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## Remedies for Gender Bias against Girls in Physics Classrooms

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By

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### Abstract

*This paper is a position paper on the remedies for gender bias against girls in Physics classrooms. For introduction, the paper considers the magnitude and importance of women's contributions to national economic development in the service sector. It then takes a look at hindrances to Physics education for Nigerian women and propounds remedies for gender bias in Physics classroom environments. Remedies such as Physics teachers expectation for effective participation of girls in science learning and instructional strategies and material for Physics learning have been elaborated upon. The Instructional strategies and materials include gender – fair learning, gender-inclusive science and technology kits, and Interactive Physics (IP) softwares. Another strategy highlighted in the paper is cooperative learning style. The paper concluded that the federal government's millennium development goals of providing equal science literacy for all sexes in Nigeria could be realized if the remedies advanced in the paper are implemented.*

In spite of the fact that statistics still fail to adequately reflect women's work, much has been learned about women's contributions to national economies. The way for enlarging that contribution is the full development of women's potential. The United Nations reported in 1980 that

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*While women represent 50 percent of the world adult population and are one third of the official labour force, they perform for nearly two third of all working hours, receive only one tenth of the world income and own less than one percent of world property (Ekpiken, 1996).*

In light of the realities of this situation, policy makers and others have begun to realize, for example, that women make up the majority of the world's farmers. Apart from farming one of the evidences of women contribution to national economies is their involvement in processing palm oil in rural areas in large quantity with the application of local technology. If a reasonable number of women are involved in economic ventures sometimes viewed as activities for men, girls can effectively participate in Physics learning in classroom setting. Gender bias held against girls can make science learning to appear as an exclusive privilege for boys and men.

Gender bias held by a physics teacher against girls can hinder female scientific literacy.

In overcoming gender bias against girls, science teaching strategies that give equal opportunity to both males and females for Physics learning should be considered. The teacher's expectation should always be that girls would perform equally well as boys in Physics class activities. Girls should be given equal responsibility as boys in classroom functions as in group discussion and practical classes.

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In this Jet Age, both men and women compete in the field of innovations and inventions. Even the areas and occupations often regarded as women's own have also experienced development. For example, women in rural areas of Nigeria devise ways of processing oil with ease and in large quantity too. Thanks to technology, science application. In this Jet Age, therefore, gender bias in Physics learning must be discountenanced in classroom setting. To achieve this objective, Physics learning by girls should be greatly enhanced and encouraged by the teacher through his expectation for girls participations in classroom and laboratory activities and introduction of innovative teaching strategies and materials. These strategies include:

**Physics Teacher Expectation for Effective Participation of Girls in Science**

Some teachers expect boys to be active, aggressive, independent and good in Physics. They expect girls to be quiet, dependant and good in reading, language and arts. Such expectations become evident when teachers constantly ask boys to do tasks that are more physically and mechanically demanding. These assignments serve to inform male and female students that they are different in ability, skill and behaviour.

Research on teacher expectation of male and female students also confirm that Physics teachers talk differently to females and males. (Passmore, 2003) That is, they

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interact in classroom setting frequently with males and ask them more questions than girls. They do this with the belief that physics is masculine.

To achieve the objective of giving equal opportunity to girls and boys in learning physics such lopsided expectation of teachers should be adequately corrected. The teacher should see girls as having the same ability, skills and attitude in learning Physics as boys assigning them task that would help them acquire science process skills and attitude. He should give both boys and girls equal opportunity to answer questions in the class. Assignment of responsibilities such as group leaders for class discussion and laboratory sessions should also be given to girls.

The situation of gender bias can further be addressed by giving more attention to girls learning Physics beyond the normal, regular classroom. Cole and Graffin (1988) suggested that special science classes designed to increase awareness of the obstacles faced by girls could be programmed to facilitate science achievement by girls. Such programme can be handled by women teachers who themselves were not confident in their science ability.

### **Instructional Strategies and Materials**

Teaching techniques and materials influence education. Through the use of appropriate teaching techniques and materials the level of physics literacy and participation of girls can increase. Teachers who adopt a variety of instructional strategies would reduce the opportunity for male competition and increase the interaction time the teacher spends with female students. Based on the reported gender achievements differentials for science proficiency, the goal of increasing female student success in physics may not be possible without a change in the traditional means of student instruction and assessment.

A number of studies suggest that one vital method of overcoming gender differentials is to create a more “gender-fair” learning environment. A gender-fair learning environment entails giving equal opportunity to boys and girls to interact adequately with the teacher and learning material in classroom. Corrective actions taken to create gender-fair in the classroom should cover the social, personal and educational influences on gender achievement differences. Classroom situations that generate a gender-fair learning environment could help to promote effective science learning to the benefit of girls. Such situations create positive “science feelings” which could contribute to abate the sex-role stereotype by giving females a feeling of success in science and encouraging females to pursue science as a career.

Njoku (2006) reported that gender biases can be eliminated by using the gender-inclusive science and technology kits and teaching strategies. In the use of

gender inclusive science and technology kits, pieces of science and technical equipment are employed in teaching Physics to reflect ordinary experiences, interest and activities of girls and boys in their socio-economic environment.

One other way of creating gender-fair classroom environment is the use of innovative instructional strategies like the use of media clippings of pictures and images. These pictures and images are put in album from which the students view them and answer questions based on the images and pictures.

Another effective way of addressing gender bias against girls in science classroom teaching is in the application of computer-based instruction. The difference between boys and girls achievement in science could be narrowed through the use of computer-based instruction. According to Abimbade (1997), computer usage can lead to improved learning because teachers will be able to recognize and pay better attention to individual differences in the learners. Computer assisted instruction offers itself to individualized learning since students can receive accurate information, access information and obtain immediate feedback. This is made possible by the use of developed instructional packages or programmes on computer-based education in science subjects. For example, Interactive Physics (IP) software, according to Otuka (2004), is a complete motion laboratory on computer that combines a simple user interface with a powerful engine that stimulates the fundamentals of Newtonian mechanics. With the use of IP, both the teacher and students can create simulations by drawing objects on the screen and bringing these simulations to life with stunning animation. Computer-based instruction provides more concrete opportunities for girls in science that eliminate or reduce difficulties in conceptualizing abstract concepts.

Other instructional strategies include adopting the cooperative learning style in teaching physics. Two major cooperative learning methods are suggested here; the Demonstration teaching strategy and the activity approach teaching strategy.

The Demonstration teaching strategy is a practical form of learning by imitation. Demonstration can be used to show methods and techniques, to verify facts and principles (like Hooks law, freezing point of water). To ensure gender friendly demonstration teaching strategy, the teacher should ensure that there is a clear statement of the objective devoid of gender nouns/pronouns. Also, adequate time should be given to both boys and girls for meaningful interaction and discussions (Archibong, 2011). Girls should be given opportunities to lead groups to ensure gender friendliness.

The activity approach teaching strategy involves the students in hands-on-activities. This helps to develop in the students science process skills in addition to cognitive and affective skills. The guided discovery/inquiry method of science teaching

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is a typical example. In this approach, the teacher initiates the learning activity and arranges the materials to be used. The teacher also directs the course of the activities, observes, corrects and asks questions when necessary. The teacher should also ensure that the students work in competitive and co-operative mixed groups, some of the groups should be led by girls.

### **Conclusion**

Useful suggestions have been advanced in this paper as to how the problem of gender stereotyping in a science classroom setting could be eliminated or reduced. The major therapy that can be applied against gender bias at the secondary school science level has been suggested to be: (i) The teacher's expectation which should be equally positive for both boys and girls and (ii) application of innovative and effective instructional strategies and materials that would help the teacher to carry all the students along, including the girls, in science learning. If these remedies are put in proper place or implemented the Federal Government Millennium Development Goal of providing equal science literacy for all sexes in Nigeria would be a reality.

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