

Strategies for Closing the Gender Gap in Science & Technology (S&T) Classrooms in Nigeria Secondary Schools: Teachers' Perception of Gender Mainstreaming

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Abstract

The study invested teachers' perception of gender mainstreaming as a strategy for closing the gender gap in S&T classrooms. The study was carried out in Enugu education zone of Enugu State. The population of the study comprised a total of 397 teachers teaching Physics, Chemistry, Biology, Basic Science and Basic Technology in the zone. A sample of 150 teachers was drawn from all the co-educational secondary schools in the zone using stratified random sampling technique. The instrument for data collection was a structured questionnaire developed by the researchers. It was face the content validated by two experts in S&T education and one expert in measurement and evaluation. The reliability coefficient was determined to 0.81 using cronbach alpha coefficient three research questions which guided the study were answered using means, standard deviation and variance. The findings of the study revealed that; gender-related unethical ideologies and practices exist in S&T classrooms; even though teachers are aware that gender gap in S&T can be narrowed down by mainstreaming gender in S&T classrooms, teachers do not presentation of lessons.

Keywords: Gender, Gender Gap, Science, Technology, Gender Mainstreaming.

1. Introduction

Science is the process of acquiring knowledge about the physical and natural world and phenomena by using systematic observation and experimentation. Technology on the other hand is the right application of scientific knowledge in solving problems emanating from the environment. According to Okeke (2007), science is a systematic process of obtaining verifiable and testable knowledge about nature and natural occurrences utilizing careful observations and experiments. He also defined technology as the practical application of science in solution of problems encountered in the environment. The aphorism "educate a boy, educate a human being, educate a girl, educate several nations" has indicated the widely accepted importance of educating women especially in science and technology as a pre-requisite for social transformation and development (Elechi, 2010). Science and technology education are viable tools for empowering women and girls. This is why it is important to explore the various instructional strategies that could be adopted in closing the gender gap which exists in science and technology classrooms.

Gender is a set of physical and mental characteristic behaviours and roles which distinguish between males and females. Opong in Aja – Okorie (2002) defined gender as a term used to describe and analyze roles, relationships, status, expectations, obligations and the entire notion of

what is ascribed by culture to males and females at a given time in history. Udousoro (2011) viewed gender as a cultural construct that distinguishes the roles, behaviours, mental and emotional characteristics between males and females developed by a society. According to Umoh (2003), gender is a psychological term used in describing behaviours and attributes expected of individuals on the basis of being born as either male or female. Okeke (2008) opined that gender is a broad analytical concept which draws out women's roles and responsibilities in relation to those of men. Gender is not synonymous with sex. While sex refers to biological composition of man and woman, gender describes those roles and behaviours which are socially and culturally assigned to males and females.

There is strong evidence in Literature that gender gap exists in science and technology classrooms and this gap is in favour of the males. Gender gap is a noticeable statistical difference in behaviour or attitude between males and females. This noticeable difference (gender-gap) is not biologically pre-determined but the male-child and the female-child are socialized into a highly gender-stereotyped culture right from home. To eradicate the gender gap in science and technology education, Okeke in Okon, Udofia and Williams (2010) recommended alterations in materials, pedagogies, ideologies (the belief system) and practices of learners, teachers and stakeholders in S&T education. Shackelford (1992) argued that gender gap in science and technology education can be narrowed down by creating a proactive feminist environment. According to him, a proactive feminist classroom is student-centered and non-hierarchical with emphasis on community and co-operation. Okoli (2012) reported that gender mainstreaming has been globally recognized as the most effective strategy to achieve gender equality and justice in all fields of life and in all sectors of development. She recommended five instructional strategies that could be adopted in gender mainstreaming thereby achieving equality between males and females in S&T classrooms. The five instructional strategies are

1. Use of teaching strategies that promote co-operation rather than competition.
2. Use of gender inclusive languages or expressions.
3. Use of gender inclusive images, pictures and textual materials.
4. Use of gender inclusive teacher-student interaction in S&T classrooms.
5. Eliminating/avoiding behaviours or utterances that are gender sensitive in S&T classrooms.

The present study explored the various instructional strategies that could enhance the promotion of gender equality and the extent to which these strategies are being employed by S&T teachers.

2. Gender Mainstreaming As a Strategy for Closing the Gender Gap in S&T Classrooms.

Gender mainstreaming according to Okoli (2012) was established as a 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. She described gender mainstreaming as a strategy for bringing gender issues into the mainstream of society so as to ensure gender equality. The economic and Social Council (ECOSOC) in Okoli (2012) defined 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 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 S&T classrooms thereby achieving equality between males and females. To close the gender gap in S&T classrooms through gender mainstreaming, Okoli (2012) proposed five instructional strategies which S&T teachers can adopt.

1. Use of teaching strategies that promote cooperation rather than competition. Co-operative learning strategies have been found to enhance achievement and interest in science for both boys and girls (Okebukola, 1985). Hesse-Biber & Gilbert (1994) asserted that one way to change the traditional classroom structure is by teaming students in co-operative

learning dyads. During practical classes in science, students should be made to work in small groups with roles shared among them. Examples of cooperative learning strategies include; games, simulations, role-play, group discussion and career oriented teaching. Seymour in Elechi (2010) found out that females prefer cooperative learning in S&T 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 S&T classrooms. The following gender – inclusive nouns have been recommended for use in S&T classrooms e.g.
humankind 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 girls' participation and performance in S&T classes (Akalanu in Nwosu, 2006). According to Freeman (1975),

"an academic institution that neither encourages nor discourage students of either sex is inherently discriminatory against women because it fails to take into account differentiating external environments from which female and male students come".

S&T classrooms before now have been dominated with masculine pictures, images and textual materials. Gender mainstreaming can be achieved through de-sexing S&T instructional materials (Okoli 2012). To de-sex instructional materials used in S&T classrooms, female pictures, images and textual materials should be used to illustrate scientists at work doctors, nurses, engineers, etc. This will go a long way in dispelling the myth that science is masculine.

4. Use of gender inclusive teacher – student interaction in S&T classrooms. A gender inclusive classroom is one where equal opportunities are provided for male and female students to interact with their teacher as well as among themselves. Sadker and sadker (1982) and Grayson (1988) investigated teacher – student interaction patterns and found that some teacher behaviours provide more instructional time to male students than their female counterparts. This lowers the self esteem of the female students. Equal attention, time and opportunities should be given to all students irrespective of whether the learner is a male or a female.
5. Elimination/avoiding behaviours or utterances that are gender sensitive in science and technology classrooms. Okoli (2012) advised S&T teachers to avoid the use of jokes or behaviours that negatively impinge on the personality or cultural roles of male and female students

3. Statement of the Problem

Inspite of the efforts made at national and global levels to ensure that females are given equal rights as their male counterparts, research studies still reveal under-achievement and under-representation of women in S&T classrooms. The under-representation of women and girls in science and technology has been traced to socio-cultural, gender stereotyping, economic and pedagogical barriers. If this is allowed to continue, the advancement we are clamouring for in S&T will remain a mirage. The present study explored the various instructional strategies that could be adopted in closing the gender gap in S&T classrooms.

4. Purpose of the Study

The study aimed at exploring the various instructional strategies that could help in closing the gender gap observed in S&T classrooms. Specifically, the study sought to determine.

- the gender-related unethical ideologies and practices that are prevalent in Nigeria S&T classrooms.
- the strategies for promoting gender equality in S&T classrooms.
- the extent to which S&T teachers employ the identified strategies in S&T classrooms.

5. Research Questions

1. What are the gender – related unethical ideologies and practices that are prevalent in S&T classrooms in Nigeria?
2. What are the strategies for promoting gender equality in S&T classrooms?
3. To what extent do S&T teachers employ these strategies in daily presentation of lessons?

6. Research Method

The design of this study is descriptive survey. The study was carried out in Enugu Education zone of Enugu State comprising of three local government areas. The population of the study consisted of 397 teachers teaching chemistry, physics, biology, basic science and basic technology in all the public secondary schools. The sample was made up of 150 teachers selected through stratified random sampling technique from all the co-educational secondary schools in the zone.

The instrument used was four-point likert scale questionnaire developed by the researchers. The instrument was face and content validated by two experts in Science Education and one expert in measurement and evaluation. Trial testing was done on 30 teachers from Agbani education zone. The reliability coefficient of the instrument was established to be 0.81 using cronbach alpha co-efficient. The questionnaires were administered to 150 teachers and there was 100% return as the questionnaires were filled and collected on the spot. Four responses; Strongly Agree (SA), Agree (A) Disagree (D) and Strongly Disagree (SD) were obtained. The responses were assigned 08; 4; 3; 2 & 1. The data were analyzed by computing the mean, standard deviation and variance for each item. In order to take a decision on whether and identified factor as indicated by the respondents should be accepted, the researchers chose a mean cut-off point of 2.50. thus a questionnaire item with a mean score 2.50 or above was accepted while an item with a mean score of less than 2.50 was rejected. The standard deviation and variance were also presented to show how the individual raw scores from which the mean was computed were scattered about the mean.

7. Results

7.1 Research Question One: What are the gender – related unethical ideologies and practices that are prevalent in Nigeria S&T classrooms?

Table 1: Responses On the Gender Related Unethical Ideologies and Practices that are Prevalent in Nigeria S&T Classrooms.

S/N	Items	SA	A	D	SD	\bar{X}	STD	VAR	Decision
1	Leadership positions are reserved for the males while females deputize them.	80	50	15	05	3.37	0.80	0.64	Accepted
2	Boys dominate practical activities and manipulation of apparatuses	70	40	25	15	3.10	1.01	1.03	Accepted
3	Teachers believe that boys are superior to girls when	60	50	30	10	3.07	0.93	0.87	Accepted

	it comes to mental ability or intellectual capacity								
4	Boys are reprimanded more often than girls	65	40	25	20	3.00	1.07	1.14	Accepted
5	Teachers give more attention to boys than girls.	40	60	30	20	2.80	0.98	0.97	Accepted
6	Difficult tasks are given to boys to perform.	95	20	30	05	3.37	0.92	0.84	Accepted
7	Easy tasks are given to girls to perform.	80	40	17	13	3.25	0.97	0.94	Accepted
8	Teachers believe that boys are more energetic than girls.	70	60	10	10	3.27	0.86	0.73	Accepted

Each item in table one scored above 2.50 which is the level of acceptance indicating that S&T teachers agree that gender – related unethical ideologies and practices exist in S&T classrooms in Nigeria.

7.2 Research Question Two: What are the strategies for promoting gender equality in S&T classrooms?

Table 2: Responses on Strategies for Promoting Gender Equality in S&T Classrooms.

S/N	Items	SA	A	D	SD	\bar{X}	STD	VAR	Decision
1	Use of teaching strategies that promote co-operation rather than competition.	55	35	10	50	2.63	1.28	1.64	Accepted
2	Use of games	65	15	60	10	2.90	1.05	1.10	Accepted
3	Use of simulations	40	50	20	40	2.60	1.15	1.32	Accepted
4	Use of role – play	40	60	35	15	2.83	0.94	0.88	Accepted
5	Group discussion	50	30	35	35	2.63	1.17	1.37	Accepted
6	Use of career-oriented teaching	70	40	30	10	3.13	0.96	0.92	Accepted
7	Use of gender – inclusive language or expression e.g. chair person instead of chairman, humankind instead of mankind.	80	40	20	10	3.27	0.93	0.87	Accepted
8	Use of female images, pictures and textual materials to illustrate a scientist at work, a doctor, a nurse, etc.	90	40	10	10	3.40	0.88	0.78	Accepted
9	Use of gender inclusive teacher – student interaction i.e S&T teachers giving equal attention, time and opportunities to all students whether male or female	40	60	25	25	2.77	1.03	1.05	Accepted
10	Avoiding behaviours or utterances that are gender sensitive in science and classrooms	60	50	30	10	3.06	0.93	0.87	Accepted

In table 2, all the items scored above 2.50 which is the level of acceptance showing that S&T agree that the instructional strategies listed in items 1 – 10 can promote gender equality in S&T classrooms.

7.3 Research Question Three: To what extent do S&T teachers employ the identified strategies in daily presentation of lessons?

Table 3: Responses on the Extent to Which S&T Teachers Employ the Identified Strategies in Daily Presentation of Lessons.

S/N	Items	VHE	HE	LE	VLE	\bar{X}	STD	VAR	Decision
1	Use of teaching strategies that promote co-operation rather than competition	13	45	57	35	2.24	0.91	0.83	Rejected
2	Use of games	10	40	80	20	2.27	0.77	0.60	Rejected
3	Use of simulations	15	25	70	40	2.10	0.91	0.83	Rejected
4	Use of role – play	20	30	80	20	2.33	0.87	0.76	Rejected

5	Group discussion	18	42	75	15	2.42	0.83	0.69	Rejected
6	Use of career oriented teaching	32	38	50	30	2.48	1.04	1.08	Rejected
7	Use of gender inclusive language or expression e.g. chairperson instead of chairman, humankind instead of mankind etc.	25	30	55	40	2.27	1.03	1.06	Rejected
8	Use of female images, pictures and textual materials to illustrate a scientist at work, a doctor, a nurse, an engineer, etc.	20	20	80	30	2.20	0.91	0.83	Rejected
9	Use of gender inclusive teacher – student interaction i.e S&T teachers giving equal attention, time and opportunities to all students whether male or female.	50	30	40	30	2.67	1.14	1.30	Accepted
10	Avoid behaviours or utterances that are gender sensitive in S&T classrooms.	45	40	15	50	2.53	1.23	1.53	Accepted

In table 3, only items 9 and 10 scored above 2.50 showing that respondents agree that S&T teachers give equal attention, time and opportunities to all students irrespective of their sex. Again the response to item 10 shows that S&T do not use gender sensitive utterances or behaviours that negatively impinge on the personality or cultural roles of male and female students. However, items 1 – 8 scored below 2.50 which is the level of acceptance. This implies that even though S&T teachers accept that these instructional strategies can promote gender equality, they do not employ the recommended strategies in S&T classrooms.

8. Discussion

In research question one, all the eight items listed were accepted by the S&T teachers in Enugu state as gender-related unethical ideologies and practices that are prevalent in Nigeria S&T classrooms. These ideologies as practices include; reserving leadership positions for boys while girls deputize them, allowing boys to dominate practical activities and manipulation of apparatuses; reprimanding boys more often than girls; teachers giving more attention to boys than girls; giving difficult tasks to boys to perform and giving easy or less difficult tasks to girls to perform and the belief that boys are more energetic than girls. This finding implies that the S&T classroom environment in Nigeria is not conducive for the girl-child. It presents science as masculine and entirely reserved for the male-folk. The result is agreement with sadker and sadker (1982) and Grayson (1988) who found out that some teacher behaviours provide more instructional time to male students than their female counterparts. When the environment is not favourable or encouraging to the girl-child, it is automatically discriminatory against the female-folk. This agrees with studies by freeman (1975) who argued that an academic institution that neither encourages nor discourages students of either sex is inherently discriminatory against women because it fails to take into account differentiating external environments from which female and male students come.

In research question 2, all the ten items were accepted by the respondents as strategies that can promote gender equality in S&T classrooms. These instructional strategies include; the use of co-operative learning strategies such as games, simulations, role-play, group discussion, and use of career-oriented teaching, use of gender-inclusive language or expressing e.g. use of female images, pictures and textual materials, use of gender-inclusive teacher-student interacting, and teachers avoiding behaviours and utterance that can narrow down the gender gap in S&T classrooms. The result is in agreement with shackle ford (1992) who said that technological gender gap can be narrowed down by creating a proactive feminist environment. It is also consistent with Okoli (2012) who reported that gender mainstreaming has been globally recognized as the most effective strategy to achieve gender equality and justice in all fields of life and in all sectors of

development.

The result in table 3 reveals that even though S&T teachers are aware that mainstreaming gender in S&T classrooms can promote gender equality, they do not recommend instructional strategies that are not being employed by teachers in daily presentation of lessons. This finding is consistent with Seymour in Elechi (2010) who found out that females prefer cooperative learning in S&T but science teachers do not give them opportunities to carry out tasks equally with the males in order to learn cooperatively.

9. Recommendations

1. Science and technology educators and researchers should develop computer games and simulations using the national curricular for science and technology subjects.
2. Curriculum planners should incorporate girl-friendly curricular materials in their programmes.
3. Science and technology educators should explore more cooperative learning strategies that can motivate the girl-child into science and technology.
4. Authors of textbooks and charts should use female photographs to illustrate scientists at work, a doctor, an engineer, a technologist, etc.
5. Professional bodies such as STAN and ministries of education should organize seminars, workshops and conferences to update sciences and technology teachers of the identified instructional strategies that can promote gender equality in S&T classrooms.

10. Conclusion

The learning environment in S&T classrooms is not conducive for the females. Teachers present science and technology as masculine. A change in the status quo requires a change in materials, pedagogies, and practices so as to motivate the female into Science and Technology.

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