



PROMOTING GENDER EQUALITY IN SCIENCE EDUCATION IN NIGERIA: AN ESSENTIAL FACTOR FOR NATIONAL HARMONY AND DEVELOPMENT

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Abstract: Gender inequality is one of the problems facing science education in Nigeria with its negative effect on national harmony and development. This paper discussed ways of promoting gender equality in science education for national harmony and development. It looked at the needs for promoting gender equality in science education and stressed gender equality as an essential criterion for national harmony and development. This paper also examined boys and girls education by comparing their ratio in Nigeria science education classrooms. It then talked on gender barriers and how science teachers can break the barriers in science education classrooms. As a way forward, the paper suggested the promotion of gender equality in science education through gender mainstreaming and discussed the instructional strategies for mainstreaming gender in science education classrooms. It was therefore concluded that gender equality in science education should be promoted as a necessity for national harmony and development. This paper recommended among others that government should ensure gender equality in science education through compulsory, fair and accessible education for all students irrespective of gender.

Keywords: Promotion, Gender equality, Science Education, National Harmony, Development.

I. INTRODUCTION

Gender is a set of physical and mental characteristic behaviors and roles which distinguish between males and females. Udousoro (2013) viewed gender as a cultural construct that distinguishes the roles, behavior, mental and emotional characteristics between males and females, developed by a society. Okeke (2014) opined that, gender is a broad analytical concept which draws out women's roles and responsibilities in relation to those of men. Gender also refers to the socially or culturally constructed characteristics and roles which are ascribed to males and females in any society. Males are assigned such attributes as bold, aggressive, logical in reasoning, intelligent, self confident, dominating or assertive, tactful and economical in use of words etc. Females are assigned the opposite attributes such as fearful, timid, gentle and illogical in reasoning, dull, passive, submissive, tactless and talkative. In schools male students are more likely to take difficult subject areas like sciences while the female students take to career that will not conflict with marriage changes, responsibilities and mother hood. This creates a fewer job areas available for women which might be of low status and income too.

Ogada (2013) assessed the place of women in education accessibility and stated that that Nigerian women do not have equal access with men in education especially science education. Science education is an integrated field of study which considers both the subject matter of science disciplines such as biology, chemistry, physics, agriculture etc as well as the processes involved in the learning and teaching of science. It can be said to embody all education processes aimed at providing unlimited



opportunities for learners to understand and utilize necessary knowledge, skills and attitudes required to operate effectively in scientific society. The importance of science education in the development of any human society in modern times cannot be overemphasized as it cut across gender.

Gender became an important issue in science in 1993 through the activities of the United Nations Commission and Science Development (UNCSD, 2012) that portrays that women were treated worse than men worldwide. The gender dimensions of science education came as a result of series of reports on international conferences such as World Conference on International Women's year, World Conference of United Nations decade for women equality, Millennium Development Goals Summit Declarations of Development and Peace and concerns expressed by women in the field of science education. The aphorism "educate a boy", educate a human being "educate a girl", educate several nations (Elechi, 2016) has indicated the widely accepted importance of educating women especially in science education as a prerequisite for National Harmony and Development.

National development is actually a very broad concept to define because it is continuously evolving. It is seen as a process of improving the range of opportunities that will enable people achieve their aspirations and full potential over a period of time while maintain the resilience of economic, social and environmental systems. The growth of any nation is a measure of its level of science education that was why Orukotan (2014) stated that science education has introduced a lot of changes in our world today and it will continue to do so in the future. Achievements in science education will go a long way in reducing illiteracy and poverty which are impediments to national harmony and development (Nwachukwu, 2013).

Akpan (2016) opined that science education contributes to the quality of life in such areas as health, nutrition, agriculture, transportation, material and energy production leading to National Harmony and Development. He finally concludes that if science education forms the bedrock of national harmony and development, it should therefore constitute as beacon to our nation. National harmony is characterized by the lack of violence, conflict, and the freedom from fear of violence commonly understood as absence of hostility. Harmony suggest the existence of healthy or newly healed relationships, prosperity in matters of social, economic and educational welfare and also establishment of equality .Science education has promoted National Harmony and Development by its pursuit in reducing illiteracy and poverty, though it is still short of gender equality.

Hornby (2014) defined equality as the fact of being equal in rights, status and advantages. The achievement of equality between women and men in Science Education is a matter of a human rights and a condition for social justice. Gender quality refers to the equal, responsibilities and opportunities of women and men, girls and boys; this means that interests, needs and priorities of both women and men are taken into considerations, recognizing the diversity of different groups of women and men. Gender equality emphasizing sameness refers to the provision of equal conditions, treatment and opportunity for both men and women or boys and girls to realize their full potentials meaning that males and females have equal opportunities to realize their full human rights, contribute to and benefits from economic, social, cultural and political development.

According to United Nations Educational Scientific and Cultural Organization (UNESCO) in Education for All (EFA) global monitoring reports 2015 'gender equality' in science education refers to boys and girls experiencing the same advantages or disadvantages in attending school, the same approaches in terms of teaching methods, gender-cultural curricula and academic orientation all of which are aimed to ensure equal achievements and subsequent life opportunities (UNESCO, 2015)

According to Organization for Economic Cooperation and Development (OECD, 2014) gender equality in Science Education gives both girls and boys the means to contribute to a better society thereby improving the economic and social opportunities of young individuals, thereby reducing poverty while fostering National Harmony and Development. It is also a key driver of the degree of self-reported, well-being and peace across the world. Life satisfaction increases overtime as gender equality increases (Veenhoven, 2014). Gender equality moves beyond access and requires that boys and girls also experience the same levels of quality outcomes of science. One of the key impediments to achieving gender equality in science education is that it cannot be addressed in a vacuum; rather educational institutions are products of the inequalities that exist in larger society. Gender equality in science education necessities that girls and boys have equal opportunities, policy makers and practitioners have different rationales for improvement. The need to address gender inequality permeates the Millennium Development Goals (MDGS), United Nations Educational, Scientific and Cultural Organization (UNESCO), and Education for All (EFA) goals. It will lead to sustenance of boys and girls in school, and then promoting gender equality will get rid of those cultural, social norms which see men and women not contributing equally to the society. Gender equality in science education will ensure equal outcomes by men and women for better educational reform, broader social and economic change.

In Nigeria some laudable efforts has been made to promote gender equality in science education and eliminate gender discrimination so as to ensure national harmony and development. Achievement of gender equality in science education entails



maintaining equal number of girls and boys in schools at all levels of education. Promoting gender equality in science education should concern with helping both boys and girls to develop skills necessary for achieving, understanding, tolerance and goodwill in the world today. It equally aims at changing science educator's perception of ascribing certain roles and courses to specific gender for this will help to promote national harmony and development. This national development can be accelerated if science education should be made available, accessible and affordable to all irrespective of the type of sex, race and color.

Likewise National harmony which implies peace, absence of conflict, violence or arguments can be achieved if gender equality which is duly considered as an essential precursor to peace and tolerance is advocated. According to Millennium Development Goals (MDGs, 2015), gender equality and peace are closely linked; therefore promoting gender equality especially in science education is vital to National Harmony and Development.

Needs for Promoting Gender Equality in Science Education for National Harmony and Development

Development according to Oxford Dictionary of current English (2015) is a state of being developed. A new stage in a changing situation, for a nation like Nigeria a national development would mean the process of improving the total circumstances of the citizenry, of satisfying his physical, psychological needs with a consequent mastery of his environment. This can only be achieved by gender equality through science education because gender equality assures that males and females have equal rights and opportunities to realize their human rights, contribute to benefit from economic, social, cultural and political development. It also suggests a situation where males and females have equal opportunities to realize their full human rights with capacity to contribute to and benefit from everything their societies avail or possess.

Promoting gender equality in science education is an essential factor for national harmony and development. Science education is considered as the most valuable tool for human development. Promoting gender equality in science education enables any nation to meet its aspirations, goals and liberates its citizenry from the culture of victimization, oppression, ignorance and poverty. Every nation is striving to achieve scientific and technological breakthrough through equalizing gender so that men and women will have equal rights. Gender equality will play an important role to determine the choice of careers by allowing female and male participation in science education and other professions to show case their inbuilt ability and draws the hand of development forward. Gender equality will ensure that all human beings are empowered freely to develop their personal abilities and free to make choices without limitations occasioned by prejudices, cultural beliefs, rigid gender roles and stereotypes. Gender equality has been identified as a criteria for National Harmony and Development, in fact the attainment of gender equality is not only seen as an end in itself, it is equally a catalyst to, and a sine-qua-non for the achievements of National Harmony Development.

Relating Boys and Girls Education; Gender Inequalities in Science Education

Boys and girls do have differences and historically this has led to inequality. In the past dominant belief was that women's place was in the home, so girls didn't need the same level and type of education as boys. Today, girls and women have many opportunities, women make up a large percentage (sometimes the majority of college and university enrollment) and they have access to profession that was traditionally male dominated (Matthew, 2016). Although great strides have been made in the realm of women's equality, there is still a long way to go, hampered by the problem of culturally stereotypes that affect boys and girls from the day they are born examples; pink clothes for girls and blue for boys, dolls for girls and trucks for boys, Girls can cry but boys cannot, dance class for girls and football for boys.

Differences in the way boys and girls are treated in the classrooms shows differences in treatment by teachers and other school personnel who may be both conscious and subconscious. Teachers tend to pay more attention to boys than girls by having interaction with them. They tolerate behaviors in boys that they don't tolerate in girls and they tend to provide boys with more criticism and praise. Differences in the extra attention given to boys are due to the fact that boys simply tend to demand more attention, while girls tend to be quieter more often than boys do. Boys tend to dominate classroom discussions and they also access computers and technology more often than girls do. Boys are still more likely to enroll in mathematics, science and engineering than girls and are more likely to take advanced courses in these subject areas while girls engage in biology, English and foreign languages.

Overall, women are underrepresented in the professions that centre on mathematics, business or leadership. Boys tend to be selected for leadership roles and are called on in class more often than girls. In secondary schools leadership roles, boys are made the school prefects or class prefects and girls are made to assist them in all the school functions, males are made the head believing that they are smarter and better. In a classroom boys are engaged in harder works like carrying heavy things e.g. boards,



chairs, tables or heavy laboratory equipments while girls are left with domestic work like sweeping the classrooms or watering the flowers. Teachers show inequality in giving punishments, like assigning boys to cut the school grasses while girls are knelt down or asked to clean the classroom. This study is also aimed at suggesting ways of curbing the aforementioned with reference to classroom teachers.

How the Teacher can Break the Barriers in Gender Inequality

Gender barriers means impediment or obstacle such as any act, practice, process, belief or value that overtly or covertly prevents one from attaining his or her set goals because of gender discrimination. Teachers can facilitate gender equality in classrooms by arranging the classrooms to accommodate student’s discussions. These interactions can be effective if the teacher sets out clear procedures and etiquette that allows students and teachers to understand each other. All displayed material in the classroom should reflect the cultural backgrounds of the students. The teachers can establish rules from the beginning that promote equality in the classroom. She can set example with her behavior, She should recognize inequalities that exist for both genders and encourage children to follow their dreams regardless of existing gender stereotypes. The education system should equip students with knowledge and skills to overcome the barriers so that they can participate to the fullest in the society and so the teacher’s role become important.



Menon (2015)

Fig 1: The teacher can facilitate gender equality in classroom by arranging the classroom to accommodate discussion from both sexes

- ❖ Role models- Activities that use nontraditional gender roles models can help fight gender barriers and teach children the myriad choices available to them. A teacher can bring professionals to the classrooms who are working in non typical gender jobs to talk about their works. Girls often lack appropriate role models in the sciences and engineering and



therefore may lose interest in these occupations. Bringing female professional scientist to the classroom will break the stereotype and teach children that girls can be just as skilled at science and mathematics as boys.



Menon (2015)

Fig 2: A teacher brings a professional (Nurse) who works as a non-typical gender job to talk on their works.

- ❖ Group work- Boys can sometimes fill the stereotypical roles of leaders and speak out more in classroom settings while girls may shy away from active participation. Girls should be encouraged to participate actively particularly in games or activities that involve science and math (such as counting games) one way to do this is to use groups that are single-sex. While this may seem to promote divisiveness, girls in groups are less likely to speak up or take leadership roles if there is an assertive boy in the group. Using same gender groups can give girls more of a say, teachers can encourage leadership in both genders by doling out leadership responsibilities equally.
- ❖ Learning- Teachers can use books that represent females and males in nontraditional gender roles and talk about these roles with the students. Books should include both males and female protagonists. When books or course content arises that follow or reinforce stereotypes, open discussions with students about these stereotypes can help to discourage their way of thinking and empower students to question them.
- ❖ Play- Teachers can use playtime to enforce gender equality. Introducing games that fight gender stereotypes is one way to do this .This may include having both male and female games, football, basket ball, cricket, hops kip, chess etc.

Gender Mainstreaming

Mainstreaming implies making a particular idea or option accepted by most people (Hornby, 2014). The term gender mainstreaming came into widespread use with adoption of the Beijing platform for action in 1995. It came as a result of realization that not much has been achieved in reducing gender inequality in different levels of education and development.

It is a strategy for bringing gender issues into the mainstream of society so as to ensure gender equality. The ultimate goal of mainstreaming is to achieve gender equality. In practice gender mainstreaming means identifying gaps in gender equality through use of sex-disaggregate data, analyzing the underlying causes, development strategies to close those gaps, putting resources and expertise into implementing strategies for gender equality, monitoring implementation and holding individuals and institution accountable for results.

Gender mainstreaming according to Okoli (2015) was established as major global strategy for the promotion of gender equality in Beijing platform for action emanating from the fourth United Nations world conference on women in Beijing in 1995. The economic and social council (ECOSOC) in Okoli (2015) defined gender mainstreaming as the process of assessing the



implications for women and men of any planned action, including legislation, policies or programs in any area and at all levels so that women and men benefit equally and inequality is not perpetuated. The ultimate goal of gender mainstreaming is to close the gender gap in science education classrooms thereby achieving equality between males and females. To close gender gap in science education classroom through gender mainstreaming, Okoli (2015) proposed five instructional strategies which science education teachers can adopt.

1. Use of teaching strategies that promote cooperation.

The use of teaching strategies that promote cooperation rather than competition in science education institutions should be adopted while those teaching techniques that reflect the pattern of male needs only should be avoided in science education classrooms. Cooperative learning strategies have been found to enhance achievements and interest among boys and girls in science education classrooms. During practical classes in science education, students should be made to work in small groups with roles shared among them. Examples of cooperative learning strategies include games, stimulations, role plays, group discussion and career oriented teaching.

Saymour in Elechi (2016) opined that females prefer cooperative learning in science education but science teachers do not give them opportunities to carryout tasks equally with the males in order to learn co-operatively.

2. Use of gender inclusive languages or expressions

The use of masculine nouns and pronouns to refer to both males and females should be avoided in science education classrooms. The following gender-inclusive nouns have been recommended for use in science education classrooms e.g. human kind instead of mankind, human being in place of man to refer to males and females chair-person instead of chairman etc.

3. Use of gender inclusive images, pictures and textual materials

Use of girl-friendly curricular materials can enhance girl’s participation and performance in science education classrooms. Science education classrooms before now have been dominated with masculine pictures, images, and textual materials. Gender mainstreaming can be achieved through de-sexing science education instructional materials (Okoli, 2015). Instructional materials that promote gender equality in career choices should be used to illustrate scientists like doctors, nurses, engineers etc at work. This will go a long way in dispelling the myth that science education is masculine.



Okoli (2015)

Fig 3: Male and female engineers, dispelling the myths that science education is masculine.



Okoli (2015)

Fig 4: Male and female doctors.

4. Use of gender inclusive teacher-student interaction in science education classrooms.

A gender inclusive classroom is one where equal opportunities are provided for male and female students to interact with teacher as well as among themselves, but some teachers behaviors provide more instructional time to male students than their female counterparts. Male students receive more attention and more encouragement from their teachers than to female students. In a male dominated classroom, male students are more likely to be praised and more likely to be reprimanded by their teachers.

In addition, teachers allow more opportunities for male students to respond to questions, talk more, interact more, receive more teacher time and thus grow at expense of their counterparts. Whenever a task proves difficult the teacher do the task for female students instead of teaching them how to do it. In male dominated classrooms, the average female student is ignored. Hence girls grow the impression that their opinions are not valid, their responses to questions are not worthy of attention and they are not as clever and as important as their male counterparts.

Furthermore female students go about with the erroneous impression that their success in academic work is due to chance and not because they are clever and capable. All these lower self esteem of female students. Teachers should expose both male and female students equally; gender equality should therefore be maintained in teacher-student interactions.

5. Eliminating/avoiding behaviors or utterances that are gender sensitive in science education classrooms.

Okoli (2015) advised science education teachers to avoid the use of jokes or behaviors that negatively impinge on the personality or cultural roles of male and female students.

Promotion and Achievements of Gender Equality in Science Education

There are four main principles or patterns underpinning successful gender equality in science education.

- ❖ Partnership approaches that bring together government donors and civil society
Government should create a platform through partnership approaches with Donors, Philanthropist, Private sectors, Non-Governmental Organizations (NGO'S) to ensure that gender equality is achieved in science education. Government on its own might not achieve their aim single handedly without the help of other sectors.
- ❖ Multiple and multi-sectoral interventions to address the complex demand supply-side challenges.
When the complex demands of the society are not reached by the government such as, schools, good water supply, employment, hospitals, conducive environment, some challenges like poverty, unemployment, lack of opportunities arises which gendered socio-cultural expectations and practices e.g. early marriage/pregnancy, domestic work burdens and security concerns, this continue to represent some of the greatest barriers to girls i.e. when the demands of the society are not solved. Government should



meet their demands through, good water supplies, employment and security as these will ensure girls participation in science education

❖ **Need for strategic and evidence-based policy advocacy.**

There is a need for strategic and evidence-based policy advocacy because there is shortfalls in performance on gender equality results, there should be support for continued research, monitoring and evaluation.

❖ **Lack of commitment on the part of government.**

Government on their own part does show a laissez-faire attitude to promotion of gender equality in science education as well the proposed methods or a pattern to solve inequalities in science education has not be achieved due to lack of fund from government. Research by Manion (2016) therefore suggests that to address these successfully three main interconnected areas should be applied

- Intervention
- Institutions
- Interactions

Intervention

The concept of ‘intervention’ refers to specific policy levers that can be used to promote access to science education, addressing both demand and supply side challenges to gender equality in schools. The building of more schools, with co-education and recruitment of more science teachers, including more science women teachers to act as positive role models, is one of the relatively straight forward ways government can support gender equality in science education.

The provision of adequate and effective teaching and learning materials that are free from gender biased. Gender-responsive teacher training, both in-service and pre-service is also seen as effective way to support gender equality. Promoting and establishing of school participation and the development of self-esteem and leadership skills with both genders inclusive. A further supply-side intervention to support gender equality in science education is curriculum reform and textbooks revision to remove gender bias and promote gender awareness.

Institutions

Enacting and promoting gender equality in science education involves institutional reform and transformation. Gender mainstreaming and gender responsive budgeting represent two of the most approaches that governments have adopted to demonstrate their commitment to the realization of gender equality in science education and beyond. Institutional reform also covers the need to develop strong monitoring, accountability for successful implementation and development. Monitoring boys and girls activities will help in identifying challenges to achievement of gender equality in science education. The institution should be conducive at all levels for sound learning e.g. primary or secondary schools levels.

Interactions

The government, school administrators, teachers, parents and students (boys and girls) should interact more through meetings, debates and dialogues. The government interacts to know the needs of the people and create awareness about gender discrimination and to the people. School administrators should interact with students of both genders inclusive in order to understand them more. Teachers should have or use teacher-student method in teaching during classroom interactions and parents should interact with their boy and girl child without any form of discriminations or biases.

CONCLUSION

The problem of gender equality in science education is a serious educational problem that could affect the advancement of any nation and as such should not be seen as women’s issue or dismissed with a wave of the hand. To compliment governments’ effort at ensuring gender equality in science education, teachers should mainstream gender in science education classrooms by using gender inclusive expressions in instructional delivery, interacting with both male and female students during practical activities or discussion sessions by using gender-inclusive textual materials, pictures, images and illustrations during science education



lessons. Avoiding utterances that are gender sensitive and use of instructional techniques that are gender friendly so that equal opportunity to learn is provided in science education classrooms for all students, irrespective of their gender so that national harmony and development could be achieved.

RECOMMENDATIONS

Based on the review, the following recommendations are made;

- Science teacher educators should build in instructional strategies for gender mainstreaming into pre-service science teachers programs through workshops and seminar.
- Professionals' bodies such as (STAN) Science Teachers Association of Nigeria and ministries of education should organize seminars, workshops and conferences to update science education teachers of the identified instructional strategies that can promote gender equality in science education classrooms.
- Government should ensure gender equality in science through compulsory, available and accessible education for all.

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