Socio-Economic Status and Female Enrollment in Engineering and Technology Programmes in Anglo-Saxon State Universities of Cameroon

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ABSTRACT

Educational goals and systems around the world differ in many respects. The concerns to meet up with the science educational goals regarding the supply of human resources originate from the decreasing number of qualified female candidates for admission into the field of science and engineering in tertiary education in Cameroon. The objective of this study was to investigate the impact of socio-economic status on female enrolment in Engineering and Technology programmes in Anglo-Saxon state universities of Cameroon. The study used a cross-sectional research design, and multi-stage sampling technique was used to randomly select 276 respondents from the universities of Bamenda and Buea. Both quantitative and qualitative data were collected using structured questionnaire and interview schedules with 10 parents whose children are admitted in engineering and technology programs in the English speaking state universities. Descriptive statistics, point biserial and binary logit regression analysis were performed to achieve the stated specific objectives of the study. Content analysis was used to analyse the qualitative data. The findings revealed that, socio-economic status of parents correlate significantly to students' enrolment in engineering and technology. The null hypothesis tested was rejected. It is recommended that parents should feature prominently in future educational activities of their children.

KEYWORDS: *Family socio-economic status, female enrolment in engineering and technology programmes, Anglo-Saxon stat universities*

INTRODUCTION

Science education is important for the building of human capacity of a country towards engineering and technology. It is therefore advantageous that both males and females are given the opportunity to access and participate in science education to improve their competences and contribute to the development of the communities in which they find themselves. The general trend in most developing nations is that female enrollment is higher in tertiary education in general but fewer females further their studies at the tertiary education in the science domain (UNESCO, 2010) as well as in the engineering and technologies. Education for all understood in terms of equal access to education is not enough. Equality and future development of societies are dependent on providing a high quality science education for all (Ekine & Abay, 2013).The gender gap in enrollment in engineering and sciences could be associated to the socio-economic status of the family among other factors. The desire for parents to provide better educational opportunities to their children will depend on their level of influence on their children both at home and in schools. Children of secondary school age can recognize their parents' efforts and can cite their parental sacrifices as sources of motivation to succeed in their academic pursuits particularly persisting in the sciences where sacrifice is needed from both the parents and the learners. This study therefore, sets out to examine the influence of family socio-economic status on female enrollment in engineering and technology programmes in Anglo-Saxon state universities in Cameroon.

Objectives of the study

The specific objectives of the study were:
➢ To investigate the influence of family socio-economic status on female enrolment in to Engineering and Technology programmes in the English speaking state universities of Cameroon.
➢ To investigate the influence of parents' educational level on female enrolment in to engineering and technology programmes in the English speaking state universities of Cameroon.

Hypothesis of the study

HO : There is no statistically significant relationship between family socio-economic status and female enrolment in engineering and technology programmes in the English speaking state universities of Cameroon.

HI : There is a statistically significant relationship between family socio-economic status and female enrolment in engineering and technology programmes in the English speaking state universities of Cameroon.

Literature review

This section provides the theoretical framework that gives insight on how people acquire and maintain certain

behavioral patterns within the family and their community that impacts their educational trajectory (Bronfenbrenner, 1994). Evaluating behavioral change largely depends on environmental factors, people and behavior. Environment (e.g. school and home) is a factor that can affect a person's behavior (academic achievement). Similarly, environment and situation (family influence and status) provides a framework for understanding human behavior. Favourable environment creates opportunities for self-efficacy (Bandura, 1977) where the learner is motivated both from home and school to develop interest in sciences and subsequent interest in engineering and technology programmes. The gender imbalance in enrollment in to sciences has prompted UNESCO and UNICEF to recall government to ensure that they provide equal opportunities for boys and girls to study in any domain and be given equal employment (Lynch & Feeley, 2009).

Poor educational outcomes at the secondary school level are a result of a series of complex and interrelated factors, both within and outside the school system. This study focuses specifically on the family socio-economic status of the learner and how it impacts their future career path in engineering and technology programmes. Families of low socio-economic status presumably will find it challenging educating the female child in a domain where financial obligations is paramount for success to be achieved. Poverty still remains a major hindrance to quality education as was documented by Kena, et al. (2014) whose findings revealed that endemic poverty coupled with unemployment provides the opportunities for average learners to drop out of schools in developing nations. This was enforced by Ashtiani and Feliciano (2012) who indicated that young adults from low-income families continue to face barriers of accessing college or completing their programme. Therefore, children from low socio-economic background find it difficult pursuing their studies in sciences and engineering where additional cost is required during the laboratory, practical and field work in order to complete a course.

Methodology

This study adopted a cross sectional design and the study population was all first year undergraduate students in the programmes of engineering and technology of the Anglo-Saxon state universities of Cameroon. The population of study comprise of target and accessible population from the Universities of Buea and Bamenda. A target population of all the undergraduate students (year 1,2,3 & 4) for the academic year 2018/2019 and an accessible population of all the first year undergraduate students (level 200) enrolled in engineering and technology related programs. The year one students are chosen because they just completed high school and still have a lot of affections towards the family and are still influence by their parents.

Samples of 276 respondents were randomly selected from the engineering and technology programmes of the two English speaking state universities. Data collected focused on the family socio-economic status of the respondent, educational level of the parents, parent's occupation, family feeding pattern and family health care. The gathered data were compiled and coded in the Microsoft Excel spreadsheet and analyzed using the Statistical Package for Social Science (SPSS). Descriptive statistics were produced which included; frequencies, percentages, means, and standard deviations. The statistical analysis technique used to test the hypothesis was the point Biserial correlation analysis test which in this circumstance uses the Pearson Product Moment approach where the independent variable is continuous data and the dependent variable is dichotomous. A paired sample t-test was used to check whether or not the effect of family socio-economic status on enrolment in the engineering and technology programmes significantly differ between male and female gender groups and the binary logit regression was used to show cause-effect relationship between the dependent and the independent variables.

Results and discussion
Descriptive analysis of students' family socio-economic factors
The aim of this study is to describe the family socio-economic factors and female student enrolment in engineering and technology which were educational level of parents, major occupation of parents, family feeding and household health care. These family socio-economic factors were equally considered important because of their influence on other family factors such as family resources as well as family welfare and education.

Table 1: Socioeconomic Indicators

Indicator	Modalities	Frequency	Percent
Socio-economic Status of Respondents	Lower	34	12.3
	Lower-Middle	42	15.2
	Middle	135	48.9
	Upper-Middle	44	15.9
	Upper	21	7.6
Highest Educational Attainment of Mother	Mass Literacy Education	45	16.3
	Primary School	55	19.9
	Secondary School	61	22.1
	No High School	7	2.5
	Some High School	16	5.8
	High School Graduate	20	7.2
	Diploma/Certified	12	4.3
	Some University	6	2.2
	University Graduate	24	8.7
	Graduate Professional School	30	10.9

	Mass Literacy Education	35	12.7
	Primary School	47	17.0
	Secondary School	32	11.6
	No High School	2	.7
Highest Educational attainment of Father	Some High School	11	4.0
	High School Graduate	37	13.4
	Diploma/Certified	15	5.4
	Some University	8	2.9
	University Graduate	27	9.8
	Graduate Professional School	62	22.5

The findings reveals that among the respondents, majority (48.9%) of them indicated that they are of middle socio-economic status followed by those of the upper-middle (15.9%), those of the Lower-middle (15.2%), Lower (12.3%) and lastly those of upper socio-economic status (7.6%).

The three most popular highest educational attainment of mothers were secondary school (22.1%), primary school (19.9%) and mass literacy education (16.3%) with the least popular being some University (2.2%), no high school (2.5%) and some high school (5.8%).

On the part of the fathers, their highest educational attainments reveals that majority of them were graduates of professional schools (22.5%), primary school leavers (17%) and high school graduates (13.4%) while the least popular were no high school (0.7%), some university (2.9%) and some high school (4%). The study findings showed that 75% of the parents were literate, which corroborate with findings by Hunt (2003), who found a high proportion of educated parents who were more committed to educate their children. Chen (2009) asserts that parents' education is an important key indicator of children's academic achievement. Hence, this study finding on parent education implies that parents' high educational attainment could increase children's learning activities both at home and school. This was also evident in the focus group discussions (FGDs) with parents who demonstrated interest in their children's education, even the uneducated parents showed their readiness to sponsor their children to attain the highest level of education

Parents Major Occupations

Table 2: Parents Major Occupations

Indicator	Modalities	Frequency	Percent
Farming	Subsistence	118	42.8
	Mechanized	22	8.0
Craftwork/Artisan	Blacksmith	10	3.6
	Mechanic	15	5.4
	Brick layer	29	10.5
Commercial Trading	Shop Keeping	36	13.0
	Transporter	31	11.2
	Merchant	21	7.6
Civil Servant	Both Parents	32	11.6
	Only Father	57	20.7
	Only Mother	48	17.4
Technocrat	Banker	5	1.8
	Industrialist/Entrepreneur	29	10.5
	Engineering	26	9.4

The purpose of studying occupation of parents was to determine the economic activities done by parents and see if it influences the support of students' education. For the parent's major occupation, the findings reveal that 25.3% of the respondents are farmers, this significant population is involved in either subsistence or mechanized farming while 6.59% are involved in craftwork/artisan profession, 17.3% of the respondents indicated that their parents engaged in commercial business, 38.1% of respondents indicated their parents are civil servants (either one of the parents or both parents) and 12.7% of the respondents confirmed that their parents are technocrats (banker, engineers and entrepreneur).

Also, during the FGDs most of the parents stated that they strived to educate their children to earn a better future irrespective of their profession. For instance, Sahlni (2007) on parents' occupation as cited in Abdullahi (2016) concluded that the main goal of parents' occupation is to facilitate an individual's means of livelihoods and enable him/her to become a good human being. Meklin and Caines (2008) stated that the economic fortunes of parents influence academic success of their children through support for education. The result above shows that 50.8% of the respondents are homes where the parents are either civil servants or technocrats and significant numbers are from families where the parents are farmers. These are viable homes where they can provide for the education of their children especially the girl child.

Table 3: Family Feeding Patterns

	Almost Never	Rarely	Sometimes	Usually	Always
How Often Does your Family have Daily Meals	4 (1.4%)	9 (3.3%)	29 (10.5%)	61 (22.1%)	173 (62.7%)
Do you Eat Together as a Family	32 (11.6%)	50 (18.1%)	125 (45.3%)	33 (12%)	36 (13%)
Frequency of Balance Diet by Family	10 (3.6%)	43 (15.6%)	103 (37.3%)	59 (21.4%)	61 (22.1%)

For the family feeding pattern, the findings reveal that majority (62.7%) of the respondents indicated that they always have daily meals while 22.1% of them indicated that they usually have family meals, 10.5% of them indicated that they sometimes eat family meals 3.3% of them indicated that they rarely have family meals and lastly 1.4% of them indicated that they almost never had family meals. Also, 45.3% which is a majority of the respondents indicated that they sometimes eat together as a family, followed by 18.1% indicated that they rarely eat together as a family and thirdly 13% indicated that they always eat together as a family. More so, majority (37.3%) of the respondents indicated that they only sometimes eat balanced diet meaning if they are given an opportunity to change their diet, they will change. Also, 22.1% of them indicated that they always eat balanced diet, 21.4% indicated that they usually eat balanced diet, 15.6% of them indicated that they rarely eat balanced diet and lastly 3.6% indicated that they almost never eat balanced diet.

Study findings by Sally and Olney (2006) and Pollitit et al. (2008) found that poor nutrition in early childhood is linked to poor cognition, school achievement, and bad behaviour in children. The latter conclude that the provision of food may both benefit students emotionally and enhance their capacity to work on school tasks. The report further noted that when a child gets proper nutrition and health care, the ability to interact with and take optimal advantage of the resources offered by any formal or information learning environment is enhanced.

Table 4: Household Health Care

Indicators	Almost Never	Rarely	Sometimes	Usually	Always
How often do your Parents handle your Sickness	7 (2.5%)	12 (4.3%)	26 (9.4%)	47 (17%)	184 (66.7%)
How Often do you undertake Medical Checkup in your family	37 (13.4%)	80 (29%)	99 (35.9%)	29 (10.5)	31 (11.2%)

From table 4, we can induce that majority of the respondents (66.7%) revealed that their parents always handle their sicknesses while a relative majority of them (35.9%) indicated that they only sometimes undertake medical checkups in their families.

Health is an excellent indicator for the overall well-being of an individual and a primary predictor and determinant of academic success (Goddard, 2003; Abdullahi, 2011). This is consistent with Barry (2006) finding that child's welfare at school is based on the rights of the child to adequate living standards (shelter, nutrition, healthcare, water, sanitation services) that are vital for child's growth and development. In conclusion, provision of proper child health care contributes to wellbeing both at home and in school. As Oribhabor and Okodugha (2010) put it, children from families with high socioeconomic status are better prepared for school because they have access to books, health care and school materials which encourage them in their learning. Generally, while the innate abilities of children particularly the girl child is important, the opportunities created by the home are crucial to their development of talents.

Hypothesis
Ho : There is no significant relationship between family socio-economic Status and female enrolment in Engineering and Technology
Ha : There is a significant relationship between family socio-economic Status and female enrolment in Engineering and Technology

The independent variable in this hypothesis is family socio-economic Status, while the dependent variable is female enrolment in Engineering and Technology. The scores of the independent variable were gotten from the responses recorded from the 21 questionnaire items that measured the family socio-economic Status. The statistical analysis technique used to test this hypothesis was the Point Biserial. The point Biserial test in this circumstance uses the Pearson Product Moment approach where the independent variable is continuous data and the dependent variable is dichotomous

Table 5: Point Biserial Correlation Analysis for the relationship between Family Socio-economic Status and Female Enrolment in Engineering and Technology Programmes

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Males	201	-0.0951562	0.0686682	0.97354	-0.23056	0.0402504
Females	74	0.2723451	0.1194524	1.027569	0.034277	0.5104135
combined	275	0.0037351	0.0602958	0.999893	-0.11497	0.122437
diff		-0.3675013	0.1343788		-0.63205	-0.1029509
r_{pb}	-0.1633					
t-stat	-2.73					
P-value	.006					

Table 5 above reveals a correlation coefficient for the relationship between family socio-economic Status and female enrolment in engineering and technology programmes as -0.1633. The negative sign reveals that family socio-economic status negatively associate with female enrolment in engineering and technology programmes, while the magnitude of the coefficient reveals that the relationship between family socio-economic status and female enrolment in engineering and technology programmes is weak. Therefore family socio-economic status has weak negative relationship with female enrolment in engineering and technology programmes. The t statistics for the correlation is -2.73 and the p-value is 0.006 (less than 0.01). This indicates that the association is significant meaning that family socio-economic status has negative and significant relationship (at 1% level) with female enrolment in engineering and technology programmes. Thus we reject the null hypothesis thereby concluding there is a significant relationship between family socio-economic status and female enrolment in engineering and technology programmes. This finding is in agreement with Adrogue (2009) cited in Abdullahi (2016) who asserts that students' academic achievement strongly correlates with their family expenditure and is based upon parents' characteristics regarding household income from wage earning activities. Hence, more family financial resources often imply increase learning opportunities both at home and in school. In line with the theory of self-efficacy (Bandura, 1977), educated parents will likely encourage the children especially the girl child by verbal persuasion to pursue their studies in the sciences as well as enrolling in engineering and technology programmes. Obama (2009) identifies this as a global issue and proposes that the number of students of both sexes be increased. He asserts that certain groups are under-represented in science careers such as girls, minorities, and people from lower socio-economic groups and that there is a need to take steps to explore reasons for such inequality and moves to remove barriers to participation.

Table 6: Binary Logit Regression Showing the Impact of Socio-economic Factors on Female Enrolment in Engineering and technology Programmes

VARIABLES		(Log Odds) FEETP	(Odd Ratios) FEETP
SES	Lower middle	0.669**	1.951867**
		(0.281)	(.5491284)
	Middle	0.320	1.376872
		(0.223)	(.3070494)
	Upper Middle	-0.110	.8960042
		(0.263)	(.235551)
	Upper	0.736**	2.086624**
		(0.347)	(.7238017)
Parents' Education	fathers education	0.0336	1.034163
		(0.0275)	(.0284141)
	mothers education	0.123***	1.130352***
		(0.0261)	(.0295106)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Given that point Biserial correlation analysis only gave us information about the nature, strength and significance of the relationship between the independent and dependent variables, Binary Logit regression analysis was also used to show cause-effect relationship between the dependent and independent variables. Binary logit was preferred over other techniques because the dependent variable is dichotomous and the categories are truly discrete (male=0, female=1). The regression table presented contains both the log odds and odd ratios. Also, this technique further gave us the possibility of testing the impact of specific indicators of the various independent variables of family socio-economic status on the dependent.

Considering lower socio-economic status, female children from households with lower middle, middle and upper socio-economic status are more likely to enroll in engineering and technology programmes compared to the males. While female children from families with upper middle socio-economic status compared to lower are rather less likely to enroll in engineering and technology programmes than the males. The findings specifically shows that compared to families with lower socio-economic status, female children from lower middle, middle and upper socio-economic status have 0.669, 0.320 and 0.736 units respectively more log odds in favour of them enrolling in engineering and technology programmes than the males but those from families with upper middle socio-economic status have 0.110 units lower log odds in favour of their enrolling in engineering and technology programmes compared to the males. The effect of socio-economic status is significant for the results comparing lower middle and lower (at 5% level) as well as upper and lower (at 5% level). This means that socio-economic status of the family has a significant impact on female enrolment in engineering and technology programmes. Moreover, parents' educational attainments (for both mother and father) positively affect the likelihood of female enrolment in engineering and technology compared to the males. The findings specifically shows that a one level increase in father's educational attainment increases the log odds in favour of their female children enrolling in engineering and technology programmes by 0.0336 units compared to that of the males while a level increase in the highest educational attainment of the mother increases the log odds in favour of their female children enrolling in engineering and technology programmes by 0.123 units compared to the males. The significance test reveals that the effect of mothers' education on their female children's enrolment in engineering and technology programmes is significant at 1% level while the effect of father's educational attainment is insignificant.

Family socio economic factors indicate that, mothers' educational attainment significantly affects female enrolment in engineering and technology programmes.

Conclusion

The finding from this study indicates that socio-economic status of a family has an influence on enrollment of female children in engineering and technology programmes. Families with high socio-economic standing influence and support their children to pursue their studies in sciences. Female children from lower, middle and upper lower socio-economic status are likely to enroll in engineering and technology programmes than the male students because their parents have much expectations from them. While female from upper socio-economic status show very little interest in engineering and technology programmes than the male students.

Parents of high socio-economic status have more expectations for the male students to pursue their studies in sciences, engineering and technology programmes than the female girl child. Similarly, results from the findings indicate that mother's educational level influences significantly female enrollment in engineering and technology programmes. Families where the mother is highly educated and more so in sciences will influence more the female girl child to further her studies in sciences and engineering programmes. The desire for parents to provide better educational opportunities to their children depends on their level of influence both at home and in schools.

Recommendation

1. Parents should be educated about good parental roles that enhance their children's motivation to pursue studies in science and engineering programmes.
2. Government should encourage more female by providing scholarships to pursue science and further their career in engineering and technology
3. Mothers should be encouraged to improve on their educational level through normal schooling or mass education or adult literacy programmes. Their educational attainment will impact female enrolment in sciences and subsequent enrolment in engineering and technology programmes
4. The state should provide micro loans to parents engaged in small scale businesses with children in science disciplines. This will help them endure the extra cost needed for the laboratory and field studies in the science disciplines.

Suggestion for further research

The study did not establish the influence of parents on career aspirations of female students in engineering and technology. Therefore more research to explicitly establish the influence of socio-economic status on career choice of female students is encouraged.

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