International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 3 Issue 5, August 2019 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Gender Disparity, Implications to Students' Academic Performance in Science Subjects in Secondary Schools in Buea Sub-Division, Cameroon

Mary-Ann Awasiri Takwe

M.Ed, PhD in view, University of Buea, Buea, Cameroon

How to cite this paper: Mary-Ann Awasiri Takwe "Gender Disparity, Implications to Students' Academic Performance in Science Subjects in Secondary Schools in Buea Sub-Division, Cameroon" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-3 | Issue-5, August 2019, pp.1541-1567, **https://doi.org/10.31142/ijtsrd26763**

IJTSRD26763

ABSTRACT

The study examined gender disparity, implications in students' academic performance in biology, chemistry, physics and mathematics in secondary schools in Buea Sub-Division, Cameroon. The Sustainable Development Goal 4 which focused "Ensure inclusive and equitable quality education and promote lifelong learning for all on adopted in September 2015 by the United Nations marked a paradigm shift in education goal which previously focussed on ensuring access to education to equitable quality education. The research objective was to investigate; students-related causes of gender disparity in students' academic performance in biology, chemistry, physics and mathematics. The survey design was used and data were collected from participants in nine secondary schools and the Regional Delegation of Secondary Education with a sample size of 251 participants. Instruments used for data collection were questionnaire, interview guide, observation check list and focus group discussion. Data were analysed using thematic analysis, descriptive and inferential statistics. Findings revealed that student related factors like negative attitudes towards science subjects which resulted from low self-esteem, negative stereotype and lack of parental support caused gender disparity in performance. This study informs current discourse on the 21st century science classroom challenges and provides a baseline data for science education reforms.

KEYWORDS: *Gender, Disperity, Implications, Students, Academic Performance, Science Subjects, Secondary*

INTRODUCTION

Science, Technology, Engineering and Mathematics (STEM) have long been recognized as the cornerstone of development. It has now been demonstrated conclusively that the social and economic development of a country is closely linked to the educational level of its female population (UNESCO, 2006). This indicates that, science and technology are becoming the most pervasive forces in our global economy and modern society, hence, the growth of Cameroon's economy today depends heavily on her investment in these educational fields where females are not well represented compared to males. As our society becomes more and more environmentally aware, health conscious, and reliant on technology, there is an urgent need to encourage more female students to pursuing studies in the sciences. Greater gender equality in scientific education can therefore enhance good health, productivity, improve development outcomes for the next generation, and make institutions more representative (World Bank, 2012).

Taking cognizance of the importance of science, the need to improve women's access to, and participation in scientific debates as a whole has been a focus of many international conferences. That need is being addressed in a number of international agreements related to education and gender issues. Issues related to the education of the girl child in scientific fields have been cogently expressed in documents like World Conference on Education for All (Jomtien, 1990) which prioritized the need for improving access to education for girls, fourth UN World Conference on Women (Beijing, 1995) which reaffirmed the need to improve women's access to science and technology education, the Eight Millennium Development Goals adopted in 2000 by the international community with Goal nº 3 which sought to "eliminate gender disparity in primary and secondary education, preferably by the year 2005, and to all levels of education no later than 2015". The Sustainable Development Goals (goal 4) is to, "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". By 2030, there should be an elimination of gender disparities in education and the achievement of equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.

Despite the fact that the Cameroon Government's effort towards achieving access to schooling (Law No. 98/04 of April 1998) was not accompanied by any commitment to equitable quality education, there are both educational and social arguments why this issue should be addressed. The Sustainable Development Goals, (goal five) lays emphasis on gender equity, equality and empowerment of women. This therefore implies that any proper education should include science and technology and all students, both male and female, should have equal access to the subjects (equality), have equal opportunities to perform well, and should be equally excited by the learning opportunities they are given (equity). Promoting gender equity in science education is crucial in the drive to accelerate sustainable development because of the multiplier effect across all other development areas and could thus benefit societies and humanity at large.

In 2009, the Government of Cameroon launched its Growth and Employment Strategy Paper which envisaged making Cameroon an emerging economy by the year 2035. For this vision to be realized, the government of Cameroon is depending on education to produce more professionals in the field of Science, Technology, Engineering and Mathematics by increasing the number of youth studying courses in STEM from 10% to at least 30% (Torto, 2016). Statement of

THE PROBLEM

Cameroon's commitment to the achievement of the Millennium Development Goals on the one hand, and the Sustainable Development Goals on the other hand ushered in a paradigm shift in education. Over the past years, much research has been carried out on gender equality, with emphasis being laid on access to education. Little attention has been paid to retention and quality education in secondary schools. Still lacking in research however, is why there is gender disparity in students' academic performance in science subjects in Cameroonian secondary schools.

Throughout Cameroon, more boys than girls opt to study Science subjects in secondary and high schools. Less than 30% of girls pursue science in college (Forba, 2011). Education of girls in science subjects in the 10 regions of Cameroon in 1997 ranged between 2% - 24% in all regions except one which had between 2% - 14% (Torto, 2016). Even when the students leave high School, more boys than girls tend to pursue science and technology-oriented careers. In the University of Yaounde 1, out of the total number that enrolled in the sciences in 2010/2011 academic year, 66% were male while 34% were female (Torto, 2016).

The issue of girls under performing or dropping out of science subjects is not only a Cameroonian phenomenon but a worldwide concern common to different educational systems and cultures. It is therefore a growing phenomenon on which research should be carried out. The under-representation of female students in science education and their poor performance in science subjects can be seen as inefficiency and major concerns in our educational system especially as Cameroon's attainment of her emergence vision for 2035 critically depends on the generation of human capacity as seen in the country's vision which reads, "Cameroon: An Emerging, Democratic and United Country in Diversity". The country depends crucially on the development of human skills and technology from higher education to meet these challenges.

Reducing persistent gender inequalities is necessary not only for reasons of fairness and equity but also out of economic necessity. Greater economic opportunities for women would help to increase labour productivity, and higher female employment will widen the base of taxpayers and contributors to social protection systems. More gender diversity would help promote innovation and competitiveness in business. Greater economic empowerment of women and greater gender equality in leadership are key components that will help develop policies for stronger, better and fairer growth. (Report on the Gender Initiative: Gender Equality in Education, Employment and Entrepreneurship, 2011).

As a prelude to the management of educational problems and equitable quality education, this study s ought to examine the causes of gender disparity in students' academic performance in science subjects in some secondary schools in the Buea Sub Division, South West Region of Cameroon and propose an intervention plan to improve performance and reduce the gender gap in science performance.

Research Objective

This paper Investigate student-related causes of gender disparity in students' academic performance in biology, chemistry, physics and mathematics in secondary schools.

Research Question

1. Which student-related factors cause gender disparity in students' academic performance in biology, chemistry, physics and mathematics in secondary schools?

BACKGROUND

The highest performing education systems are those that combine quality and equity. This study is therefore underpinned by two main concepts namely, equity in education and quality education.

Equity in Education

Educational equity, also referred to as equity in education, is a measure of achievement, fairness, and opportunity in education (Education at a Glance, 2012). Equity in education means that personal or social circumstances such as gender, ethnic origin or family background, are not obstacles to achieving educational potential (definition of fairness) and that all individuals reach at least a basic minimum level of skills (definition of inclusion). In the educational systems, the vast majority of students have the opportunity to attain high-level skills, regardless of their own personal and socio-economic circumstances.

The concept of equity is of paramount importance to this study as it explains why there are gaps in academic performance with emphasis on the socio-emotional climate in school, and how these gaps can be bridged. Equitable educational systems are therefore fair and inclusive and support their students to reach their learning potential without either formally or informally pre-setting barriers or lowering expectations.

Gender equity in science education ensures that all males and females, regardless of their gender, age, culture, and ethnic background or disability, have the support they need to become successful, respected and challenged science students (National Science Teachers Association [NSTA], 2011). To ensure this, factors that cause gender inequity in performance must be understood and dealt with.

Gender Inequity in Science Performance

Educational equity is dependent on two main factors. The first is fairness, which implies that factors specific to one's personal conditions (learners' characteristics) should not interfere with the potential of academic success. The Dakar

Framework for Action (DFA) (2000) is aimed at ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life skills programmes. Females therefore should have the opportunity to equitable education in all school subjects. There are many factors that might disadvantage some learners in achieving equitable outcomes in science education which include; gender attitude towards science, biological negative stereotypes.

Negative Attitude Toward Science

Attitude is described as, "A relatively enduring organization of beliefs around an object or a situation predisposing one to respond in some preferential manner" (Scott and Marshall, 2005:25). This means that an attitude is a feeling that one has towards a situation or case of study (subject). Gender differences in attitude significantly affect the choice of students' programmes as well as their performance in science, technology, engineering and mathematics-related fields (Morley, et. al., 2006). Weinburgh (1995) research suggests that, there is a correlation between attitude towards science and achievement or performance although this correlation is stronger for very high and very low ability girls indicating that, for these groups, 'doing well' in science is closely linked with 'liking science'. With regards to this, a positive attitude towards science enhances better performance in science and vice versa. Research studies have identified a number of factors which influence students' attitude towards science in general. According to Osborne, Simon and Collins (2003), these factors can be defined as gender, personality, structural variables and curriculum variables. Of these factors, the most significant is gender for, as Gardner (1975) comments, 'sex is probably the most significant variable related towards pupils' attitude to science'. This view is supported by Schibeci's (1984) extensive review of the literature and more recent meta-analyses of a range of research studies by Becker (1989) and Weinburgh (1995). Both the latter two papers summarize numerous research studies to show that boys have a consistently more positive attitude to school science than girls, although this effect is stronger in physics than in biology and chemistry. What is clear from an extensive literature on the subject, mainly as a result of a serious consideration and investigation of the problem in the 1980s, is that girls' attitudes to science are significantly less positive than boys (Breakwell and Beardsell, 1992; Erickson and Erickson, 1984; Harding, 1983; Harvey and Edwards, 1980; Hendley, et. al., 1996; Johnson, 1987; Jovanic and King, 1998; Kahle and Lakes, 1983; Robertson, 1987; Smail and Kelly, 1984).

Sex is probably the single most important variable related to pupils' attitudes to science (Gardner, 1975, p. 1). Some researchers believe that studying differences in males' and females' attitudes and interests in science education is less controversial than studying differences in abilities, and constitutes more popular research praxis among science educators. Small scale studies (Chambers & Andre, 1997; Greenfield, 1996; Parsons, 1997) as well as large scale studies (Jones, Howe & Rua, 2000; and Sjøberg, 2000) have documented differences in girls' and boys' attitudes to and in interest in science in school. After conducting an analysis of literature on sex differences in children's attitudes to science from 1970 to 1991, Weinburgh (1995) concluded that boys in general were more positive to school science than girls. There were, however, differences in terms of which disciplines within science education girls and boys tended to like. While girls in general seemed to have more positive attitudes than boys to biology, boys in general were found to have more positive attitudes towards physics and chemistry. Similar patterns have also been found in other research projects (Osborne, Driver & Simon, 1998; Simon, 2000; Sjoberg, 2004). Several researchers have argued that differences between girls' and boys' interests in science are linked to the former experiences of the pupils (Johnson, 1987; Jones, et. al., 2000; Kahle & Lakes, 1983; Smail & Kelly, 1984; Thomas, 1986). While the girls dominate in activities that have to do with the body and health issues, and are interested in activities with an aesthetic dimension, boys tend to show interest in activities connected to cars, weapons, electricity and mechanics (Sjoberg, 2004).

Several studies have shown that girls' and boys' attitudes tend to change as pupils move from primary to secondary education (See for instance Davies & Bremer, 2001; Imsen, 1996; Kahle & Meece, 1994; Lie, Kjærnsli & Brekke, 1997; Mbano, 2001a, 2001b; Nassor, 2001a, 2001b; Osborne, et. al., 1998; Reid, 2003). While girls generally express positive attitudes towards science at lower levels, they tend to lose interests in science and develop negative attitudes towards the subject as they move to secondary school. In a recent study from Scotland, Reid (2003) showed that by introducing a new type of application-led physics education syllabus at secondary school level, positive attitudes of girls towards physics at this level were restored. They did, however, see that the actual character of the applications of physics had a different appeal to boys and girls. While girls were drawn to themes that were perceived to have a high social relevance, boys tended to be attracted to those perceived to have a high mechanical or practical relevance (Reid, 2003). Studies concerning determining factors for girls' choice of future careers has shown that girls more than boys tend to opt for careers that enable them to work with human beings and help other people. Boys on the other hand seem to be more concerned about getting a job that will give them high status and earn high wages (Angell, Henriksen & Isnes, 2003; Baker & Leary, 1995; Myrland, 1997). Earning high wages does not longer seem to be a fruitful explanation to female underrepresentation in several science studies and engineering schools. Even though engineers still earn higher wages than nurses, science subjects have over the past years lost much of its status and becoming an engineer is no longer a guarantee for getting a well-paid job. Studies that do lead to well-paid jobs, such as law and medicine, are, on the other hand increasingly being applied to by girls.

Of late, studies have been undertaken by Jones, Howe, and Rua (2000) and Sjoberg (2000) using questionnaire with large samples. In the case of the American context, Jones, et. al., (2000) was forced to conclude that, despite a large number of interventions undertaken in the 1980s and 1990s, 'that the future pipeline of scientists and engineers is likely to remain unchanged'.

Some findings on this revealed that it is a consequence of cultural socialization that offers girls considerably less opportunity to tinker with technological devices and use common measuring instruments (Johnson, 1987; Kahle and Lakes, 1983; Smail and Kelly, 1984; Thomas, 1986). For instance, Kahle contends that her data shows that there is a gap between young girls' desire to observe common scientific phenomena and their opportunities to practice scientific experiments. More importantly, Kahle argues that her data show conclusively that 'lack of experiences in science lead to a lack of understanding of science and contribute to negative attitudes to science' which may intern affect performance.

Similarly, Johnson (1987) argues from her data, measuring a range of common childhood experiences of children, that 'early established differences in the interests and activities of boys and girls result in parallel differences in their science performances.' Jovanic and King (1998) have a similar thesis arguing that girls, rather than boys, make comparative judgments across academic domains. So girls' declining perception of their ability may reflect that, as the year progressed, girls perceived themselves to be better at other school subjects (e.g. English) and, therefore, not as good at science.

However, there is now some evidence beginning to appear that girls no longer hold such a stereotypical aversion to careers in science and are confident of their ability to undertake science courses (Colley, et. al., 1994; Havard, 1996; Lightbody and Durndell, 1996b; Whitehead, 1996). For instance, Archer (1992) has found that girls aged between 10 and 15 reported liking most strongly the three subjects regarded stereotypically as 'masculine'- mathematics, science and games. Moreover, in terms of achievement in science, Elwood and Comber (1995) have shown that the situation has now reached a position, at least in the UK, where girls are doing as well, if not better than boys.

Lack of Confidence in Science

One difference among girls and boys in science education that is pointed out by gender researchers in many countries is the difference in self-confidence (Andre, Whigham, Hendrickson & Chambers, 1999; Imsen, 1996; Kenway & Gough, 1998; Mbano, 2001 a). Studies have shown that even when girls tend to perform just as well as boys, their confidence with respect to their abilities of learning science is lower than what applies to the boys. It is claimed that the low-performing boys have higher self-confidence in their own abilities for learning science than the high-performing girls.

Biological Explanations

Some have attempted to use differences in biology between boys and girls to explain disparities in girls' and boys' participation, interest and performance in some science subjects (Reid, 2003). One such explanation is that that males, due to the physical development of their brain have better developed visual spatial ability than girls (see for instance Child & Smithers, 1971) and that this difference can explain differences in males' and females' interest and abilities in some science subjects (see for instance Gray, 1981). Other studies have found no differences in males' and females' visual spatial abilities and that these abilities depend more on what culture one belongs to than what sex one has (see for instance Jahoda, 1979).

Recent studies have, however, shown that girls in developed countries in many cases are performing just as well in science as boys are, in some cases even better (PISA, 2001; Simon, 2000). A recent trend in some developed countries is in fact that girls outperform boys in most school subjects (Epstein, 1998). Several science educators, after reviewing literature on sex differences, have argued that there is no evidence that biological factors are causing the gender inequity in science education (Kahle & Meece, 1994; Solomon, 1997). When sex differences in performance and participation in science education is still persistent in some areas, this can therefore indicate that the problem of poor performance and participation among girls in science education is more of a pedagogical and cultural problem than a problem caused by sex differences inabilities of learning science.

Negative Stereotypes

Stereotypes which tend to create a link between ability to do sciences and males may create gender differences in performance among students, and those gender differences in performance may reinforce the stereotypes which link ability to sciences and males (Nosek, et. al., 2009). Studies were carried out to investigate if gender- science stereotypes could predict gender differences in performance in mathematics and science. To test this idea the researchers examined whether a country's mean level of the implicit gender-science stereotype could predict gender difference in eight grade performance in science on the Trends in International Mathematics and Science Study (TIMSS). Using data from almost 300,000 gender-science IATs completed by citizens of countries that participate in TIMSS, the researchers first determined the level of the implicit gender-science stereotype for each country. Secondly, the researchers calculated the gender gap in performance by subtracting the average female performance from the average male performance for each of the 34 countries that took part in the 2003 TIMSS. The results of the study showed a positive relationship between the implicit gender-science stereotype of the country and the gender difference in eighth grade science TIMSS performance. Specifically, the stronger the association between male and science in a country, the larger the male advantage in science performance (AAUW, 2010). Stereotype may manifest in the following ways; stereotype threat, cultural, media stereotype.

Stereotype Threats

Stereotype threat describes the experience of "being at risk of confirming, as self-characteristic, a negative stereotype of one's group" (Steel & Aronson, 1995). A large body of experimental research has found that negative stereotypes affect women's and girls' performance and aspirations in mathematics and science through a phenomenon called "stereotype threat." Even female students who strongly identify with mathematics, who think that they are good at mathematics and being good in mathematics is important to them are susceptible to its effects (Nguyen & Ryan, 2008). As early as elementary school, children are aware of these stereotypes and can express stereotypical beliefs about which science courses are suitable for females and males (Fairnga & Joyce, 1999; Ambady, et. al., 2001).

Steele & Aronson (1995) view stereotype threat as an important factor though not the sole factor producing group differences in test performance and academic motivation. Stereotype threat arises in situations where a negative stereotype is relevant to evaluating performance. For example, a female student who is taking a mathematics test would experience an extra cognitive and emotional burden of worry related to the stereotype that women are not good at mathematics. A reference to this stereotype, however subtle, could adversely affect test performance. When the burden is removed, however, performance would improve (Steele & Aronson, 1995).

Stereotype threat can be felt as both psychological and physiological responses that result in impaired performance. Spencer, et. al., (1999) recruited 30 females and 24 male first-year University of Michigan psychology students with strong mathematics backgrounds and similar mathematics abilities as measured by grades and test scores. All the students strongly identified with mathematics were divided into two groups, and the researchers administered a math test on computers using items from the math section of the Graduate Record Examination. One group was told that men performed better than women on the test (the threat condition), and the other group was told that there were no gender differences in test performance (the non-threat condition). Spencer, et. al., believed that if stereotype threat could explain gender differences in performance, then presenting the test as free of gender bias would remove the stereotype threat, and women would perform as well as men. If, however, gender differences in performance were due to sex-linked ability differences in mathematics, women would perform worse than men even when the stereotype threat had been lifted. They found that women performed significantly worse than men in the threat situation and that the gender difference almost disappeared in the no threat condition. Research consistently finds that stereotype threat adversely affects women's performance in mathematics to a modest degree (Nguyen & Ryan, 2008). Encouraging students to think of their mathematics abilities as expandable can lift stereotype threat and have a significant positive effect on students' grades and test scores (Aronson, et. al., 2002; Good, et. al., 2003).
by the end of S2.

Self-Efficacy Theory
The underpinnings of the self-efficacy theory supports a study of the type.

Albert Bandura's (1977) social-cognitive theory focuses on learning as a social activity with the key concept of self-efficacy developed within his cognitive learning theory. Self-efficacy theory is a major construct that exists within the social cognitive theory and attempts to explain the decisions and behaviours of individuals based on their perception of potential success at a task. The construct of self-efficacy has a relatively brief history that began with Bandura's publication of, "Self-Efficacy: Toward a Unifying Theory of Behavioral Change" (Pajaras: 1996, p.545).

Perceived self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. Self-efficacy beliefs determine how people feel, think, motivate themselves and behave. Such beliefs produce these diverse effects through four major processes. They include cognitive, motivational, affective and selection processes (Bandura, 1994).

A basic premise of this theory is that people learn not only through their own personal experiences, but also by observing and imitation of the actions of others and the results or outcome of those actions. Social cognitive theory provides a reminder on how an individual's life trajectory is the culmination of many factors, some of which will have a greater impact than others at different times. Bandura (1977) referred to the interactions of such factors as reciprocal determinism, which finds a link between cognition, biology, environment and behaviour. Each of these attribute influences the other and plays a great role in determining life paths.

Therefore, biological conditions in addition to family and educational systems can influence the path of a young girl as she is determining her goals. As stated by Bandura (1989), "social and technological changes alter the kinds of life events that become customary in the society". With regards to this, the images girls are presented with, the norms of society and the views of influential people in the girl's life are all contributors to life decisions the girl child makes.

Through the social learning theory as postulated by Alfred Bandura, the path of an individual's life can be examined. Who influenced their attitudes towards mathematics, technology and science careers? How have employees in these industries been portrayed? What images do the media project? Have the girls been encouraged by teachers, peers, family members or the community to pursue studies in sciences? These and many other questions fall under the scope of social cognitive theory.

Social cognitive theory has been used to analyse both educational and occupational preferences and decisions. The key factors that influence these decisions include genetic factors, environmental conditions and events, learning experiences, and task approach skills. The interaction of these factors over time is interdependent and can produce different decisions at each point in time. Genetic factors include race, sex, physical appearance, and special abilities in music, art, intelligence or muscular coordination. Environmental conditions and events encompasses a number of social, economic, and political factors, just as job availability, training opportunities and requirements, technological developments, family experience and resources, educational organizations, and natural disasters. Each one of these conditions can act like a constraint or facilitator on the opportunities of the individual.

According to this theory, the learning experiences one is exposed to are very complex and the consequences of the learning experience influence the probability of having a similar experience in the future. For example, success and positive feedback may lead to an affinity for that particular task, while negative feedback and poor performance may have the opposite effect. Learning experiences produce preferences for various activities and develops cognitive and performance skill that the individual brings to each new task. These task-approach skills affect the outcome of the task and these results will modify future approaches (Krumboltz, Mitchell & Jones, 1976).

Bandura developed the key concept of self-efficacy within his cognitive learning theory, and provided guidelines for measuring self-efficacy beliefs across different domains Bandura (1977). He sought to assess the level, generality, and strength of perceived self-efficacy across activities and contexts. He hypothesized that self-efficacy influences how much effort an individual is willing and able to put and sustained on a given task or goal in the face of adversity.

A strong sense of efficacy enhances human accomplishment and personal well-being in many ways. People with high assurance in their capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided. Such an efficacious outlook fosters intrinsic interest and deep engrossment in activities. They set themselves challenging goals and maintain strong commitment to them. They heighten and sustain their efforts in the face of failure. They quickly recover their sense of efficacy after failures or setbacks. They attribute failure to insufficient effort or deficient knowledge and skills which are acquirable. They approach threatening situations with assurance that they can exercise control over them. Such an efficacious outlook produces personal accomplishments, reduces stress and lowers vulnerability to depression (Bandura, 1994).

In contrast, people who doubt their capabilities shy away from difficult tasks which they view as personal threats. They have low aspirations and weak commitment to the goals they choose to pursue. When faced with difficult tasks, they dwell on their personal deficiencies, on the obstacles they will encounter, and all kinds of adverse outcomes rather than concentrate on how to perform successfully. They slacken their efforts and give up quickly in the face of difficulties. They are slow to recover their sense of efficacy following failure or setbacks. Because they view insufficient performance as deficient aptitude it does not require much failure for them to lose faith in their capabilities. They fall easy victim to stress and depression (Bandura, 1994).

Bandura (1977) also made a distinction between outcome expectancy and efficacy expectancy: An out-come expectancy is defined as a person's estimate that a given behaviour will lead to certain outcomes. Efficacy expectancy is the conviction that one can successfully execute the behaviour that is required to produce the desired outcomes. Outcome expectancy and efficacy expectations are differentiated, because individuals can believe that a particular course of action will produce certain outcomes, but if they entertain serious doubts about whether they can perform the necessary activities, such information does not influence their behaviour. There are four sources of information that can develop and modify self-efficacy expectation:

- Past performance on the specific task,
- Vicarious learning experiences provided by social models,
- Encouragement or discouragement from others, and
- Emotional arousal in connection with the behaviour.

Through positive applications of these four information sources self-efficacy can be altered (Betz, 2001; Bandura, 1994). Since self-efficacy can be influenced by others, the implications of self-efficacy theory on teaching, learning and career guidance practices are particularly relevant for this study.

The idea of modelling appropriate behaviours, providing students with a variety of models, helping students set realistic academic goals for themselves and instilling a belief in the student that they are capable of accomplishing school tasks are all things that parents and teachers can do to encourage all students and bolster their self-efficacy within science domains. According to Bandura (1994), the best way to create a strong sense of efficacy is through mastery experiences within the domain. This does not actually mean that the individual should be provided or presented with experiences that are not challenging and do not present the possibility of failure. Some setback and difficulties are required to teach the individual that success generally requires perseverance (Bandura, 1994).

Bringing the theory back to our learning process, self-efficacy plays a role in four major psychosocial processes: cognitive, motivational, affective, and selection. Cognitive processes, such as personal goal setting, are regulated by an appraisal of personal capabilities. Those who experience ample self-doubt and lack of confidence will find it more difficult to perform and manage critical thinking in a demanding environment. The second process is motivation and Cognitive motivators come in the form of causal attributions, outcome expectancies, and cognized goals, all influenced by self-efficacy beliefs.

Affective processes, such as anxiety and depression, arise from people's perceptions of their ability or capabilities to cope in stressful situations. Those who cannot manage threats or control disturbing thoughts feel stress and may not be able to function at optimal levels.

Selection processes are shaped by social influences and experiences that have promoted certain competencies, values, and interests. Career choice is one example of how self-efficacy beliefs can affect the course of life paths. Strong self-efficacy beliefs generate a wider range of occupations for consideration and increase the likelihood of persistence and success along that chosen path (Bandura, 1994).

This theory will guide us to understand how students' perceived ability as reflected in their attitudes and interest influence their performance in the various subjects studied in school.

METHODOLOGY

The paper set out to investigate the gender disparity and its implications on students' academic performance in science, technology and mathematics in some secondary schools in Buea Sub-Division.

The survey research design was employed for data collection

The population was made up of all Form three students, teachers and principals from different categories of secondary schools. In this respect there were 40 secondary schools with a total population of 25,362 students, 157 science teachers, and 11 Regional Pedagogic Inspectors. The population also consisted of different categories of secondary schools in Buea Sub-Division as can be seen on the table 3 below:

Table1: Population of the Study for Students

Schools	Number of Schools	Population of Girls	Population of Boys	Total Population
Government Secondary schools	13	9,859	8,293	18,152
Denominational schools	08	1,324	2,253	3,577
Lay private schools	19	2,202	1,430	3,633
Total	40	1,3385	1,1976	25,362

Source: Regional Delegation of Secondary Education, Buea (April 2018).

Table2: Population of the Study for Teachers

TEACHERS	
Subjects	Number
Biology	54
chemistry	37
Physics	29
Mathematics	47
Total	157

Source: Regional Delegation of Secondary Education, Buea (April 2018).

The target population was made up of three pubic or government schools, three confessional schools and three lay private schools. With regards to public schools, all their various categories were identified which included, Government Bilingual Schools, Government High Schools and Government Secondary Schools in Buea Sub-Division. Schools were then selected from the various categories and in line with this; Bilingual Grammar School Molyko (BGS), Government High School Buea Rural and Government Secondary School Great Soppo were selected.

For confessional schools, three denominations were present (Catholic, Baptist and Presbyterian) and all were represented. Only the schools that had mix sex were considered. As a result, Bishop Jules Peters College (BJP), Baptist High School (BHS), and Presbyterian Comprehensive Secondary School (PCSS) Buea will be selected. With regards to Lay private schools the criteria used to select the schools was based on longevity. Summerset Bilingual High school (SBHS), Inter Comprehensive College (ICC) and Salvation College (SC) Buea were selected. Table 5 shows the target population of the various schools.

Table3: Target Population for Schools

Schools	Boys	Girls	Total Population
Bilingual Grammar School Molyko	1,876	2,378	4,254
Government High School Buea Rural	517	434	951
Government Secondary High Great Soppo	117	202	319
Presbyterian Comprehensive Secondary School Buea	295	317	612
Baptist High School Buea	272	150	422
Bishop Jules Peters College Buea	178	181	359
Inter Comprehensive College Buea	383	596	979
Summerset Bilingual High School Buea	16	7	23
Salvation College Buea	80	154	234
TOTAL	3,734	4,419	8,153

Source: Regional Delegation of Secondary Education. Buea

The accessible population was made up of 638 from 3 students, 157 science teachers, 11 Pedagogic and 9 principals giving a total 781 people. Form Three students were selected because within the context of the national syllabus, the students were studying the same concepts and as a result, they must have developed a state of mind concerning the various subjects. In addition, all subjects at this level is compulsory and these students do not yet have an option of choosing between studying the Arts or Sciences. This class is therefore considered as the foundation class in which the students start building interest and attitudes towards particular subjects. In this class, the manner in which the students perceive the various subjects at this level will affect their choices in future when they have an opportunity to specialize. Table 6 below shows the accessible population:

Table4: Accessible Population of Schools, Teachers and Principals in the Buea Sub-Division

Schools	Teachers/Principals				
	Boys	Girls	Total	Teachers	Principals
Bilingual Grammar School Molyko	128	189	317	42	1
Government High School Buea Rural	54	53	107	22	1
Government Secondary High Great Soppo	17	45	62	19	1
Presbyterian Comprehensive Secondary School Buea	11	16	27	16	1
Baptist High School Buea	7	6	13	15	1
Bishop Jules Peters College. Buea	17	9	26	11	1
Inter-Comprehensive College Buea	28	28	56	8	1
Summerset Bilingual High School Buea	9	12	21	14	1
Salvation College Buea	5	4	9	10	1
TOTAL	276	362	638	157	9

The sample was derived from the accessible population with the use of Krejcie and Morgan (1970) table. According to Krejcie and Morgan (1970) a sample size of 239 is tenable for a population of 638. Based on the above information the sample was made up of 239 students, 36 teachers and 9 principals as participants. Table 5 shows the sample size with respect to the schools.

Table 5: Sample Population for Students

Categories	School	Form Three	
		Accessible Population	Sample
Government Schools	Bilingual Grammar School Molyko	317	92
	Government High School Great Soppo	62	28
	Government High School Buea Rural	107	50
Confessional Schools	Presbyterian Comprehensive Secondary School Buea	27	15
	Baptist High School Buea	13	12
	Bishop Jules Peters Buea	26	12
Lay private Schools	Inter Comprehensive College Buea	56	16
	Summerset Bilingual High School Buea	21	8
	Salvation College Buea	9	6
Total		638	239

The sample size for teachers was 36 teachers selected across the nine schools under study. One teacher was selected per subject. The sample size for regional pedagogic inspectors was 4 as each subject was represented together with the 1 inspector Coordinated for science as can be seen on table 8 below.

Table6: Sample Population of Teachers and Inspectors per Subject

Subjects	Teachers	Sample Size	Inspectors	Sample size
Biology	54	9	3	1
chemistry	37	9	3	1
Physics	29	9	2	1
Mathematics	47	9	3	1
Total	157	36	11	4

Purposive and stratified random sampling techniques were used for selecting both samples for students, teachers and principals. In the stratification perspective, three categories of participants were involved namely the students, teachers and principals. The second level of stratification consisted of the schools. The study considered 3 categories of schools namely; Government, Confessional and Lay private schools.

A stratified random sampling technique was used to select the schools. To do this, the schools were classified following their various categories and selected using the heart and draw method by the researcher. This technique was deemed very necessary because it gave each school under the various categories an opportunity of being selected. The schools selected from the various categories were; Bilingual Grammar School Molyko (BGS), Government High School Buea Rural (GHS Buea Rural, Bokova), Government High School Great Soppo (GHS Soppo).

The purposive sampling technique was used for the denominational and Lay-private schools where by only the schools that had mix sex and effective schooling were considered. As a result, Bishop Jules Peters College (BJP), Baptist High School (BHS), and Presbyterian Comprehensive Secondary School (PCSS) Buea, Summerset Bilingual High school (SBHS), Inter Comprehensive College (ICC) and Salvation College (SC) Buea were selected. The geographical representativeness was ensured as schools were sampled across the Sub-Division.

Sampling of students was done first of all using the purposive technique where by only the students who attended classes and wrote the first and second sequence test were considered in the various schools. Secondly, students were selected following a simple random sampling selection procedure whereby the heart and draw method was used. Yes and no was written and put in a plate. The students who picked yes were considered as respondents. The number of pieces carrying yes was equivalent to the sample size.

The sampling of teachers was purposive whereby the researcher sorted out only those teachers who teach the subjects in the class under investigation. With regards to this, 36 teachers drawn from all the 9 schools under investigation formed the sample. The sampling of principals was purposive where by only principals from the identified schools were interviewed.

Semi-structured questionnaires, observation checklist, interview guide, focus group discussions and document analysis (archives data on academic achievements from schools) were the main instruments for data collection. The questionnaire used in this paper was constructed in conformity with the research questions. The questionnaire had some items coined in a Likert Scale manner carrying five scales while some were open ended items. An observation check lists which enabled the researcher to observe some interactions and relationship in the classroom was used. There was an interview guide for school administrators and teachers relating to specific variables of the research questions.

Mixed methods was used to analysis both the quantitative and qualitative data. A pre-designed EpiData Version 3.1 (EpiData Association, Odense Denmark, 2008) database which has in-built consistency and validation checks was used to enter the data. Further consistency, data range and validation checks were also performed in SPSS version 21.0 (IBM Inc., 2012) to identify invalid codes. Given that the variable related to the research objective was essentially categorical, Logistic Regression model was employed to test the effect of how gender disparity in attitude and perceptions affect students' performance in mathematics. Data gathered from open-ended items in the questionnaire and through interviews were analysed using the process of thematic analysis whereby concepts or ideas were grouped under umbrella terms or key words. This helped relate concepts or ideas in a meaningful and logical manner. The existence of ideas was therefore considered more important than frequency or grounding

FINDINGS

Finding here is present based on demographic information and the research question under investigation

Background and Demographic Characteristics of Respondents

Table7: Distribution of Student Participants' by Gender.

Gender	Stats	School types			Total
		Government	Confessional	Lay private	
Male	n	39	28	15	82
	%	47.6%	34.1%	18.3%	39.0%
Female	n	73	31	24	128
	%	57.0%	24.2%	18.8%	60.9%
Total	n	112	59	39	210
	%	53.3%	28.1%	18.6%	100.0%

For government schools, there were 39 males (47.6%) and 73 (57.0%) females which made a total of 112 (53.3 %) respondents. Confessional schools had a response rate of 28 (34.1%) males and 31(24.25) females which gave a total of 59 (28.15) respondents. With regards to the lay private schools, 15 (18.3%) boys and 24 (18.8%) girls responded which gave a total of 39 (18.6%). Male and female students were well represented in the sample, though the females were more than the males with a proportion of 60.9% (128) as compared to 39.0% (82) for the male. This was good for the study since one of the major driving aspects of the theoretical perspective was to investigate perceptions between male and female students.

Table8: Distribution of Participants' by Gender and Age

Age	Stats	Gender		Total
		Male	Female	
11	n	0	1	1
	%	0.0%	100.0%	0.5%
12	n	6	11	17
	%	35.3%	64.7%	8.1%
13	n	26	45	71
	%	36.6%	63.4%	33.8%
14	n	31	64	95
	%	32.6%	67.4%	45.2%
15	n	11	5	16
	%	68.8%	31.2%	7.6%
16	n	2	1	3
	%	66.7%	33.3%	1.4%
17	n	2	0	2
	%	100.0%	0.0%	0.9%
18	n	4	0	4
	%	100.0%	0.0%	1.9%
19	n	0	1	1
	%	0.0%	100.0%	0.8%
Total	n	82	128	210
	%	39.0%	61.0%	100.0%

From table 8 above, students' ages range between 11 and 19 years. Only one student was 11 years of age. 1 student also had the maximum age which was 19 years. 17 students were 12 years of age, 71 were 13 years, 95 were 14 years, 16 were 15 years, 3 were 16 years, 2 were 17 years and 4 were 18 years.

Students' ages therefore clustered around 13-14 years whereby 79.0% (166) of them fall within this age range. This therefore implies that the sample was homogenous as far as age was concerned. This was good for the study since we expected a homogenous sample with respect to age. This trend was the same for male and female students as presented below.

With regards to age, the lowest and highest scores were attributed to girls (11 and 19 years).only the boys had an age range of between 17 and 18 years. Most of the girls (120) had an age range of between 12 years and 14 years while the boys (13) had an age range of between 15 years and 16 years with. With the cumulative age of the student being between 13 and 14 years, it can be noticed that more girls (120) than boys (63) fall within this range. Contrarily, more boys (68.8%) are 15 years of age. Generally, Girls made up 61.0 % of the respondents while boys made up 39.0 % of the respondents.

Table9: Teachers' Gender by Subjects

Gender	Biology	Chemistry	Physics	Mathematics	Totals
Male	4	5	8	6	Total= 23
Female	5	4	01	03	Total = 13

Generally, there were 36 teachers in the study. For each subject, there were 9 participants. Looking at table 14, 4 biology teachers, 5 chemistry, 8 physics and 6 mathematic made up the sample. With regards to the females, there were 5 for biology, 4 for chemistry, 1 for physics and 3 for mathematics.

Physics had the highest number of male teachers (8) against 1female. This was followed by mathematics with 6 male teachers. The difference for biology and chemistry was not too great though biology had more females than Chemistry. This makes physics and mathematics a male-dominated subject while biology can be considered as a female dominated subject.

Overall, except for biology which had the highest number of female teachers than males, more males (23) teachers than females (13) teachers were represented in the study. This is a reflection of gender inequity in the teaching of science in the schools under study. It also demonstrates an absence of teachers as role models for girls in the various subjects under investigation.

Table10: Teachers' Qualification

Educational Level	Biology	Chemistry	Physics	Mathematics	Totals
Masters only	02	1	1	1	5
Diploma and Master in education	2	2	-	1	5
Diploma plus Bachelor degree	4	3	2	3	12
Diploma in education	2	1	3	2	8
Bachelor Degree in subject only	0	2	3	1	6

The participants were of different educational levels which ranged from a Postgraduate Teacher's Diploma to a Master degree in different specialities. With regards to teachers who had a Master's degree only, there were 2 for biology, 1 for chemistry, 1 for physics and 1 for mathematics making a total of 5 teachers.

Some teachers had a Postgraduate Teacher's Diploma and a Master's Degree as well. There were 2 for biology, 2 for chemistry, and 1 for mathematics making a total of 5 teachers. No physics teacher had a Master's Degree and a Postgraduate Teacher's Diploma.

Totally, 12 teachers had a Diploma in education and a Degree. There were 4 biology teachers, 3 chemistry teachers, 2 physics teachers and 3 mathematics teachers. With regards to those who had only a Diploma in Education, there were; 2 biology teachers, 1 in chemistry, 3 in physics and 2 in mathematics making an overall total of 8 teachers with a diploma in education.

Some 6 teachers had just a Bachelor degree in their subject area. For biology there was no teacher who had only a degree. Chemistry had 2 teachers, physics had 3 and mathematics had 1.

Majority of the teachers (12) had a diploma plus a degree in education. Biology also had the highest number (4) of teachers with a Diploma and a Bachelor Degree while physics had the least (2). On the contrary, physics had the highest number (3) of teachers with a Bachelor degree in subject are only as well as a Diploma in education while biology had none for degree in subject area only. There was no physics teacher who had a diploma and a master in education whereas all other subjects had at least one.

Overall most of the teachers were professionally and academically qualified. There were 25 teachers who were trained as professionals and obtained a professional Diploma in Education. This gives the impression that they were therefore abreast with pedagogic matters, classroom management, motivation, lesson note preparation, and methods of summative and formation evaluation. Couple with the fact that they had attended in-service teacher development programmes and seminars on teaching, makes them very qualify to apply the various teaching strategies and styles in their classrooms.

Meanwhile, 11 were not trained as professionals but had either a bachelor degree in subject area or a master's degree. These 11 teachers have also attended professional development programs and were there for not novices in pedagogic issues. It is assumed that based on their level of education, they should be vest with teaching content in their subject area.

Table11: Work Experience for Teachers

Work Experience	Biology	Chemistry	Physics	Mathematics
Below 5 years	1	0	02	01
From 6-10years	5	3	3	2
From 11 years and above	3	6	4	6

Table 15 above indicates that teachers had differences in their durations of work experience. Except for chemistry, all the other subjects had teachers have been teaching for 5 years and below. In this category, biology had 1 teacher, physics had 2 and mathematic had 1. Generally, there were 4 teachers who a less than 5 years teaching experience. Some teachers had a teaching experience of between 6-10 years. The highest being biology with 5 teachers and the lowest mathematic with 2 teachers. Chemistry had 2 teachers while physics had 3. This gives a total of 13 teachers with an above 6 and below 10 years teaching experience.

The majority (19) of teachers had above a 10 years teaching experience with chemistry and mathematic topping the list in this category. Biology has the least number of teachers (3) with an above 10 years teaching experience followed by physics (4). Overall, chemistry and mathematic had the highest number of experience teachers (6) as opposed to biology which has the least (3) experience. Only 4 teachers had less than 5 years teaching experience which implies that most of the teacher who participated in the studies were very experienced teachers and had a mastery of subject matter.

Presentation of Results

Table12: Current and Future Science Students

Subjects	Currently studying subject		Cramer's V	Plan to study subject in future		Cramer's V
	Male	Female		Male	Female	
Biology	100%(82)	99.2%(127)	V=0.055 P=0.422	61.0%(50)	64.1%(82)	V=0.031 P=0.652
Chemistry	100%(82)	98.4%(126)	V=0.078 P=0.255	58.1%(46)	56.2%(72)	V=0.001 P=0.983
Physics	100%(82)	98.4%(126)	V=0.078 P=0.255	51.2%(42)	46.1%(56)	V=0.050 P=0.468
Mathematics	97.6%(80)	99.2%(107)	V=0.068 P=0.323	44.%(57)	36.6%(30)	V=0.0790 P=0.254

Considering the fact that in form 3, all subjects are compulsory, both males and females were supposed to be studying all the subjects. Unfortunately, some of the females decided to stay away from some of the science subjects. From table 17 above, it is evident that males who were currently studying biology had 100% while females had 99.2%. More males than females were currently studying chemistry and physics as the males had 100% in chemistry and physics while the females had 98.4%. More females (99.2%) were currently studying mathematics than males (97.6%).

Overall, except for mathematics, more males than females were currently studying the other subjects. This shows that more males than females were currently interested in the study of science subjects. However, it was statistically proven that there was no significant difference (P>0.05) between males and female students who were currently studying all the science subjects. Some students also planned to study science subjects in the future. Comparatively, for biology, more females 64.1% (82) as compared to males 61.0% (50) planned to study biology in the future. However, it was the reverse in chemistry and particularly in physics and mathematics as it was noticed that less than half of the girls had interest in physics and mathematics while less than half of the boys had anticipated interest in mathematics in the future.

More males 58.1% (46) than females 56.2% (72) planned to study chemistry while 51.2% (30) males and 46.1 (56) females planned to study physics. This trend was also noticed in mathematics as 36.6% females and 44.5 males planned to study maths in future.

This definitely implies that females had more interest in biology presently and in the future. On the contrary, males were more interested in studying chemistry and physics presently and in future. Ironically, although more females were currently interested (99.2%) in mathematics than boys (97.2%), some of them planned not to study mathematics in the feature. This implies that their interest in mathematic is reducing as the days go by.

Table13: Students' Perception on Their Interest in Science Subjects

Subjects		Scale					Cramer's V
		Very Uninteresting	Uninteresting	Neutral	Interesting	Very interesting	
Biology	M	4.9%(4)	7.3%(6)	31.7%(26)	28.0%(23)	28.0%(23)	V=0.130
	F	2.3%(3)	3.9%(5)	26.6%(34)	32.8%(42)	34.4%(44)	P=0.473
Chemistry	M	11.0%(9)	11.0%(9)	20.7%(17)	31.7%(26)	25.6%(21)	V=0.108
	F	10.2%(13)	18.0%(23)	21.1%(27)	25.0%(32)	25.8%(33)	P=0.653
Physics	M	9.8%(8)	12.2%(10)	24.4%(20)	9.8%(8)	43.9%(36)	V=0.209
	F	10.9%(14)	10.2%(13)	25.8%(33)	24.2%(31)	28.9%(37)	P=0.047
Mathematics	M	4.9%(4)	7.3%(6)	13.4%(11)	25.6%(21)	48.8%(40)	V=0.110
	F	5.5%(7)	5.5%(7)	20.3%(26)	28.1%(36)	40.6%(52)	P=0.639

From table above, students had diverse perceptions on how interesting science subjects are compared to other subjects they were studying at school. Cumulating very interesting and interesting in the table above, it was realised that more girls (67.2%) than boys (56%) found biology interesting. However, this difference was statistically not significant.

In chemistry, more than half of the boys (57.3) and just half (50.8) of the girls perceived the subject as interesting compared to other subjects they were studying. There was no significant difference in their perceptions which implies that how they perceived their interest in this subject did not affect their performance.

With regards to physics, it was statistically proven that more boys than girls perceived the subjects to be interesting compared to other subjects they were studying. The Cramer's value of 0.209 (P=0.047) shows a significant influence of boys and girls perception on how interesting physics is compared to other subjects to their academic performance in physics.

For mathematics, more boys than girls perceived the subject as interesting though the difference in boys' and girls' perception was statistically not proven significant. 73.4% of the boys and 68.7% of girls perceived mathematics as interesting compared to other subjects they were studying.

There were some students who could not perceive how interesting these subjects were. This means they were undecided or neutral. More girls (32.8%) than boys (28.05) could not rate their interest level compared to other subjects. This was also the case for physics where 28.5% girls against 24.8 boys made this decision. The contrast we noticed for mathematics as most girls (20.3%) against (13.4%) were neutral.

It was therefore realised that there was a positive relationship between students' perceived interest and their performance in physics whereas there was no relationship between this indicator and performance in the other subjects.

Table14: Students' Perceptions on the Usefulness of Science Subjects

Subjects		Scale					Cramer's V
		Not useful at all	Not useful	Neutral	Useful	Very useful	
Biology	M	6.1%(5)	13.4%(11)	22.0%(18)	14.6%(12)	43.9%(36)	V=0.187
	F	2.3%(3)	7.0%(9)	15.6%(20)	21.9%(28)	53.1%(68)	P=0.120
Chemistry	M	12.2%(10)	9.8%(8)	23.2%(19)	15.9%(13)	39.0%(32)	V=0.111
	F	9.4%(12)	14.1%(18)	16.4%(21)	18.0%(23)	42.2%(54)	P=0.630
Physics	M	17.1%(14)	9.8%(8)	29.3%(24)	14.6%(12)	29.3%(24)	V=0.113
	F	11.7%(15)	15.6%(20)	30.5%(39)	16.4%(21)	25.8%(33)	P=0.613
Mathematics	M	3.7%(3)	2.4%(2)	13.4%(11)	12.2%(10)	68.3%(56)	V=0.140
	F	2.3%(3)	2.3%(3)	8.6%(11)	21.9%(28)	64.8%(83)	P=0.394

From table above, it is evident that, students had different perceptions on how useful science subjects were compared to other subjects they were studying. While some found that science subjects were not useful at all, some found that they were useful and others very useful. It was realised that 53 % of the girls against 43.9% agreed that biology was very useful to them. This trend was also noticed in chemistry as 42.2 % of the girls and 39.0 % boys perceived chemistry to be very useful. This was the reverse with physics and mathematics as more boys perceived them as very important. In physics, there were 29.3 % males and 25.8 % females while in mathematics, 68.3 % males and 64.8% females perceived that this subject was very useful compared to other subjects.

Some students were uncertain about the usefulness of the various subjects and so they were neutral. Except for physics, more boys than girls were undecided. In biology, 22.0% of the boys and 15.6% of the girls were neutral. Chemistry recorded 23.2 % for boys against 16.4 % for girls. Mathematics had 13.4 % for boys and 8.6% for girls. The trend was not the same for physics as slightly more females (30.5%) than males (29.3 %) were undecided.

In a nutshell, it was realised that there was no significant difference in the boys' and girls' perception of the usefulness of science subjects. Their perception on the usefulness of science subjects also had no significant effects on their academic performance.

Table15: Students' Perception on the Importance of Science Subjects

Subjects		Scale					Cramer's V
		Very Unimportant	Unimportant	Neutral	Important	Very important	
Biology	M	13.4% (11)	2.4%(2)	28.0%(23)	17.1%(14)	39.0%(32)	V=0.248
	F	3.9%(5)	6.2%(8)	19.5%(25)	31.2%(40)	39.1%(50)	P=0.012
Chemistry	M	14.6%(12)	8.5%(7)	19.5%(16)	24.4%(20)	32.9%(27)	V=0.166
	F	7.8%(10)	18.0%(23)	19.5%(25)	26.6%(34)	28.1%(36)	P=0.214
Physics	M	15.9%(13)	7.3%(6)	23.2%(19)	14.6%(12)	39.0%(32)	V=0.307
	F	8.6%(11)	14.8%(19)	28.9%(37)	30.5%(39)	17.2%(22)	P=0.001
Mathematics	M	3.7%(3)	1.2%(1)	11.0%(9)	14.6%(12)	69.5%(57)	V=0.206
	F	4.7%(6)	4.7%(6)	9.4%(12)	28.9%(37)	52.3%(67)	P=0.049

A glance at table above indicates that the importance (value) of science subjects to students' future career was differently perceived by respondents. In biology, more girls with a proportion of 70.3% (90) compared to 56.1% (46) boys perceived biology as being very important to their future careers. This was statistically proven with a Cramer's value of 0.248 (P=0.012).

This implies that the girls attached more value to biology than the boys. The importance attached to biology therefore had significant influence on the students' performance in biology by gender.

For chemistry, although fewer boys (57.3%) than girls (59.7%) perceived chemistry as important, it should be noted that this difference was statistically not proven significant with a value of P=0.214. Students' perceptions on how important chemistry is to their future careers by gender had no effect on their performance in chemistry.

On the contrary, boys perceived physics and mathematics to be more important to their future career than girls. The number of boys who perceived physics as important made up 53.6 % (44) while girls made up 47.7 % (61). This difference in perception was very significant as boys weighted V=0.307 (P=0.001). This is an indication that boys attached more importance (value) to physics than girls. More girls (28.9 %) compared to boys (32.2%) were uncertain and had an indecisive mind concerning the importance of physics to their future career. Findings therefore revealed that the value attached to physics by boys and girls had a significant influence on their performance.

With regards to mathematics, 69.5% of the boys perceived it as very important to their future career compared to 52.3 % females. Although more boys (11.0%) than girls (9.4%) were neutral about the importance of mathematics there was yet a significant difference (P=0.001) in their perception on the importance of mathematics to their future career. The importance students attached to mathematics therefore has a significant influence on their performance.

Overall, there was a significant difference between boys' and girls' perception on the importance of biology, physics and chemistry and its influence on performance. On the contrary, there was no significant difference in the way students perceive the importance of chemistry and this does not in any way affect their performance. Girls' high performance in biology was as a result of the value they attached to it like wise boys' high performance in physics and mathematics.

Table16: Students' Perception on Self-Confidence

Subjects		Scale					Cramer's V
		Not at all confident	Not confident	Neutral	Confident	Very confident	
Biology	M	2.4%(2)	14.6%(12)	19.5%(16)	25.6%(21)	37.8%(31)	V=0.209
	F	4.7%(6)	4.7%(6)	22.7%(29)	36.7%(47)	31.2%(40)	P=0.096
Chemistry	M	13.4%(11)	13.4%(11)	20.7%(17)	25.6%(21)	26.8%(22)	V=0.071
	F	14.8%(19)	15.6%(20)	20.3%(26)	28.1%(36)	21.1%(27)	P=0.900
Physics	M	9.8%(8)	15.9%(13)	34.1%(28)	18.3%(15)	22.0%(18)	V=0.194
	F	7.8%(10)	14.8%(19)	46.9%(60)	21.1%(27)	9.4%(12)	P=0.045
Mathematics	M	3.7%(3)	11.0%(9)	12.2%(10)	28.0%(23)	45.1%(37)	V=0.203
	F	4.7%(6)	3.9%(5)	18.0%(23)	39.8%(51)	33.6%(43)	P=0.047

Looking at table above, 37.8% (31) females were more confident in their ability in biology, than the males 31.2% (40). However, this gap was not significant. More females 22.7% compared to males 19.5% could not rate the confidence they had in their abilities. Students' confidence in their ability in biology has no significant influence on their performance or potential performance in biology.

With regards to chemistry, there was a slight difference in the way both gender perceived their confidence level in their abilities. 26.8% boys compared to 21.1% girls were very confident in their abilities. This difference was however proven to be statistically not significant. There is therefore no significant relationship between students' confidence in their abilities in chemistry and their performance in chemistry.

In physics, girls were not confident in their abilities. More male 22.0% (18) than female 9.4% (12) were very confident in their abilities in physics. Physics also registered the highest number of female students who were indecisive on the confidence they had in their abilities. It was also noticed that physics slightly had more boys 25.7% than girls 22.6% who were still not confident in their abilities. However, it was statistically proven with a Cramer's value of V=0.194 (P=0.045) that there was a significant difference between girls' and boys' confidence in their abilities to perform well in physics. Students' Confidence in their ability is a determinant of their performance in physics.

A look at the table above indicates that this trend was the same with mathematics with a proportion of 45.1% (37) for the males which was significantly higher than the 33.6% (43) for the females. More females were however indecisive on how confident they are in their abilities in mathematics. Never the less, the difference between the boys and the girls in this domain was not great. Confidence in students' ability in mathematics therefore has significant influence on their performance in mathematics.

When examining how students' confident in their ability influence their performance in the science subjects, it can be concluded that students' confidence does not have any significant relationship to performance in biology and chemistry. On the other hand, it has a significantly influence on students' physics and mathematics performance as more boys perform better than girls because they are confident in their abilities.

From the thematic analysis derived from focus group discussion, it was evident that low self-efficacy resulting from stereotype has a negative impact on girls' performance. This can be illustrated on table 21 below.

Table17: Students' Feeling at the Thought of Science Subjects

Code	Code description	Quotation
Negative stereotype about science subjects		
Challenging	Difficult to understand	"Once the chemistry, mathematics or physics teachers enters the class, I feel like going out because I know I will understand little or nothing"
Discouraging	Girls feel like they can't do it and feel like leaving class	"No matter how I try to answer a question, the physics teacher never tells me my answer is close to the right one. So I don't even feel like answering a question or sitting in class"
Scaring/frightening	Teachers put up complicated formulas	"The formulas and concept scare me. They are too abstract especially in mathematics and physics"
Difficult	Girls perceive it difficult to understand than boys	"I study hard, I try as much as possible to read chemistry and physics more yet it is too difficult to understand'
Failure	Feel it's becoming more challenging as they go further in education	" I just know that the teachers will set an exam at the end in which I will not understand not to talk of solving up to half of the questions in mathematics and physics"

Table above, shows a thematic analysis of students' feelings and mind-sets at the thought of studying science subjects. This analysis was to corroborate what was said in the questionnaire. Some students made mention of the fact that their feelings for science had changed over time. Some girls insisted that their interest and passion for mathematics and physics had dropped over the years. "When I started from one, I was at least having a pass mark in all science subjects. But now, it is becoming more difficult and challenging especially chemistry and physics. I passed only in biology so I do not need to stress myself to study science". Some students expressed discouragement as they said "The concepts are really abstract and less interesting. The teachers even make physics and chemistry very boring so, I have no interest in those two subjects again".

Others saw it as a male-dominated subject as a student said "since form 1, only male teachers have been teaching us physics and mathematics. Does that mean only men can teach physics well"? However, some few students had positive feelings as they were planning to study science in high school though they were not too good at mathematics.

Table18: Students' Rating of Potential Ability in Science Subjects

Subjects		Scale: Very poor	Poor	Average	Good	Very good	Cramer's V
Biology	M	6.1%(5)	4.9%(4)	31.7%(26)	24.4%(20)	32.9%(27)	V=0.264
	F	0.8%(1)	8.6%(11)	21.9%(28)	44.5%(57)	24.2%(31)	P=0.005
Chemistry	M	11.0%(9)	11.0%(9)	20.717)	30.5%(25)	26.8%(22)	V=0.225
	F	3.9%(5)	17.2%(22)	30.5%(39)	33.6%(43)	14.8%(19)	P=0.031
Physics	M	12.2%(10)	25.6%(21)	25'6%(21)	25.6%(21)	11.0%(9)	V=0.193
	F	16.4%(21)	12.5%(16)	30.5%(339)	33.6%(43)	7.0%(9)	P=0.048
Mathematics	M	2.4%(2)	8.5%(7)	17.1%(14)	29.3%(24)	42.7%(35)	V=0.134
	F	4.7%(6)	5.5%(7)	24.2%(31)	32.0%(41)	36.6%(43)	P=0.434

Students' rating of their potential ability in science subjects by gender as can be seen on table above shows that, in Biology, more males than females rated their potential performance as very good. But when cumulating good and very good, it was significantly proven for biology with a Cramer's value of V=0.264 (P=0.005%) that more females than males rate their potential performance to be good with a proportion of 68.8% (88) as compared to 57.3% (47) for the males. More males 31.7% than females 21.9 % rate their potential abilities as average. Only 1 girl rated her ability as very poor which implies girls are better in biology than boys. Students' self-efficacy can be seen to have a significant influence on girls' performance in biology.

A close look at the findings in chemistry reveals that there was a significant difference between boys' and girls' rating in their potential abilities. More boys (26.8 %) than girls (14.8 %) rated their abilities as very good. In addition, more girls than boys rated themselves to be average while a few others rated their abilities to be poor.

It is therefore important to note that there was a significant difference in self-efficacy as boys rated their abilities as very good. More girls rated their abilities as average (30.5%) than very good (14.8%). This greatly had a positive effect on boys' academic performance than girls.

With regards to physics, 11.0% of the boys compared to 7.0% girls rated their abilities as very good. This difference was quite significant though when we merge good and very good, more girls (30.6%) compared to boys (36.6%) rated their potential abilities as good. Just like chemistry, physics also has a higher number of girls than boys who rated their potential ability as average. However, there was a significant influence of students' self-efficacy in physics and their performance. Boys are seen from table 21 to have a higher self-efficacy in physics than girls.

As for mathematics, though more males rated their ability as very good, with a proportion of 42.7% (35) as compared to 36.6% (43) for the females, the gap was statistically not significant. Even if we cumulate good and very good, this trend will not change. More females compared to males also rated their potential ability to be average. Self-efficacy may have an influence in boys' high performance though this influence may not be significant compared to that of other subjects.

To sum up, it can be said that the students' self-efficacy in biology, chemistry and physics had a significant influence on their performance. More girls than boys had high self-efficacy in biology which accounted for better performance of girls in biology. On the contrary, more boys than girls had high self-efficacy in physics and chemistry. That accounts for their better performance in the subjects. It was realised that self-efficacy in mathematics had an insignificant role in determining the performance of students.

Table19: Students' Perception on their Performance if Motivated

Subjects		Scale					Cramer's V
		Much worse	Worse	Same	Better	Much better	
Biology	M	4.9%(4)	14.6%(12)	24.4%(20)	23.2%(19)	32.9%(27)	V=0.259
	F	5.5%(7)	3.1%(4)	16.4%(21)	38.3%(49)	36.7%(47)	P=0.007
Chemistry	M	7.3%(6)	17.1%(14)	25.6%(21)	20.7%(17)	29.3%(24)	V=0.110
	F	8.6%(11)	10.2%(13)	31.2%(40)	21.9%(28)	28.1%(36)	P=0.624
Physics	M	15.9%(13)	14.6%(12)	26.8%(22)	24.4%(20)	18.3%(15)	V=0.194
	F	14.1%(18)	18.8%(24)	37.5%(48)	22.7%(29)	7.0%(9)	P=0.048
Mathematics	M	4.9%(4)	9.8%(8)	9.8%(8)	26.8%(22)	48.8%(40)	V=0.136
	F	5.5%(7)	4.7%(6)	13.3%(17)	34.4%(44)	42.2%(54)	P=0.424

Students' Perception on their potential performance if they are Motivated on table 18 shows that cumulatively, 75.0% (96) of females as compared to 56.1% (46) of males perceived that they could perform better in biology than other students in their class if they were motivated. More males 24% than females 16.4% perceived that their performance will not change even if they were encouraged or motivated to study biology. There was therefore a significant difference between girls' and boys' perception on the influence of motivation to their performance. Girls believed they would do better more than boys if they were motivated and encouraged. Motivation is therefore a factor that accounts for better performance in biology for the girls.

In chemistry, there was no significant difference in the way girls and boys perceived the role of motivation. Both had the same mind set with a proportion of 50% boys and 50% girls who said they will do better. However, more females with a proportion of 31.25 compared to 25.6% males perceived that their performance may not change even when motivated.

Physics is one of the subjects that registered the highest number of boys who perceived that motivation will make them perform better. A cumulative proportion of 42.7% males and 29.7% females perceived that motivation would make them perform better than they used to. More girls than boys also did not perceive any change in their performance even when motivated. There was a significant difference in the way boys and girls perceived the influence of motivation as more boys believed they would perform much better with a Cramer's value of V=0.194 (P=0.48).

In mathematics, although more boys 48.8% than girls 42.2% perceived that they would do much better, there was statistically no difference between the boys and girls on their perceived influence of motivation on their performance. When we cumulated better and much better, more girls 76.6% than boys 75.6% perceived that they would perform better.

Whatever the case, it can be said that more girls perceived that motivation has an influence over girls' ability to performance better in biology and mathematics. On the other hand, boys believed motivation will enable them perform better in physics. In all the other subjects except biology, more girls perceived that even when motivated, their performance would remain the same.

Table20: Natural Abilities in Science Subjects

Subjects	Girls are better		Boy are better		Neither		Cramer's V
	Male	Female	Male	Female	Male	Female	
Biology	18.3% (15)	22.7% (29)	59.8% (49)	55.5% (71)	22.0% (18)	21.9% (28)	V=0.054 P=0.735
Chemistry	6.1% (5)	15.6% (20)	56.1% (46)	57.8% (74)	37.8% (31)	26.6% (34)	V=0.167 P=0.153
Physics	12.2% (10)	11.7% (15)	43.9% (36)	55.5% (71)	43.9% (36)	32.8% (42)	V=0.119 P=0.226
Mathematics	9.8% (8)	20.3% (26)	62.2% (51)	53.9% (69)	28.0% (23)	25.8% (33)	V=0.140 P=0.126

Looking at table 19, more boys than girls perceive that boys are naturally endowed with scientific abilities. In biology, more than half (55.5%) of the girls believed that boys are better while only 22.7 % believed that girls were better. Some 21.9% perceived that neither boys nor girls were better in biology. 59.8 % of the boys perceived that boys were better compared to 18.3% who perceived the contrary. Although more boys than girls perceived that boys are naturally better in science, this difference was however not proven significant.

Chemistry registered the highest number of females who perceived that boys were better in it. 57.8 % of girls had this perception against 15.6% who perceived boys were better. Furthermore, 56.1% of the boys were in favour of the boys while only 6.1%percieved girls as better. It should be noted that despite the fact that even though both males and female perceived that boys are better than girls, the number of boys who have this perception is more than the number of girls. This implies boys have more confidence in their natural abilities and are more stereotypes about who it's meant for.

In physics, 43.9% males compared to 55.5% females perceived that boys are better while only 11.7% females and 12.2% males perceived females were better. Physics registered the highest proportion of males (43.9%) who believed that neither boys nor girls were better. It was also noticed that it had the lowest number of boys who perceived that boys were better in science subjects. Boys' self-esteem in physics was therefore not too high as was noticed in mathematics.

Mathematics had the highest proportion of boys 62.2% who perceived that boys were better at mathematics compared to a smaller proportion of 9.8% who assumed girls were better. 53.9% of the girls perceived that mathematics is for boys while 20.35 assumed girls are better in mathematics.

Table21: Female Perceptions on Who is Better in Science Subjects

Code	Code description	Quotation
Boys		
They are interested	Girls perceive it as a masculine subjects	"Science deals more with objects and boys are more interested in objects than girls who are interested in people and activities of verbal nature"
Gender Role	Girls perceive a kind of gender roles sort of deal	"When I think of science, I think of men in white coats who sit every day in the laboratory examining test tubes filled with chemicals under a microscope or in blue jackets on trucks constructing roads. Those jobs linked to science are not for girls" "There are certain skills that are really good for boys. You would not expect a woman to have the energy and strength to climb on an electric pole like a man" "How would you expect a woman to repair an aircraft or build a ship"?
Courageous and confident	Boys are perceived more courageous than girls, therefore have the courage to undertake science subjects	"Most of our science teachers are men and they encourage the boys more. They believe in the boys and make them feel more confident than the girls"
Boys are naturally born more intelligent in science	The social belief that boys have a science-oriented brain and excel at science	"Most people including some of our teachers believe that boys perform better in science especially mathematics"

Even though there was no significant difference between boys' and girls' perception in all the subjects, it could still be concluded from thematic analysis on table 25, that both boys and girls had a stereotype mind-set concerning which gender is better in science. The logistic regression table below highlights some of the stereotypes associated with science by both gender.

Table22: Logistic Regression of Stereotypes by Male Students

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi Square		Sig.
Boys are naturally better in science than girls	283.551	3.504	2	.173
Girls are more diligent and conscientious at school than boys	285.258	5.211	2	.074
Girls do not have the "right brain cells" for mathematics; they are not so talented in math	283.633	3.586	2	.166
Men have better logical thinking than women	283.145	3.098	2	.212
Women and men differ in their abilities	285.201	5.154	2	.076
Women are able to take care of young children better than men	285.558	5.511	2	.064
Technical occupations are more suitable for men than for women	281.467	1.420	2	.492
Men do better in high positions than women	281.173	1.126	2	.570
Women and men have similar abilities and can handle the same jobs	284.055	4.008	2	.135
Have family members (or other close adults) that have careers that use math, science, technology, or engineering	290.733	10.686	4	.030
	311.346	31.299	6	.000
Your level of interest in a physical-science-related career (physicist, chemist, engineer, etc.) is important	296.964	16.917	6	.010

Table23: Logistic Regression of Stereotypes by Female Students

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Boys are naturally better in science than girls	106.390	11.038	2	.004
Girls are more diligent and conscientious at school than boys	122.300	26.948	2	.000
Girls do not have the "right brain cells" for science ; they are not so talented in science	103.671	8.319	2	.016
Men have better logical thinking than women	96.617	1.265	2	.531
Women and men differ in their abilities	100.420	5.068	2	.079
Women are able to take care of young children better than men	102.531	7.179	2	.028
Technical occupations are more suitable for men than for women	101.231	5.879	2	.048
Men do better in high positions than women	96.046	.694	2	.707
Women and men have similar abilities and can handle the same jobs	97.316	1.964	2	.375
Have family members (or other close adults) that have careers that use science.	110.970	15.618	4	.004
Your level of interest in a math-related career (accountant, economist, financial analyst, etc.) is important	106.100	10.748	6	.096
Your level of interest in a physical-science-related career (physicist, chemist, engineer, etc.) is important	113.457	18.105	6	.006

The stereotype exhibited by both gender on table 20 and 21 on the above perception can be express using information from focus group discussion with the girls. This can be seen on the thematic analysis below as expressed by the girls.

Table24: Students' Perception on Difficulty in Science Subjects

Subjects		Scale					Cramer's V
		Much more difficult	More difficult	Average	Less difficult	Much less difficult	
Biology	M	7.3%(6)	13.4%(11)	24.4%(20)	25.6%(21)	29.3%(24)	V=0.260
	F	0.8%(1)	6.2%(8)	26.6%(34)	43.0%(55)	23.4%(30)	P=0.007
Chemistry	M	15.9%(13)	14.6%(12)	34.1%(28)	17.1%(14)	18.3%(15)	V=0.079
	F	10.9%(14)	18.0%(23)	35.2%(45)	18.0%(23)	18.0%(23)	P=0.859
Physics	M	8.5%(7)	8.5%(7)	25.6%(21)	22.0%(18)	35.4%(29)	V=0.133
	F	6.2%(8)	6.2%(8)	36.7%(47)	23.4%(30)	27.3%(35)	P=0.442
Mathematics	M	9.8%(8)	13.4%(11)	11.0%(9)	25.6%(21)	40.2%(33)	V=0.319
	F	6.2%(8)	7.1%(10)	21.1%(27)	34.3%(44)	30.5%(39)	P=0.000

From table 22, on how they perceive difficulties in the various subject by the end of the year by gender, a cumulative proportion of 66.4% females and 54.9% males perceived that biology would be less difficult if they were to study it next year. There was a significant difference between the female and male self-mind set. More female also anticipated that there would have an average performance in biology.

A keen look at chemistry indicates that there was no significant difference between boys' and girls' perception concerning future performance. However, more boys than girls perceived chemistry to be much difficult. Majority of the boys also perceived that they would have an average performance if they were to study chemistry.

In physics, the majority of the girls 36.7% against 25.6% males had the perception of being average. A cumulative proportion of 50.7% for boys compared to 57.4% males perceived it as less difficult. This difference in perception was however not significant.

This was the opposite in mathematics as significantly more males 40.2% (33) than females 30.5% (39) perceived that mathematic will be much less difficult with a Cramer's value of V=0.319 (P=0.000). This shows that boys are more confident and have a high self-efficacy in their mathematics ability than the girls who are less confident and have low self-efficacy.

To sum up, girls had a positive perception in their self-efficacy that by the end of the year they would find biology less difficult while the reverse was true for the boys in mathematics. Physics registered the highest number of females who perceived it as average while majority of the males perceived chemistry as average. Mathematics registered the lowest number of males and females who perceived that their ability will be average by the end of the year although those for the females were more than males (that is 21.15 and 11.0% respectively). Girls' perception that the other science subjects would be difficult except for biology is an indication that the students are undergoing some sort of anxiety.

Socio-Cultural Background

Table25: Students' Perception on Parental Encouragement

Subjects		Scale					Cramer's V
		Strongly discouraged	Discouraged	Neutral	Encouraged	Strongly encouraged	
Biology	M	3.7%(3)	4.9%(4)	23.2%(19)	22.0%(18)	46.3%(38)	V=0.149
	F	0.8%(1)	4.7%(6)	15.6%(20)	28.1%(36)	50.8%(65)	P=0.325
Chemistry	M	12.2%(10)	8.5%(7)	19.5%(16)	20.7%(17)	39.0%(32)	V=0.098
	F	7.0%(9)	7.8%(10)	24.2%(31)	21.1%(27)	39.8%(51)	P=0.734
Physics	M	8.5%(7)	19.5%(16)	23.2%(19)	20.7%(17)	28.0%(23)	V=0.272
	F	11.7%(15)	6.2%(8)	33.6%(43)	32.0%(41)	16.4%(21)	P=0.004
Mathematics	M	1.2%(1)	3.7%(3)	9.8%(8)	15.9%(13)	69.5%(57)	V=0.077
	F	1.6%(2)	3.1%(4)	8.6%(11)	21.9%(28)	64.8%(83)	P=0.870

Students' perception on whether their parents encourage them to study science subject as shown on table above revealed that more males than females were encouraged in physics and this was statistically significantly proven with a value of $P<0.05$. It was accompanied by a proportion of 28.0% (23) boys as compared to 16.4% (21) for the females. As for the other subjects, the difference was not statistically significant ($P>0.05$) though more boys than girls indicated that their parents have encouraged them to study the other subjects. It was noticed that girls have more parental encouragement in mathematics and biology than the other subjects.

In biology, cumulatively, more females were encouraged by their parents though statistically the difference was significant. Meanwhile, in chemistry and mathematics, both males and females had the same perception as males weighted 85.4% and females 86.7. There was no difference in the way they perceived encouragement to have an influence on their study.

Table26: Family Members that have Science-Oriented Careers

Gender	Stats	Have family members (or other close adults) that have careers that are science-oriented			Total
		Yes	No	Don't know	
Male	n	34	21	27	82
	%	41.5%	25.6%	32.9%	100.0%
Female	n	46	28	54	128
	%	35.9%	21.9%	42.2%	100.0%
Total	n	80	49	81	210
	%	38.1%	23.3%	38.6%	100.0%

Cramer's V: V=0.093; P=0.404

From table 24 which depicts family members that were engaged in science-oriented careers, it was evident that only 38.1% (which is less than 50%) of the boys and girls agreed that they had family members (or other close adults) that had careers that were science-oriented. More boys 41.5% (34) compared to girls 35.9% (46) agreed that they had family members in science-oriented careers although this difference was statistically not significant ($P>0.05$). 42.2% of the girls did not even know if their family members were science-oriented. This indicates a lack of interest in career choices and an absence of role models in science-oriented-careers at family and community level.

When the female students were asked to make projections about their career plans, 80% of the girls had arts-oriented career plans while only 20% had plans to embrace science-oriented careers. This was the contrary with boys as 92.6% has a science-oriented plan compared to 7.4% who had an arts oriented plan.

When the students were asked who had influenced their career plans, both boys and girls had different sources of motivation as to who or what influenced their career plans as presented on the table below.

Table27: Students' Perception on Future Career Plans Influence

Subjects	Stats	Gender		Total
		Male	Female	
Mother	n	54	84	138
	%	65.9%	66.1%	
Father	n	39	68	107
	%	47.6%	53.5%	
Other relative	n	59	102	161
	%	72.0%	80.3%	
Friend	n	53	79	132
	%	64.6%	62.2%	
Teacher	n	61	81	142
	%	74.4%	63.8%	
Guidance counsellor	n	60	82	142
	%	73.2%	64.6%	
Myself	n	71	96	167
	%	86.6%	75.6%	
Movies	n	64	108	172
	%	78.0%	85.0%	
Magazines	n	63	87	150
	%	76.8%	68.5%	
Books	n	53	100	153
	%	64.6%	78.7%	
Total	Count	82	127	209

Majority of the boys 86.6% perceived that their career plans were self-motivated while majority of the girls 85.0% were mostly influenced by movies. It was noticed that mothers had a greater influence over both sexes than fathers as 65.9% of women influenced their sons while 66.1% influence their daughters. On the other hand, 47.6% fathers influenced their sons while 53.5% fathers influenced their daughters. Above all, fathers had the lowest influence on their children career plan. This indirectly indicates that there is an unconscious absence of fathers' influence in From the study, it is evident that boys and girls perceive science instruction differently, constructing different filters that regulate thinking and actions in science-related situations and performance. The findings revealed that in as much as there are some factors like interest and value attached to science that generally influence the performance of both sexes, some other factors were identified to be unique or more peculiar only to girls. One of the most salient student-related factors identified were negative attitudes towards some science subjects (due to low self-confidence and stereotype) and lack of parental support.

Students' Negative Attitude Toward Science

Attitudes do not consist of a single unitary construct but rather consist of a large number of sub-constructs all of which contribute in varying proportions towards an individual's attitudes towards science. Some of the constructs used in this study were derived from Woolnough's (1994) work which incorporated a range of components in their measures of attitudes to science like, interest, perception of the science teacher, the value of science subjects, self-esteem at science, motivation towards science, attitudes of parents towards science and the nature of the classroom environment.

More than half of the girls currently studying science subjects have a negative attitude towards it and plan not to study science in future because they see it as difficult and challenging thus, they will not succeed if they dare into it. This perception is not different from what Morley, et. al., (2006) found out, that gender differences in attitude significantly affect the choice of students' programmes as well as their performance in science. While girls in general seemed to have more positive attitudes than boys in biology, boys in general were found to have more positive attitudes towards physics, mathematics and chemistry as was the case in the works of Osborne, Driver & Simon (1998), Simon (2000) and Sjoberg (2004).

Most of the female students' possess a negative attitude towards mathematic, chemistry and physics which influenced their performance negatively compared with the boys. This finding corroborates Weinburgh's (1995) research which suggests that there is a correlation between attitude towards science and achievement or performance, 'doing well' in science is closely linked with 'liking science'. He believed a positive attitude towards science enhances better performance in science and vice versa. This negative attitude by the girls stems from low self-efficacy, stereotype, and the absence of parental support.

Low Self-Efficacy for Girls

Confidence can be assessed in terms of self-efficacy, which is defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances". Some of the starkest differences in performance between boys and girls are only revealed when students express their feelings about their own abilities in the various subjects they study as was done in the study. What was realized in this study corroborates studies by Fredericks and Eccles (2002) and Herbert and Stipek (2005) had found that, girls rate their own ability as lower than that of boys as early as the first year of secondary school even when their actual performance does not differ from that of boys. How boys and girls think and feel about themselves shapes their behaviour, especially when facing challenging circumstances especially in classroom situations. Self-beliefs have an impact on learning and performance on several levels: cognitive, motivational, affective and decision-making. They determine how well students motivate themselves and persevere in the face of difficulties; they influence students' emotional life, as well as affect the choices students make about subjects to study, educational as well as career paths.

The Organization for Economic Cooperation and Development (OED) report attests that when students have more self-confidence, they give themselves the freedom to fail, and to engage in the trial-and-error process that are fundamental to acquiring knowledge in science. Findings of this study revealed that such assertion was evident with the boys but not with the girls. The girls had less belief or self-confidence in their own abilities in mathematics and physics in particular and were plagued with greater anxiety towards mathematics and physics than boys. Even though some girls turn to perform just as well as boys, their confidence relating to their ability of learning science is lower than that of boys particularly in physics and mathematics. However, although the girls had more confidence in their ability in biology, it was very clear that lack of self confidence in their ability to study chemistry, physics and mathematics is detrimental to the continuation of these subjects as less than 45% of the girls currently studying physics and mathematics plan not to study them in the future. This is partly because the level of confidence a student has in Form Three is the strongest predictor for students choosing to pursuit science in future. This was evident in what some of the girls said, "I don't study biology as much as I study physics and chemistry. I really put in much effort to study but no matter how well I study, I know I cannot have above 12 in the test".

According to the girls, their achievement in some science subjects like mathematics, chemistry and physics was attributed to their effort while those of boys in the same subjects was attributed natural ability. This mind-set made the girls see themselves as deficient, and is not different from what Bandura (1994) in his self-efficacy theory concluded that, individuals who have high confidence in their abilities are likely to approach difficult tasks as challenges they can master instead of threats that need to be avoided while those who doubt their own abilities are likely to attribute setbacks to personal deficiencies.

As Dweck (1999) rightly said, whether students view their performance as a gift or something that can be developed by hard work can influence their interest in the subject and performance. If students view science ability as a fixed ability that they either possess (were born with) or do not possess, they are more likely to lose interest when they encounter difficulty with mathematics and physics. If students view ability to do sciences as something that can be developed through study and by seeking additional resources and assistance when they feel challenged, they maintain an interest in it despite difficulties or obstacles. Girls' perception that boys are naturally better in science than girls' acts as a barrier for girls and as a result, they make little or no effort to do better. While this same pattern may occur in relation to other subjects, Dweck (2007) believes that negative gender stereotypes about female interest in mathematics work in tandem to diminish pursuit of mathematics skills among females.

Additionally, while the boys reported high level of self-confidence, girls reported higher levels of anxiety and lower level of confidence about their abilities in mathematics, physics and chemistry. Findings from questionnaire and focus groups indicate that girls feel more anxiety and dread in mathematics and physics classes, particularly when they do not know the right answers or when they don't understand and attempt to ask questions in class. As more girls believe that these subjects increase in difficulty, so too does their level of anxiety about their ability to do well in these subjects. Girls in particular have continued to experience low self-confidence and this has not appeared to have improved over the last five years looking at the number who enrol in the science classes in form five. Our Educational systems would therefore be successful when they equip all students, both boys and girls, with the ability to influence their own lives.

Negative Stereotype

It is well noted that the family is one of the most significant contexts of socialization in the early childhood and adult developments. Attributing roles, behaviours, and aspirations to individuals (stereotype) based on gender is not healthy in children's academic and career pathways. Parental influence as a micro-system factor based on Bronfenbrenner's (2005) theory has been found to affect students' career preferences especially when it comes to non-traditional careers. Family background and parental influence were noticed to have affected students' achievements and career pathways via stereotype.

There are two main ideas that were prevalent in the findings: boys naturally do better in the sciences than girls and scientific careers are better suited for males. Stereotypes that link ability to do sciences with the male gender have created a difference in performance among students, and those gender differences in performance may reinforce the stereotypes that link ability to science with male if nothing is done about it. This finding corroborates Dweck (2007) who believes that negative gender stereotypes about female interest in mathematics and science works to increase diminishing pursuit of mathematics and science skills among females.

The girls' views on science have been shaped in part by gender-based stereotypes that convey misconceptions that differential innate mathematical abilities exist between males and females. This view is contrary to Spelke's (2005) findings that, mathematical reasoning among females and males develop from a shared set of biologically based capabilities that lead both genders to develop an equal aptitude for mathematics. As perceived by the boys in the study, both girls and boys have the same innate abilities to learn mathematics and science skills and are born interested in a variety of objects and ideas as confirmed by Spelke (2005) and Spelke & Grace (2007).

However, some students come from households and communities that are heavily influenced by beliefs that girls may be disadvantaged genetically when it comes to ability to study mathematics. The stereotype is expressed by the girls that, "boys are naturally better in science" and "technical occupations are better suited for boys" while "girls do not have the right brain cell "and "can better take care of children", can be linked to their socio-cultural background and gender roles they engaged in while growing up.

Parental perception, support and motivation greatly contribute to foster stereotype and the performance of their daughters. They produce a picture of what they think girls and boys should be involved in which should not be the case. This assertion was expressed by one of the students:

> My Parents told me that I should not become a road engineer because I will not be able to spend weeks in the forest like men do during construction projects. He says it is risky for any woman to venture into such a career. He prefers I study journalism or law. (Female form 3 student, Bilingual Grammar School Molyko, Buea)

Some parents build and communicate pervasive social, cultural, and historical messages explicitly and implicitly to girls from a very young age that science is not useful to women. Such parents believe science careers are masculine and that women are more suited in social fields. This finding is in line with Okonkwo's (1983) observation that, parents discourage female students generally from studying science subjects which they stereotype as masculine and encourages them to study humanities instead. Parental stereotype is communicated in the different ways they respond to their children's material and psychological needs. An example is shown below as expressed by a student.

> Last term, I failed in mathematics and physics and my twin brother had 10 average in mathematics, 14 in physics, and 17 in literature. My father was disappointed and shouted at him that such score in mathematics and physics are for girls. He congratulated me for having 18 in literature and 16 in history. My father knows mathematics and physics are for boys. (Female form 3 student, Baptist High School Buea).

The manner in which a parent perceives the importance of a subject with respect to gender either directly or indirectly affects the type or amount of support and encouragement the parent provides to the child. It was noticed that perceptions of ability and achievement in different subjects were closely linked to the sex-role stereotypes of that society, even when actual ability between the genders is similar. Most of the girls were found to be engaged in home practices from a very tender age based on sex roles, for example, cooking, washing and cleaning. These are routine roles which do not activate the cognitive development of the girls at an early age. Girls were not given equal opportunities by parents to experience the 'scientific activities' that will boost their societal orientation towards science.

> Every summer holidays, my father usually sends my younger brother who is now in form two for computer classes. When I told him I also want to participate, he told me I should either chose hair dressing or tailoring. If not, then let me stay home and assist my mum in her petite trading. (Female form 3 student, G.H.S Great Soppo)

The girls believed that if they had been exposed to the same opportunities the boys were exposed to like attending computer lessons, going to building sites with their parents, manipulation of electronics in the house to have just these; they would have been more interactive with scientific knowledge. These findings corroborate Twoli's (1986) view that activities that girls engage in from childhood disadvantage them as they do not 'tinker'. Bigger challenges can mean bigger accomplishment therefore, parents are faced with a serious responsibility, but also a great opportunity in preparing their children for what lies ahead.

> My parents made us to believe that boys and girls have their roles. Activities that need physical energy are meant for boys. My mother cannot allow my brother to cook or clean the kitchen even if I am not there. She will do it herself. Likewise, my father will never tell me to find out why the television is not showing or even to arrange the antenna pole. If my younger brother is not there, he prefers we wait till he comes back. (Form 3 student, G.H.S Great Soppo)

Family expectations are seen to be a disincentive for girls than boys. Girls give time for more domestic responsibilities which leaves them with little or no time for private studies after school. In the process of contemplating a science-oriented future in this culture, girls therefore find the issue of family versus career a major dilemma, and family usually takes precedence. Most of the girls in the study acknowledged that science is not meant for girls not only through their own perception but also from their observation of the actions of their parents and the results of those actions. There is therefore the tendency for more girls to avoid making career plans based on their interests. Rather, they depend on the mandate of the actions of influential persons especially their parents as parents encourage boys more to pursue science-related careers. This idea of observation has been clearly stated in Bandura (1994) self-efficacy theory as a major method through which people learn and this greatly affects the decisions they make at the end.

Lack of Academic and Parental Support at Home

Academic support and parental involvement in their children's education are frequently cited as factors in students' success. Findings from discussions with the girls revealed that most of the students did not receive academic support at home due to low educational level of their parents (especially mothers), wrong perception about science education by some parents (leading to lack of interest by parents) and too much house chaos. The analysis of focus group discussions with students revealed that the majority of the parents had not attended formal education up to university level. Information on their educational background confirms Smith- Hefner's (1999) findings that, parents who have not been to school have little experience of school by which to guide their own children. Most of the parents had not been to school so they lack the knowledge and experience in science to help the girls with academic work at home. Worthy of mention also is the fact that most fathers were more involved in occupations that had a science background than mothers and a review of literature by American Association for university Women (2007) indicates that girls are more likely to pursue a degree in science if a parent is employed in a career involving science. Since most of their mothers spent more time with them in the house more than their father, it was evident that they could not provide the academic support mostly needed by the girls.

Although support is not necessarily manifested in ways such as direct parental involvement or collaboration in the school campus and homework, the fact that the parents show moral support towards their daughter's education could have motivated them. But this was found absent in this study. In Brofenbrenner's (2005) bio-ecological framework, these parents exemplify individuals in the mesosystem (the interaction between the home and the school) who create conditions against the development of individuals (students) and may lead to the absence of the mesosystem.

From the study, parental perception on the importance of science subject with respect to gender directly or indirectly affected the quality and quantity of support and encouragement provided to their children. Mathematics and physics continue to be stereotyped as a male domain indicating that males are believed to have stronger abilities in these areas, or are better suited for work in these fields. In most of the cases encountered, parents view science as a more masculine field and provided the academic and moral support (books, fees and counsel) first to the boys before the girls. This was expressed by some girls who said that, "My father usually buys all the science text and work books for my brother. But when it comes to me, he buys just the mathematics workbook and tells me to beg the other text books from my friend".

Parents provide a more supportive environment for their sons than daughters making the boys to have more interest and confidence in their science ability than the girls. Such acts fuel the manifestation of the "self-fulfilling prophesy" in education. The findings are not different from Davis-Kean's (2007) findings which show that, as parents' stereotype and support increase, girls' interest in mathematics decreases while for the boys' interest for mathematics increases with their parents' gender stereotype and support. This also confirms Bleeker & Jacobs (2004) and Nosek's, et, al., (2002) findings that, parents tend to view mathematics as a more masculine field and buy more math-related products for their sons than for their daughters.

Interview with the school personnel (the teachers and the principals) revealed great dissonance in the mesosystem with respect to expectations of parental involvement. On the one hand, the school expected parents to be more involved in the education of their daughters since they were weak in the sciences than was forthcoming (for example, having actual contact with the teacher, attending Parent Teachers' Association to talk about it, responding to school notices and ensuring that homework is done). A very insignificant proportion of the parents were fully involved in the education of their children while majority were not. One of the teachers mentioned that,

> I convoked 10 parents because their children did not have work books in physics. Only 7 came and out of the seven, 5 were the parents of boys. Before the end of the week, four boys brought workbooks but the girls said their parents do not have money (Teacher, G.H.S Great Soppo).

When parents do not give the necessary support, students are likely to lose interest and hope in some of these subjects since they do not have the necessary materials to study it. Lack of parental support was also identified by the students when they were asked to say who had influenced their career choice. There was a contrast somehow between Bachman, Hebl, Martinez, and Rittmayer's (2009) findings and what prevailed in this study. The researchers have a great deal of research indicating that, parents have a strong influence on their child's academic path and which directly or indirectly influence their career aspirations. The situation was slightly different in this study as it was discovered that although most of the parents guided the subject choice of their children, they did not give them the support they need neither did they greatly influence subject choices of these same children. The girls' career choices were influenced by the media while boys were self-motivated. Parents on their part had no intention to support the girls based on stereotype.

Conclusions

The focus of this study was to examine gender disparity in students' academic performance in science subjects in secondary schools in Buea Sub-Division. This study goes beyond the already-documented problem of access to education for girls to provide an insight into the student related and school related challenges responsible for girls' low performance in science subjects.

Based on the findings, it can rightfully be concluded that, untreated student-related negative attitude linked to issues like low self-confidence, stereotype and lack of parental support affected the ability of girls to develop interest and sustain a positive attitude towards most science subjects. Except for biology, girls saw all the other science subjects as challenging and reserved for male students. This was coupled with the fact that the girls had very few teachers as role models. Girls' inability to interact with mathematical concepts and toys at their early age because of gender role stereotype introduced by parents caused the girls to believe in a myth that "boys are naturally good in science". This negatively affected them which led to low performance. Boys interacted more with science-oriented toys and gadgets at their early age, were more confident in their abilities, attached more value and interest in science subjects, and were more positive in their expectations. This provoked the boys to get more engaged and enabled them to perform better than the girls.

Most parental support was geared towards the boys than girls. Some few interested parents' efforts to support their children's education were thwarted by their limited knowledge on these science subjects and inability to provide material and financial resources to meet their daughters' needs.

REFERENCES

[1] Adesoji, F. A. (2002). *Modern Strategies in the Teaching of Integrated Science*. Ibadan: Power House.

[2] Afia, B. A. (2014). *Inequality of Gender Participation of Females in STEM Disciplines in Higher Education: A case study of KNUST*: Ghana. Unpublished Ph.D. thesis. Dec. 2014

[3] Agborbechem, P.T. (2006). Dimensionality and Students Academic Performance in Mathematics in Cameroon General Certificate of Education Ordinary Level (GCE O/L) Examination. Unpublished Ph.D. Thesis. Dec. 2006

[4] Ainley, M. and Ainley, J. (2011). Student engagement with science in early adolescence: The contribution of enjoyment to students' continuing interest in learning about science, *Contemporary Educational Psychology*, 36, 4 – 12.

[5] Akinyemi, O. (2009). Enhancing Students' Attitude towards Nigerian Senior Secondary School Physics through the Use of Cooperative, Competitive and Individualistic Learning Strategies, *Australian Journal of Teacher Education*, v3.

[6] Ambady, N., Shih, M., Kim, A. and Pittinsky, T. (2001). Stereotype susceptibility in children: Effects of identity activation on quantitative performance, *Psychological Science*, 12(5), 385–90.

[7] Amelink, C. T. (2012). *Female Interest in Mathematics, Apply Research to Practice (ARP) Resources. Retrieved 10/02/2018 from http://www.engr.psu.edu/AWE/ARPResources.asp*

[8] American Association of University Women & American Institutes for Research. (1998). *Gender gaps; Where schools still fail our children*. New York: Marlowe & Co.

[9] American Association of University Women. (2004). *Under the microscope; A decade of gender equity projects in the sciences*. Washington, D.C.: American Association of University Women Educational Foundation.

[10] American Association of University Women (2010). *Improve girls' and women's opportunities in science, technology, engineering, and math.* Retrieved from http://www.aauw.org/learn/research/upload/STEMrecommendations.pdf. Accessed 28/12/2018.

[11] Amin, M. E. (2005). *Social Science Research: Conceptions, methodology & Analysis.* Uganda: Makerere University Printery.

[12] Archer, J. (1992). Gender stereotyping of school subjects, *The Psychologist* 5, 66–69.

[13] Aronson, J., Fried, C. B. and Good, C. (2002). Reducing the effects of stereotype threat on African American college students by shaping theories of intelligence, *Journal of Experimental Social Psychology*, 38(2), 113–25.

[14] Aziz, Z., Nor, S.M., $ Rahmat, R. (2011). Teaching Strategies to Increase Science Subject Achievement: Using Videos for Year Five Pupils in Primary School . *World Applied Sciences Journal* 14, 08-14.

[15] Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change *Psychological Review*, 84, 191-215.

[16] Bandura, A. (1989). Human agency in social cognitive theory, *American Psychologist, 44*, 1175-1184.

[17] Bandura, A. (1994). Self-efficacy, *Encyclopaedia of Human Behaviour* Vol. 4, pp. 71-81. New York: Academic Press.

[18] Bandura, A. (1997). Self-efficacy. *Harvard mental health letter*, *13*(9), 3-4.

[19] Becker, B. J. (1989). Gender and science achievement: An analysis of studies from two meta analyses. *Journal of Research in Science Teaching*, 26, 141–169

[20] Beilock, S. L., Gunderson, E. A., Ramirez, G. and Levine, S. C. (2010). Female teachers' math anxiety affects girls' math achievement. *Proceedings of the National Academy of Sciences,* 107 (5), 1860-1863

[21] Betz, N. (2001). *Career self-efficacy. Contemporary models in vocational psychology*: Mahway, NJ: Lawrence Erlbaum Associates, Inc.

[22] Bøe, M. V., Henrikson, E. K., Lyons, T. and Schreiner, C. (2011). Participation in science and technology: Young people's achievement-related choices in late-modern societies. *Studies in Science Education*, 47(1), 37 – 72.

[23] Breakwell, G. M. and Beardsell, S. (1992). Gender, parental and peer influences upon science attitudes and activities. *Public Understanding of Science*, 1, 183–197

[24] Brofenbrenner, U. (2005). *Making Human Beings Human: Bio-ecological perspectives on human development*. Thousand oaks, CA: Sage Publications

[25] Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge: Harvard University Press.

[26] Brown, L. I. and Kanyongo, G. Y. (2010). Gender differences in performance in mathematics in Trinidad and Tobago: Examining affective factors. *International Electronic Journal of Mathematics Education*, 5, 113–130

[27] Brown, S. (1976). Attitude goals in secondary school science. Edinburgh: University of Edinburgh

[28] Carr, M., Jessup, D. L. and Fuller, D. (1999). Gender Differences in First-Grade Mathematics Strategy Use: Parent and Teacher Contributions. *Journal for Research in Mathematics Education*, 30(1), 20-46.

[29] Catsambis, S. (1995). Gender, race, ethnicity, and science education in the middle grades. *Journal of Research in Science Teaching.* volume 32, issued 3.

[30] Coleman, J. S, Ernest, Q. C, Carol, J. H, James, M., Alexander, M., Frederick, D. W. and Robert, L. Y (1966). *Equality of educational opportunity*. Washington DC.: US Government Printing Press.

[31] Colley, A., Comber, C. and Hargreaves, D. (1994). School subject preference of pupils in single sex and co-educational secondary schools. *Educational Studies*, 20, 379–386.

[32] Corbett, C., Hill, C. & St. Rose, A. (2008). Where the girls are: The facts about gender equity in education. *American Association of University Women Report*. Washington: D.C. Retrieved from http://www.aauw.org/learn/research/ upload/ STEMrecommendations.pdf Accessed 28/12/2018.

[33] Corbett, C., Hill, C. & St. Rose, A. (2010). Why So Few? Women in Science, Technology, Engineering, and Mathematics. *American Association of University Women Report*. Washington: D. C. Retrieved from http://www. aauw.org/learn/research/upload/STEMrecommendations.pdf Accessed 28/12/2018.

[34] Davis, K. and Irwin, C. (2001). *Building a bridge for females to equitable, inclusive, and participatory science activity*. Retrieved from http://web.ebscohost.com (ED 452053). Accessed 28/12/2018.

[35] Davis-Kean, P. (2007). How dads influence their daughters interest in Maths. University of Michigan Institute for Social Research retrieved from http://www.science daily.com/releases/2007/06/070624143002.htm Accessed 28/12/2018.

[36] Dee, T. S. (2006). Teachers and the Gender Gaps in Student Achievement the. *The Journal of Human Resources*. XLII.3

[37] Delor, J., et al., (1996). *Learning; The Treasure Within*. Paris: UNESCO

[38] Dweck, C. and Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, 95(2), 256–73.

[39] Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality, and development.* Philadelphia, PA: Psychology Press.

[40] Dweck, C. S. (2007). "Is maths a gift? Beliefs that put females at risk" *Top researchers debate the evidence* (pp. 47–56).

[41] Dweck, C. S. (2008). *Mindsets and math/science achievement.* New York: Carnegie Corporation of New York, Institute for Advanced Study, Commission on Mathematics and Science Education.

[42] Eccles, J. S. (1994). Understanding women's educational and occupational choices: Applying the Eccles et al. model of achievement-related choices. *Psychology of Women Quarterly,* 18(4), 585–609.

[43] Eccles, J. S. (2006). *Where are all the women? Gender differences in participation in physical science and engineering*. Washington, DC: American Psychological Association.

[44] Eccles, J. S., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L. and Midgley, C. (1983). Expectancies, values, and academic behaviours. In J. T. Spence (Ed.), *Perspective on achievement and achievement motivation* (pp.75–146). San Francisco: W. H. Freeman

[45] ECD Development Centre (2010), Gender Inequality and the MDGs: What are the Missing Dimensions? *Issues Brief,* OECD, Paris

[46] Edmonds, R. R. (1979). Effective schools for the urban poor. *Educational Leadership*, 37, 15 – 27.

[47] Else-Quest, N., Hyde, J. and Linn, M., (2010). Cross-national patterns of gender differences in mathematics:

A meta-analysis, *Psychological Bulletin,* 136(1), 103-127.

[48] Elwood, J. and Comber, C. (1995). Gender differences in 'A' level examinations: the reinforcement of stereotypes. Paper presented as part of the symposium A New ERA? *New contexts for gender equality:* BERA conference, 11–13 September.

[49] Erickson, G. and Erickson, L. (1984). Females and science achievement: evidence, explanations and implications. *Science Education*, 68, 63–89.

[50] Fairnga, S. J. and Joyce, B. A. (1999). Intentions of young students to enrol in science courses in the future: An examination of gender differences. *Science Education,* 83(1), 55–76.

[51] FEMSA (1997-1 to 19). FEMSA's Dissemination reports [Report]. Nairobi: FAWE.

[52] Fenema, E. (2000). *Gender and mathematics: What is known and what do I wish was known?* Retrieved from. http://www.wcer.wisc.edu/archive/nise/news_ Activities / Forums/Fennemapape Accessed 28/12/2018.

[53] Fennema, E. and Carpenter, T. P. (1998). New perspectives on gender differences in mathematics: An introduction and a reprise. Educational *Researcher,* 27(5), 4-11, 19-22.

[54] Fennema, E. and Leder, G. (Eds.). (1990). *Mathematics and gender: Influences on teachers and students*. New York: Teachers College Press.

[55] Fennema, E. and Peterson, P. L. (1986). Teacher-student interactions and sex-related differences in learning mathematics. *Teaching and Teacher Education,* 2(1), 19-42.

[56] Fennema, E. and Sherman, J. (1977). Sex-related differences in mathematics achievement, spatial visualization, and affective factors. *American Educational Research Journal,* 14(1), 51-71.

[57] Fennema, E., Peterson, P. L., Carpenter, T. P. and Lubinski, C. A. (1990). Teachers' attributions and beliefs about girls, boys, and mathematics. *Educational Studies in Mathematics,* 21(1), 55-65.

[58] Flabbi, L. (2011), Gender Differentials in Education, Career, Choices and Labour Market Outcomes on a Sample of OECD Countries. *Mimeo, forth coming.*

[59] Fullan, M. (2001). The new meaning of educational change. 4th ed. New York: Teachers College Press.

[60] Gallagher, M. and Kaufman, J. C. (2005). Gender differences in mathematics self-efficacy beliefs. In A. (Eds.), *Gender differences in mathematics: An integrative psychological approach* (pp. 294–315). Boston: Cambridge University Press.

[61] Gardner, P. L. (1975). Attitudes to science. *Studies in Science Education*, 2, 1–41.

[62] Glickman, C. (2002). Leadership for learning. How to help teachers succeed Arlington. *Association for supervision and curriculum development.*

[63] Good, C., Aronson, J. and Harder, J. A. (2008). Problems in the pipeline: Stereotype threat and women's achievement in high-level math courses. *Journal of Applied Developmental Psychology,* 29(1), 17–28.

[64] Good, C., Aronson, J. and Inzlicht, M. (2003). Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat. *Applied Developmental Psychology,* 24, 645–62.

[65] Good, C., Rattan, A. and Dweck, C. S. (2009). *Why do women opt out? Sense of belonging and women's representation in mathematics.* Unpublished paper, Baruch College, Stanford University.

[66] Good, T. L. and Weinstein, R. (1986). Teacher expectations: A framework for exploring classroom. Alexandria, VA: Association for Supervision and Curriculum Development.

[67] Haladyna, T., Olsen, R. and Shaughnessy, J. (1982). Relations of student, teacher, and learning environment variables to attitudes to science. *Science Education*, 66, 671–687.

[68] Harvey, T. J. and Edwards, P. (1980). Children's expectations and realisations of science. *British Journal of Educational Psychology*, 50, 74–76.

[69] Havard, N. (1996). Student attitudes to studying A-level science, *Public Understanding of Science* 5(4), 321–330

[70] Hendley, D., Stables, S. and Stables, A. (1996). Pupils' subject preferences at Key Stage 3 in South Wales. *Educational Studies*, 22, 177–187.

[71] Herbert, J. and Stipek, D. (2005). The emergence of gender differences in children's perceptions of their academic competence. *Applied Developmental Psychology,* 26, 276-2

[72] Hidi, S. and Renninger, K.A. (2006). The four-phase model of interest development. *Educational Psychologist*, 41(2), 111-127.

[73] Higgins, E.T. (2007). Value. In A.W. Kruglanski and E. T. Higgins (Eds.), *Handbook of social psychology (2nd ed.),* pp. 454 – 472. New York: Guilford

[74] Hines, M. (2007). Do sex differences in cognition cause the shortage of women in science? Washington, DC: AAUW

[75] Hyde, J.S. and Lindeberg S. M. (2007). *Facts and assumption about the nature of gender differences and the implications for gender equity*. New Jersey: Lawrence Erlbaum Associates publisher.

[76] Jacobs, J. E., Lanza, S., Osgood, D. W., Eccles, J. S. and Wigfield, A. (2002). Changes in children's self-competence and values: Gender and domain differences across grades one through twelve. *Child Development,* 73, 509-527.

[77] Jebson, O. R and Hena, A.Z (2005). Students` attitude towards science subjects in senior secondary schools in Adamawa state, Nigeria. Impact. *International Journal of Research in Applied, Natural and Social science,* 3, (3), 117-124.

[78] Johnson, S. (1987). Gender differences in science: parallels in interest, experience and performance. *International Journal of Science Education,* 9, 467–481.

[79] Jones, G., Howe, A. and Rua, M. (2000). Gender differences in students 'experiences, interests, and

attitudes towards science and scientists. *Science Education*, 84, 180–192.

[80] Jones, M. G. and Wheatley, J. (1988). Factors influencing the entry of women into science and related fields. Science Education University of Nairobi. *Journal of Human Resources*. XLII.3

[81] Jones, M. G. and Wheatley, J. (1990). Gender differences in teacher-student interactions in science classrooms. *Journal of Research in Science Teaching.* volume 27, issued 9/9/1990.

[82] Jovanovic, J. and King, S. S. (1998). Boys and girls in the performance-based science classroom: who's doing the performing? *American Educational Research Journal,* 35, 477–496.

[83] Jussim, L. and Eccles, J. S. (1992). Teacher expectations: II. Construction and reflection of student achievement. *Journal of Personality and Social Psychology, 63*(6), 947-961.

[84] Jussim, L. and Harber, K. D. (2005). Teacher expectations and self-fulfilling prophecies: Knowns and unknowns, resolved and unresolved controversies. *Personality and Social Psychology Review,* 9(2), 131-155.

[85] Jussim, L., Smith, A., Madon, S. and Palumbo, P. (1998). Teacher expectations. In J. E. Brophy (Ed.), *Advances in research on teaching: Expectations in the classroom* (Vol. 7, pp. 1-48). Greenwich, Connecticut: JAI Press.

[86] Kahle, J. B. and Lakes, M. K. (1983). The myth of equality in science classrooms. *Journal of Research in Science Teaching*, 20, 131–140.

[87] Kane, E. (2004). Girls' education in Africa: What do we know about strategies that work? Washington, DC: The World Bank re

[88] Keller, J. (2002). Blatant stereotype threat and women's math performance: Self-handicapping as a strategic means to cope with obtrusive negative performance expectations. *Sex Roles,* 47(3/4), 193-198.

[89] Krejcie, R.V and Morgan, D.W. (1970). Determining sample size for research. *Educational and psychological measurement* 1970, 30, 607-610.

[90] Krumboltz, J. D., Mitchell, A. M. and Jones, B. (1976). A social learning theory of career selection. *The Counselling Psychologist*, 6(1), 71 – 81.

[91] Kuklinski, M. R. and Weinstein, R. S. (2001). Classroom and developmental differences in a path model of teacher expectancy effects. *Child Development,* 72, 1554-1578.

[92] LeGrand, J. (2013). Exploring Gender Differences across Elementary, Middle, and High School Students' Science and Math Attitudes and Interest. Unpublished Thesis. Feb. 2013

[93] Liem, A., Lau, S. and Nie, Y. (2008). The role of self-efficacy, task value, and achievement goals in predicting learning strategies, task disengagement, peer relationship, and achievement outcome. *Contemporary Educational Psychology*, 33(4), 486-512.

[94] Lightbody, P. and Durndell, A. (1996b). The masculine image of careers in science and technology –fact or fantasy. *British Journal of Educational Psychology,* 66, 231–246

[95] Lucidi, A. (1994). Gender equity in education: A review of the literature. Retrieved from http://web.ebscohost.com (ED 374044)

[96] Marcus, S. and Joakim ,S. (2016). Gender differences in boys' and girls' perception of teaching and learning mathematics. *Open Review of Educational Research*, 3:1, 18-34, DOI: 10.1080/23265507.2015.1127770. Paris: UNESCO.

[97] Morley, L., Gunawardena, C., Kwesiga, J., Lihamba, A., Odejide, A., Shackleton, L. and Sorhaindo, A. (2006). *Gender equity in commonwealth higher education: Emerging themes in Nigeria, South Africa, Sri Lanka, Tanzania and Uganda. Department for International Development.* Retrieved from http://94.126.106.9/r4d/PDF/Outputs/ImpAccess/Educationalpaper_65.pd. Accessed 28/12/ 2018.

[98] Murphy, P. and Elwood, J. (1998). Gendered experiences, choices, and achievement – exploring the links. *Journal of Inclusive Education, 2(2), 95 – 118.*

[99] Musua, L.M., and Abere, M.J. (2015). Teacher Qualification and Students' Performance in Mathematics, Science and Technology Subjects in Kenya. *International Journal of Educational Administration and Policy* vol.7(3), pp 83-89, May 2015.

[100] Musau, L. M. (2013). Determinants of girls' performance in science, mathematics and technology subjects in public secondary schools in Kenya. *International Journal of Educational Administration and Policy Studies;* 5(3), pp. 33-42, July, 2013.

[101] Myers, R. E. and Fouts, J. T. (1992). A cluster analysis of high school science classroom environments and attitude toward science. *Journal of Research in Science Teaching*, 29, 929–937.

[102] National Science Foundation (1982). *Women and Minorities in Science and Engineering.* Washington, D.C.: National Academies Press.

[103] Ng'etich, J. K. (2014). *Factors influencing girls' low enrolment and poor performance in physics: The Case of Secondary Schools in Nandi South District, Kenya*. Unpublished Thesis.

[104] Nguyen, H.-H. H. and Ryan, A. M. M. (2008). Does stereotype threat affect test performance of minorities and women? A meta-analysis of experimental evidence. *Journal of Applied Psychology, 93(6), 1314–34.*

[105] Nosek, B. A., Banaji, M. R. and Greenwald, A. G. (2002a). Harvesting implicit group attitudes and beliefs from a demonstration web site. *Group Dynamics: Theory, Research, and Practice*, 6(1), 101–15.

[106] Nosek, B. A., Banaji, M. R. and Greenwald, A. G. (2002b). Math = male, me = female, therefore math ≠ me. *Journal of Personality and Social Psychology*, 83(1), 44–59.

[107] Nosek, B. A., Smyth, F. L., Sriram, N., Lindner, N. M., Devos, T., Ayala, A. and Bar-Anan, Y. (2009). National differences in gender-science stereotypes predict national sex differences in science and math achievement. *Proceedings of the National Academy of Science,* 106(26), 10593–97.

[108] Nyamizi, G. L. and Lotto, J. (2018) Towards O-Level Students' Performance in Mathematics: Do Teaching and Learning Environment Factors Matter? *Journal of Education and Practice* Vol.2, Issue No.2, p 1 - 18, 2018

[109] OECD (2012). *What is equity in education? Education at a Glance 2012: Highlights*. Paris: OECD Publishing.

[110] Ogunkola, B.J. and Olatoye, R.A. (2005). Strategies for Improving Participation and Performance of Girls in Secondary School Science in Nigeria: Science Teachers Opinions. *Gender & Behaviour,* 3, 453-464.

[111] Ojong, T. M (2008). *Philosophical and historical Foundations of Education in Cameroon 1844-1960*. Design House, Limbe.

[112] Olatunji, O. P. and Olusola, A. R. (2016). Students' Attitude and Gender as Correlates of Students' Academic Performance in Biology in Senior Secondary School. *International Journal of Research and Analytical Reviews* Volume 3 (I JULY – SEPT. 2016]

[113] Oredein, A. O. (2012) Impact of Teachers' Motivational Indices on Science Students' Academic Performance in Nigerian Senior Secondary Schools. *International Education Studies;* Vol. 6, No. 2; 2013.

[114] Osborne, J., Simon, S. and Collins, S. (2003). Attitudes towards science: A review of the literature and its implications, International. *Journal of Science Education,* 25:9, 1049-1079.

[115] Pajares, F. (1996). Self-efficacy beliefs and mathematical problem-solving of gifted students. *Contemporary Educational Psychology,* 21(4), 325–44.

[116] Pajares, F. (1996b). Self-efficacy beliefs in academic settings. *Review of Educational Research*, 66, 543-578

[117] Pajares, F. (1996b). Self-efficacy beliefs in academic settings. *Review of Educational Research,* 66, 543-578. Thousand Oaks, CA: Sage Publications.

[118] Pehkonen, E. (1995). *Pupils' view of mathematics: Initial report for an international comparison project.* (Research report 152). Helsinki: University of Helsinki.

[119] Pehkonen, E. and Kaasila, R. (2011). Students' conceptions of effective mathematics teaching. Tallinn: Institute of Mathematics and Natural Sciences, Tallinn University.

[120] Potvin, P. and Hasni, A. (2014). Interest, motivation and attitude towards science and technology at K-12 levels: a systematic review of 12 years of educational research. *Studies in Science Education,* 50:1, 85-129, DOI: 10.1080/03057267.

[121] Randall, G. J. (1987). Gender differences in pupil-teacher interaction in workshops and laboratories. In G. Weiner and M. Arnot (eds), *Gender Under Scrutiny: New Inquiries in Educatio*n (pp. 163 – 172). Milton Keynes: Open University Press.

[122] Republic of Cameroon. Law no 98/004 of 14 April 1998. *To lay down the guidelines for education in Cameroon.*

[123] Sadker, D., Sadker, M. and Zittleman, K.R. (2009). *Still failing at fairness: How gender bias cheats girls and boys in school and what we can do about it.* New York, NY: Simon & Schuster, I

[124] Sadker, M. and Sadker, D. (1994). *Failing at fairness: How America's schools shortchange girls.* New York, NY: Touchstone

[125] Samuelsson, J. (2008). The impact of different teaching methods on students' arithmetic and self-regulated learning skill. *Educational Psychology in Practice*, 24, 237–250.

[126] Santrock, J.W. (2008). *Adolescence: Twelfth edition.* McGraw-Hill Higher Education

[127] Schibeci, R. A. (1984). Attitudes to science: an update. *Studies in Science Education,* 11, 26–59.

[128] Schroeder, C. M., Scott, T. P., Tolson, H., Huang, T. Y. and Lee, Y. H. (2007). A meta-analysis of national research: Effects of teaching strategies on student achievement in science in the United States. *Journal of research in science teaching, 44*(10), 1436–1460.

[129] Schunk, D. H. (1996b). *Self-efficacy for learning and performance.* Paper presented at the meeting of the American Educational Research Association, New York.

[130] Schunk, D. H. and Pajares, F. (2009). *Self-efficacy theory*. In K.R. Wentzel & A. Wigfield (Eds.), *Handbook of motivation at school* (55-76). New York: Routledge.

[131] Scot, J. and Marshall, G. (2005). *Oxford Dictionary of Sociology*. Oxford: Oxford university press.

[132] Simpkins, S. D., Davis-Kean, P. E. and Eccles, S. (2006). Math and Science Motivation: A longitudinal examination of the links between choices and beliefs. USA. Springer United Nations, Division for the Advancement of Women. (2010). Aid-Memoire for Expert Group Meeting on Women's and Girl's Access to and Participation in Science and Technology, 18 June.

[133] Sjoberg, S. (2000). Interesting all children in 'science for all' , In R. Millar, J. Leach & J. F. Osborne (Eds.), *Improving science education* (165–186). Buckingham: Open University Press.

[134] Smail, B. and Kelly, A. (1984). Sex differences in science and technology among 11 year old schoolchildren: II – affective. *Research in Science & Technology Education*, 2, 87–106.

[135] Spangler, D. (1992). Assessing students' beliefs about mathematics. *The Mathematics Educator,* 3, 19–23

[136] Spelke, E. S. (2005). Sex differences in intrinsic aptitude for mathematics and science? A critical review. *American Psychologist*, 60(9), 950–958.

[137] Spelke, E. S. and Grace, A. D. (2007). Sex, math, and science. In S. J. Ceci & W. M. Williams (Eds.), *Why aren't more women in science? Top researchers debate the evidence* (pp. 57–68). Washington, DC: American Psychological Association.

[138] Spencer, S. J., Steele, C. M. and Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology*, 35(1), 4–28.

[139] Stack, S. (2004). Gender, children and research productivity. *Research in Higher Education,* 45 (8), 891–920.

[140] Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance*. American Psychologist,* 52(6), 613–29.

[141] Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology*, 69, 79.

[142] Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology*, 69, 79.

[143] Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology*, 69, 79.

[144] Steele, J., James, J. B. and Barnett, R. C. (2002). Learning in a man's world: Examining the perceptions of undergraduate women in male-dominated academic areas. *Psychology of Women Quarterly*, 26, 46-50.

[145] Subrahmanian, R. (2005). Gender equality in education: Definitions and measurements. *International Journal of Educational Development* 25 (4): 395-407.

[146] Talton, E. L. and Simpson, R. D. (1987). Relationships of attitude toward classroom environment with attitude toward and achievement in science among tenth grade biology students. *Journal of Research in Science Teaching,* 24, 507–525.

[147] The Forum for African Women Educationalists (FAWE) (2001). *Girls' education and Poverty eradication: FAWE's Response*. Presented at the Third United Nations Conference on the Least Developed Countries 10-20 May 2001, Brussels, Belgium.

[148] Thomas, G. E. (1986). Cultivating the interest of women and minorities in high school mathematics and science. *Science Education*, 73, 243–249.

[149] Tiedemann, J. (2000a). Parents' gender stereotypes and teachers' beliefs as predictors of children's concept of their mathematical ability in elementary school. *Journal of Educational Psychology*, 92, 144–151.

[150] Tiedemann, J. (2002). Teachers' gender stereotypes as determinants of teacher perceptions in elementary school mathematics. *Educational Studies in Mathematics,* 50(1), 42-69.

[151] Torto, R. (2016). Extracurricular and out of school factors affecting girls' participation and performance in SMT subjects: (home/community factors; distance from school; safety; time use). *Cameroon Tribune (Yaoundé)* 20 January 2016.

[152] UNESCO (1960). Right to Education. Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology*, 69, 79.

[153] UNESCO (2000). *The Dakar Framework for Action: Education for All: Meeting our Commitments.* Paris: UNESCO.

[154] UNESCO (2001). *Education for all assessment thematic paper: Girls' education.* Paris: UNESCO

[155] UNESCO (2003). *EFA Global Monitoring Report: Emergency Educational.* Reporthttp://portal.unesco.org/education/en/ev.php RL_ID=15623&URL_DO=DO_TOPIC&URL_SECTION=201.html (Accessed April 20, 2008).

[156] UNESCO (2005). *EFA Global Monitoring Report: Understanding Education Quality.* Retrieve from http://portal.unesco.org/education/en/ev. phpURL_ID=15623 & URL_ DO=DO_TOPIC&URL_SECTION=201.html (Accessed 2nd June, 2014).

[157] UNESCO (2005). *Scaling up' good practices in girls' education*. Paris: UNESCO

[158] UNESCO (2009). Overcoming Inequality: Why governance matters. *Education for all global monitoring report 2009.* London: Oxford University press.

[159] UNESCO Institute for Statistics (2010). Global Education Digest, Comparing Education Statistics across the World, Montreal.

[160] UNESCO World Conference on Science. (1999). *Science Agenda—Framework for Action*, Budapest, Hungary, 16 June – 1 July.

[161] UNESCO, (2003). Gender and education for all. The leap to equality. *Global monitoring report* 2003/2004,

[162] United Nations Centre for Science and Technology for Development (UNCSTD) Gender Advisory Board. (2006). *Gender Working Group: Transformative Actions*. New York: United Nations Press.

[163] United Nations Economic and Social Council (2006). *Economic, social and cultural rights: Girls' right to education.* n.p.: United Nations.

[164] Unutkan, O. P. (2006). A study of pre-school children's school readiness related to scientific thinking skills. Retrieved from http://web.ebscohost.com (ED 494373). Accessed 28/12/2018.

[165] Weinburgh, M. (1995). Gender differences in student attitudes toward science: a meta-analysis of the literature from 1970 to 1991. *Journal of Research in Science Teaching,* 32, 387–398.

[166] Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review*, 92, 548–573.

[167] Weinstein, R. S., Madison, S. M. and Kuklinski, M. R. (1995). Raising expectations schooling: Obstacles and opportunities for change. *American Educational Research Journal,* 32(1), 121-159.

[168] Whitehead, J. M. (1996). Sex stereotypes, gender identity and subject choice at A level. *Educational Research*, 38, 147–160.

[169] Wigfield, A. and Eccles, J.S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology*, 25,68-81

[170] Wigfield, A., Tonks, S. and Klauda, S.L. (2009). *Expectancy-value theory. In K.R. Wentzel & A. Wigfield (E*ds.), Handbook of motivation at school (5576). New York: Routledge

[171] World Bank (2008). Girls' Education in the 21st Century: The World Bank, Washington DC, USA. *World Education Forum proceedings*, Dakar, Senegal.