

THE CHALLENGE OF GENDER GAP IN SCIENCE AND TECHNOLOGY AMONG UNDERGRADUATE STUDENTS: THE CASE OF UNIVERSITY OF MKAR, MKAR

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Abstract

One of the challenges of university education in Nigeria is the issue of gender imbalance in the choice of pure science and technology courses. While private universities have contributed immensely in narrowing the gap between male and female students in over all admission, much is yet to be achieved in the area of pure sciences. A case of the University of Mkar shows that the gender gap in core science and computer courses is too wide to be imagined. It was discovered that there is no single female students in Chemical and Physical Sciences. The study equally reveals that only 8.7% of female students enrolled for computer science and 46.7% for Microbiology as against 86.4% in Mass communication and 60.9% in Sociology. Several reasons have been advanced for this anomaly which includes parental influence, lack of models and child upbringing. In order to address this challenge, some recommendations were made. They include sensitization of parents by management of private universities; encouragement of female students through tuition scholarship and the introduction of sexuality education for the purpose of enhancing students' self-esteem. This paper is optimistic that the challenge of gender imbalance in science and technology will soon become history if these recommendations are given due consideration.

Keywords: Challenge; gender gap; science & technology and undergraduate students.

Introduction

Every living being, irrespective of gender is obviously endowed with some innate potentialities, which must be discovered and harnessed for the development of all sectors of the economy. This expectation is anchored on the acquisition of knowledge through proper education of all citizens, males and females alike. Education is fundamentally aimed at the development of the self and intellect without any prejudicial consideration particularly in relation to ones sex. After all, the directive of God in the Christian Holy Book (Genesis 1:28) that mankind should replenish, subdue and have dominion over everything in the world is not limited to a particular gender. Both males and females have the privilege of discovering their innate potentials and

exploiting them for the growth of the social system.

Unfortunately, this expectation is yet to be fully actualized particular by the female folk due to prejudices on gender. Gender has apparently become a social challenge which has attracted much concern. This is the argument by advocates of feminism that the female folk is continuously experiencing much prejudice, discrimination, subservience and in some cases the deprivation of the right to make choices, including the choice of academic career (Hodges, 2001). Consequently, a wide gap appears to have been created between males and females both in the school system and in the work environment. Gender differences seem to have been over

exaggerated at the expense of the numerous biological and physical similarities that ought to have been considered for social harmony and growth of the economy. Gender stereotype in Nigeria is so pervasive that it affects girls' access to education and even their choice of science courses in the university (Hodges, 2001). The wide spread gender stereotype often makes one wonder if males and females are living in two different worlds. Kassin (1995) posits that numerous similarities do exist between males and females which scholars on gender seem to have taken for granted. He asserts that the differences between the two genders are pronounced because differences make news whereas similarities do not.

It is against this backdrop that protagonists of gender sensitivity have continuously called for more enlightenment on the right place of the female folk, which includes the choice of courses in universities that were hitherto assigned to males as an exclusive preserve. This paper strongly believes that the school system, which is one of the most profound agents of socialization has the capacity to resolve the challenge and narrow the gap between males and females through massive school enrolment as well as the choice of science courses in tertiary institutions. It is however observed that while the general enrolment gap between male and female students in the universities is improving appreciably, a wide gender gap in the choice of science and technology courses still persists. Selection of courses by students appears to be considered along gender stereotypes. This imbalance, which has been a major challenge in public universities has become a matter of serious concern in private universities. Effort to resolve this challenge must be made particularly now that many private universities have emerged to compliment the efforts of public universities

so that the untapped innate potentialities inherent in the female gender may be actualized.

Conceptual and theoretical framework

The concept of gender has been viewed differently by scholars in relation to their cultural background. Some societies refer to it as an individual's inner sex or psychological sense of being a male or female irrespective of one's (outer) sex identity as determined by one's sexual organs. This definition takes cognizance of the fact that several sexual orientations exist. But as far as the Nigerian-culture is concerned, the concept of gender cannot be separated from one's sex identity as a male or a female, which is determined by one's sexual organs. Gender is therefore, being a male or female. These two genders are considered acceptable within the Nigerian culture. Any variation from this definition can be construed as a psychological disorder that requires expert intervention.

Unfortunately, society has constructed or assigned specific roles to children along gender lines and such impositions influence human functioning throughout life. From infancy, a child is made to know through the socialization process that certain roles are masculine (male) and others are feminine (female). Children therefore, grow up from infancy through adolescence to adulthood holding tenaciously to such beliefs and practices. It is that expectation regarding the appropriate behaviour attitudes, skills and interests culturally assigned to males and females that referred to as gender roles (Kassin, 1995; Papalia, Olds and Feldman 1999). This conceptualization points to the fact that gender roles are predominantly socially motivated. They may be a reflection of cultural beliefs or aspirations of particular genders. In some cases, gender roles may be manipulated for political advantage resulting in bias,

marginalization and oppression of a particular gender.

The social roles theory sees gender stereotype as having a measure of truth but are in most cases greatly exaggerated (Kassin 1995). According to the theory, perceived sex differences are magnified by the unequal social roles occupied by men and women. It is the different social roles that bring about the persistent impression that men are dominant and women are subordinate or nurturant (Crowl, Kminsky and Podell, 1997). The theory asserts that gender stereotype has brought about the division of labour between the sexes both at home and in work environment. Men are more likely to work in construction companies and do rigorous business while women take to child care and lower status jobs.

This paper is in agreement with Kassin (1995) that the similarities between male and females are more alike than they are different. New born babies irrespective of sex follow the same pattern of human development: sitting, crawling, and development of teeth, walking, behaviour pattern and other psychosocial development. In fact, they grow without any noticeable difference until society begins to impress on them their unique social roles.

Literature review

A review of some related literature shows that the issue of sex differences can be understood from both biological and environmental perspectives.

Biological perspective

This paper agrees with Kassin (1995) that the existence of biological differences between male and female is a fact of life that is tenable anywhere. Genetic differences are noticed right from the conception stage where the fetus must have 23 pairs of chromosomes. The 23rd

chromosome determines the sex of the baby. Basic knowledge in human development shows that every fetus receives an x chromosome from the mother but has a chance of receiving either an x or a y chromosome from the father. If the pair of chromosomes is xx, the child becomes a female but if it is xy, the baby becomes a male. This difference in chromosomes naturally accounts greatly for the differences in the biological make-up of the two sexes. Children therefore behave in line with their unique sexual orientations. Some research studies have pointed to a measure of differences that occur in the brain of males and females which showed marked difference in the hypothalamus and the corpus callosum. The right hemisphere which is responsible for spatial skills and calculations is larger in males while the left hemisphere which is responsible for verbal fluency is larger in females. More emphasis is laid on the differences in sex hormones (Kassin 1995). The testosterone which is the male sex hormone has been associated with aggression. It has also been discovered that a high level of testosterone appears to enhance spatial skills and mathematical calculations while the estrogen and progesterone which are the female sex hormones have been linked with lower spatial skills but a higher verbal fluency (Hampson and Kimura, 1992). The link between testosterone and aggression has culturally given the male a dominant and oppressive posture hence crime rates appear to be higher among male teenagers. In line with this belief, he-goats are often castrated to reduce the level of aggression. The fact however remains that testosterone does not cause aggression though it may have a role to play. It is believed that sex hormones accounts for the better performance of males in mathematics and better performance of females in language and communication skills. However, studies have shown that there is no significant difference between males and

females in intellectual performance due to their different sex hormones (Kimura, 1989). Kimura maintains that the differences are too small to make any predication between males and females. In a study by the federal ministry of education Abuja in conjunction with UNESCO and UNICEF in 2000, it was revealed that there was no significant difference between boys and girls in their average scores on tests for literacy, numeracy and life skills. If there is no significant difference between the sexes in intellectual performance and in numeracy, why should there be a wide gap between male and female undergraduates in the choice of mathematics, pure sciences and technological courses?

Environmental perspective

Despite the biological difference between males and females, the difference in the choice of courses at the university appears to be determined mainly by environmental influences. The Nigerian cultural orientation has made gender Schemas too strong that it affects even schooling and choice of courses. According to Schaefer and Lamm (1998), “we socially construct our behaviour so that male-female differences are either created or exaggerated (p.324)”. courses in the sciences and computers are seen as masculine, while other courses like Secretarial Studies and Food and Nutrition are tagged feminine courses, which invariably deny the sexes the opportunity of benefiting maximally from university education (Hogdes, 2001).

Since culture is known to be dynamic, the question of gender gap particularly in the choice of courses is expected to change as well. Fortunately, the female folk is experiencing some appreciable changes in their roles. For instance, females have demonstrated their managerial prowess in organizations, institutions, government services and even in religious institutions.

Females have excelled as Federal Ministers, Senators, Vice-Chancellors, Directors and vibrant Evangelists. A few have dared to take to professional careers in Engineering, medicine and mathematics. Males are equally entering into careers that were culturally assigned to females such as Nursing, Mass Communication and Home Economics. The gap between males and females in over-all university admissions particularly in private universities is seemingly becoming too narrow to be recognized, but gender gap in the core science and technology courses appears to be very wide.

Empirical study

A study by Best and Williams (1993) on gender stereotype shows that men are perceived to be adventurous, strong, dominant, assertive, task-oriented, aggressive, enterprising and independent while women are seen as sensitive, gentle, dependent, emotional, sentimental, weak, submissive and people-oriented. In another study by Rubin, Provenzano and Luria (1974), first time parents of 15 girls and 15 boys were interviewed about their new born babies who had not lived up to 24 hours from the time of birth. The parents of the girls said their children were softer, smaller, and more finely featured while the fathers of the boys saw their children as stronger, larger, better co-ordinated and more alert. Certainly, these objectives were influenced by gender stereotypes because the children had not exhibited any behaviour that qualifies such comments. Based on these judgments, Schaefer and Lamm (1998) show the expectation of people regarding the two sexes: “People expect boys to be masculine-active, aggressive, tough, daring and dominant while girls must be feminine-soft, emotional, sweet and submissive (p.324)”. It is these expectations that equally affect the choice of courses that are in line with their cultural or social characteristics. These studies have

shown that sex differences exist but have not ascertained the actual difference between males and females especially in the choice of science courses. This is the gap that this study is set to fill.

Data collection and presentation

This paper considered a case of the enrolment figure of the University of Mkar, Mkar in

Benue State for the 2009/2010 session. Data collected from the academic office were converted into percentages to show clearly the gap that exist between male and female students. Data collected equally show the gap between male and female staff in the College of Natural and Applied Sciences. The result of the study is shown in tables below.

Table 1: Percentage Overall Admission of students 2009/2010

S/No	Sex	%	Gap
1.	Males	52.0	4.0
2.	Females	48.0	

Source: Academic Office University of Mkar, Mkar

Table 2: Admission of Students in selected Social and Management science courses at the University of Mkar, Mkar 2009/2010.

S/No	Courses	M %	F %	Gap
1.	Mass Comm.	13.6	86.4	72.8
2.	Sociology	39.1	60.9	21.8
3.	Accounting	44.1	55.9	11.8
4.	Public Admin.	50.0	50.0	Nil
5.	Business Mgt.	55.6	44.4	11.2
6.	Economics	64.5	35.5	29.0

Source: Academic Office University of Mkar, Mkar

Table 3: Admission of Students in selected pure science and computer courses at the University of Mkar, Mkar 2009/2010 session.

S/No	Department	%		
		M	F	GAP
1.	Chemical Sciences	100	0	100
2.	Physical Sciences	100	0	100
3.	Maths/Computer Sc.	91.3	8.7	82.6
4.	Microbiology	53.3	46.7	6.6

Source: Academic Office University of Mkar, Mkar

Discussion

Table 1 shows that the current admission of students at the university has 52% males and 48% females. There is just a little gap of 4% which implies that the gap between males and females in admission is almost closed. More females are now getting interested in university education probably due to the intensive enlightenment campaign on the education of the girl child.

Table 2 reveals that the gap between male and female students in Mass Communication, Sociology, Accounting and Public Administration has been perfectly bridged. Female students outnumbered their male counterparts in those courses with a reasonable gap of 72.8%; 21.8% and 11.8% respectively. However, the table equally reveals that male students still dominate in Business Management and Economics with a gap of 11.2% and 29.0% respectively. The percentage of female students in Business Management (44.4%) and in Economics (35.5%) are equally appreciable. The table has confirm the assertion that gender stereotypes in the choice

of courses by undergraduate students still exist.

Business Management and Economics have more males because they are relatively mathematical in nature and any course that has to do with mathematics is traditionally a course for male students. Mass Communication which has to do with Secretarial duties has only 13.6% male and 86.4% females showing a wide gap of 72.8% in favour of females

Table 3 reveals that no female student applied for courses in Chemical and Physical Sciences.. All the students admitted for those courses were males. Only 8.7% female students were admitted to read computer science. The remaining 91.3% were male students. When the computation of students in computer science was calculated in ratio, it showed a ratio of 11:1 in favour of males. This confirms the earlier work of Sakamoto (1994) who had a ratio of 4:1 in favour of male computer users. The table however shows a very narrow margin of 6.6% in Microbiology. This is possibly because Microbiology does

not require much calculations. It is equally a confirmation of the traditional belief that females make choices of courses that relate to child care, nursing and other low level careers.

The choice of science courses is one of the major challenges of university education in the 21st century. Gbor (2004, P. 217) suggests that “the issue of girl child education must be vigorously pursued so that Nigerian girls could be encouraged to develop their God-given potentialities and develop their innate abilities”.

The few students who have dared to select the traditionally assumed male courses have debunk the notion that their potentials are only limited to the humanities. Academic Gurus like Professor Grace Alele-Williams (Professor of Mathematics); Professor Mrs. Dosumun (Professor of Chemistry); Professor Dora Akunyili (Professor of Pharmacy) and Professor Elizabeth Amuta (Professor of Parasitology) have excelled in their various professions. They have proved that sex differences in the choice of science courses is not necessarily biological. Their action shows that the need to break away from the statusquo has become very imperative. In order to proffer useful suggestions on how to meet with the challenge, it is fundamental to ascertain the rationale for the refusal or inabilities of female students to apply for pure science and computer courses in the university. Some of the reasons are summarized below.

Reasons for gender stereotype

One of the reasons for the persistent gender stereotype in the choice of courses for university education is the influence of parents. Undoubtedly, parents hold the key to enrolment and determine the choice of courses

for their children because they pay the fees and provide all the materials needed for educational pursuit. Their influence appears to have made a dividing line between definite and specific roles of their children along gender lines. According to Cauter (1991) parents are the most important people that influence the life of a child because their perception on career choice vis-à-vis gender are often very weighty. In other words, parents often dictate for their children on the choice of career (Hodges, 2001). They do this because of their perception of the kind of career that fits the different genders. Such parental interruptions have adversely affected the attitude of female students regarding the choice of pure science courses because they have been informed that pure science and technology courses are the exclusive preserve of male students. They therefore, loose interest in the sciences, which may apparently have been their genuine area of specialization.

Another major reason for female adherence to gender stereotype in the choice of science and technology courses is the apparent lack of role models. Gender imbalance in pure science and technology has been a long time challenge in the university system. Many female students who would have been interested in the science by virtue of their academic performances at the lower level appear to have very few models to emulate. In some universities, female models are non existent. It is a herculean task to have female lecturers in the pure science and computer courses in the universities. For instance a case of the University of Mkar, Mkar conducted by the authors of this paper reveals that there are 52 lecturers in the College of Natural and Applied Sciences but only 5 of them are females. Detail is as shown in table 4 below.

Table 4: Number of staff by Sex in the College of Natural and Applied Sciences, University of Mkar, Mkar 2009/2010 session.

S/No	Department	%		
		M	F	GAP
1.	Chemical Sciences	100	0	100
2.	Physical Sciences	100	0	100
3.	Maths/Computer Sc.	91.3	8.7	82.6
4.	Microbiology	53.3	46.7	6.6

Source: Academic Office University of Mkar, Mkar

Table 4 shows that the College of Natural and Applied sciences of the University of Mkar has 90.4% male lecturers and only 9.6% female lecturers. When students discover that female models are almost non-existent, they become scared. The relatively lack of female lecturers in the pure sciences and computer is an indication that such courses are not female oriented courses. Horizons (1988) lament that only few mentors are available for females to emulate when they think over the type of career opportunities that are available for them. They seem not to have people of the same sex to discuss career interest with. Okebukola (1991) equally laments that as at 1999, only about 10% of full professors in Nigerian universities are women. When this percentage is broken down into science and arts courses, the percentage is likely to be less than 2%. The analysis above shows that the low number of female lecturers especially in the pure science courses may be responsible for the imbalance in female enrolment in science and technology (Okoro, 1998). If nothing is done to address this challenge, the question of gender imbalance in the choice of courses may continue unabated.

Another crucial factor responsible for gender stereotype in the choice of science courses is the pattern of upbringing. Social researchers have argued that boys and girls are not raised

on the same level playing ground (Papalia, Olds & Feldman, 1999). Parents and caregivers have consciously or unconsciously held to the cultural gender schemas where anything mechanical is done by boys. The difference begins from infancy where parents buy doll babies, stuffed animals, kitchen toys, sewing kits and tea sets for their daughters and buy toy guns, toy trucks, baseball bats, building blocks, mechanical tools and toy soldiers for their sons (Wilder, Marchie and Cooper, 1985; Kassin, 1995; Schaefer and Lamm, 1998). According to Papalia, Olds and Feldman (1997) parents are likely to display a feeling of discomfort if their sons play with a doll. Even in this 21st century, parents buy toy cars, toy video games, computers and any toy that has to do with calculations and manipulations for their sons. When a boy cries, certain consoling words such as ‘are you a woman?’; ‘why do you cry like a woman?’ ‘be a man’ are often used. As children grow up, especially in typical Nigerian communities, boys are taught how to make heaps on the farm, set traps and hunt while girls are taught to sweep, weed grasses and fetch firewood. Children grow up with these impressions and conclude that males are born naturally to be adventurous, innovative and calculative while women are weak vessels that must do the low status and supporting duties. Parents often see their

daughters as less competent and set lower goals for them.

Consequently, girls lose interest and confidence thereby avoiding any mathematical-related endeavour. This paper is of the view that since these challenges on the girl-child are mostly man-made, a concerted effort must therefore be made to resolve them so that their hidden potentials can be exhibited favourably for the actualization of our collective aspirations.

Recommendations

In spite of the great strides that have been made by private universities in Nigeria, the issue of gender stereotype which has perpetually limited females to courses in Arts and Humanities, and deprived them the privilege of discovering their potentials in science and technology courses, is one of the major challenges that private universities are still unable to resolve. In view of the dynamic nature of the world system, the need for female to be fully involved in the current wave of science and technology cannot be overemphasized. This paper therefore make the following suggestions as plausible means of resolving the challenge.

Sensitization of parents

Available evidence points to the fact that parents have been the major driving force of gender stereotype, particular in the choice of course and careers. If the goal of encouraging female students to choose science and technology courses in the university is to be actualized, parental influences must be redirected through proper sensitization programmes. It is clear that many parents are ignorant of the age or stage the world has gone into. The onus is on private universities to create parents interactive forum where they will be educated on the place of females in this

age of technology. The case of University of Mkar as shown in this paper clearly reveals that the sensitization work done on the need for girl-child education is yielding a very positive result. The gap between males and females in overall admission is only 4% which is quite insignificant. It is believed that if this effort is made by private universities, the goal of having female scientists and technologists in Nigeria will be realized. Undoubtedly, parents have the ability to assist their daughters overcome the gender gap in science and technology hence private universities must begin with parents. Parents can be sensitized to encourage their daughters in particular through:

- (i) Giving of praises and rewards for creativity, skillfulness and innovation
- (ii) Frequent discussion of gender stereotype and the implication for female gender
- (iii) Allowing children especially their daughters the freedom to think independently. They could be given some task that require indepth thinking
- (iv) Avoiding words and subtle actions that overtly show the dichotomy between male and female. Equal treatment should be given to the two sexes in terms of intellectual and skill acquisition
- (v) Exposing their daughters at early age (infancy) to technology by buying technology products for them just as they do for their male counterparts.

Encouragement of female by the university

For private universities to achieve the goal of equal participation in science and technology female students who are currently undertaking science and technology programmes should be adequately encouraged so that prospective students will desire to enroll into the sciences. One of such encouragements is to tentatively

award tuition scholarship to any female student who is interested in pure science and computer courses in all private universities in Nigeria. This programme can take an initial period of ten years. It is hoped that when female students get interested, they may continue to lure others even without any scholarship. Moreover, active admission of females into pure science and computer courses could be done by allowing some waivers such as a pass in Mathematics.

Academic staff in pure sciences should equally join the pursuit by using strategies and approaches that may be of interest to females. Female students can also be encouraged through the formation of female science clubs where they can rob minds together as females and face whatever challenge that may come their way without any interruption from the male folk. It is hoped that if this encouragement is given, female scientists and scholars will be produced within the shortest possible time and they will in turn act as models for others to emulate.

Secondary schools should equally encourage full participation of female students in pure sciences; organize debates and appoint female students as exco members in their science clubs. Other states are encouraged to emulate the Rivers State Government which gave vehicle loans to women to buy cars and use them as taxis. This will encourage women to take to traditionally assumed male careers such as commercial driving, photography, shoe making, computer operators and even engineering jobs.

Sexuality education

There is no gain saying the fact that many female students develop low self-esteem during the period of puberty and throughout their adolescent stage. They can only discover

their self worth and self-image through proper sexuality education. It is a major means through which the girl-child can pass through her adolescent stage without storm and stress. It has been observed that females perform averagely well in mathematics and other spatial skills in the primary school and even up to the junior secondary school but on attaining puberty, they lose interest in such subjects and activities. In order to have a smooth transition and continue with their intellectual work in the sciences up to the university level, they require adequate sexuality education. This could begin from the secondary school and continue to the early years in the university.

Conclusion

Gender stereotype has adversely affected the choice of undergraduate courses as revealed in a case study of University of Mkar, Mkar. While more females preferred courses in Social and Management Sciences, the pure science and computer courses were left almost for male students. This action may be due to parental influence, lack of role models in the pure sciences and the pattern of upbringing where infants are treated separately as males and females. Thus many female students could not have the opportunity of demonstrating their God-given potentials in some areas of special interests. Though biological differences in sexes exist, it is observed that environment has contributed greatly to further widen the gender gap. This paper therefore concludes that gender stereotypes are socially constructed and so much exaggerated that the similarities between male and female have become less important. Through a concerted effort by all stakeholders of the university system, the challenge of gender imbalance in the core science and computer courses will be adequately resolved.

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