

Family cultural factors influencing female enrolment in engineering and technology in Anglo-Saxon State Universities of Cameroon

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Abstract

Informal sociocultural norms and expectations about the role of females in society have affected girls' educational opportunities in the domain of engineering and technology and their future career aspirations in many science disciplines. The objective of this study was to investigate the impact of family cultural factors 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 these English speaking state universities. Content analysis was used to analyse the qualitative data. Descriptive statistics, point biserial and binary logit regression analysis were used for data analyses and to test the hypothesis at $p < .05$ level of significance. The findings revealed that, family cultural factors of parents correlate significantly to students' enrolment in engineering and technology. Beyond gaining access in the domain of engineering and technology, cultural biases hinder girls' learning and pursuit of studies in engineering and technology programmes are significant in the Anglo-Saxon state universities of Cameroon. It is recommended that parents should prominently encourage their female children to pursue studies in domains culturally deem for the male students like engineering and technology.

Key words: Family Cultural factors, Female enrolment in engineering and technology, Anglo-Saxon State Universities of Cameroon.

Introduction

Engineering and Technology play a central role in modern society today with the potential to improve lives and advance national development. Nowadays, students with the greatest understanding of science, engineering and technology have access to the best opportunities and jobs. Any nation that neglects to educate her citizens in these disciplines will become seriously wanting in terms of human resources and technological innovations. Biya (1986 p.131) as cited in Nekang (2011) properly stated that:

The true democratization of education presupposes a revision of the school charter so that all young Cameroonians of age can as far as possible attend schools in their areas of residence. Since the resulting multiplication of

schools itself will create the need for more teachers, it is imperative to increase the number of teacher training schools both at the primary and secondary levels. Also, priority should be given to the mastery of science and technology in order to ensure the independence and progress of Cameroon in the modern world.

Only a person, be he a farmer, engineer, technician or intellectual, who has a good grounding in his field of study can be efficient. The technological and cultural revival of our nation requires the participation of each and every one (males and females) and the architects of this revival who are our men and women of art, letters, sciences and applied technology must be well trained. The ultimate objective is a realistic democratization of education in a spirit of independence and creativity (Nekang 2011).

The development of any society depends on equal participation of both the male and the female folks in engineering and technological development of that society. Rathgeber (2009) affirms that women should not be limited to being passive users of science and technology but instead should be active participants in scientific development and decision making. In many African countries particularly Cameroon, girls' low participation in engineering and technology programmes and subsequent career choices can be attributed largely to the construction of feminine identities and cultural beliefs that the female position is in the home as well as gender stereotypes (Kitetu, 2008). These beliefs and thoughts about gender participation in sciences and engineering hinders female participation in these professions and eventually impact on the female role in the development of their society. The propagation of these beliefs of gender stereotypes by misinformed parents hinders female choice of a career in engineering and technology field.

The influences of the parents are very important for the developmental growth of the girl child. The microsystem in bioecological theory is a pattern of activities, social roles, and interpersonal relations experienced by the developing person in a given face-to-face setting with particular physical and social features that invite or inhibit engagement in the immediate environment (Bronfenbrenner, 1994).

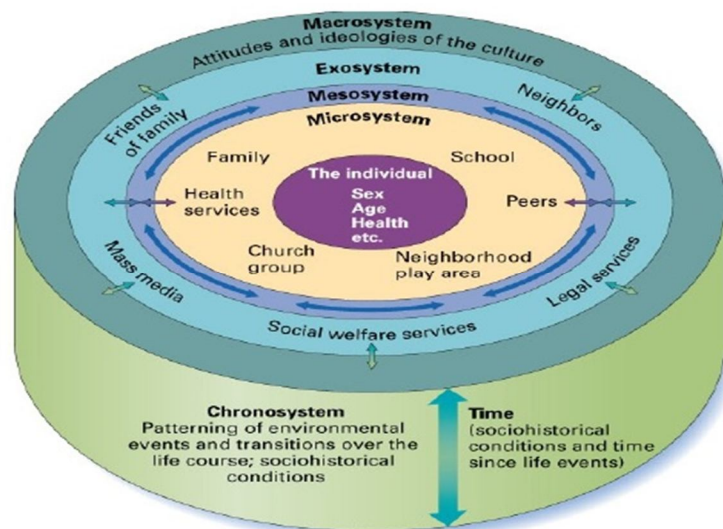


Figure 1: Bronfenbrenner (1994) bioecological model

Source: Bronfenbrenner ecological model (1994). Adapted from Yingst (2011, p.15)

In each concentric circle, the model shows how a girl child would be influenced by multiple factors and relationships between factors. To understand the growth and development of a human, one must understand and consider the entire ecological system (Bronfenbrenner, 1994). It is important to examine the entire ecological view to consider the factors affecting a young girl's involvement in sciences and subsequent enrolment in engineering and technology at the Universities. The school setting, as well as the teachers, peers, and families, are in the microsystem layer.

The family beliefs and the roles girls play at home can influence their academic trajectory. Eccles' expectancy-value theory (Eccles et al., 1983) is used to explain how parents shape children's self-perceptions about their abilities in mathematics and sciences. Parents perform these tasks in relation to their own belief systems, and these belief systems are reflected by their expectancies, values, and gender-related beliefs. In turn, children's belief systems are shaped through the combination of the experiences provided for them by their parents and through the feedback that they receive from their parents. In Cameroon, it is expected that girls from less educated parents will in adulthood take on the roles of wives and mothers (Ndefo, Tagne & Makoudem 2014) and money spent on the girl's education would thus be considered lost to the girls' family (Hart, 2008). These cultural beliefs prevent the parents from paying more attention on the education of the girl child and instil a negative perception about education on the girl child.

Ormrod (2007) observed that boys and girls interact with peers in distinctly different ways, and Santrock (2008) noted that peers extensively reward and punish gender-related behaviour, creating a set of gender-appropriate or gender-inappropriate behaviours and interests. Peer relationships influence children's beliefs, behaviours, academic achievement and motivation, especially during adolescence (Barker and Aspray, 2006 Nelson and DeBacker, 2008). Students with friends that value academic achievement are themselves more likely to value mathematics and science (Nelson and DeBacker, 2008). Similarly, girls might be discouraged from taking sciences, engineering and technology subjects if their peers and immediate environment view these subjects as inappropriate for women (Robnett and Leaper, 2013). Wentzel (1998) hypothesized that parents who believe in the entity theories of intelligence, seeing it as a stable and unchangeable trait, may hold low aspirations for their children, taking on the view that it is hopeless to have high educational goals for their children because achievement is limited by intelligence quotient (IQ). Parents who believed that intelligence is flexible have higher aspirations for their children's educational attainment than parents who believe that intelligence is rigid and fixed.

Research has demonstrated that parents who believe that they can positively impact their child's education are more involved in their child's education, spending more time on educational activities with their children at home (Hoover-Dempsey, Bassler, & Brissie, 1992, 1995, 1997). The higher educational attainment of a parent, the higher their expectations for their child's educational attainment (De Civita *et al.*, 2004) cited in Monica (2010). The correlation between mothers' educational attainment and expectations appears to grow stronger at higher levels of education; mothers who have a bachelor's degree have even higher expectations for their children than mothers who have some college education (Zhan, 2006).

Statement of the Problem

The participation and enrolment of female students in engineering and technology in the Anglo-Saxon State Universities of Cameroon is low as can be seen from the enrolment statistics in Faculty of Engineering and Technology at the University of Bamenda for the years 2014/2015 (484,

18.88%), 2015/2016 (472, 17.90%) and 2016/2017 (477, 17.91%). While in Faculty of Engineering and Technology at the University of Buea 2019/2020 (33, 07.51%), 2018/2019 (27, 08.13%), 2017/2018 (31, 09.31%) and 2016/2017 (18, 7.36%). These statistics depicts female participation in Engineering and Technology to be below 20% and comparatively, that of the male students have always been above 80%. Even when students are admitted on the bases of study of academic document, the trend remains low as can be seen in the admission of 304 students as pioneer batch of students in National Higher Polytechnic Institute of the University of Bamenda during 2017/2018 academic year which is an institute for engineering and technology. During this period where admission was done on the basis of study of files, 243(79.93%) male students were admitted against 61(20.66%) female students indicating the need to investigate the reasons for the low intake of the female students into the engineering and technological field which is the backbone of any growing economy.

Engin-Demir (2009) posit that learning is not only an outcome of formal schooling but informal learning takes place in the families, communities and peers. Engin-Demir also affirms that, Social, economic and cultural forces affect learning and thus academic achievement. These factors constitute some home factors which include: socio-economic factors, family structure, parent's predisposition to education, family role and parental expectation influences female achievement in the science subjects and subsequent enrolling in Engineering and Technology. The problem of this study therefore is; To what extent do family cultural factors affect female enrolment in engineering and technology programmes in the Anglo-Saxon State Universities in Cameroon.

Objective of the Study

The specific objectives of the study were to investigate;

- The influence of some family cultural factors on female enrolment in engineering and technology programmes in the Anglo-Saxon State Universities in Cameroon.

Hypotheses of the Study

H₀₁: There is no statistically significant relationship between family cultural factors and female enrolment in engineering and technology programmes in the Anglo-Saxon State Universities in Cameroon.

H_{a1}: There is a statistically significant relationship between family cultural factors and female enrolment in engineering and technology programmes in the Anglo-Saxon State Universities in Cameroon.

Methodology

This study adopted a cross sectional research design. The study population was all first year undergraduate students in the programmes of engineering and technology of the Anglo-Saxon State Universities in Cameroon. The study targeted 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 were chosen because they just completed high school and still have a lot of affections towards the family and are still influence by their parents.

A sample of 276 respondents was randomly selected from the engineering and technology programmes of the two Anglo-Saxon State Universities. Data collected focused on the family sociocultural factors of the respondent and educational level of the parents. 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 sociocultural factors 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 Discussions

The aim of this study was to investigate the family cultural factors on female student enrolment in engineering and technology which were the beliefs, expectations, aspirations and gender stereotype notion within the family.

Research Question One: How do family cultural factors influence female enrolment in engineering and technology programmes in the Anglo-Saxon State Universities in Cameroon?

Table 1: Family Cultural Indicators

Indicator	S. A	A	D	S.D	Dec.
Chores that girls do are difficult to combine with study	26 (9.4%)	60 (21.7%)	135 (48.9%)	55 (19.9%)	D
Girls are supposed to be home makers	17 (6.2%)	46 (16.7%)	83 (30.1%)	130 (47.1%)	D
Females are Supposed to Pursue Art Courses	75 (27.2%)	150 (54.3%)	26 (9.4%)	24 (8.7%)	A
Mathematics and science courses are meant to be pursue by boys	8 (2.9%)	24 (8.7%)	66 (23.9%)	178 (64.5%)	D
Parents tend to force their children to pursue courses they are interested in and not their children	50 (18.1%)	161 (58.3%)	40 (14.5%)	25 (9.1%)	A
Girls are rarely challenged at home or school to strive to succeed in Maths and Science subjects	30 (10.9%)	148 (53.6%)	70 (25.4%)	28 (10.1%)	A
Mean Response Score 1655	206 (12.4%)	589 (35.6%)	420 (25.4%)	440 (26.6%)	U

S.A=Strongly Agree A=Agree D=Disagree S.D=Strongly Disagree Dec.=Decision U=Undecided

Findings on family cultural factors reveal that chores that girls do are not difficult to combine with study but that house chores are good for the mental development of the child and even increase the performance level of the child and not negatively influencing their performance in science and subsequent enrolment in engineering and technology. Girls are not supposed to be home makers. In the past, women were thought of taking care of the homes and the men to be responsible in everything but civilization has changed us. Women have to be educated so that when the husband is not viable or sick or dead, she can be able to take care of the home also and bring up the children. Females are supposed to pursue art courses and that mathematics and science courses are not meant for boys only. Females need to be encouraged in any science discipline if they have the potential. Parents tended to force their children to pursue courses they were interested in and not their children

choosing their fields of study but the situation is gradually changing. Girls are rarely challenged at home or school to strive to succeed in science, technology, engineering and mathematics (STEM) subjects. Summarily, family cultural factors moderately influence female enrolment in engineering and technology programmes in the Anglo-Saxon State Universities in Cameroon.

H₀₁: There is no significant relationship between family cultural factors and female enrolment in Engineering and Technology.

H_{a1}: There is a significant relationship between family cultural factors and female enrolment in Engineering and Technology.

Table 2: Point Biserial Correlation Analysis for the relationship between Family Cultural Indicator and Female Enrolment in Engineering and Technology Programmes

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Males	201	-0.0957415	0.0669292	0.948886	-0.22772	0.036236
Females	74	0.216907	0.1212402	1.042948	-0.02472	0.4585384
combined	275	-0.0116106	0.0592777	0.98301	-0.12831	0.1050871
diff		-0.3126485	0.1325637		-0.57363	-0.0516715
r_{pb}	-0.14131					
t-stat	-2.36					
P-value	.029					

Table 2 above reveals a correlation coefficient for the relationship between family cultural indicator and female enrolment in engineering and technology programmes as $r_{pb} = -0.14131$. The negative sign reveals that family cultural indicators negatively associate with female enrolment in engineering and technology programmes while the magnitude of the coefficient reveals that the relationship between family cultural indicators and female enrolment in engineering and technology programmes is weak. Therefore family cultural indicators have weak negative relationship with female enrolment in engineering and technology programmes.

The t statistics for the correlation is -2.36 and the p-value is 0.029 (less than 0.05). This indicates that the association is significant meaning that family cultural indicators have negative and significant relationship (at 5% level of significance) with female enrolment in engineering and technology programmes. Thus we reject the null hypothesis thereby concluding there is a significant relationship between family cultural factors and female enrolment in engineering and technology programmes.

Table 3: Binary Logit Regression Showing the Impact of family cultural indicators on Female Enrolment in Engineering and technology Programmes

VARIABLES			(Log Odds) FEETP	(Odd Ratios) FEETP
Family Cultural Indicators	Difficult chores		-0.0248 (0.0809)	.975496 (.0789447)
	Supposed_home_makers		0.0106 (0.0770)	1.010687 (.0778217)
	Females_pursue_arts		0.444*** (0.0866)	1.559202*** (.1350898)
	Parents force		-0.107 (0.0915)	.8984551 (.0822059)
	Girls_rarely_challenged		0.445*** (0.0928)	1.560937*** (.1447901)

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

Binary Logit regression analysis was also used to show cause-effect relationship between the dependent and the independent variables. Binary logit was preferred over other techniques because the dependent variable is dichotomous and the categories are truly discrete.

The results reveal that controlling for other effects, difficult house chores reduces the likelihood of female enrolling in engineering and technology programmes compared to their male counterparts. The log odds of -0.0248 indicates that increase in difficult house chores reduces the log odds in favour of females enrolling in engineering and technology programmes by 0.0248 compared to the males. This effect is however insignificant revealing that house chores does not significantly impact female enrolment in engineering and technology programs, except difficult house chores.

Also, increase in the belief that females are supposed home makers positively affect likelihood of females enrolling in engineering and technology programmes. Specifically, the log odds of 0.0106 reveals that increase in the belief that females are supposed to be home makers increases the log odds in favour of female enrolling into engineering and technology programmes by 0.0106 compared to the males.

Furthermore, increase in the belief that females are supposed to pursue arts courses rather increases the likelihood of females enrolling in engineering and technology programmes compared to the males. The findings specifically shows that an increase in such beliefs increases the log odds in favour of females enrolling in engineering and technology programmes by 0.444 compared to that of the males. This effect is significant at 1% level of significance revealing that the belief that females are supposed to pursue arts courses instead of engineering and technology is a family cultural indicator that significantly increases female enrolment in engineering and technology programmes compared to the males.

The family cultural belief that parents force their children to do what they like reduces the likelihood of female enrolment in engineering and technology programmes compared to the males. The findings suggest that increase in the family cultural belief that parents force their children to do what they like reduces the log odds in favour of female enrolment in engineering and technology programmes by 0.107units compared to the males but the effect however is insignificant.

The family cultural factors that girls are rarely challenged both in school and at home positively affect the likelihood of females enrolling in engineering and technology programmes compared to their male counterparts. Specifically, the findings suggest that increase in the belief that females are rarely challenged increases the log odds in favour of female enrolment in engineering and technology programmes by 0.445 units compared to the males and this effect is significant at 1% level of significance. This implies that the beliefs that females are rarely challenged to work hard significantly affect female enrolment in engineering and technology programmes compared to male enrolment.

Conclusion

The aspirations of parents to provide better educational opportunities to their children depend on the level of their commitments in motivating their children at home and their ability to provide the necessary requirements needed by their children in school. Children of secondary and high school age recognized their parents' efforts and can cite their parental sacrifices as sources of motivation to succeed in their academic pursuits. The study findings show that respondents had different perceptions about the cultural indicators practice in their respective homes. These home cultural indicators which include house chores to be done by girls, girls as home makers, female pursue arts based courses, mathematics and science for boys and parents tend to influence the choice of discipline for their children has an impact on female enrolment in engineering and technology.

Overall, the students' perceptions were measured using point biserial which in this circumstance uses the Pearson Product Moment approach where the independent variable is continuous data and the dependent variable is dichotomous. It is expected that family cultural factors affect children from pursuing their studies in sciences and the impact is felt more by the female girl child as can be seen from the analysis using the paired sample T-test. Mothers educational attainment was seen as a major booster to encourage their female girl child pursue further studies in all the domains. Respondents from the FGD supported that house chores helps in grooming the girl child. A significant proportion of the respondents were of the opinion that females are supposed to pursue arts discipline. These beliefs prevent both the siblings and relations of the girl child from encouraging her to further her studies in the sciences and subsequent enrolment in to engineering and technology. The respondents also agreed that parents tended to force their children to pursue courses they are interested in and not their children. When children are forced to pursue a study path that is proposed by their parents, there is likelihood that female students might be encouraged to pursue arts discipline and the boys go for the sciences which significantly affects female enrolment into engineering and technology. Also, respondents indicated that girls are rarely challenged either at home or in school to do mathematics and science which are the prerequisite for admission into engineering and technology. A weak background in mathematics and sciences inhibits further studies in engineering and technology.

Recommendation

- 1) Both parents and school administrators should ensure that their female children who perform averagely in science discipline be encouraged to pursue their studies in such fields in order to promote and encourage them to choose a career in engineering and technology.
- 2) Parents should be educated about the importance of having their female children pursue a career in engineering and technology and the importance of such career to them and the country at large.

- 3) Female role models should be encouraged to visit high schools regularly in order to encourage and spur up other female students on their career choice in these domains.
- 4) Scholarships should be provided by the state to encourage female students enroll in engineering and technology programmes

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