
PROMOTING GENDER EQUITY, SCIENTIFIC LITERACY AND PEACE AMONG NIGERIAN SECONDARY SCHOOL STUDENTS THROUGH GENDER MAINSTREAMING STRATEGIES

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Abstract

The paper discussed the promotion of gender equity, scientific literacy and peace among Nigerian secondary school students through the use of gender mainstreaming strategies. The concepts of gender equity, scientific literacy and peace were defined. The importance of acquiring scientific literacy and peaceful co-existence of Nigerian children were emphasized. The under- representation, discrimination and under- achievement of Nigerian students in science technology and mathematics courses were discussed. Some of the factors militating against gender equity and scientific literacy were high-lighted, such as, gender stereotyping, parental preference of early marriage to education and masculine image of science and technology. The paper outlined the aims of gender mainstreaming strategies which include ensuring the rites, roles of girls and boys, equal attention in all school activities, respecting cultural differences and ensuring participation and protection of rights of all students in STM classrooms. Gender mainstreaming package discussed by the paper included the use of gender- inclusive images and constructs, use of gender- inclusive languages or expressions, use of gender- inclusive pictures and textual materials. The implication of the use of gender mainstreaming strategies for peaceful co-existence and conflict resolution by Nigerian students were highlighted. Finally, the paper concluded that, if gender equity was not attained in our educational institutions at a foundational level, it would be difficult if not impossible to have social peace, economic and technological

advancement in Nigeria, no matter how scientifically literate the citizenry might be.

Introduction

The issue of gender equity in science technology and mathematics education has been a great concern for more than two decades to the government, researchers and educators in Nigeria (Okebukola 2004). Worse still is the fact that women and girls constitute about half of the world's population, yet, they are underrepresented in STM education and as such do not contribute their quota to national development and are locked up in cycles of illiteracy and poverty. It is in recognition of this fact the Nigerian government prescribed in her national policy that every Nigerian child should have a right to equal education opportunity.

The critical role the knowledge and study of STM courses play in national development needs no emphasis. STM is the best rock for acquisition of scientific literacy without which it will be difficult for man to live effectively in this era of globalization and rapid changes in the environment. However, it is not possible to achieve any meaningful national development by any country that is devoid of peace. This might have informed the United Nation's decision to declare the 8th of September 2003 as the international year of peace and 2003 to 2013 as the decade of peace. Furthermore, The Reading Association of Nigeria had its 2012 conference theme as "Literacy for Peace". It is against this back drop that the paper discussed likely ways of promoting gender equity, scientific literacy and peace through gender mainstreaming strategies.

Concept of Gender Equity

The term gender equity has been given several meanings by different authors. Generally, gender is construed to mean sex which is the biological feature in the human body that makes it to be categorized as male and female. Okeke (2001) sees gender as a social or cultural construct, characteristics or behaviours and roles which a society ascribes to females and males. Gender according to Okoli (2009) has to do with roles and relationships between men and women in a given context. In Nigeria for

instance, the society assigns gender roles to males and females in line with the prevailing culture and tradition of the Nigerian society.

Gender issue in science, technology and mathematics education (STM) came into lime light in 1993 through the activities of the National Commission on Science and Technology (Okoli, 2012). According to Okoli, the gender dimension of STM emanated from the result of series of reports in international conferences and concerns expressed by science experts on the existence of gender gaps in the field of STM. What then is gender equity?

Gender equity is defined by Pearshall (2002) as the quality of being fair and impartial. In line with this definition, Okoli (2012) in citing Sadker and Sadker (1982) presents gender equity as a system where both males and females enjoy the same opportunities for realizing their human rights to contribute to all spheres of national development. Gender equity in science, technology and mathematics education means providing equal opportunities to boys and girls to study STM courses. The achievement of equity between males and females is therefore not a privilege but a matter of human rights, a condition for peace and social justice. It is in recognition of this fact that the Federal Government of Nigeria in her National Policy on Education (Federal Republic of Nigeria, 2007) stated that, every Nigerian child, male or female should have a right of equal educational opportunities.

Scientific Literacy

To understand the meaning of scientific literacy, it is pertinent to look at the terms, literacy, Science, Mathematics and Technology (STM). Literacy is commonly defined as the ability to read and write. However, there are more scholarly definitions of the word by some authors. For instance, Abordan (1999) defines literacy as the ability to read, write, numerate and process documents.

Science is the study of the natural environment which involves enquiry and problem-solving. Science is studied through unbiased observation and systematic experimentation (Okeke, 2001). Technology simply refers to the application of scientific knowledge and principles to the solution of human problems and manipulation of the environment for the benefit of man. Mathematics is known generally as the language of science

literacy according to Nwagbo (1991) as one's ability to understand and appreciate the scope of scientific knowledge and application of such knowledge in decision making and problem-solving in his personal or civic life. From this definition, it is clear that scientific literacy is acquired through exposure to science, technology and mathematics education. It further means that scientific literacy through exposure to science, technology and mathematics education. It further means that scientific literacy of any nation cannot be above the quality of science, technology and mathematics education taught in its schools..DeBoer (2000) in acting National Science Teachers' Association (NSTA) sees scientific literacy as the relationship between science and society and, as the most important goal of science education. To DeBoer, the scientifically literate person should be able to use science concepts, process skills and values in making every day's decision as he interacts with the people and his environment, and, understands the relationship between science, technology and other facets of society including development.

DeBoer, citing Yofstin and Yager argue that science should be taught in relation to the personal needs of students and in relation to important aspects of contemporary life. Students should be thought in relation to important aspects of contemporary life. They should be made to be aware of science as a social and cultural force and of the relationship between science and the rest of human knowledge.

The foundation of scientific literacy is laid in schools, especially at the secondary school level. It is at this level that the scientific, technological and mathematical concepts and principles are taught for both further studies and application of acquired knowledge in different facets of human endeavour. By implication, without adequate exposure of secondary school students to STM courses, there would be no scientifically literate youth to man the affairs of the nation in the distant future.

Scientific literacy is important for every Nigerian child, especially, now that the country is targeting scientific literacy for all by the 21st century. The importance of scientific literacy is captured by the National Policy on Education (2007) in the goals for science education as to

- I. Provide scientists for national development

- II. Service studies in technology and the cause of technological development
- III. Provide knowledge and understanding of the complexity of the physical world, the forms and conduct of life.

How possible is it to attain scientific literacy by the 21st century when literacy is at its lowest ebb in the developing countries which Nigeria is part and parcel of? Nigeria is one of the developing countries with a high awful illiteracy index. The report by UNESCO cited by Otagburuagu (2012) shows that over one million children were found to be out of school at the primary school level in Nigeria. This means that this population of children did not have access to secondary education and as such are not scientifically literate. Okeke's report corroborates this revelation because according to her, more than 60 million people in Nigeria are illiterates. Nigeria is also a prominent member of the league of nine nations with the highest number of illiterate citizens.

For scientific literacy to be achieved in Nigeria, STM teaching and learning in Nigerian secondary schools have to be overhauled. The federal government has to do more in the area of funding. Science, mathematics and technology courses should be taught for social relevance. That is to say, that, these courses should be taught in ways that students will be prepared to utilize the knowledge, science process-skills and scientific attitudes acquired in the course of their study to live effectively and harmoniously with one another in the school environment, the wider society, as well as, to make informed decisions for the betterment of the society. Scientific literacy should be acquired by all and sundry in Nigeria in this era of globalization and rapid changes in the environment, such as, desertification, deforestation, global warming and climate changes. How could this be achieved when there is dearth of STM teachers, inadequate laboratory and library facilities in schools, lack of interest, negative attitudes of students towards STM learning?

Gender Equity and Scientific Literacy

For Nigerian youths to be scientifically literate, they have to be exposed to STM courses early in life. The federal government has taken a

giant stride in that regard by prescribing in its National Policy on Education that at the basic level of education, it is mandatory for every child to study Basic science, Mathematics, Introductory technology and English language, which is the language of instruction. Then, at the secondary school level, it is mandatory for every student to study mathematics and English language, in addition to one science course, which is either, Biology, Chemistry or Physics. All these are to ensure that the foundation for scientific literacy is laid at this formative stage of education.

Science, technology and mathematics education culminates in scientific literacy and is crucial to national development. Since Nigerian youths are expected to be future key players in the development of the nation, they need to be well grounded in STM subjects in order to equip them to cope with present and future challenges in scientific and technological advancement of the nation. For this reason, the federal government made huge investments on education, particularly, in the area of promoting STM education.

Regrettably, research evidences show that gender equity in STM courses by Nigerian students has not been encouraging, in that female students have consistently not been able to attain the same levels of enrolment and achievement outcomes in STM courses with their male counterparts (Ozaji, 2009; Okoli, 2012). A report by WAEC (2004) for instance, reveals that 53.45% of Nigerian boys enrolled for the West African Examinations Council for Biology against 40.28% girls. In chemistry, 59.14% males enrolled against 41.68% females. The worst enrolments recorded that year were in technical subjects. In Applied Electricity, 86.63% males enrolled against 13.37% females. Then, in Auto Mechanics, 98.53% males enrolled against 1.78% females. The situation was lamented over by the former president of Nigeria, General Obasanjo, who revealed in 2006 that a wide disparity in gender gap existed in STM education., where 62.5% Nigerian literates were males against 39.5% females. Worst still, is the fact that women and girls constitute more than half of the world's population yet, they are underrepresented in STM education (Olagunju & Akanbi, 2009). A fact that was reported by Okebukola (2004) that 50% of the Nigerian population were women yet, only 11% of them are in STM professions and

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even then, they are being discriminated against during recruitment. Moreover, according to Olagunju and Akambi, out of the 40 million children in schools in Africa, about two thirds are girls. The meaning is that this population of people does not contribute meaningfully to the development of the African society irrespective of the many virtues enormous potentials they are endowed which should have be impacted the society positively..

Many factors have been advanced by researchers and science educators as to why there has been consistent low enrolment and abysmal performance of girls in STM courses, such as, preference of marriage to education, the use of ineffective methods of instruction, poor communication skills by STM teachers and abstractness of STM concepts (Ozoji, 2009), dearth of reading materials and lack of understanding of the language of instruction (Ncharam, 2012).

In pursuance of its commitment to the improvement of the status of girls and women UNESCO pays special attention to the issue of equal access of girls and boys to scientific, technological and vocational training. The 4th world conference on women held in Beijin in 1995 also called for increase in participation of women in industry and all other sectors in non-traditional areas to advanced industry (Chibuogwu, Nnaka & Ezekannagha, 2009).

The marginalization of women world-wide has been summarized by UNESCO as follows:

- women perform two-thirds of the world's work,
- women earn one-tenth of the world's income,
- women are two thirds of the world's illiterates ,
- Women own less than one hundredth of the world's property (Okeke, 2001).

Then, the fore-going position is clear. More than half of the women world-wide are not scientifically literate. If the vices of marginalization and under representation of women must be overcome for the future of Nigeria, and for the nation to take up its position as one of the big economies of the world come 2020, then, Nigerian youths, particularly, secondary school boys and girls must be adequately informed in scientific literacy. This reason being that they are the ones that will take Nigeria to the next level of

scientific and technological advancement when the key players in STM in the present generation are no more.

Scientific Literacy and Peace

The constitution of the federal republic of Nigeria (2011) states that the State shall promote national prosperity, efficient dynamic and self reliant economy, provide security, maximum welfare, freedom and harmony. This, by implication means that the federal government would ensure that there is peace and political stability for her citizenry. This provision in the constitution is quite appropriate because there is no meaningful development in any on earth the absence of peace.

Peace as defined by Pearshall (2002) is freedom from disturbance or cessation of war literacy helps to create a conducive social atmosphere people of any nation, literacy is a tool that brings about economic reconstruction, political stability and national development where there is absence of peace, there is strike, rancour, destruction of lives and destruction of lives and property.

When the polity is literate, law and order are upheld in the society. Events around the globe show that illiterate youths engage in acts of vandalism, terrorism, drug trafficking, ethno-religious conflicts and many other barbaric acts in crises ridden countries. Illiteracy locks communities into cycles of poverty, unemployment, hunger strife and disharmony and these vices that lay the foundation for violence, and most times wanton destruction of lives and property.

The political atmosphere in Nigeria for over a decade has been a complete deviation from the provisions by the nation's constitution. Nigerian youths have been engaging in vandalization of oil pipe lines in the Niger-Delta region of the country, youth restiveness, armed robbery, ethnic and religious crises. All these vices boil down to the fact that many Nigerian boys and girls that are not scientifically literate, if they were, they would have channelled their knowledge of science and technology education to more positive actions for national development. This corroborates the report of the study of UNESCO as reported by Guardian newspaper that youths that engage in violence word-wide are mostly illiterates. The illiterate

youths are more vulnerable to ill health, human rights abuse, all which culminate in lack of peace. It was in recognition of the critical role literacy plays in world peace that the United Nations declared 2003 as the international year of peace. The theme for 2012 international conference was literacy for peace and the period 2003 to 2013 is tagged the international decade of peace.

When students are scientifically literate, they would be able to make far reaching decisions about peaceful co-existence among one another in the classroom and with their environment. They would see the need to live in harmony with one another and other people of different gender, people from different ethnic groups and religious inclinations in the wider society now and in the distant future. They would know the consequences of their actions and inactions themselves and the societies they live in. They would refrain from actions that might lead to the break down of law and order in the society. They would not engage in unwholesome dealings such as substance abuse and prostitution because of their health implications. They would not want to engage in vandalization of oil pipe lines. For instance they would know that doing that would lead to environmental pollution, loss of revenue by the government and destruction of aquatic lives

Other vices like suicide bombing, youth restiveness which most of the time result in wastage of human resources. When students are scientifically literate, they realize the importance of protecting themselves and the environment from degradation, such as, deforestation and erosion resulting from indiscriminate felling of trees and bush burning; climate change, etc.

Scientific and technological advancement has led to the construction of sophisticated weapons of war such as nuclear bomb, biological and chemical weapons, cloning which can be used to destroy life and property on a large scale. In the absence of scientific literacy, and peace these products of science will be turned into weapons of mass destruction of lives and property.

Promoting Gender Equity and Scientific Literacy Through Gender Mainstreaming Strategies

Mainstreaming according to Horny (2006) refers to making a particular opinion acceptable by most people. Gender mainstreaming is a strategy which can be used for bringing issues of gender into the mainstream of education; for instance for the purpose of ensuring gender equality in STM instruction. Economic and social council (ECOSOC, 1997:78) defines gender mainstreaming as “the process of assessing the implications for women and men of any planned action, including legislation, policies or programmes in any area and at all levels. It is a strategy for making the concerns and experiences of women, as well as, men an integral part of the design, implementation, monitoring and evaluation of policies and programmes in all political, economic and social spheres so that women and men benefit equally and inequality is not perpetuated.

The ultimate goal of gender mainstreaming in STM education is to achieve gender equity; in specific terms, the strategy can be used to achieved the following aims:

- Ensuring that the rights, roles and needs of girls and boys are attended to equally in all programmes and activities in STM education classrooms.
- Respecting cultural differences among boys and girls
- Ensuring equal participation and protection of rights of all people, male and female students, alike.

Mainstreaming strategies involve the use of strategies that promote co-operation among students. This is because co-operation strategies have been integrated round to enhance achievement and interest of secondary school.boys and girls in science (Ozoji, 2009) as well as de-emphasize the ‘I win, you loose’ philosophy which according to Okoli (2010) is a male orchestration and as such not the best STM environment for male and female students.

Other gender- inclusive strategies which can promote gender equity and scientific literacy are the use of games and simulation, role play, discussion, concept mapping, etc. In using these methods in the teaching and learning of science, technology and mathematics courses, male and

female students work in a harmonious peaceful environment. They share their cognitions, empathize with one another, see ideas from other students' point of view. These virtues in turn will definitely translate into peaceful coexistence of the students with one another in the larger society irrespective of their gender, tribal affiliations and religious inclinations.

Most science, technology and mathematics, textbooks have masculine images and pictures for illustrations. These textual materials portray male dominance showing that STM courses are meant for males. Gender streaming can therefore be achieved by using both masculine and feminine pictures as literacy materials in STM classrooms. Science, technology and mathematics teachers should use gender inclusive books for instruction. Curriculum writers should also address this issue because according to Njoku (2007), male exclusive textual materials lower the self esteem of girls and affect the conduciveness of the learning environment.

Science teachers should, therefore, not use words that are masculine, particularly, nouns and pronouns during STM instruction. For instance the use of ' he' for mankind to stand for male and female. In place of these, pronouns like human kind, chairperson, he/she should be used. In other words STM teachers should use gender-inclusive terminologies or language of instruction in order to provide a conducive emotional climate for males and females during STM emotional instruction. This will go a long way to give female students a sense of belonging in the STM classroom which is a stimulus for favourable attitudes towards the subject and even enhanced performance outcomes.

Teachers should do away with all forms of gender stereo typed behaviours in the form of verbally or non- verbally expression of praise, criticism, reward. Interaction level languages and communication, positive feedback, such as praise and encouragement should be provided in gender inclusive classrooms.

Career education should be provided within every learning situation through the use of illustrations and resources which link STM problems with the lives of people. Counselling department of schools can be used periodically for giving lectures on career opportunities and chances.

Another gender mainstreaming strategy that can be used to promote gender equity and scientific literacy is gender-inclusive teacher-student interaction. Most STM classes in Nigeria are known to be dominated by male students. The male students are the ones teachers ask questions most of the time. They are given leadership positions and more challenging tasks than their female counterparts. They are more active in class discussions, practical activities, etc. These build more self esteem in male students than female students. The male students might as a result of the fore-going grow with the intention of not being liked by the teachers or not being worthy of the teachers' attention. This experience could have far reaching consequences on attitudinal dispositions of girls to the study of STM courses. Science technology and mathematics teachers should therefore treat male and female students equally in terms of encouragement, questioning, motivation, reprimanding irrespective of whether the person is a male or female. This will go a long way in fostering peace among the students as well as scientific literacy.

Conclusion

In order to promote gender equity, scientific literacy and peace among secondary school students in Nigeria, all hands must be on deck. The government should engage in massive funding of education, particularly, STM education, motivate STM teachers and encourage students, particularly, girls to study STM subjects in order to improve their lot and equip them with appropriate skills for effective living in the society. Teachers should employ effective and gender-inclusive strategies that will help to demystify STM courses. If gender equity and scientific literacy are not attained at the foundational level of education in Nigeria, it will be difficult if not impossible to have peace in our schools and in the wider society.

Recommendations

In the light of the fore-going discussion, the following recommendations are made:

Teachers should eliminate all forms of gender stereotyped behaviours in the form of verbally expressed or non-verbally expressed forms criticisms.

They should provide positive feedback in form of praise and reward and avoid criticisms that can affect girls' self image and perception of their capabilities.

Teachers should work on gender role awareness so that student can question stereotypic attitudes and behaviours in the society.

Teachers should use multiple strategies of teaching in STM classrooms, such as discussion, role play and cooperative learning strategies that will help to create a gender friendly classroom environment.

Teachers should introduce a lot of hands-on activities during instruction to help to promote social interaction, sharing of ideas, endurance, confidence among students and subsequently create a peaceful and harmonious learning environment.

Teachers should provide career education within every learning situation through the use of illustrations and models.

Government should embark upon massive revolutionary campaigns on female education, in order to fight cultural stigma inherent in the society regarding girls study of STM subject.

Teachers should ensure that classrooms are gender friendly.

Government should engage in massive funding of education particularly in STM courses. School libraries should be adequately stocked with modern and relevant STM texts.

Science Laboratories and technology workshops should be adequately equipped with relevant facilities.

The Government should ensure that text book developers and curriculum writers use gender-friendly pictures, drawing and illustrations in STM text books.

Teachers should not use words that portray the masculine image of STM subjects.

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