain social background: mother with high-education, father in science-based occupation and attendance at single-sex schools. Her personal attributes include positive attribute towards science, high rating of self-ability and less concern with the reward of a career in the field, as well as certain behaviour patterns involving regular participation in academic activities in science and occasionally in tinkering activities. It is also evident that career woman scientists resemble young women scientists on these characteristics.

Today, more women than in the past obtain degrees in science and Engineering (Dean and Fleckenstein 2007, Hill, Corbett and St. Ros 2010). However, women still remain underrepresented in Science, Technology, Engineering and Mathematics (STEM) (Hill *et al*, 2010). Valiant (2007) suggested that fewer females than males pursue professional careers in science due to low interest.

INTERVENTION STRATEGIES

Taking clue from Duncan's (1984) view of school as an "engendered" process which accentuates the gender differences; Balogun (1994) recommended the following intervention strategies to "disengender" the process.

CURRICULUM INSTRUCTION

1. Education systems should teach science and possibly technology from nursery school upwards, and as much as possible make use of female teachers in order to reduce the male mystique about the subjects.
2. From secondary level in upwards, syllabus in Science and Technology courses should be broadened to include issues, e.g on social implications of Science and Technology which are thought to be of interest to girls and women.
3. Traditional "masculine" subjects e.g Technical drawing, should be made more acceptable to girls while the same is done for "feminine" subjects like Home Economics to make them attractive to boys.
4. At the secondary level, we should make Science and Technology part of a compulsory core curriculum for all pupils even up to the age of 16.
5. Teachers should ensure that both boys and girls have equal opportunities to practice the use of essential tools.
6. Boys should not be allowed to dominate classroom/laboratory activities or "hog" resources while girls should be encouraged to participate fully in activity-based learning, experiments e.t.c.
7. Girls should also be encouraged to be forthcoming, assertive and show more confidence in their relatives.
8. Teachers should create supportive classroom atmosphere and provide (where necessary) compensatory classes in scientific skills.
9. Female/male staffing ratio should be improved upon, so that more women can be used as science and technology teachers and role models. For example, female students are known to be influenced by the presence of women academics in Science and Technology.

CURRICULUM ORGANIZATION

Schools should avoid time-tabling of subject or vocational options in a way that stereotypical choices, e.g time-tabling Technical Drawing and Home Economics for the same period and thereby make them initially exclusive for boys and girls.

INSTRUCTIONAL MATERIALS

Educational systems should review curriculum materials and methods to remove sex-bias language and examples.

GUIDANCE AND COUNSELING

1. Attention should be paid to the needs of female and male students especially those in non-traditional" areas.
2. Intervention and remedial strategies should be used on a sustainable basis to change sex-stereotyped attitude.
3. The low level of achievement of girls in Science, Technology and Mathematics should be improved through attitude modification, compensatory classes, challenging the girls to the highest peaks of their potentials and achievements.
4. Girls should be encouraged to remain in STM by providing assistance to indigent girls and awarding scholarships to promising ones as is being done by Nigerian Association of Women in Science, Technology and Mathematics.
5. Wherever possible, conversion programmes should be provided for girls with good arts subjects at O'level or Senior Secondary Certificate Examination to switch to STM subjects at the beginning of their tertiary studies.
6. There should be no pressure from peers, parents and even teachers on females to pursue conventional paths in their academic and professional pursuits.
7. The media should be used to publicize the "problem" of equal opportunities and the need for remedial action to compensate for girls' under-achievement.

In the same vein, Yoloye (1994) citing Chivers (1985) example, gave recommendations by categorizing the strategies according to the agency or organization applying them. Such agencies include- 1. Government 2. Educational Institutions 3. Employers 4. Professional Associations 5. Agencies/Non-governmental Organizations.

GOVERNMENT

1. Introduction of legislations to promote equality of opportunities for males and females in education and careers.
2. Support for special training programmes to facilitate the entry of females into Science and Technology-careers.
3. Putting pressure on major employers to increase representation of women in non-technical jobs and to improve the career ladder from women.
4. Introduction of specific programmes to place women into industry.
5. Change from predominantly single-sex schools to mixed-sex schools.
6. Organisation of mobilization and enlightment programmes.
7. Support for research to bring about change or to identify key factors influencing participation and achievement.
8. Policy of making Mathematics and at least one Physical Science subject compulsory in Secondary schools.

EDUCATIONAL INSTITUTION

1. Research involving situation analysis as well as diagnosis of problems and casual agents in low participation and achievement.
2. Appointment of full-time "equal opportunity" staff in universities to make direct contact with prospective female students to urge them to consider science and technology courses.
3. Modification of curricula in Science and Technology to make them non-sexist.
4. Special programmes for increasing women participation in Science and Technology.
5. Universities developing support network for women technology studies.

EMPLOYERS

1. Organisation of training programmes for existing women workers in non-technology fields to cross over into technology-related jobs.
2. Putting pressures on Science, Engineering and Technology institutions to increase the supply of women technologists.

3. Financial support to enable women technologists entering their ranks either as students or employees to improve their qualifications and competence.

PROFESSIONAL ASSOCIATION

1. Serving as sources of information and role models. Such associations, like Nigerian Association of Women Scientists (NAWS), Nigeria Association of Women in Science, Technology, and Mathematics (NAWSTEM), Science Teachers Association of Nigeria (STAN), Mathematics Association of Nigeria e.t.c. can facilitate women and girls access to Science and Technology Education in Nigeria.
2. Provision of financial support for women in technological studies and helping to reduce problems of high drop-out rate of women from such courses.

AID AGENCIES/NON-GOVERNMENT ORGANIZATIONS

Financial support to enable intervention and research programmes e.g UNiCEF has numerous programmes for women, some of which relate their participation in Science and Technology.

Lastly, Lambo (1994) recommended that both school texts and materials that are meant for pleasure reading most reflect Nigeria's aspiration for her citizens to acquire Science and Technology as a way of life. Secondly, the achievement of the relatively few women in Science and Technology should be given prominence in the print media so that the younger generation will have role models to emulate.

CONCLUSION

Successful development of any nation depends on the expansion of individual human opportunities and the involvement of the broad masses of the people in the development process. Since knowledge in Science and Technology is sine quanon to nation building, sex-stereotyping should be discouraged so that everybody would be given equal chance to contribute his/her own quota to the growth, development and advancement of the country. Girls and women capacity for nation building should not be wasted on the basis of bias and prejudice since there is now a heightened world-wide shift in status and value from traditional occupational role, gender and even race stereotyping towards fostering personal growth, realization and fulfillment of everyone

REFERENCES

1. Akinde S. (1994): Participation of women in the teaching of science and technology.- related subjects at the Secondary Level in Ondo State. In Erinosho, S.Y. (ed) Perspectives of Women in Science and Technology in Nigeria Ibadan Sam Bookman.
2. Amara J.M. (1985): Some socio-cultural factors that influence science education of girls in Sierra Leone and some suggested remedial strategies. In Girls and Science and Technology. Third GASAT Conference, 1: 116-126.
3. Balogun T.A. (1984): The attitude of secondary school pupils in science and technical subjects. Mimeo.
4. Balogun T.A. (1985): Interests in science and technology education in Nigeria. Journal of Science Teachers Association of Nigeria 23(1&2): 92-99.
5. Balogun T.A. (1987): Girls and women in science and technology in Nigeria. Crrent status and prospect. Paper presented at the Common Wealth Africa Regional Workshop on Gender Stereotyping in Science and Technology and Mathematics Education. Accra, January 12-16.
6. Balogun T.A. (1994): Gender Issues in the teaching of science, technology and mathematics. In Erinosho, S.Y. (ed). Perspectives on women in science and Technology in Nigeria Ibadan, (sam) Rook man.
7. Dean and Fleckenstein (2007): Gender differences in interest, perceived personal capacity and participation in STEM-related activities, Journal of Technology of Education 24(1): 12-18.
8. Duncan W. (1989): Engendering school learning science attitudes and achievement among girls and boys in Botswana Studies in Comparative and International Education, 16.
9. Hill Corbett and St. Rose (2010): Gender differences in Interest, perceived personal capacity and participation in STEM-related activities. Journal of Technology of Education 24(1).
10. Kelly A. (1978): Girls and science: An International study of sex difference in school science achievement. IEA Monograph Series, 9. Stockholm: Almauist and Wiksell.
11. Kelly A. (1981): Science achievement as an aspect of sex roles. In Kelly, A. (ed). The missing half. 73-84.
12. Lambo E.O. (1994): Portrayal of females in the Nigerian print media: implications for science and technology Development. In Erinosho, S.Y. (ed) Perspectives of women in science and technology in Nigeria. Ibadan, Sam Bookman.
13. Marangu L. (1985): Kenyan women's experience in science and technology. Contributions to Third GASAT Conference 1: 203-211.

14. Osibodu B.M. (1985): Technology education and girls participation in Nigeria. In Girls and Science and Technology-Contributions to Third GASAT Conference 2: 10-19.
15. Valiant (2007): Gender differences in interest, perceived personal capacity and participation in STEM-related activities. Journal of Technology of Education 24(1).
16. Williams G.A. (1987): Science and technology and mathematics education for all, including women and girls in Africa. A keynote Address delivered at the Commonwealth Africa Regional Workshop on Gender Stereotyping in Science, Technology and Mathematics. Education, Africa.
17. Yoloye E.A. (1989): Resources for science, mathematics and technical education in Nigerian secondary schools: A national survey report Submitted to the Federal Ministry of Science and Technology, Lagos.
18. Yoloye E.a. (1990): Problems and prospects of women's access to scientific studies and technological training at University level in Oyo State. A Keynote address delivered at the Awareness seminar for secondary teachers in Oyo State, St. Anne's School, Ibadan.

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