

Gender Differences and Achievement at the Advanced Level Chemistry in the General Certificate of Education Examinations in the English Speaking Sub System of Education in Cameroon

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ABSTRACT

Achievement is used as one of the important indices upon which most decisions about the learner is based and it is a complex and multivariate issue with a plethora of evidence associated with determinants of student achievement disparities. The objective of the study was to investigate the influence of gender differences on achievement disparities in Chemistry at the Advanced Level GCE examination in the English Speaking sub system of education in Cameroon. This study adopts a qualitative case study design and makes use of the concurrent procedures of an inquiry strategy of multiple case study research in which the researcher uses a triangulation method of analyzing the GCE results and engaging in an interview with passed Chemistry candidates and Chemistry teachers. The population comprised of 55,786 candidates who wrote the GCE in A/L Chemistry in the English Speaking sub system of education in all the regions of the Republic of Cameroon from 2012 – 2016. The sample of the study consisted of 42,766 candidates who wrote Advanced Level Chemistry from 2012-2016 in five of the ten regions in Cameroon purposefully selected from all coeducational institutions for content analysis of their GCE results and also twenty students and eight teachers purposively selected for interviews. A non-probability design of convenience sampling and purposive sampling technique was used. The instruments for data collection for the study was a self-made Document Analysis Form (DAF), and an interview guide. At the end of data collection, the statistical analysis technique used to test the hypothesis was the independent t-test while the perceptions and opinions of the students and teachers interviewed were analysed thematically in terms of percentages. One research question and one hypothesis guided the study. The research question was answered using mean and percentages while the formulated hypotheses were tested at 0.05 level of significance using the student t-test statistics. The analyses showed that Gender was strongly associated with Chemistry achievement and mean difference was significant ($P < 0.05$) with male having a mean of 82.046 higher than of the female (40.1230). Based on these findings, it is recommended that Chemistry and Mathematics teachers should team up to ensure integrative learning, transfer and application of knowledge among the females by giving them more attention/time during classes, use of teaching strategies which the female perceive as attainable and compatible with their abilities, preferences, and goals.

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KEYWORDS: Gender differences, Achievement, Advanced level Chemistry GCE

INTRODUCTION

The existence of gender disparities in achievement of both boys and girls in the sciences in general is a controversial debate. While many researchers differ in their perspectives on the origin and causes of gender disparities in cognitive abilities, including the relative contributions of biological factors such as the influence of genetics (chromosomes, hormones and brain functioning), social and cultural factors (stereotype expectations and modeling), many others including Maccoby & Jacklin (1974) also argue that cognitive ability which is a sine qua non for higher Chemistry achievement, does not correlate with gender differences and could not favour one sex than the other. Gender as a factor in

science achievement has generated a lot of concern for science educators. There is much controversy and acrimony concerning gender differences and achievement in the sciences. Many researchers including Inesman (1949), Duncan (1989), and Greenfield (1996) as cited in (Eriba and Ande 2006), on one hand have found out that male students achieve better in the sciences than their female counterparts. However, on the other hand, many researchers including Calsambis (2007) in (Oluwatosin & Ogbaba (2017)), demonstrated that girls outperformed boys in sciences. Nonetheless, there is masked imbalance between the sexes in many fields of employment and specifically,

there are relatively few female scientists and engineers at the professional level and even fewer technicians and tradeswomen at the skilled worker level, (Kelly, 1978; Keeves and Kotte, 1991). In the past, many of the more prestigious and more highly paid jobs have gone to men who have been trained in science-based programs, such as medicine, engineering and technology. Since girls have not studied science courses at school and achieved to the same extent, as have boys, such occupations have been filled by more men than women (Keeves and Kotte, 1991). Optimizing science (and by extension to Chemistry) achievement and at the same time reducing differences in performance levels between boys and girls may eventually lead to greater economic efficiency within a system. This shows that there is controversy on science achievement by gender. This underscore the need to use the standardised GCE results of both boys and girls in Chemistry to investigate the effect of gender on achievement disparities in Advanced Level Chemistry, so as to identify the main determinants.

In Cameroon like in many other examinations-oriented education systems, there exists a highly competitive national examination at the end of secondary school. Those who perform well in the GCE examination are selected through national competitive entrance examinations into the various professional training institutions or simply gain admission into higher education. More students are needed to become competent in the key science subjects of Physics, Chemistry, and Biology. For an all-round contribution to the changing need of the society and the aspirations of Cameroon becoming a newly industrialized country, the society have placed enormous responsibilities on the learners (males and females alike), and the educational system to train and produce scientifically literate citizens that are competent human resources who are qualify and equipped with skills necessary to fully and productively participate in the development of the country.

STATEMENT OF THE PROBLEM

Chemistry is a key subject for selective advancement in science and technology and needed for most careers in the education system. The need to orient the youth more to the study of science and technology relates to the recognition that without the mastery of these disciplines, Cameroon cannot be able to industrialize and become competitive in regional and global market places. In this respect Chemistry is one of the key science disciplines, the mastery of which is connected to different domains of industrial performance. Achievement in Chemistry will ensure the realization of a critical mass of human resource needed to accompany the industrialization vision and the unprecedented technological development in Cameroon. However amongst many determinant is the issue of human capital development which is impaired by gender imbalance. The belief that certain occupations are for men and some for women turn to shut down access and their scope to employ their innate abilities, thus perpetuating achievement disparities in Chemistry that also leads to gender imbalance in science and engineering career related jobs. An important way to measure access to a subject area by different categories of students is to assess their achievement in high stake examinations. The trust of this work is to explore the effect of gender differences and achievement at the Advanced Level Chemistry in the General Certificate of Education

examinations in the English Speaking sub system of education in Cameroon.

Research Question

To what extent does gender influence achievement disparities in Chemistry at the Advanced Level GCE examination in the English sub system of education in Cameroon?

Hypotheses

HO₁: There is no significant difference in the mean achievement scores between male and female in Advanced Level Chemistry GCE in Cameroon.

Literature Review

Gender according to Halpern (2012) refers to the social roles that men and women play and the power relations between them which usually have a profound effect on the use and management of natural resources. Gender is shaped by culture, social relationships, and natural environment and so based on values, norms, customs and laws, men and women in different parts of the world have evolved different gender roles, (Halper, 2012). These gender roles include different labour responsibilities, decision making and knowledge. These roles are learned and they can change over time and vary within cultures. It's a social construct and therefore not biologically predetermined nor is it fixed. According to the UNESCO's Gender Mainstreaming Implementation Framework (2003), the concept of gender also includes the expectations held about the characteristics, aptitudes and likely behaviours of both women and men (femininity and masculinity). However the system of social differentiation that leads to women subordination or male domination in aspects such as political status, class, ethnicity, age, physical and mental ability modify gender roles.

Sex describes the biological differences between male and females, which are usually determined at birth such as the genitalia and genetic differences. In this work the researcher shall stand by Halpern (2012), who is a strong advocate of combining the two, from a bio psychosocial perspective, and argues that it is often impossible to separate sex as a biological property from the social consequences of being either male or female and shall use gender difference or sex differences interchangeably.

Gender as a factor in science achievement has generated a lot of concern for science educators. One factor in the debate surrounding the underrepresentation of women in science, technology, engineering and mathematics (STEM) involves male-female mathematical ability differences.

Gender differences point to areas where student background and characteristics significantly affect student performance. Understanding what drives differential student performance can foster the design of effective educational policies to address quality and equity concerns. It is observed that the males score higher than the females in science and science-related examinations. This has created a big psychological alienation or depression in the minds of female students towards science and science- related subjects.

Many researchers have been carried out about the underachievement of females in the sciences. These include

those of Inesman (1949), Duncan (1989), and Greenfield (1996) as cited in (Eriba and Ande 2006) They found that male students were superior in the sciences than their female counter parts. According to Tsado (1987), Gipps (1994), O'Connor (2001), as cited by (Eriba and Ande 2006), as boys and girls grew up, the differences they have in achievement in other subjects tend to diminish except in the sciences, and mathematics. The fear of Mathematics is often transferred to Chemistry, which involves one form of calculation or the other. However, it is not all aspects of Chemistry that involve calculations. It is mostly topics in Physical Chemistry and the Kinetic theory of gases.

Biological perspective of gender differences and achievement

While teaching students at a certain age level, and even if all external influences were to be kept constant, some individual characteristics of students might lead to differences in achievement. This indicates that what women and men think and how they behave may be more influenced by the brain than previously thought. Education research and practice have reflected a belief that education – related gender differences are genetic in origin. The structural differences between male and female brains is such that the women's brains are often slightly smaller than males, but this is in proportion to body size not intellect because general intelligence does not differ between males and females (Halpern, 2007).

The general assumption has been that females and males have different intellectual capabilities, so that, for example, males are genetically predisposed to succeed in the physical sciences and mathematics while females are genetically predisposed to succeed in biological sciences and humanities. This is why Mott (2002) opined that to be able to communicate appropriately in science; one needs the ability to use graphs, symbols and diagrams. All these are in mathematics and this seems to be where the girls have fallen short. This is not particularly acceptable to Maccoby and Jackline (1974). They advanced that cognitive ability which is a sine qua non for higher Chemistry achievement, does not correlate with gender differences and could not favour one sex than the other. There is much controversy and acrimony as the questions about sex differences. Perhaps the way we pose questions about sex differences contributes to the controversy and acrimony. According to Maccoby and Jackline (1974), the focus of the sex differences questions needs to change from "Who is better?" to "Where and when are meaningful differences found?" and "How can we use our findings to help all people achieve their maximum potential?"

Psychosocial Gender Roles, Gender Stereotypes and Achievement

The psychosocial gender roles, and associated stereotypes about the relative abilities of males and females, the way in which they ought to behave, and the types of interests and activities that are typical for a boy or girl shape the way we see ourselves as well as the way we judge others. Early differences in socialization and gender stereotypes stress caring and empathy for females while encouraging an interest in things, objects and tools for males. This may lead to different motivation to choose occupations that reflect those interests, as well as motivation to develop skills in masculine or feminine cognitive domains (Eccles, 1987).

Despite advances in gender equity, implicit stereotypes prevail of mathematics as being masculine, and reading as feminine.

According to UNESCO (1998), local customs and values have been developing in girls and they are so deeply ingrained that women themselves often subscribe to them and play a subservient role in the society. Lie and Sjoberg, (1984) in Eriba and Ande (2006), observed that invincible rules within the society have provided what is feminine and what is masculine. Hence, science in most cultures is defined as a masculine domain and lot of people speculate without research verification that chemistry is a masculine school subject. Norfleet (2009), alludes to the fact that if girls and boys are not processing information in the same way, this has implications for the classroom. Teachers need to be cognizant of these differences and understand that not only do children learn differently but also good students may learn differently from the way the teacher learns, and advocates that education of children should focus on the similarities that exist between girls and boys.

According to Gender Schema Theory (GST), children develop ideas and theories about what it means to be masculine or feminine (called gender schema) from early age and use these theories to categorize information, making decisions and regulate behaviours. Bem (1983) argues that as gender represents a phenomenon that can be learned; gender schema is not amorphous and can be modified. Accordingly, changes in employment patterns and gender culture, as well as social shocks and recession periods can contribute to modifications in gendered career choices of young individuals.

Also, Tchombe (2016), pointed out that people can make a difference in their cognitive abilities styles by using appropriate thinking skills. This means cognitive abilities is more than an ability to manipulate and strategise information, but also the ability to internalize, self-regulate and transfer these cognitive skills to construct knowledge and make sense of the surround irrespective of gender.

Methodology

This study adopts a qualitative case study design and makes use of the concurrent procedures of an inquiry strategy of multiple case study research in which the researcher uses a triangulation method of analyzing the GCE results and engaging in an interview with passed Chemistry candidates and Chemistry teachers. The population comprised of 55,786 candidates who wrote the GCE in A/L Chemistry in the English Speaking sub system of education in all the regions of the Republic of Cameroon from 2012 – 2016. A non-probability design of convenience sampling and purposive sampling technique was used. The instruments for data collection for the study was a self-made Document Analysis Form (DAF), and an interview guide.

The sample of the study consisted of 42,766 candidates who wrote Advanced Level Chemistry from 2012-2016 in five of the ten regions in Cameroon purposefully selected from all coeducational institutions for content analysis of their GCE results and also twenty students and eight teachers purposively selected for interviews. These regions include; the North West (NW), South West (SW), Littoral (LT), Centre (CE), and West (W). These five regions registered a

considerable number of Chemistry candidates (42,766) for the GCE in the English subsystem of education in Cameroon excluding single-sexed schools and external centers from 2012 to 2016 as opposed to the other five with a total of less than 1000 candidates within the same period of time.

Instrumentation

The instruments for data collection for the study was a self-made document analysis form and an interview guide. The Document Analysis Form (DAF) designed by the researcher was used for data collection. The choice of this method lies on the fact that the information required is already available on records of achievement of students and need only be extracted from a secondary source. This tool will enable the collection of the GCE results of Chemistry students from the GCE Board office and extract their grades and arranging them with respect to gender. The second instrument for collecting data will be an interview schedule. The interview

schedule will be used to interview eight experienced Chemistry teachers and examiners to obtain in-depth explanation of the phenomenon and also twenty students purposively selected who wrote the GCE within the period of 2012 to 2016 and either passed or failed taking into consideration their gender.

Procedure for Data Analysis

The analysis was done descriptively and inferentially to establish relationship between gender and achievement in Advanced Level Chemistry. At the end of data collection, the statistical analysis technique used to test the hypothesis was the independent t-test while the perceptions and opinions of the students and teachers interviewed were analysed thematically in terms of percentages. The research question was answered using mean and percentages while the formulated hypotheses were tested at 0.05 level of significance using the student t-test statistics

Presentation of Findings

Research Question: To what extent does gender influence achievement disparities in Chemistry at the Advanced Level GCE examination in the English sub system of education in Cameroon?

Table 1, shows a Comparison of the mean score for male and female passed in terms of grades, and the total passed. A total of 13250 boys as against 10015 girls passed the Advanced level from 2012 to 2016.

Table 1: Distribution of overall passed grade score by the students in terms of gender

Passed Grade	Male		Female	
	Frequency	Mean	Frequency	Mean
A	354	14.16	134	5.36
B	955	38.20	545	21.80
C	3137	125.48	2029	81.16
D	5567	222.68	4577	183.08
E	3237	129.48	2730	109.20
Total	13250	106.00	10015	80.12

Findings showed that from 2012 to 2016, male did better than the female with the mean score for male that had "A", "B" "C" "D" and "E", higher than that of female. More male students did not only have good grades in Chemistry more than their female counterpart, they also outperformed the female students qualitatively and quantitatively with an overall mean of 106.00 as against 80.12 respectively.

Testing of hypothesis one Ho₁:

There is no significant difference between male and female achievement in Chemistry at the Advanced Level GCE in the English sub system of education in Cameroon

Table 2: Independent Samples Test comparing the differences in achievement between male and female that passed in term of grade

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	P-value	t	df	P-value	Mean Difference	Std. Error Difference
Male	Equal variances assumed	82.046	.000	5.291	48	.000	115.320	21.797
	Equal variances not assumed			5.291	24.608	.000	115.320	21.797
Female	Equal variances assumed	40.123	.000	5.730	48	.000	103.840	18.124
	Equal variances not assumed			5.730	24.168	.000	103.840	18.124

Grouping variable: Grade

Level of significance: =95% Confidence Interval of the Difference

Assuming that the variance is not equal, appraising the difference in achievement between male and female in terms of grade, findings showed that the mean difference was significant ($P < 0.05$) with male having a mean of 82.046 which is significantly higher than that of the female 40.123. Therefore, the null hypothesis was rejected and the alternative hypothesis that states that there is a significant difference between male and female achievement in Chemistry at the Advanced Level GCE in the English sub system of education in Cameroon was accepted.

The qualitative data were obtained through interview guides. The past Advanced Level Chemistry students were interviewed as well as the Chemistry teachers. The opinions or perceptions on the disparities in achievement observed based on gender within as a category of candidates for the Advanced Level GCE examinations in the English sub system of education in Cameroon were recorded according to themes as presented below following the objective of the study.

The past Chemistry students selected from who succeeded or failed A/L Chemistry were interviewed to express their opinions on possible factors that account for achievement disparities between boys and girls in schools in the English sub system of education in Cameroon from 2012 to 2016. Similarly, the experienced Chemistry teachers, GCE examiners and regional inspectors in charge of Chemistry were also interviewed to express their opinions on the possible causes of the observed trend of gender achievement disparities of Advanced Level Chemistry candidates for the GCE examinations in the English speaking sub system of education in Cameroon.

Objective One: The influence of gender disparities on students' achievement in Chemistry at the Advanced Level GCE examination in the English sub system of education in Cameroon

Table 3: Presentation of students' opinions of the disparities in Chemistry achievement as a result of gender

Theme	Specific Code	Frequency		Quotations
		Male	Female	
Calculations in Chemistry	Weakness in the calculatory aspects of Chemistry syllabus	6	7	Females: "Topics like the Mole Concept, Equilibrium, rates of reaction, that entails much calculations were challenging" Males: "Mathematical aspects of Chemistry was an issue" and this affected my achievement in the Subject.
Graphs and Sketches	Challenges in plotting of graphs and sketches	5	6	Females: "It requires the determination of the scale, producing the correct shape followed by interpretation and calculations and challenging.
Inability to do hands-on experiments in the laboratory	Manipulation of equipment, preparing solutions, use of thermometer and stopwatch, recording of data and interpretations/ calculations	4	6	Males: We faced "difficulties in thermometer and stopwatch reading" Females: "Obtaining the correct data, interpreting it and doing calculations that follow every practical exercise is a real issue" and this affected achievement and brings about disparities in achievement between boys and girls
Cognitive ability	Understanding and mastery of Chemistry concepts.	4	5	Females: "Some concepts appear to be abstract".... Females: "Organic Chemistry is volatile" and we tend to forget the concepts faster.
Self-regulated learning	Ability to organize studies: Copying of notes, attending classes, doing assigned task and controlling one's learning	7	3	Females: "I had all the notes and attended lectures regularly." Males: "I hadn't all the notes, but could read my text books and understand"
Peer pressures	Inability to manage distractions from the learning environment	5	5	Females: "Men and friends of the opposite sex were an issue too" Most boys agreed that distractions were part of the learning process but "we didn't forget our books"
Motivation	Self esteem	5	5	Males: "I believe in myself as an achiever"... Females: "I trust myself that I can do it".

Based on students' perception on how gender influences their academic achievement in Chemistry, findings showed that a host of factors affect students' in the learning of Chemistry including: mathematical aspects of Chemistry, graph work, practical laboratory exercises, intellectual ability, self-regulatory learning and motivation. Of these factors, the most influential that brings about disparity in achievement between boys and girls is mathematical aspects of Chemistry. The majority (13) 65% of the respondents affirmed the veracity of this finding with six out of twelve males and seven out of eight females, this is an indication that female students face more challenges in the mathematical aspects of Chemistry than their male counterparts and this is one of aspects that enhances achievement disparities between boys and girls in Advanced Level Chemistry.

Table 4: Presentation of Chemistry teachers GCE examiners and pedagogic inspectors' opinions on the disparities in Chemistry achievement as a result of gender

Theme	Specific Code	Frequency		Quotations
		Male	Female	
Perception	Rating achievement of boys and girls in A/L Chemistry	5	3	"Boys achieve more" and most engage in more challenging task than the girls.
Calculations in Chemistry	Skills in the calculatory aspects of Chemistry syllabus	6	2	"The boys achieve more on problems involving calculations in Chemistry and this makes a difference"
Graphs and Sketches	Engaging in aspects of Chemistry requiring the skills of plotting of graphs and sketches	5	3	"Male students usually face less challenges in manipulating figures to determine the scale and plotting graphs correctly". This also enable them to give a good interpretation and do calculations
Ability to do hands-on experiments in the laboratory	Manipulation and use of equipment, thermometer and stopwatch. Preparing solutions, recording of data, interpretations, and calculations involved in practical exercises.	5	3	"Challenges in using thermometer and stopwatches and reading values from them" affect more females than males "Obtaining the correct data, interpreting it and doing calculations that follow every practical exercise are the issues" and these affect more females than males.
Cognitive ability	Different ability in understanding and mastery of Chemistry concepts.	5	3	"Both boys and girls face difficulties in mastering and understanding the concepts in Chemistry but the boys are more creative and more engaging in challenging task than the girls".... "Most girls complaint that Organic Chemistry is volatile" and they turn neglect it" and this affect them
Self-regulated learning	Copying of notes, attending classes, doing assigned task and controlling one's learning	4	4	"Girls copy notes and attend lectures regularly than boys, however, boys easily adopt the usage of other resources like textbooks, ICTs than girls"
Peer pressures	Inability to manage distractions from the learning environment	4	4	"Both boys and girls face peer pressure issues but the boys can easily manage it because they are mostly those who constitute the distractions"
Motivation	Self-fulfilling prophesy	6	2	"I am more likely to encourage male students in the learning of Chemistry than females because males have shown a consistent record of performing well". "Some female students perform as well as males or even better in Chemistry tests and exams, so I do well to encourage both gender during learning" "Boys are more conscious of future responsibilities and are also motivated by science related careers such as mining, engineering, industrial works etc. that most girls consider them to depend on physical ability and risky to them"

Similarly, Findings reveal that teachers of Chemistry and GCE examiners perceive the ability of female and male students differently and to them, these are responsible for the achievement disparities. More generally, teachers affirmed that male students achieve better than their female counterparts in Chemistry (63%). Other factors that cause an achievement disparity amongst boys and girls according to the teachers are mathematical aspects of the subjects, plotting of graphs, practical work, students' intellectual ability, self-regulated learning and peer pressure mainly in favour of male students. Again, many more teachers are likely to encourage male students to study harder and achieve better grades than will be the case with female students.

Discussion of Findings

Findings relative to gender disparities and achievement in Advanced Level Chemistry revealed that there is a significant, consistent, strong and positive relationship between gender and students' academic achievement in the Advanced Level Chemistry GCE examination in the English Speaking sub system of education in Cameroon. Further findings from the t-test analysis revealed that there is a significant difference between the mean learner differences with respect to gender and achievement in Advanced Level

Chemistry GCE. Based on this finding, boys achieve better in Advanced Level Chemistry GCE than the girls in the GCE. This phenomenon has been consistent based on GCE results in Advanced Level Chemistry from 2012 to 2016 which indicates that males outperformed females significantly.

In addition, the results showed that the males outperformed their female counterparts in Advanced Level Chemistry quantitatively with 13,250 pass for males as against 10,015 pass for the females from 2012 -2016. Qualitatively, findings

showed that from 2012 to 2016, the percentage of male that had “A”, “B” and “C” grades is higher than that of female while the percentage of female who scored “D” and “E” grades is higher than that of the male.

These results are corroborated by both the teachers and students interview findings. Both affirmed that boys achieve better in Advanced Level Chemistry than the girls. Both teachers and students agreed that all the students engage in the learning of Chemistry but identify a host of factors that affect students’ in the learning of Chemistry including: Mathematical aspects of Chemistry, graph work, practical laboratory exercises, intellectual ability, self-regulatory learning, pedagogic practices and motivation. Of these factors, the most influential that brings about disparity in achievement between boys and girls is mathematical aspects of Chemistry according to the students interviewed whose majority expressed that “Topics like the Mole Concept, Equilibrium, rates of reaction, that entail much calculations were challenging”

The above findings are corroborated by empirical evidence from other researchers including those of Inesman (1949), Duncan (1989), and Greenfield (1996) as cited in (Eriba and Ande 2006) who carried out research on the underachievement of females in the sciences and found that male students were superior in the sciences than their female counter parts. According to Tsado (1987), Gipps (1994), O’Connor (2001), as cited by (Eriba and Ande 2006), as boys and girls grew up, the differences they have in achievement in other subjects tend to diminish except in the sciences, and mathematics. The fear of Mathematics is often transferred to Chemistry, which involves one form of calculation or the other. In the same line, Sperry (1961) alluded to the fact that spatial or configurationally information processing that requires visuospatial processing, such as graphs, charts, formulas, or geometric figures, it has been thought that men are better able to remember that information simply through visualization of the information. (Maccoby and Jacklin, 1974) observed gender differences in particular abilities, and concluded that females possess superiority in verbal ability and are genetically pre-disposed to succeed in biological sciences and humanities while the males are genetically predisposed to be more superior succeed in spatial and mathematical ability.

Despite the fact that reviewed studies support the view that males achieve more in Chemistry, many females also had outstanding achievement than some of their male counterpart. This was observed in the GCE results of 2016, where findings showed that the percentage of male that passed was 57.0% while that for female was 62.44%. This observation is not very far from the conclusions of Husen (1989) who opines that even if learning opportunities and teaching strategies would be equally effective in science instruction for every boy or girl in class a formal test given at the end of a certain curricular sequence would still yield marked differences between boys, between girls and between boys and girls. Again this better performance of the females over the males is also corroborated by Chamber (2008), Soyibo (2009) (in Oluwatosin & Ogbeba, 2017), and by Gabel and Sherwood (1984),(as cited in Eriba and Ande 2006).

Form a theoretical perspective, Sandra Bem (1981), the Gender Scheme Theory is most prominent when it comes to encouraging the concept of male privilege and placing men in a greater status than women thereby perpetuating gender stereotype. She observed that invincible rules within the society have provided what is feminine and what is masculine, hence, Chemistry and science in most cultures is defined as a masculine domain and the associated careers thereof. Accordingly, Sandra Bem (1981), also believes that sex-typed individuals are seen as differing from other individuals not primarily in terms of how much masculinity or femininity they possess, but in terms of whether or not their self-concepts and behaviors are organized on the basis of gender. Therefore both boys and girls can achievement well in Chemistry if the environment is fair and enabling. Moreover, learners irrespective of sex can make a difference in their cognitive development and capacity by manipulating their mental process, cognitive styles of self-regulation, and cognitive skills of thinking, reasoning, analyzing problems and information processing as well as personal experiences affect achievement and behaviours through the use appropriate thinking from multiple intelligence perspectives of Howard Gardener (1983) and the Achievement-Oriented Performance theory of Atkinson (1950) whose central tenets are based on the fact that a person’s achievement oriented behavior is based on the individual’s predisposition to achievement, the probability of success and the individual’s perception of value of the tasks and not on gender. This is because cognitive abilities is more than an ability to manipulate and strategized information, but also the ability to internalize, self-regulate, and transfer of cognitive skills to construct knowledge in the meaning making process of teaching and learning (Tchombe 2011). Norfleet (2009), argues that there exist cognitive gender differences at birth and in young children and opines that the problems that girls have with mathematics and science and that boys have with language arts begin early and only by using gendered educational approaches will men and women become more equal in their cognitive abilities. Teachers and the educational stakeholders are called to stop reflecting on “Who is better?” and change the reflections on “Where and when are meaningful differences found?” and “How can we use our findings to help all people achieve their maximum potential?” This is in line with Vygotsky’s Social Constructivism in Tchombe (2011) that emphasizes the need for learning to occur in a social context where learners can interact with the teachers and more knowledgeable peers to build their own knowledge. Learners by the dictates of this theory are supposed to be helped by teachers especially and in a significant others across the Zone of Proximal Development in a social/interacting context to bridge the gap between what they already can do and what they can do with help through a system of scaffolding and providing hurdle help.

It was observed that the majority of the teachers interviewed affirmed to frequently perceive the male Chemistry students as greater achievers than the girls. This is in line with the theories of Marxism and symbolic interactionism which describes and explain how social systems affect learning in the classroom by promoting male superiority. According to the self- fulfilling prophecy of symbolic interactionism, teachers perception on students’ performance reveal that when a teacher perceives a learner as a high achiever, he/she treats that student as such and the student achieve

highly in class and if he/she perceives a student as a low achiever, he/she treats the student as such and the student achieve low as much. As such the teachers turn to spend more time and give longer time to listen to answers from students they believe as high achiever and impatient for answers from students believed to be a low achiever. This is why as far as science and Chemistry education is concerned, Erinosh (2005), argues that what has remained the main focus of great concern in the field of science education are the biases and misconceptions about women and science, i.e. science is a male enterprise. This breed gender inequality in class as this theory reveals that teachers call and give praises to boys more than the girls in the classroom and it plays on the psychology of the female students to remain inferior in this subject. Meanwhile teachers ought to be supportive to learners irrespective of gender especially when the majority of female students interviewed for the study expressed the need for more support as they continue to face challenges at the level of calculations, plotting of graphs, manipulations of laboratory equipment, collection and analysis of data from experiment.

Conclusions

The findings of this study show that there is gender disparity in achievement in the Advanced level Chemistry GCE examinations in the English speaking sub system of education in Cameroon.

Recommendation

Based on the findings, analyses and conclusions of the study, the following recommendations have been made. To reduce this gap in achievement between male and female students, attention should be given to address the contributory pedagogic practices, cognitive factors, motivational and sociocultural factors primarily by ensuring that Chemistry and Mathematics teachers team up to ensure integrative learning, transfer and application of knowledge among the females by giving them more attention/time during classes, use of teaching strategies which the female perceive as attainable and compatible with their abilities, preferences, and goals. Until then, large numbers of mathematically low gifted females will continue to slip through the cracks when their choices are restricted by cultural barriers, gender stereotype and misinformation and we rather maximize career options for women by capitalizing on female cognitive strength, emphasizing on hard work and effort and cultivating female interest in mathematics and science.

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