

Girls Education in Science: The Challenges in Northern Ghana

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Abstract

This study seeks to find out the causes of the widening disparities in the study of science in second cycle schools in the Upper West Region of Ghana. In Ghana, education policies do not discriminate against any section of the community. Even though the Science Technology and Mathematics Education (STME) clinics were initiated to address the gender disparities and misconceptions about girls' participation in science and technology there has not been any significant improvement in female students studying sciences in the three northern regions of Ghana. For this research study schools were purposively selected based on schools offering pure science and science related programs. The study used a mixed method design that includes qualitative and quantitative data process. Methods employed for data collection include focus group discussions, questionnaires, interviews, observation and review of secondary data. The research established that high illiteracy rate among parents left children to their own fate in deciding the choice of programs of study in the second cycle schools; identified inadequate science resources; poor performance recorded by students in the science departments; understaffing; harassment by peers and teachers; inadequate female teachers as role models in science and; lack of motivation either from parents, peers or teachers. The research findings added to the knowledge base on the causes of gender disparities in science education. In addition, they served as reference materials for policy makers, as well as gender activists.

Keywords: Gender, disparity, parity, science education, northern Ghana.

1. Introduction

Education is the process of equipping an individual with information to help develop mentally, socially, spiritually, emotionally, politically and economically. It is the acquisition of knowledge and skills that play a fundamental role in poverty alleviation, as well as economic and social growth (Hanushek & Woessmann, 2008). According to Schultz (1993), education also expands the range of opportunities available to individuals and equips them with the tools to make better-informed choices. The issues of access to education have been a major concern worldwide with disparity in gender attracting more attention in recent times. Globally, disparities in literacy between males and females remain everywhere although they have narrowed considerably since 1970s (UN, 2006). The gender gap is greater in North Africa and Middle East, Sub-Saharan Africa and South Asia. In South Asia in 1990s, for every 100 literate males, there were 54 literate females (UN, 1995).

Ghana has made positive progress towards increasing access to education and bridging gender disparities in education. In 2005, the Ministry of Education abolished school fees nationwide in basic education and introduced a capitation grant for all basic schools after a successful pilot in 2004. It effectively addressed poverty, one of the main barriers to access to education. The grant demonstrated that eliminating school fees leads to narrowing gender gaps and has an immediate and substantial impact on enrolment at the basic level and enrolment at the second cycle level as well (GES,2009).

The Ministry of Education, Science and Technology in its sector performance review report 2008 had the following targets: female enrolment in universities to increase from its stage of 34% to 50% by 2015, female enrolment into polytechnics to increase from its present state of 30% to 50% by 2015 (MOESS, 2008). Even though the Science, Technology and Mathematics Education (STME) clinics were initiated in 1987 to address the gender disparities and misconceptions about girls' participation in science and technology, there has not been any significant improvement in female students studying sciences in the three northern regions of Ghana.. The study of science is an indispensable part of the educational system worldwide; it results in a more productive workforce, which contributes to an internationally more competitive nation (Robottom & Hart, 1993). Gender differences are now widest at the level of secondary education, where the acquisition of cognitive skills is crucial for national economic growth.

The researchers took eight (8) second cycle schools across the region and sampled for a preliminary study. Science student's enrolment covered one thousand seven hundred and seventy (1,770) students. It was obvious that very few female students opted for the study of science and science related subjects. Out of this figure, only four hundred and fifty-one (451) representing 25.4% were girls. In 2006/2007 academic year, a total of 3,395 female students enrolled into second cycle institutions in the Upper West Region. Out of this figure, female science students numbered 299 representing 8.8%. A whopping 1124 representing 33.1% of students were admitted into the home economics program. In 2007/2008 and 2008/2009 academic years the figures increased but not to any appreciable level. In 2007/2008, female students population of 373 out of 3,680 representing 10.1% were admitted to pursue science while 1200 students representing 32.7% were admitted to study home economics. Also, in 2008/2009, 502 out of 4,233 representing 11.8% of female students that studied science in second cycle schools. However, in 2009/2010 academic year, there was a decline in the percentages even though the total female population in all programs increased slightly at a total of 433 out of 4,408 representing 9.8% studied science (GES, 2010). Below are tables from the Senior High School (SHS) regional profile report (2010):

TABLE 1.1: 2006/2007 Enrollment by Sex into SHS in Upper West Region

Programme	Boys	Girls	Total	% Female
Agriculture	902	220	1122	19.6
Accounting	1363	351	1714	20.5
Secretarial	94	144	238	60.5
General science	877	299	1176	25.4
General arts	1,878	1054	2932	35.9
Technical	285	45	330	13.6
Home econs.	392	1124	1516	74.1
Visual arts	279	158	437	36.2

Source: GES 2007

TABLE 1.2: 2007/2008 Enrollment by Sex into SHS in Upper West Region

programme	Boys	Girls	Total	% female
Agriculture	990	247	1237	20.0
Accounting	1630	420	2050	20.5
Secretarial	76	189	265	71.3
General science	955	373	1328	28.1
General arts	1650	1016	2667	38.1
Technical	333	73	406	18
Home econ	438	1200	1638	73.3
Visual art	283	162	445	36.4

Source: GES, 2008

TABLE 1.3: 2008/2009 Enrollment by Sex into SHS in Upper West Region

Programme	Boys	Girls	Total	% female
Agriculture	1016	363	1379	26.3
Accounting	1396	378	1774	21.3
Secretarial	31	118	149	79.2
General science	1236	502	1378	28.9
Gen. arts	2213	1372	3585	38.3
Technical	398	36	434	8.3
Home econs.	424	1355	1779	76.2
Visual arts	261	109	370	29.5

Source: GES, 2009

TABLE 1.4: 2009/2010 Enrollment by Sex into SHS in Upper West Region

Programme	Boys	Girls	Total	% Female
Agriculture	885	281	1166	24.1
Accounting	1682	553	2235	24.7
Secretarial	135	159	294	54.1
General science	1051	433	1484	29.2
Gen arts	2162	1311	3473	37.7
Technical	515	147	662	22.7
Home Econs	353	1274	1627	78.3
Visual arts	308	247	555	44.5

Source: GES, 2010.

Problem Statement

Ghana had made frantic efforts by spending huge sums of money and resources to ensure that development take place in all parts of the country. The new developmental approach which is people centered referred to as “Sustainable Human Development (SHD)” emphasizes on the participation of all segment of the population aiming at the eradication of imbalance between sexes with respect to education, economy and health. In spite of the fact that improvement and making of education accessible to all has been a major aim of African governments since 1960s, the history of education to date has been a catalogue of enduring and existing inequalities between boys and girls, men and women. Though educational opportunities have greatly expanded for all children in Ghana, there is still an under representation of females in schools, showing a disparity in educational access and achievement geared to the growing disadvantage of female students. Even as access to education in Ghana clearly put the female student at the disadvantage side, another worrying phenomenon in the educational system is the growing disparities in the choice of programs of study in second cycle schools. This study therefore seeks to find out the causes of the widening disparities in the study of science in second cycle schools in the Upper West Region of Ghana.

Research Question

The question that this study seeks to address includes:

What causes the gender disparities in the study of science in second cycle schools in Upper West Region of Ghana?

Scope of the Study

The study which was focused mainly on second cycle schools in the region covered eight purposively selected Senior High and Technical Schools spread across the entire region on the bases of the program they offered. The issues of disparity is evidenced in almost all the programs however the focus of this study is on finding out the causes of disparity in the study of science. The study also covered stakeholders in education and the gender ministry in the Upper West Region.

Significance of the Study

The research will add to knowledge on the causes of gender disparities in science education in the region, Ghana and the whole world that would serve as a source of reference to readers and researchers. The findings of this research will serve as a reference material for policy makers in the design of educational policies affecting female students in the country. Gender activists will also find the outcome of the research useful as the study reveals the cultural, political, economic and social causes of the disparities in science education that set precedence for gender activists and educationists in addressing the issue.

Purpose of the Study

This study is meant to examine internal (school based) and external (home or environmental based) factors that cause gender disparity in the study of science in the Upper West Region of Ghana. It is meant to contribute to theory and literature on the female student and the study of science. Again it is meant to set the tone for further research into gender disparities in science education in northern Ghana. The focus of the study will be on female students in Senior High Schools in the Upper West Region of Ghana.

Literature Review

The Concept of Education

Education is the process through which individuals are made functional members of their society (Ocho, 2005). It is a process through which the young individuals acquire knowledge and realize their potentials and use them for self-actualization. It is also a means of preserving, transmitting and improving the culture of a society. Education enables individuals to develop their knowledge and skills throughout their lives and thus build human capital. Relatively high levels of education are often related to higher earnings and productivity, better career progression, health, life satisfaction as well as to better investments in education and health of future generations (OECD, 2010a). One of the benefits of good education is that it helps individuals to contribute to development in the quality of life, their environment and the country as a whole. Education is one of the fundamental human rights of individuals. Article 26 of the Universal Declaration of Human Rights, which was adopted by the United Nations General Assembly in December, 1949 stipulated that:

- Everyone has the right to education. This shall be free at least in the elementary and primary stages.
- Elementary education shall be compulsory while technical and professional education shall be made generally available.
- Higher education shall be equally accessible to all on the basis of merit.
- Parents have a prior right to choose the kind of education that shall be given to their children (Nwangwu, 1976).

The Concept of Gender and Gender Disparities

The term 'gender' describes the social relations between men and women and the characteristics of men and women. It concerns men and women's participation in the determination of their lives including access to rights, power and control over resources. Gender is understood to mean that people are born male and female but learn to be girls and boys who grow into men and women. They are taught what the appropriate behaviors and attitudes, roles and activities are for them and how they should relate to other people (William, Seed & Mwau, 1994). According to UN ECOSOC (1997), gender refers to the socially determined differences between women and men such as roles, attitudes, behaviors and values while sex refers to the biological differences between women and men and is genetically determined. They posit that while sex is universal, gender is socially defined category that can change.

Britain, America, Russia and Germany have given recognition to the need for equity in education for all much earlier than developing countries such as Ghana where the wind of change blew late. This situation according to Dauda and Idachaba (1996) has placed the female child at a disadvantage and has retarded efforts to progress in some countries including Ghana. Equjobi (as cited in Dauda & Idachaba, 1996) pointed out that women constitute 70% of the world's labour force but regrettably, they have less access to education than men. A study by Ejere (1991) points out that the main reason for gender inequality in terms of education emanates from the believe that the female is a supporter of the male and are accepted as caretakers of the household and nothing more.

Ofori (2003) brought out figures to make known the status of women in education in Ghana by reporting that while 75% of male aged between 15 and above are literate, only 37% females are literate. This he attributed to the fact that in developing countries, women are relegated to the background; “they can only be seen but not heard.”

Notwithstanding government policies such as the Capitation grant and school feeding program which have witnessed increases in enrollment, boys continue to outnumber girls in the education system in Ghana especially at the second and tertiary levels. Studies have shown that the percentage of girls become gloomier as they climb the educational ladder (Atakpa 1996, Giddens 1993, UNESCO, 2000). Giddens (1993) observed that the organization of teaching within schools have tended to sustain gender inequalities. Roles specifying distinct dresses for girls and boys encourage sex typing as text continue to depict gender bias images. There is evidence that teachers treat girls and boys differently and there is a long history of separation in sexes.

Textbooks in Ghana consistently present science as a male dominated subject while studies have also reported that text books represent scientific observations and inventions as masculine. Illustrations in books always depict boys as brave, strong and competitive while girls are shown as fearful and helpless. Giddens (1993) wrote to support this allegation that science, engineering and medicine at the colleges and university levels are still dominated by male students. Patterns of gender inequality in schools do not only manifest in African countries but the world as a whole. There is argument that the educational opportunities for both sexes have been biased in favour of the male child (Fafunwa, 1994; Ejere, 1991; UNESCO, 1995). A survey conducted by the Ghana Education Service in 2002 reports that gender disparities permeates all aspects of life and culture since inequalities are unavoidable part of any human society. The inequalities in educational opportunities have created gender disparities through discriminatory attitudes, practices and policies based on socially constructed beliefs about female roles that limit women’s capabilities in education.

Benefits of Female Education

The African cultural setting maintains that the girl child has been associated and attached to the kitchen rather than going to school. Nonetheless, OECD (2010a) reported that, education enables individuals to develop their knowledge and skills throughout their lives and thus builds human capital. Despite the numerous advantages women stand to gain from education, society has not given to them their rightful portions of education. This phenomenon was noted in studies conducted by Eguinyomi et al (2001) in which they noted that, women represent half of the world’s population, performs two thirds of the work and receive one tenth of total income. Educating the girl child in some African cultural settings is seen to be a taboo even in this twenty- first century. Parents in parts of Africa still feel that by giving the girl child the opportunity to go to school is a waste of resources, but by preparing such girls for marriages are seen to be the most profitable venture because of the expected bridal price. However, the need to educate the girl child cannot be overlooked.

Studies have proved dozens of benefits an individual, families and nations can derive from educating the girl child. Nkwantabisa (2012) postulates that, education trains up the girl child’s mind, ending up in equipping the individual with knowledge which can be applied to situations to achieve better results. Abanihe (1997) also added that education is the basis for the full promotion and improvement of the status of women. She stressed further that education is the basic tool to be given to women in order to fulfill their role as full members of society. Furthermore, education is the greatest resource for women empowerment. According to her, education influences decisively women’s overall health and access to paid employment and therefore enables them to make informed decisions about themselves, and to assume a status that identify beyond those that are linked with child rearing and family. According to Gopal and Salim (1998), low levels of female education lead to legal illiteracy, creating a severe constraint to effective implementation of equitable legal provisions.

Kwapong (1995) and Anamuah–Mensah (1995) noted that there can be no meaningful development of a nation without emphasis on education. Addae-Mensah (2000) postulated that the greatest need of a country’s socio-economic development is the right type of manpower and not just the availability of natural resources. He further notes that a country’s greatest asset is not the gold or oil or diamonds in its soil. It is the quality of its manpower, and that, manpower development is heavily dependent on the provision of education from the basic to the highest level. Numerous research conducted over the last decade has proved essential benefits of female education. Fagelind and Saha (1989) made reference to Psacharopoulos (1985), who reviewed literature from many countries and concluded that the rate of return to educational investment on women exceeds that of men particularly in developing countries.

According to the study, the average return for all levels of education combined was 15% for women and 11% for men. Herz, Subbarao, Habbib and Raney (1991) also pointed out that returns to schooling for women often exceed that for men especially at Senior High Schools. A lot of research carried out into the importance of girl's education have shown that committing resources into girls education is the most effective way a developing country can take to improve its standard of living (Acheampong, 1992). Educating girls yields appreciable social and welfare benefits such as lower infant mortality and fertility rates (Bruce, 1997).

The former UN Secretary General, Kofi Annan said, that there is no development strategy better than one that involves women as central players. It has immediate benefits for nutrition, health, savings and reinvestment at the family, community and, ultimately, country level. In other words, educating girls is a social development policy that works. It is a long-term investment that yields an exceptionally high return (Annan,2001). In 1987, Ghana instituted new educational reforms which now expose both boys and girls to a wide range of choices in life. The new national curriculum requires both boys and girls irrespective of their sexes, to study all stipulated subjects at the basic level of education. The reforms therefore took into consideration mainstreaming of women in education and does not discriminate at the basic level therefore helping to create equal opportunities for boys and girls. Emphasis is placed on acquisition of skills and knowledge in pre-vocational, pre-technical and basic science. However enrolment has been the least and performance has been poor in science and technology related subjects. Female participation and performance at high levels has been worse.

Female Attitude towards Science Subjects

In most developed countries, many young people appear to lose interest in science and technology in schools and further studies (Black & Atkin, 1996). Several contributing factors have been advanced for pupils' declining interest in science during their school careers in developed economies. One of such factors has been the apparent lack of relevance of the school curriculum to teenagers' curiosity and interest (Millar & Osborne, 1998). The report by the Ministry of Education in 1999, that there has been improvement in the performance of girls in science at Junior Secondary School level and the enrolment of girls in science at Senior Secondary Schools (i.e. 11.6% to 23.0%) was in sharp contrast to Whyte (1999) who reported that, generally one finds more boys studying physics, chemistry, mathematics and some technical subject while on the other hand, more girls are found studying biology or social subjects like languages or vocational subjects like cookery and needle work.

Many females regard the physical sciences as masculine and find the biological sciences more feminine (Fox, 1981; Hoyenga & Hoyenga, 1979; Kahle and Lakes, 1983). It is on this note that Easlea (1986) suggests that, the practice of physics is associated with a masculine ability to manipulate and control inanimate matter rather than a feminine ability to empathize, communicate and care. As a consequence, the discipline of physics may be embraced by many schoolgirls as one of the sciences further removed from a stereotypically feminine realm of relating empathically and caringly to other human beings. Biology with its concern for living things appears more of value and emotion which women are expected to inhabit. Choosing the biological science as opposed to the physical science thus involves girls in fewer contradictions, and they receive more encouragement and support in their choice. It is however a documented fact that given the option to choose subjects to study in schools, boys would normally opt for subjects considered masculine whilst girls would opt for subjects considered feminine. This tradition has existed in many educational institutions the world over especially institutions of high learning (Easlea, 1986).

Challenges to Girl Child education in Ghana

The challenges to girl child education in Ghana emanate from several dimensions such as cultural, political, social and economic. Tanye (2003), reported that, a negative attitude towards women's education, the dowry system, control of women's lives, male privilege and time constraint as well as the multiple roles women perform are some of the cultural barriers impeding women's access to education. Anamoah-Mensah (1995) affirmed that society also believe that higher education endangers women's moral lives. It is therefore a general notion held in Africa that the women's place is the kitchen. Women do not need higher education to be able to play this role, hence the denial of their right to education. Despite the platform created for women in the fourth world conference held in Beijing in 1995, women still face limitations that hinder their efforts to acquire formal education. It is obvious that two-third of the world's illiterates are women and that majority of them are from developing countries (UNFPA, 2006). Gender equality and women empowerment are the major challenges facing the United Nations and the world today. It is against this background that (UNESCO, 2005) emphasized that men and women should be equally valued by society regardless of their differences or roles they play.

This view was agreed upon at the Beijing conference of 1995, where most countries registered their commitment to work hard towards gender equality in all ramifications. In spite of the above commitments, Africa in general and Ghana in particular still face a lot of challenges in respect to the girl-child education. These challenges are prevalent in the three northern regions of the country.

Methodology

The Study Area (Upper West Region)

The Upper West Region is the youngest region among the ten administrative regions in Ghana. Wa is the regional capital. The region derived its name from the geographical location in Ghana. It is situated in the North-Western part of the country. The region lies between longitude 1° 25' W and 2° 45' and latitude 9° 30' N and 11° N. It is bordered to the south by Northern Region, to the north and west by Burkina Faso and to the east by Upper East Region. The region has a human population of 702,110 making up only 2.8% of Ghana’s population and the least populated region in the country and covers a geographical area of 18,477sq.km representing 12.7% of the total land area of Ghana (GSS, 2010).

Below is the map of Ghana and Upper West Region:

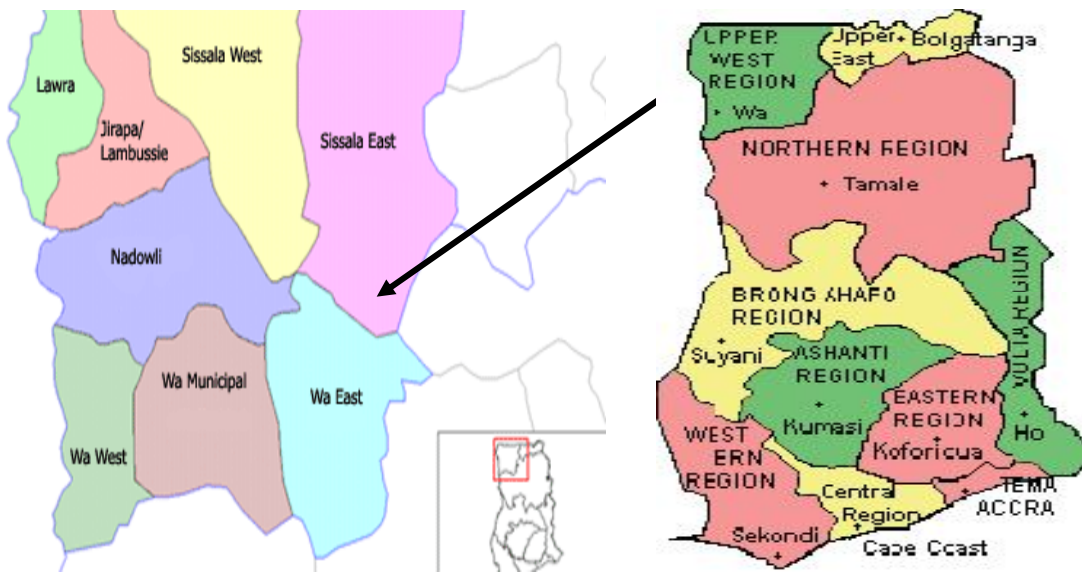


FIGURE 3.1 Map of Ghana and the study region

Source: www.ghanaweb.com

Selection of Schools for the study

The study schools were purposively selected. According to Maxwell (1997:87) purposive is a type of sampling in which “particular settings, persons, or events are deliberately selected for the important information they can provide that cannot be gotten as well from other choices. Eight senior high and technical schools namely; Wa senior high school in the Wa municipality, Kanton senior high in the Sissala East district, Lawra senior high school in the Lawra district, Ullo senior high school in the Jirrapa district, Lassie-Toulo senior high school in the Wa west district, Piina senior high schools in the Lambussie-Kaani district, Daffiama senior high school in the Nadowli district and Kaleo senior technical school in the Nadowli west. The bases for selection of schools were on schools offering pure science and science related programs.

Research Design

Since the study aims at finding out the causes of gender disparity in the study of science, it was prudent to select schools which run science program. Below is a table indicating the purposively sampled schools and the political districts in which they are located:

Table3.4 List of Selected Senior High Schools in Upper West Region

NAME OF DISTRICT	NAME OF SELECTED SCHOOL
Wa municipality	Wa Senior High School
Sissala East	Kanton Senior High School
Lawra	Lawra Senior High School
Jirapa	Ullo Senior High School
Wa West	Lassie-Toulo Senior High School
Lambussie-Kaani	Piina Senior High School
Nadowli East	Daffiama Senior High
Nadowli West	Kaleo Senior High Technical School

Source: *Author's construct, 2013.*

According to Kumekpor (2002), there are two major methods of sampling; Probability and Non-probability sampling. As mentioned earlier, this study used both methods. Under the probability sampling, the study used simple random sampling to sample 208 students in the eight schools comprising of 26 students from each school. For the non-probability sampling method, purposive sampling was used to select the eight schools, eight heads of science department of the schools and nine GES officials. The sample size for the study was 289. This was distributed as follows; 208 students, 64 science teachers, 9 GES Officials and 8 Heads of science department. The 64 teachers selected by simple random method constituted 40% of accessible teacher population of 160 for the study while out of the 520 accessible student population, 208 student representing 40% was selected.

Data Collection Tools

The fluidity of every social research involves decisions about how to collect data, how to analyze the data and interpret the data to unearth the research goals as designed by the researcher. Methods employed include focus group discussion, (FGD) the use of questionnaires, interviews, observation and review of secondary data.

Preliminary Field Visits

Preliminary field visits were embarked upon by the researchers prior to data collection. Visits were made to all the eight schools to observe and scout in other to have first-hand information on certain key issues relevant to the study. The visits were carried out in November 2012. The choice of that date yielded positive results as students were in school and the actual data collection was done in February, 2013. The preliminary visits were beneficial to the researchers because they used the visit to interact unofficially with heads of science department and science teachers. The main goal of the research was made known to them. Arrangement on where to lodge during data collection was made during the preliminary visits.

Focus group discussions (FGDs)

According to Campbell (2008:3), a Focus Group Discussion (FGD) is a planned, facilitated discussion among a small group of stakeholders designed to obtain perceptions in a defined area of interest in a permissive, non-threatening environment. Kumar (1987) also posits that, FGD is a rapid assessment, semi-structured data gathering process in which participants are purposely selected by the researchers to discuss issues and concerns on key themes on the subject under investigation. The choice of the FGDs technique was a step in the right direction because the researcher's unearthed varied concerns, opinions and reactions from the science teachers on the causes of gender disparity in science education in second cycle schools and suggested achievable and result oriented interventions to reverse the trend.

Interviews

Interviewing generally involves asking people questions and listening carefully to the answers given. Interviews are direct conversation with a purpose and allow the researcher to have a face-to-face interaction with the researched (David & Sutton, 2004; Bryman & Burgess, 1994; Fontana & Frey, 2000). The researchers made a visit to the regional education office and had a formal discussion with the regional girl child officer. The officer was briefed on the aims and objectives of the study. Arrangement on the date, time and place of convenience for the interview was discussed and later interviewed.

Questionnaire

Questionnaire can be defined as a document containing questions and other type of items such as statement designed to solicit information on specific issues, themes, problems or opinion to be investigated (Babbie, 2005). In designing a questionnaire, researchers consider the working sample unit level of understanding of the research issue before settling on either open-ended question or close ended question (Smith 1975). With open-ended question, the respondent is given the will to respond relatively on unrestricted manner. Close-ended questions on the other hand restrict the choice of response by forcing respondent to answer by presenting categories or alternatives (Smith, 1975).Cannel et al (1968) noted that in situations where the study demands for knowledge of respondent level of information, open-ended questions are useful. In the study, open-ended questions were used to elicit respondent’s level of information and opinion on the causes of gender disparity in the study of science in second cycle schools in the region.

Observation

To obtain a first-hand information on the phenomenon under study, the researchers saw the need to observe in a scientific, systematically planned manner the issue under study so as to obtain a better lens to give accurate description of what pertains in schools (Kumekpor, 2002; Kothari, 1986). For the purpose of this study, the non-participant observation was adopted. In the nonparticipant observation, the observer is only a spectator and not an actor that is the observer is detached from the group, though the group is aware of the presence of the observer (Kothari, 1986). The decision to opt for the nonparticipant observation and not the participant observation emanated from the fact that in the participant observation, the observer becomes so immersed in the activities of the group being studied that the observer can lose objectivity (Kumekpor, 2002). In all the eight schools the researchers visited, observations were made on the state of their science laboratories, teaching methods employed by teachers in the science departments, availability of teaching and learning materials and school infrastructure. The researchers observed the school environment taking into consideration how friendly the school environment was to female students. Availability of urinals and toilet facilities were observed. The observations were made within the data collection phase of the study. The researchers paid frequent visits to the selected schools. Scenes observed received video coverage and photographs were taken as well.

Discussion of Results

Parental involvement in the choice of program of study in Senior High Schools

Studies have proved that, pursuing a program against one’s wish does not yield any good results. Performances in terms of passing rates are normally not good as compared to students who voluntarily in consultation with their parents choose programs of interest to study (Becker & Thomas, 1986). Been mindful of this, the study gathered and analyzed data on parental involvement in choices of program of study to ascertain if they have a hand in the gender disparity in the study of science in the schools. The results obtained and analyzed are presented in the graph below:

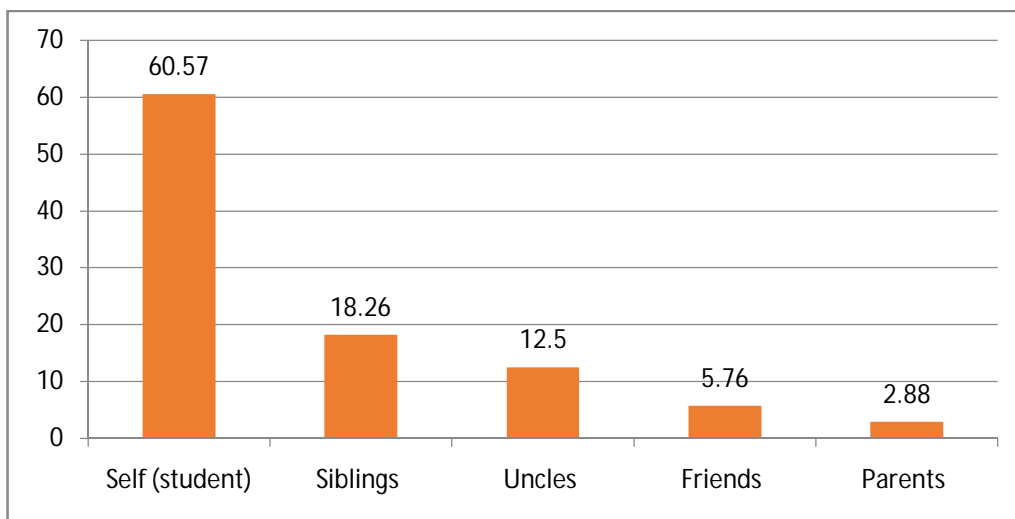


Figure4.3 Parental involvements in the choice of programmes of study in senior high schools

The results revealed a whopping 126 out of 208 representing 60.57% of students interviewed who were left to their fate to decide the choice of program for study in schools, while as low as 6 representing 2.88% of parents had an influence in one way or the other in the choice of the program of study for their wards in schools. Most parents are not educated so they have little or no say at all in whatever their wards do in schools. In an interview with the heads of science department of the selected schools and the district girl child officers of GES, the issue of high illiteracy rate among parents cropped up. They alleged that the school authorities sometimes have to come to the aid of the students through the guidance and counseling department to make appropriate choices for the students. The heads lamented on the issue saying some students are made to repeat their class because they choose wrong programs. In an exclusive interview with Mr Die Stephen, the head of Science Department of Wa senior high school he said, our science students need supervision, but this is lacking because majority of their parents are complete illiterates. Even students do not send their terminal report home for advice simply because their parents cannot read nor write and thus have no interest in the education of their wards.

Reasons for choice of science program of study in secondary schools

Questions were posed to students on possible reasons that guided the choice of their current programs of study in the schools. All the 80 female science students sampled and questioned gave reasons that their choice to study science at the second cycle schools was guided by their career aspirations in future. Career aspirations of becoming such as medical doctors, nursing, biochemist, pilots, pharmacists and teachers were given by the students. The heads of science department admitted changing programs of study for students but was quick to add that the changes are only made based on recommendation of form masters in consultation with students being guided by their career aspirations. For example, Mr. Baah-Yaany Obed, a science teacher of Wa senior high school recounted an incident where an SHS one student found herself in the pure science class but her career aspiration was to be a journalist. He affirmed that most of the students choose programs of study based on their career aspirations and added that their parents should have been the best persons to guide their wards but because of illiteracy, their wards education means nothing to them.

School based factors causing disparity: The perspectives of students

Data gathered from all the selected schools, became obvious that disparity exists in the study of science in the region. Though the government of Ghana through the ministry of education resolved to resource all science laboratories in the selected secondary schools, it was revealed that with the exception of Wa senior high school and Kanton senior high school which can boast of a well-equipped science laboratory, the rest of the six schools have no science laboratories. The situation in Daffiama secondary school was worrisome as chemicals intended for practical lessons in the science department were stored with bread. The students also alleged that there is inadequate staffing in the science department which they said have been a major worry to them. Elective subjects like physics have no teachers according to the students. Female students faced problems of unsafe and unfair treatment in the classroom by the boys and some teachers. Female students interviewed alleged that they have been unfairly treated in the classroom by their teachers by directing most of the questions to the male students.

Students interviewed attested to the fact that they are intimidated by the male students in the classroom as they sometimes shout them down when they attempt answering questions in class. A student of Kanton senior high school narrating her ordeal in the hands of the boys said, "Our boys shout and insult us in class when we attempt to seek more clarifications to questions in class. They sometimes call us names such as witches when we score high marks in class. They even tell us we will not get husbands in future since we are not offering Home Economics as a subject."

With regards to teachers' attitude toward female students in the science class, the findings indicated that teachers' attitude toward boys tend to be more positive than it is toward girls. Female students expressed the concern that their teachers have been good to them but were quick to point out that there are few teachers who sometimes make derogatory remarks about them in class. The students expressed their displeasure about certain comments some of their teachers make about them in class. A form four science student in Piina SHS recounted her ordeal when her physics teacher who is supposed to know better likened her to a witch and telling her she will not get a husband in future because she appears to be more masculine. The allegations are in favour of studies conducted by Mulemwa (1999) and UNESCO (1999b) in which they posit that girls in developing countries are often told by parents, teachers, and peers that science is not suitable for girls. The report further established that, choosing a career in science is therefore in many developing countries regarded as masculine.

According to the report, girls who choose this career path are often looked upon as less feminine and thus are regarded as less attractive on the marriage market. Issues of verbal harassment and bullying were rampant in all the selected schools.

Students also cited lack of female science teachers who will serve as role models in their schools. The students complained that almost all the teachers in the science department are male teachers. This situation to them does not motivate them enough to take the study of science seriously as they believe they cannot make it up to any level. This concern raised by the students was confirmed in the focus group discussion by eighty science teachers, ten each from the eight schools selected. Out of the eighty teachers selected for the study there were only sixteen women, representing 20% of female teachers. Schools such as Ullo Senior High and Piina Senior High school were without female teachers in the science department. This observation at Piina Senior High prompted the researcher to probe the head teacher on why the science department was without a female teacher. His response was that the region produces very few female teachers in general and the few female teachers do not accept posting to the rural areas in the region. Despite all the factors which seem to work against the female students, all students declared their intentions of furthering in science up to the tertiary levels in order to achieve their career aspirations in life. This finding is however in sharp contrast to a study on female participation in science and technology and mathematics education in Nigeria in which Aguele & Agwa (2007) reported that the interest of female students in pursuing science education diminishes toward the university levels due to a variety of factors that are primarily rooted in religious and cultural beliefs about the role of women in society.

School based factors causing disparity: The perspectives of teachers and heads of science departments

The researchers sorted the views of science teachers through a focus group discussion with a guide. Not much difference was noticed after the focus group discussion. Problems outlined by the teachers were similar to those highlighted by the students. However, there was a sharp contrast to the allegation of harassment posited by female students. The teachers vehemently denied any allegation of harassment from the teachers. However in Kanton Senior High school a teacher was alleged to have raped a female student in 2009 and another alleged rape case involving a teacher took place in the same school. It would be recalled that in 2009 a teacher of the above named school raped a student girl and that teacher is currently serving a seven year jail sentence. According to Mr George Dery, the Upper West regional manager of Action Aid-Ghana, a non-governmental organization another rape case occurred involving a sixteen year old form one girl of which the accused teacher is on remand at Wa prisons (GNA, Wa, February 9, 2013). Studies conducted by Wellesley Centers for Research on Women reported that, violence toward girls in schools is pervasive and worldwide. An unsafe learning environment is among the reasons that girls discontinue their studies or parents refuse to enroll and keep their daughters in school (Terefe & Mingistu, 1997). UNICEF (2007) reported that there can be no gender equality when sexual harassment exists in schools, when teaching materials are biased and when teachers are not sufficiently cognizant of gender issues.

Teachers lamented about the dilapidated nature of their laboratories saying they have to convey harmful chemicals to the classrooms anytime they intend performing practical lessons. Mr. Remmy S. Tenzagh, head of Daffiama Senior High School complained about the poorly resourced laboratories by saying “We have been neglected in this part of the country for long. We don’t have any chemicals to perform practical lessons with our students yet the students will be writing the same examinations with their colleagues in well-resourced schools in other parts of the country like Accra academy, Legon PRESEC, Adisadel College etc. Lack of these resources has demoralizing effects on teachers who teach science. Lack of resources and the poor state of the science laboratories impacted negatively on students’ performance in their external examinations. Students’ attitudes and aspirations in science are affected by their access to resources.

Below is a graph showing prioritised school based factors causing disparity in schools:

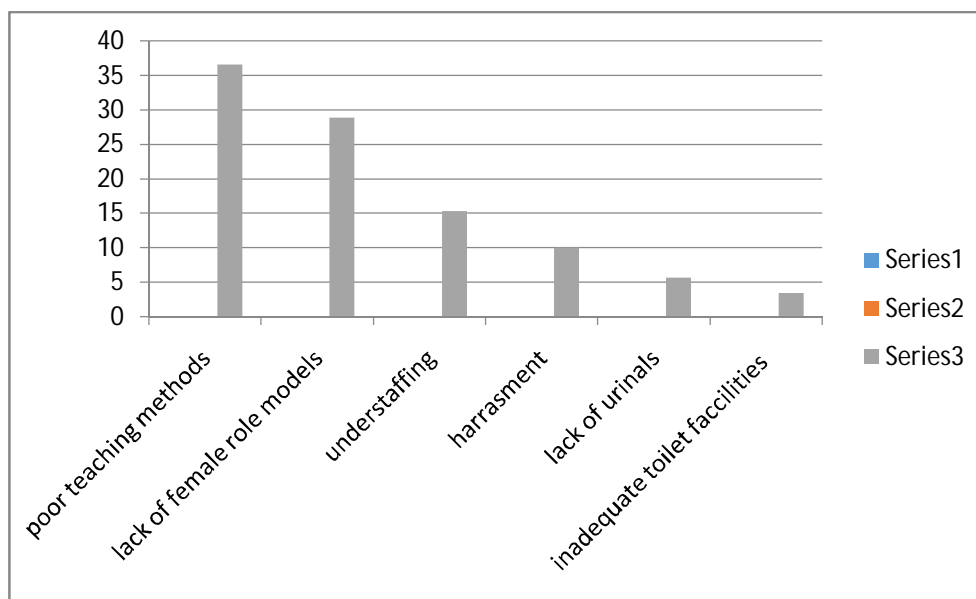


Figure 4.12 School Based Factors (Teachers and Heads View)

School based factors Causing Disparity (perspectives of GES Officials)

Several factors work against the girl child in her quest to enjoy her basic fundamental human right that is the right to education. In an exclusive interview with the GES Officials in the eight selected districts the officers noted that their outfit speaks generally for girls and has no particular preference for girls in the sciences. Despite the position of the officers, they unanimously agreed on issues that have to do with harassment of female students in schools, poor teaching and learning equipment and lack of female teacher role models in schools especially the science department.

Discriminatory Socio-cultural and Religious Practices

The existence of discriminatory cultural practices such as early and forced marriages restricts girls' right to education. Generally it is perceived that girls must be good at cooking and taking care of their houses. Female students who find themselves in the home economics class in secondary schools are perceived to be doing the right thing, but girls who go into the study of science are not recognized and are sometimes seen as masculine. The issue of early marriage militates against the girl-child and it is exacerbated with girls studying science in second cycle schools. The data gathered unearthed concerns from the female students, who are often told that they will not get husbands in future because the study of science will make them less feminine. The students alleged that their colleagues do tease them that they will not get husbands in future.

In Ghana, for one to become a medical doctor means one must study in the university for seven continuous years. These long years of studies in the sciences delay the marriages of the young females and create problems for the students in their families. Children in the context of the Ghanaian culture are cherished more than wealth so any attempt to delay marriage and child bearing is normally met with highest resistance.

Findings/Results

The focus of the study is to unearth the main causes of gender disparity in the study of science in second cycle schools in the Upper West Region of Ghana. The research established high illiteracy rate among parents in the region. The findings revealed 48.7% of parents of students who have no educational background. Because of this, parents show little or no concern towards the education of their children. Their children are left to their own fate in deciding the choice of programs of study in the second cycle schools. The research identified inadequate science resources as a factor contributing to the disparity in the study of science in the region. With the exception of Wa SHS and Kanton SHS which can boast of moderately resourced science laboratories, all the six remaining schools have nothing to talk of concerning science laboratories thus the abysmal performance in the external examinations. Because students do not have well equipped laboratories to perform practical lessons, they find it difficult to answer practical questions in the final examinations and hence performed poorly.

The poor performance recorded by students in the science departments deter female students from enrolling in science programs and hence the disparity between male and female students in the science department.

The study revealed that harassment has been meted out to female students in the science department. Students alleged they have been harassed by their male students during lessons. The students cited negative comments that were passed by their male counterparts and on a few occasions sexual harassment by their colleague students, as well as male teachers. Casting of insinuations and insults whenever they score high marks in subjects like chemistry, physics and elective mathematics according to the girls make the learning environment uncomfortable for them. Data collected from the focus group discussion revealed that all the eight schools visited had the problem of understaffing. Subjects like physics and chemistry are lacking qualified teachers to handle them. An investigation in the qualification of teachers in the science departments revealed that most teachers did not study pure chemistry or pure physics at the university level but are made to teach pure chemistry at the secondary schools. Teachers who agreed to remain anonymous said they attended the University for Development Studies (UDS) and obtained B.Sc. Agricultural Technology but they are posted to teach physics. The teachers stated that such arrangements will not help the students. The problem of understaffing emanated from teachers refusal to honor postings to deprived districts in the region.

The few female students studying science in the region are not motivated either by their own parents, their peers or the teachers. Parents also do not motivate their wards to excel in their educational pursuit. Teachers who are supposed to play motivational roles in schools tend to demoralize students with the derogatory remarks they make about the female students. The research revealed that only 20% of female teachers were in the Science Departments of the eight selected schools selected for the study. The situation in some schools was worrying as there was not even a single female teacher in the Science Department. Schools such as Daffiamah SHS and Piina SHS are without female teachers in the Science Department. The scenarios where teachers in the Science Department are all males posit that the course is masculine in nature thus female students find themselves less comfortable studying the course.

Conclusion and Recommendations

School based initiatives are the steps taken either by the schools or their Parent - Teacher - Associations (PTA) to motivate female students in the study of science. Unfortunately, the research revealed that the schools are not taking any initiative in their own capacity to reverse the trend of gender disparity. The students interviewed suggested initiatives such as PTA scholarships, speech and prize giving days and school girls clubs as efforts that can boost their moral in the study of science. The study identified some factors causing the gender disparity in the study of science in the Upper West Region. Blame may be apportioned to individuals, parents, teachers, school authorities, NGOs and the government, who are expected to work as a team to enhance gender parity in the study of science in the second cycle schools of the region in particular and Ghana as a whole.

Recommendations were given based on each finding. School authorities are admonished to educate parents on the importance of education especially, education of the girl child. There should be constant interactions between parents and school authorities on Parents - Teacher - Association (PTA) platforms. Parents should be involved in the education of their wards by attending speech and prize giving days. Again, NGOs should inculcate into their programs sensitization and advocacy programs aimed at protecting the need and importance in educating the girl child. Government should enact laws which will spell out stiffer punishment for parents withdrawing their girl child from school and forcing them into early marriages.

To whip up the enthusiasm in the study of science in the Upper West region, attention should be paid to the science laboratories in the secondary schools in the region. The government through the Ghana Education Service as a matter of urgency should resource all science laboratories in secondary schools in the region. The poorly resourced science laboratories have affected the performance of students in WASSCE. These demoralize students and compel them to change their programs. NGOs in education are admonished to help resource science laboratories in schools in the region so as to complement efforts by the government. In recent days, corporate organizations have diverted huge sums of money into beauty pageants. These organizations should come to the aid of the schools to renovate and resource science laboratories so that children can get access to quality education. The culture of maintenance was lacking in some schools. School authorities are advised to make routine maintenance as part of their responsibility.

Apart from Wa senior high school, which has a qualified laboratory technician to arrange and mix chemicals accurately for practical lessons, all other schools did not have an expert. The Ghana Education Service should therefore post qualified personnel to man such facilities.

Students should be empowered and encouraged to report dehumanizing incidents of harassment to the appropriate authorities for miscreants to be brought to book to serve as deterrent to others. Male students should be educated on the effects of harassment of colleague female students. Exposing offenders of harassment should be encouraged. NGOs partnering with the Ghana Education Service should step up their advocacy roles on the protection of female students. The Ministry of Education through the Ghana Education Service should post qualified teachers to the science departments. Scholarships in the form of granting study leave to teachers to pursue science courses in the universities so that upon completion, they can be posted to teach science subjects should be encouraged. Teachers refusing postings to rural schools in the region contributed to the problem of understaffing. To address this phenomenon, it is recommended that Ghana Education Service should spell out stiffer sanctions to teachers refusing postings to rural schools. Conditions of service for teachers in these rural schools should be enhanced in the form of incentives to attract and retain these teachers in the rural schools.

Basically the interest in science dwindled as a result of the low passing rate of students especially the female students in the external examinations. Female students need to be motivated in the form of scholarships and awards in their schools and outside their schools. Teachers, especially female teachers handling the science subjects should be motivated by providing them with incentives to be able to deliver. Symposiums should be organized in schools. And female doctors, engineers, pilots etc. should be invited to talk to female students studying science in the schools. This will boost students' interest in the study of science. Ghana Education Service should grant study leave to more female teachers to pursue science in the universities and ensure that these teachers accept postings to everywhere their services may be needed. The Ghana Education Service should reduce the promotion years for female science teachers to attract more females to study science and subsequently become science teachers to serve as role models for students. The masculine lenses with which people perceive science should be discouraged. Non- Governmental Organizations should partner with government to design scholarship packages for female teachers teaching science especially those in the rural secondary schools in the region. Again, the works of the few female teachers should be recognized by selecting them for awards during best teacher awards ceremonies.

Government initiatives such as the Science Technology and Mathematics Education (STME) aimed at achieving parity in science education have been ongoing for decades. However, the research revealed that students of the selected schools in the region are not even aware of such initiatives. The Ghana Education Service is therefore advised to intensify the education of students on the existence of such initiatives and the advantages the girl child can gain from such programs. The research identified that most of the initiatives are been centered in the regional capital of the region, Wa. The research revealed that all government initiatives are centered in the municipality giving less opportunity to the rural schools. The Government should therefore spread its programs to cover all schools in the region.

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