

**DETERMINANTS OF FEMALE STUDENTS ENROLMENT IN SCIENCE,
TECHNOLOGY, ENGINEERING AND MATHEMATICS IN ABUBAKAR
TAFAWA BALEWA UNIVERSITY, NIGERIA**

ISAH MAGAJI

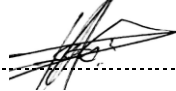
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**A RESEARCH THESIS SUBMITTED TO THE SCHOOL OF EDUCATION
IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE
AWARD OF DEGREE OF MASTER OF ECONOMICS OF EDUCATION
OF KENYATTA UNIVERSITY**

SEPTEMBER, 2021

DECLARATION

I declare that this research thesis is my original work and has not been presented in any other university/any other institution for consideration of any certificate. This research thesis has been complemented by referenced sources duly acknowledged. Where text, data (including spoken words), graphics, pictures or tables have been borrowed from other sources, including the internet, these are specifically accredited and references cited using the current APA style and in accordance with anti- plagiarism regulations.

Signature: 

Isah Magaji

Registration Number: E55F/29141/2014

Date: 1st September 2021

We attest that the work reported in this thesis has been conducted by the candidate under our supervision as the University supervisors.

Signature:

Dr. Purity Muthima

Department of Education Management, Policy and Curriculum Studies,
Kenyatta University

Date:

Signature:

Dr. Nobert Ogeta

Department of Education Management, Policy and Curriculum Studies,
Kenyatta University

Date:

DEDICATION

This thesis is dedicated to my beloved parents: Alhaji Magaji Mohammed Udubo and my late mother Malama Hauwa Magaji. It is also dedicated to my wife Mubarakah Mohammed and my children: Mubarak, Amina, Aisha, Mustapha, Fatima and Habeeb for their endurance and prayers for the success of this study.

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ABBREVIATION AND ACRONYMS

| | |
|--------|--|
| EFA | Education for All |
| FGN | Federal Government of Nigeria |
| FRN | Federal Republic of Nigeria |
| JAMB | Joint Admission and Matriculation Board of Nigeria |
| NGOs | Non-Governmental Organizations |
| NPC | National Population Commission |
| NPE | National Policy on Education |
| NUC | National Universities' Commission |
| TE | Technical Education |
| TVET | Technical, Vocational and Educational Training |
| UBE | Universal Basic Education |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNICEF | United Nations International Children's Emergency Fund |
| UPE | Universal Primary Education |
| ELPS | Education Less Privileged States |

ABSTRACT

The Nigerian National Policy on Education emphasizes the importance of university education to national development as well as educational equity to all citizens of the country irrespective of their gender, race, class or disabilities. Although there have been so many international development policies to promote gender equity in education in many countries, women continue to experience a wide range of gender disparity in enrolment essentially in Science, Technology, Engineering and Mathematics (STEM) courses in Nigeria. The study wish; to establish the extent to which Nigeria's admission policies contribute to female enrolment in Abubakar Tafawa Balewa University; to determine the extent to which students, parents and lecturers' perception contribute to female enrolment in the university, to establish the extent to which motivation contribute to female enrolment in Abubakar Tafawa Balewa university. The study adopted Bakers' theory of Human Capital on educational enrolment and decision to invest in education. The study employed mixed method approach and descriptive research survey design. The target population of the study consisted of 2025 students, 6 Deans of faculties, 77 Lecturers and 60 students' parents. Data was obtained by use of questionnaire and interview schedule. Content and face validity of the instruments were determined expert judgment. Test re-test technique was used to ascertain the reliability of the instruments using Cronbach's reliability analysis and a coefficient of 0.8 was achieved. Data was collected after obtaining a permit from Kenyatta University graduate school and Abubakar Tafawa Balewa University. Quantitative data was analyzed using descriptive statistics and regression analysis through SPSS. Analyzed data was presented in tables and graphs. Qualitative data were analyzed thematically guided by the objectives of the study. The study revealed that lack of proper admission policies contributes significantly towards low female enrolment to STEM. Furthermore, negative perceptions of parents, teachers and students on female education in STEM contributed to low female enrolment in STEM; the study also revealed that lack or negative motivation from parents and teachers contribute significantly towards low female enrolment to STEM. The study recommends that there is need for development of policy guideline by the Ministry of Education on STEM to ensure gender parity in STEM. Sensitization programs can be organized for the communities on the importance of STEM education. Lastly sensitization programs should also be organized for both the parents and teachers so as to have a change in attitude towards the education of the females so as to motivate more females to enroll in STEM related courses

CHAPTER ONE

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Introductions

This chapter covers the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, assumptions as well as the significance of the study. Others include the limitation and delimitation of the study, conceptual and theoretical framework as well as operational definition of terms.

1.2 Background to the Study

The study of STEM courses gives students a greater opportunity to understand the relationship between school, community work and the global enterprises so as to favourably compete in the new and changing world, (Akpoghol & Ugo 2016). The importance of STEM education cannot be over emphasised, as it drives economic growth and pervades every part of the society's lives. Science, Technology, Engineering and Mathematics develops students' mind, their critical thinking skills and improves their abilities (Edzie, 2014). It is also imperative to acknowledge that STEM careers play an important role in global competitiveness and thus society advances through the progress in the four STEM fields considering their importance to the society (Robert, 2015). However, despite the knowledge of the importance of STEM in economic and societal development there still exists a gender gap in STEM. The STEM fields that were considered in this study include Science, Engineering, Environmental and Technology courses.

Enrolling more women in STEM courses ensures a better nation where the nationals will be having healthier lives, are more educated, improved empowerment and a more productive country because education for women and girls, is educating the whole nation (Ngozi, 2014). Further, Thulani (2015) observed that improving access to education is central in the achievement of poverty reduction and other millennium development goals in Africa.

In the United Nations (UN) Millennium Declaration, member countries affirmed to promote gender equity and the empowerment of women as effective means to combat poverty hunger and diseases and to stimulate development that is truly sustainable, (UN Resolutions, 2000). Although progress have been made to increase women participation in many fields, UNESCO figures reveal that women made up a minority of the world's science researchers, (UNESCO, 2010).

Sustainable Development Goals (SDGs) Goal four ensures inclusive and equitable education and promotes lifelong learning opportunities for all. The goal ensures not only that, all girls and boys complete primary and secondary schooling by 2030 but also aims to provide equal access to affordable vocational training to eliminate gender and wealth disparities with the aim of achieving universal access to a quality higher education. Conclusively, it ensures by 2030 there should be equal access for all women and men to affordable and quality technical, vocational and tertiary education including university. This promotes equity in Science, Technology, Engineering and Mathematics (STEM).

Globally, women are underrepresented in the field of STEM, this is mentioned by international organizations like the UNESCO, European Commissions, the Association of Academics and Societies of Sciences in Asia (AASSA), (UNESCO, 2015). It is observed that in the European Union 16.7% on the average of Information and Communication Technology specialist are women. It is only in Romania and Bulgaria that women hold more than 25% of these roles (Catherine 2018).

Moreover, according to National Science Foundation (NSF) in the USA, women comprises of 43% of the US workforce for scientist and engineers under 75years old (NSF, 2015). The National Centre for Education Statistics in the US stated that in the US women dominated the number of persons with bachelors' degree as well as those in STEM, however they are underrepresented in specific fields including computer sciences, engineering and mathematics (NCES, 2015). Further, statistics from study in Canada by University of British Columbia in 2019 also shows that only 20 – 25% of computer science students from all colleges and universities in Canada are women. In India women earned over half of undergraduate degrees in both Information and Technology and Computer 50.7% and sciences 54% fields respectively but remain under represented in Engineering and Technology undergraduate degrees with an overall of 31.4% in 2018 (Government of India 2019). More so, in 2019 Undergraduate women in japan represented only 15.4% of Engineering major and Physical Science major (Government of Japan, 2020).

According to UNESCO Institute of Statistics 30% of Sub-Saharan technological work force are women. A strong gender imbalance exists internationally in regard

to women in STEM fields. It was pointed out by UNESCO (2014) that women constitute more than half of the world's population yet only a small proportion of them are in STEM. Nigeria as a developing nation needs more Scientists, Engineers and Mathematicians to help the country get along with the developed nations as well as develop her own technologies and sustain them (Ngozi, 2014). Women should be fully involved in STEM fields and can never be ignored in any meaningful development.

The current Nigerian education system structure is 9 – 3 – 4. This means that basic education covers nine (9) years of formal (compulsory) schooling. The basic education level is divided into two: six years of primary (elementary) and three years of Junior Secondary Education. Post Basic Education is next with three (3) years of Senior Secondary Education and lastly the Tertiary Education level that covers four years. Tertiary education level in Nigeria is comprised of Polytechnics, Monotechnic, Colleges of Education and the Universities, Federal Government of Nigeria (FGN, 2008). This study focused on girls who are at the university level doing STEM fields.

The admission policies guide and regulate admission into university education in Nigeria. The country has not initiated national policy towards gender equity in admission to universities. However, the admission policy admits a given number of students (quota system). This means that a certain number of students are admitted to the university according to catchment area or educationally disadvantaged states disregarding gender equity. The effect is that qualified female applicants' opportunities are limited as most of the vacancies are filled by their male

counterparts who scores highly. This policy does not allow other applicants from other states outside the catchment areas. This study established the extent to which system admission policy contributes to female enrolment in STEM.

The current guideline on admission in Nigeria shows the distribution as follows: the proportions by Merit (45%), Catchment area (35%) and disadvantaged states (20%) according to (NUC, 2009). Even though the policy allows a higher ratio of science-based disciplines to Arts (60:40,) there is no specific gender policy showing the proportion attached to the number of females to males admitted, which is a concern.

Studies carried out in Ghana show that low female enrolment is caused by negative perception by students and parents Afia, (2014). Further, parents usually encourage males more than the females to pursue an educational career. Egun, (2010) observed that in Nigeria the students and parents perceive STEM courses to be masculine in nature, very expensive and they take a long time to graduate. Hence, most of the females prefer to enroll in arts related disciplines. It is against this backdrop that this study wanted to determine the extent to which perceptions contribute to female enrolment specifically in ATBU. Despite the fact that the study was carried out in 2010 in Nigeria the current study wishes to establish if the same perception still holds ten years after.

In addition, it is clear that some dedicated and committed girls lack confidence in themselves. They lack opportunity and, in many cases, encouragement from those around them especially their parents and teachers. The lack of encouragement of young

women and girls to develop interests and motivation, in STEM poses a very big obstacle on their career choice (Okeke, 2019). Also Ogunjuyigbe, et al (2006) observed that socio-cultural and economic factors still determine which sex to encourage reading Science, Mathematics and Technology. This study established the extent to which motivation from parents and teachers contribute to female enrolment in STEM in Abubaakar Tafawa Balewa University, Bauchi. Table 1.1 that shows the national enrolment at the universities for all courses. It also shows the gender enrolment disparity in Nigeria from 2015- 2018.

Table 1.1: National Enrolments into Universities in Nigeria 2015 - 2018

| YEAR | FEMALES | MALES | TOTAL | % OF FEMALE | % OF MALE |
|--------------|----------------|----------------|------------------|--------------------|------------------|
| 2015 | 149,569 | 210,003 | 353,599 | 41.6% | 58.4% |
| 2016 | 166,088 | 218,354 | 388,442 | 42.2% | 57.8% |
| 2017 | 182,961 | 235,337 | 418,304 | 42.9% | 57.1% |
| 2018 | 189,619 | 232,634 | 422,253 | 44.9% | 55.1% |
| TOTAL | 688,243 | 896,328 | 1,582,598 | 44.5% | 55.5% |

Source: National Bureau of Statistics (NBS), Annual Report (2019)

Table 1.1 indicates that the number of students both male and female enrolled have been increasing significantly overtime in the Nigerian Universities. However, it is evidently observed that for the period between 2015-2018 female students were fewer than male students (NBS, 2019). Further, Table 1.2 shows the Nigeria's National Enrolment by gender and discipline in universities in all STEM courses

| Table 1.2: National Enrolment into Nigerian Universities by Gender and Discipline from 2015 to 2018 | | | | | | | | | | | | | | | | |
|--|----------------|----------------|----------------|-------------|----------------|----------------|----------------|-------------|---------------|---------------|---------------|-------------|---------------|---------------|---------------|--------------|
| | 2015 | | | | 2016 | | | | 2017 | | | | 2018 | | | |
| FACULTY | F | M | T | % OF | F | M | T | % OF | F | M | T | % OF | F | M | T | % OF |
| ADMIN | 15445 | 14563 | 30,008 | 51.5 | 15049 | 14889 | 29,938 | 50.3 | 11771 | 12589 | 24360 | 48.3 | 12440 | 12991 | 25431 | 48.9 |
| AGRIC | 4488 | 4545 | 9,033 | 49.7 | 5130 | 5626 | 10,756 | 47.7 | 14447 | 14865 | 29321 | 49.3 | 14959 | 14185 | 29144 | 51.3 |
| ARTS/ HUMANITIES | 14525 | 13860 | 28,385 | 51.2 | 12667 | 11396 | 24,063 | 52.6 | 20718 | 18050 | 38765 | 53.5 | 20301 | 16734 | 37035 | 54.8 |
| EDUCATION | 13368 | 9762 | 23,130 | 57.8 | 15751 | 11027 | 26,778 | 58.8 | 43515 | 40686 | 84201 | 51.7 | 48466 | 41151 | 89617 | 54.1 |
| ENG/TECH/ENV | 6019 | 51502 | 57,521 | 10.5 | 10102 | 52810 | 62,912 | 16.1 | 6217 | 37361 | 43578 | 14.3 | 6274 | 37707 | 43981 | 14.27 |
| LAW | 11267 | 9776 | 21,043 | 53.5 | 13132 | 10851 | 23,983 | 54.8 | 4476 | 3951 | 8427 | 53.1 | 3900 | 3590 | 7490 | 52.1 |
| MEDICINE/ PHARMACY | 31765 | 26579 | 58,344 | 54.4 | 35534 | 28316 | 63,850 | 55.7 | 15535 | 12905 | 28440 | 54.6 | 16396 | 13319 | 29715 | 55.2 |
| SCIENCES | 21633 | 38428 | 60,061 | 36 | 25632 | 39973 | 65,605 | 39.1 | 38346 | 58084 | 96430 | 39.8 | 39530 | 57186 | 96716 | 40.87 |
| SOCIAL SCIENCES | 31086 | 40988 | 72,074 | 43.1 | 33091 | 43466 | 76,557 | 42.2 | 27936 | 36846 | 64782 | 43.1 | 27353 | 35771 | 63124 | 43.3 |
| TOTAL | 149,596 | 210,003 | 359,599 | 41.6 | 166,088 | 218,354 | 384,442 | 42.2 | 182961 | 235337 | 418304 | 43.7 | 189619 | 232634 | 422253 | 44.9 |

Source: Joint Admission and Matriculation Board Annual Statistics from 2015 to 2018

According to Table 1.2, disparity exists in favor of males in the enrolment in STEM courses into the Nigerian Universities and this is more evident in the field of Engineering, Environment and Technology where 16% and below females was enrolled from 2015 to 2018. In the faculty of Science (Mathematics inclusive) only 40% and below were enrolled. This is more glaring when compared to the number enrolled for instance in the Arts/Humanities, Education and Law disciplines with 52.6%, 58.8% and 54.8% respectively in 2018. Hence a great concern that this study sought to unearth. In addition, enrolment statistics in Abubakar Tafawa Balewa University reveals the disparity in enrolment in favor of males in the university as indicated in Table 1.3.

Table 1.3: Enrolment into Abubakar Tafawa Balewa University, Bauchi (2015-2018)

| YEAR | FEMALE | MALE | TOTAL | % OF FEMALE | % OF MALE |
|--------------|--------------|---------------|---------------|---------------|---------------|
| 2015 | 2403 | 5,401 | 7,804 | 30.80 | 69.20 |
| 2016 | 2,321 | 8,011 | 10322 | 22.50 | 77.50 |
| 2017 | 2,511 | 7,989 | 10,500 | 23.91 | 76.09 |
| 2018 | 2,659 | 8,803 | 11,462 | 23.20 | 76.80 |
| TOTAL | 9,894 | 30,204 | 40,098 | 24.67% | 75.33% |

Source: Academic Planning Records, Abubakar Tafawa Balewa University, Bauchi (2020).

In Abubakar Tafawa Balewa University which is a University of Technology where STEM courses are taught there exists disparity in enrolment in favor of male students because of the fact that only 30.8%, 22.5%, 23.9%, & 23.2% in 2015, 2016, 2017, & 2018 respectively were females as indicated in table 1.2 with an average of 24.7% against males (75,33%). This disparity usually leads to inequity, low participation,

income disparity between men and women among others. In the light of this, this study therefore hoped to establish the determinants of female enrolment in STEM courses in Abubakar Tafawa Balewa University as a University of Technology.

1.3 Statement of the Problem

In Nigeria the level of females in STEM enrolment and participation is greatly low as compared to their male counterparts especially in Engineering and Environmental technology courses which has less than 15% of females enrolled. Statistics from Abubakar Tafawa Balewa University, the University of Technology where STEM courses are taught, there exists disparity in enrolment in favor of male students because of the fact that only 30.8%, 22.5%, 23.9%, & 23.2% in 2015, 2016, 2017, & 2018 respectively were females with an average of 24.7% against males (75,33%). This disparity usually leads to inequity, low participation and income disparity between males and females.

In recognition of the importance of STEM development to the overall national development, Federal Government of Nigeria has been supporting it through policies, actions, and programs. Specifically, science and technology is inculcated in National Policy on Education while there is National Policy on Science and Technology whose philosophy emphasizes Nigeria's commitment to the creation of independent, integrated, and self-sustaining economy.

Despite the interventions from Federal and state scholarship boards, TETFund, PTDF that provides scholarship to those in STEM fields the problem still exist and hence this study therefore established the determinants of female enrolment in STEM courses in Abubakar Tafawa Balewa University as a University of Technology.

1.4 Purpose of the Study

The purpose of this study was to establish the determinants of female enrolment in STEM subjects in Abubakar Tafawa Balewa University, a university of technology in Bauchi, Nigeria, and recommend possible measures to enhance female enrolment in STEM courses.

1.5 Objectives of the Study

1. Establish the extent to which admission policies contribute to female enrolment in Abubakar Tafawa Balewa University;
2. Determine the extent to which Students, Parents and Lecturers' perceptions contribute to female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria; and
3. Establish the extent to which parents and teachers' motivation contribute to female students' enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria.

1.6 Research Questions

The study sought to answer the following research questions:

1. To what extent do admission policies contribute to female enrolment in Abubakar Tafawa Balewa University?
2. To what extent do perceptions of Students, Parents and Lecturers' perceptions contribute to female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria?
3. To what extent does teachers and parents' motivation contribute to female students' enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria?

1.7 Significance of the Study

The findings of this study may be of help to various bodies in Nigeria in order to ensure gender parity;

Female students at the various levels of education may find the recommendations of this study very useful so as to encourage them to participate in the STEM courses and develop positive perception and in these fields and participate the labor force.

Parents may find the recommendations of this study valuable to motivate and encourage their female daughters to enroll in STEM programs so as to contribute their quota in the socio- economic development of their country.

Lecturers may also find the recommendations arising from this study useful in devising an appropriate environment of teaching so as to encourage and motivate the female students to enroll as well as participate in STEM programs.

The study findings may be of use to the Federal Ministry of Education (FMoE) and National Universities Commissions (NUC), in reviewing education admission policies to ensure gender enrolment parity and STEM disciplines in the Nigerian universities.

Secondly, recommendations arising from the research may also be used by Non-Governmental Organizations (NGOs) who have interest in women empowerment and devise strategies for handling issues of low female enrolment.

Lastly, the study may form basis for further research as it contributes to the knowledge on increasing female enrolment into Nigerian Universities.

1.8 Assumption of the Study

This study has the following assumptions:

- (i) The Nigerian university admission policies will not change during the study period.
- (ii) All the informants would be willing to give and honest in their responses

1.9 Limitations of the Study

The following were the limitations of the study:

Inadequate resources and finance posed a challenge for this study. However, the researcher sampled the subjects of the study.

1.10 Delimitation of the Study

The delimitation of the study included the following:

- (i) The study was conducted at Abubakar Tafawa Balewa University, Bauchi only because it is the only Federal University in Bauchi State and the largest University of Technology in the North East Zone of Nigeria.
- (ii) The research's respondents were Deans, Lecturers, parents and students of the university because they are the major internal stakeholders to respond to the questions about female enrolment in STEM.

1.11 Theoretical Framework

The study was grounded on Beckers' theory of Human Capital (1975) on educational enrolment and decision to invest in education. According to Cudd, (2002) there are so many theories that are used to explain and describe differences in enrolment. However, majority of the studies done on enrolment patterns in college were based on Gary Becker's model, the "Human Capital". Hence the underpinning theory for this research was Bakers' theory of Human Capital on enrolment.

The central tenets of the Human Capital Theory (HCT) is that education increases an individual productivity and therefore leads to higher future earnings. It conceptualized students' decision about whether or not to attend college which can be viewed as the first in a sequence of college-going decision student make, (John, 2003). The HCT views students' decision to attend college is investment in higher education as important form of human capital.

It is also seen as an access decision and view policies affecting the decision to access policies, Pema, (2006). If access to higher education is a policy problem, then a key question from economists to ask would be what policy would re-arrange incentives to stimulate behavior by individual and /or institutions that would promote access to participation in higher education. Hence, HCT can be used for higher education policy analysis because it explained how economists developed and utilized models of decision making to analyze higher education policies.

The HCT also explained and illustrates how models of market for investment in higher education can be applied to the analysis of higher education policies in the policy problem areas on students' access to post-secondary education. This study would focused on the university admission policy of Nigeria.

According to the HCT, an individual decides to enroll in college/university as an investment in his or her earning power. The proponents of this theory are of the view that individuals usually calculate the value of going to college by making a

comparison between both direct and indirect cost with the expected income to gain. Hence, they make decisions that will guarantee maximum utility in the long term.

Moreover, sociologist's models of status attainment also suggested a number of other variables that compliments economic factors to influence the college plan and enrolment. The factors include both the personal traits (like academic ability) and inter-personal factors (like the level of encouragement one receives from his parents as well as the teachers, (Luke 2003). Hence, this theory is appropriate to this research since it stresses on the level of encouragement one receives from his parents as well as teachers which is essentially a motivation.

Further, Alex (2010) argued that individual choice to enroll in Higher education can be understood only on the ground of human expectation, perception and beliefs. Therefore, it would help us to analyze perceptions of parents, students and lecturers of Abubakar Tafawa Balewa University, Bauchi, Nigeria.

1.12 Conceptual Framework

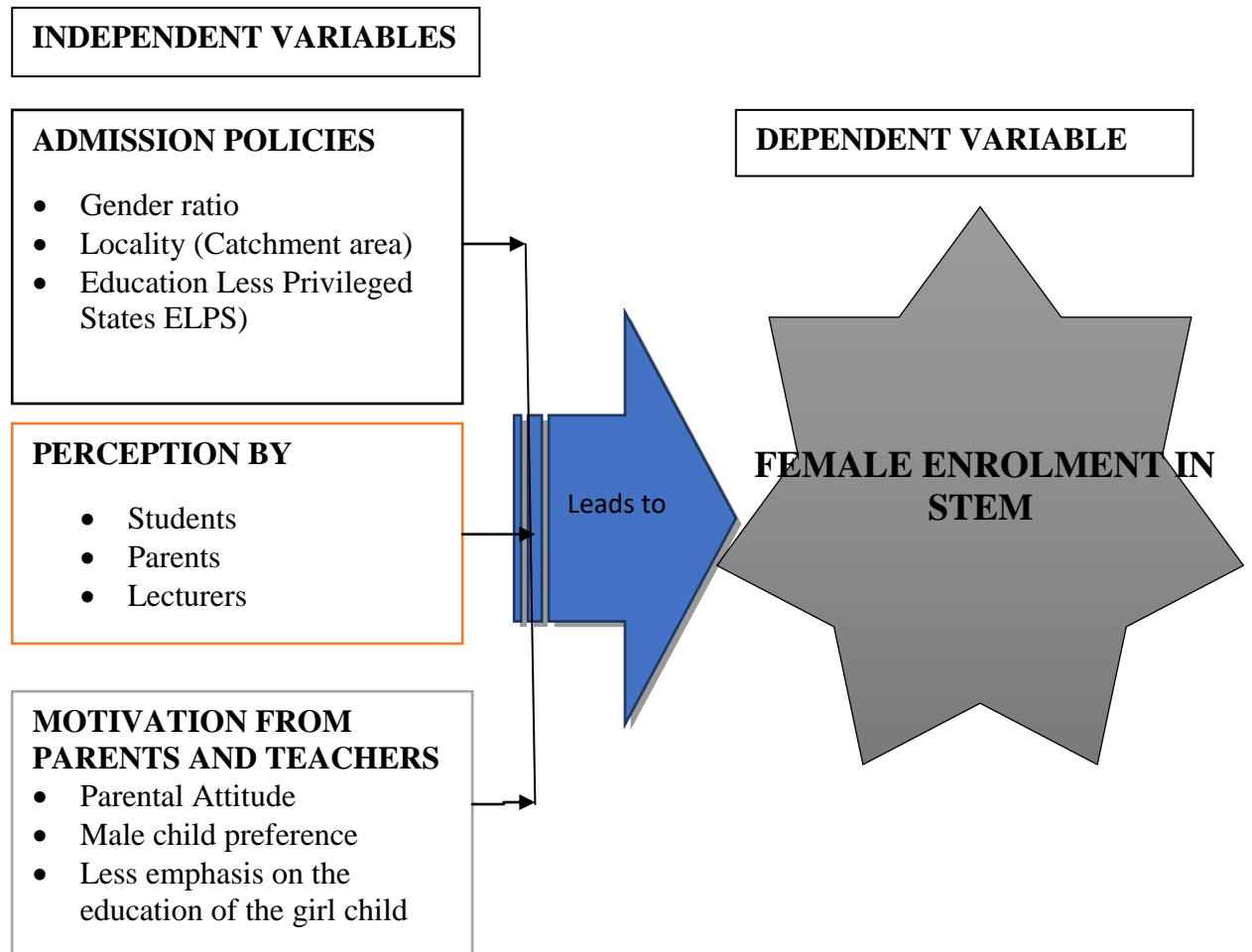


Figure 1.1: Conceptualised Frameworks on Determinants of Female Enrolment in STEM Courses (Researcher, 2018)

Figure 1.1 shows the relationship between dependent and independent variables. It shows how the independent variables (admission policy, the stakeholders' perceptions, and motivation) contribute to the dependent variable which is female enrolment in STEM courses. It explains how the policy and the quota given to catchment areas, Education in Less privileged States (ELPS) as well as the proportion assigned to gender

can lead to high or low female enrolment in STEM. The policy emphasis a given numbers to areas with no particular interest in specifying an increased and specified proportion to each gender can affect the dependent variable which is female enrolment in STEM.

Secondly, the perceptions of the various stakeholders like the students, parents and lecturers can also negatively affects the enrolment of females in STEM related courses. Hence it shows how perceptions of these stakeholders can affect female enrolment in STEM either positively or negatively.

Lastly, how motivation from parents and teachers can also affect female enrolment in STEM related disciplines. Female enrolment in STEM courses is a function of the independent variables of admission policy, the stakeholders' perceptions, and motivation from parents and teachers.

1.13 Operational Definition of Terms

| | |
|------------------------------|---|
| Access to education: | This is a free and unlimited or unhindered opportunity to enroll at university level to obtain knowledge, skills, and abilities to participate and contribute actively to the societal development. |
| Equity in education: | It is ensuring that all members of the society are fairly given opportunity to access education at all levels |
| Gender parity: | The equality or state if being equal or equivalent in term of male and female enrolment |
| Enrolment: | Admission into university undergraduate program. |
| Enrolment disparity: | Unequal admission into university undergraduate program. |
| University education: | An undergraduate degree education received at universities. It is usually the next level of education after secondary level of education. |
| Gender disparity: | This is the unequal treatment between male and female |
| Motivation: | Moral and financial support given to candidates to enroll in STEM from parents and teachers. |
| STEM: | Technology and Environmental undergraduate courses |

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter reviewed literature related to the study. This includes enrolment trends in Nigerian Universities, Nigeria's University admission policy, students' perceptions, motivation for female enrolment in STEM in Nigeria and lastly, the summary and gap identification.

2.2 Enrolment Trends in Universities

It is widely acknowledged that females make up more than fifty percent of the world's active population. According to UNESCO, (2014) there are about 1.9 million children, sixty percent of whom are girls, and greater percentage has no access to primary schooling. Even though in African, women contribute greatly to the national development, inequalities still exist when it comes to school enrolment in all levels of education. The constitution of the Federal Republic of Nigeria (FRN, 1999) stipulates that the country's commitments to equal treatment of the citizens irrespective of their race and sex. In support of the constitution the National Policy of Education (NPE), (FGN, 2008) also stresses equal educational opportunities for all Nigerian children. According to the Department of Economic and Social Affairs, Population Division of the United Nations 2019 Report, Nigeria had a population of 206,139,589 and out of this; females constitute about forty-nine percent. Studies done point out the inequity in access to female education in favor of the males.

Although the federal government of Nigeria launched universal basic education program there seem to be no concrete effort by the government to guarantee and ensure equal access for the girl child enrolment, retention and completion rate at the basic education level. This has robbed off the girl child an opportunity to contribute to national development optimally. Girls' education is indispensable to the achievement of quality learning. It is also acknowledged that girls who attend school usually get married late, bear fewer children and are less vulnerable to diseases including HIV and AIDS. Girls have an advantage of acquiring knowledge and skills that lead to increased earnings. Evidence shows that the rate of return to a year of secondary education for girls brings about 25 per cent increase in wages later in life (UNICEF, 2015). This study hoped to establish if the same phenomena exist at the university level of education.

There is a difference female enrolment among various countries in Africa, South-East Asia and Latin America at the different levels of education. Primary school enrolments are highest in all the countries while tertiary level enrolments are the lowest (UNICEF, 2015). Globally, the enrolment into universities is witnessing a great disparity between male and female students and rates differ by regions of the world, with less women being enrolled in universities in Sub-Saharan Africa and Asia. On the contrary, higher rate of admission of female students is experienced in the developed nations UNESCO (2008 and 2013). Nonetheless, this research established the nature of the disparity in enrolment in Abubakar Tafawa Balewa University, Bauchi.

UNESCO (2013) points out that in the Caribbean and Latin America the enrolment rates in tertiary education have increased but gender disparity is evident. It was observed by (UNICEF, 2013) that approximately ninety percent of countries have achieved gender parity at the primary level. Only forty-six percent had done so for secondary education and that Peru and Mexico had reached gender parity at the tertiary level by 2005. However, in 2019, undergraduate women in Japan represented just 15.4% of engineering major and 27.9% of physical sciences major, (Government of Japan, 2020). Further, according to UNESCO statistics, 30% of the Sub-Saharan technology work force are women, (UNOSSC, 2019). This study, therefore, tried to explore the reasons why most of the countries of sub-Saharan Africa particularly Nigerian Universities have a lower female enrolment into universities compared to their male counterparts and in STEM courses.

This is glaring in the statistics provided by National Bureau of Statistics (NBS), (2019) that pointed out that female enrolment into national universities of the country in engineering, technology and environment courses was less than 15% from 2015 to 2018. And even in sciences (mathematics inclusive) the enrolment of females was 39.77% and 40.87% in 2017 and 2018 respectively. It is in light of this that, the study examined the determinants STEM low enrolment.

It was also observed by UNESCO (2013) that in sub-Saharan Africa, there is a significant gender disparity at the tertiary education level and no country had achieved gender parity by 2005. Hence, it is pertinent to establish the elements that contribute to

this significant low female enrolment among most of the countries of Africa, most especially Nigeria intending to put forward strategies to enhance female enrolment in university education. This study therefore, tried to establish the determinants for female enrolment in STEM in Abubakar Tafawa Balewa University, Bauchi. With a view to forward strategies to enhance female enrolment in STEM.

According to UNESCO Institute of Statistics (2015), the tertiary gross enrolment ratio (GER) was 10%. Ajayi and Adeniji (2009) observed that Nigeria being the most highly populous country in Africa had witnessed a growth in enrolment leading to an immense expansion and more important and obvious at the lower level of educational system which has put more burden and pressure at the university level. The total enrolment into STEM courses in universities of Nigeria as reported by JAMB statistics from 2012 to 2016 indicate a wide discrepancy in the enrolment between males and females as the average percentage of female enrolled was 26% as indicated in table 2.1. The table below shows the variations in enrolment between male and female students in STEM courses between 2011 and 2015. The study tried to establish the current situation.

Table 2.1: Enrolment into Nigerian Universities STEM programmes (undergraduate) from 2015 to 2018

| YEAR | FEMALE | MALE | TOTAL | % OF FEMALE |
|-------|---------|---------|---------|-------------|
| 2015 | 35,734 | 92,783 | 128,517 | 27.8 |
| 2016 | 37,876 | 94,495 | 132,371 | 28.6 |
| 2017 | 74,545 | 123,215 | 197,760 | 37.8 |
| 2018 | 77,159 | 122,397 | 199,556 | 37.8 |
| TOTAL | 225,314 | 432890 | 658,204 | 34.23 |

Source: National Bureau of Statistics (NBS), 2019

From the above Table it is pertinent to note that there exists a gap between male and female students when it comes to enrolment in STEM courses into Nigerian Universities. Therefore, this study tried to establish the determinants contributing to low female enrolment in STEM courses in Abubakar Tafawa Balewa University Nigeria.

A study by Eloka (2014) on gender disparity in school enrolment in Nigeria maintained that there is gender disparity between male and female students in enrolment in favor of males at primary, secondary and tertiary. Few studies have been conducted in the STEM courses in Nigerian Universities on low female enrolment and focused mainly on analysis and pattern of enrolment. This research focused on the determinants of female enrolment in STEM disciplines in the Nigerian Universities.

In a study conducted by Egun and Tubi (2010) on gender gap in vocational education affirms that the enrolment ratio in Engineering, Agriculture and Business Education is more in the favor of males at the detriment of the girls. It was also noted there is a gap

in enrolment and participation in physical sciences at the secondary school level. This is also witnessed in Switzerland which also witnessed a persistent gender segregation among adolescent youth especially noticeable on STEM, (Makarova, 2019). This study focused on female enrolment in STEM courses at the university.

A study by Kolawole (2014) analyzed the development and pattern of enrolment in Nigerian universities generally as well as some selected discipline and across Nigeria's geopolitical zones and found out that disparity exist between females and males in the university enrolment in favor of males. The study also noted that an enrolment gender gap exists in the science and science-based disciplines. This study hoped to find out if the same gender gap in STEM enrolment exist in Abubakar Tafawa Balewa University, Bauchi.

2.3 Nigeria's Universities Admission Policies

Over the years, admission into Nigerian universities has become a serious problem because of some inherent problems in the admission policies itself that do not focus on gender equity in enrolment into universities and STEM programs in particular. Prior to 1978, each university conducted its placement examination and admitted students based on the available spaces.

Due to the over concentration in one university leaving others for some reasons, the Nigerian government established a central placement examination body, the Joint Admissions and Matriculation Board (JAMB) which was mandated to regulate

admissions into universities, colleges and polytechnics in the country (Nwadiani & Igineweka, 2005, Kanyip, 2013 & JAMB 2015). However, this study hoped to establish whether the Joint Admission and Matriculation Board ensured gender equity in enrolment especially in Abubakar Tafawa Balewa University, Bauchi.

The federal government initiated and promoted a federal character policy which has the responsibility of ensuring equal opportunity to all university education. One of the objectives of the policy is equal opportunity for all, and also to ensure proper implementation and application of the federal character principle, where everyone is given an opportunity to equally participate in the socio-economic and political development of the country (Odigwe and Swem, 2016). However, the admission policies of the country do not take care of the gender concerns as far as enrolment in STEM in Nigerian Universities is concerned which this study tried to establish as there is no specific national policy towards gender parity in STEM enrolment in the country. The policy of equal opportunity deals with all aspects of life of the population. However, the focus of this study is on the application of this policy in university education with particular emphasis on admission. The quota system is one of the strategies used in the equalization of educational opportunity through its influence on admission matters. Odigwe & Swem (2016) believe that the quota system is a principle that stipulates the number of candidates from each State of the federation. The quota system encourages giving certain percentage, ratio or proportion to states or the federation and try to balance the gender gap both in admission in general and STEM enrolment in particular.

Another admission policy in Nigeria is on Academic merit. Odigwe & Swem (2016) opine that the policy takes into consideration the scores of individuals in the university matriculation examination conducted by the Joint Admission and Matriculation Board (JAMB), and Senior Secondary Certificate Examinations (SSCE). The gap in girls and women enrolment in STEM courses in the university level of education is growing day by day. Is the same trend found in Abubakar Tafawa Balewa University, Bauchi? This may not be connected to the fact that the number of girls applying to enroll in these disciplines is low and coupled with the fact that their performances is lower sometimes than that of the males. Hence there is no cut off marks for the females so as to have the chance to be enrolled as in other countries like Kenya.

The policy on education for less privileged states is also seen as another issue in the application of admission policy under the federal character of Nigeria. According to Federal Government of Nigeria Adamawa, Bauchi, Benue, Borno, Benue, Niger, Plateau, Yobe, and Jigawa, Taraba, Zamfara Kano, Kaduna, Katsina, Kebbi, Kwara, Gombe, Bayelsa, Ebonyi, Kogi and Sokoto States were identified as the educationally disadvantaged states in the country (Okwori, 2003 & NUC, 2009). Even though a quota (20%) is assigned to the less educationally disadvantaged states, there is no specific proportion or number assigned to women in their admission even with their peculiarity, which this study tried to establish.

The catchment area is the next Policy in the Nigerian admission policy which seeks to promote equalization of educational opportunity. Catchment area is seen as the

geographical location where a university is established. This policy stipulates that the states close to each university should receive special preferences concerning admissions. The current guidelines on admission are as follows according to NUC (2009) and Omeje (2016): merit (45%), catchment area (35%), disadvantaged states (20%). Even though the policy stipulates the percentage of sciences-based disciplines to Arts as (60:40, sciences: arts ratio). This study established how admission policies of the Federal Government of Nigeria, specifically with regards to quota, educationally disadvantaged states and catchment areas contributes to female enrolment in Abubakar Tafawa Balewa University, Bauchi.

Agboola and Ofoegbu (2010) were of the opinion that some of the problems of access to university education in Nigeria could be traced back to the fact that formal education was introduced in the different regions of the country at different times and the country mainly laid much emphasis on the basic education, cared less on laying a strong foundation for the university education which could provide policies to ensure access, equity as well as quality and efficiency. The research further revealed that enrolment in university education in Nigeria is generally low when compared with the number of the applicants with fewer females all over the country. However, in the US studies showed girls have an interest in STEM with about 74% of middle school girls having interest in STEM but the interest drops when they reach high school Silva (2019). This study hoped to establish if the same phenomena in STEM courses in Abubakar Tafawa Balewa University, Bauchi.

Moreover, Kalai, (2010) affirms that the quota system, which is seen as a system that guides and regulates admission into university education in Nigeria has a great consequence of limiting the chances of admitting more qualified candidates basically because of the state they originated from. Kalai, (2010) further explained that in Kenya there is tremendous increase in enrolment in higher education that grew up to 230% in 2010, and concluded that it as a result of the introduction of parallel programs or self-sponsored programs in the country (Kalai, 2010). Whereas in Nigeria enrolment into university education do not witness a greater increase, solely because of the policy adopted by the country which emphasize 60:40 science to arts ratio, catchment area and quota system. It is important to acknowledge that while some countries of Africa adopted policies that ensure maximum opportunities for a greater access to higher education in their countries, Nigeria on the other hand emphasized more on equal opportunity for enrolment into university education based on the geographical location in the country which resulted in not witnessing a greater increase in the number enrolled in universities. There is no gender policy in the enrolment criteria in STEM which this study focused in Abubakar Tafawa Balewa University, Bauchi.

A study conducted by Kanyip, (2013) on admission crises in Nigeria and quality of education in Universities, affirms that the recent admission policies in the country have further worsened the access to university education. Kanyip, (2013) further maintained that universities in Nigeria admit students using the guidelines and principles of the NUC and JAMB, basically on the principles of merit, quota,

catchment areas and educationally disadvantaged states. Instead of these policies enhancing and increasing access to university enrolment in the country, they end up restricting it with less than 20% gaining admission into universities. This study found out the extent to which the quota system to catchment areas and less educationally disadvantaged state policies contribute to female enrolment in STEM courses in Abubakar Tafawa Balewa University, Bauchi in particular.

A study by Odigwe & Swem (2016) revealed that Nigerian university quota admission system and quality of university education in Cross Rives state in Southern part of the country concluded that the quota principle of admission into universities in Nigeria which reflect the federal character policy negates the principles of equality. In the same vein, the study was of the opinion that indigene and non-indigene policy in admission to Nigerian universities has greatly limited access to university education, nevertheless the current study paid attention to specifically admission policies in relation to specifically STEM courses. This study, therefore established the extent to which Nigeria's quota admission policy contributes to female enrolment in STEM courses in Abubakar Tafawa Balewa University, Bauchi.

2.4 Stakeholders' Perceptions of Female Enrolment

Most African societies minimally fail to appreciate the role of women in economic development, bearing in mind the importance of the traditional role men played (Egun & Tobi, 2010). Girls are given more domestic responsibilities, which consequently leave them with no much time for their studies, (Yusuf, 2015). Most Parents tend to

support male student more than females to pursue educational careers. Sometimes girls are likely to marry early and bear more children to whom they devote much of their time (Egun & Tobi, 2010). The study hoped to find out if same practice happens in Abubakar Tafawa Balewa University, Bauchi.

Culturally, girls were encouraged to take up fields of study that corresponded with their traditional roles as wives and mothers as a result it was erroneously conceived that “women education ends in the kitchen”. These roles were also promoted and reinforced by educational institutions and family expectations resulting to low enrolment in sciences and agriculture by girls who fall back to more “feminine subjects, such as home economics and arts (McDonald, 2004). It is perceived that sciences are masculine fields of study and women do not possess the energetic and mental capacities required to succeed in this field, (Egun & Tobi, 2010). This study tried to establish if the same negative perception is found in Abubakar Tafawa Balewa University, Bauchi.

A study conducted by Aderemi (2013) on the trends in enrolment, graduation and staffing in science and technology in tertiary institutions of Nigeria stresses that socio cultural attitude influences to a greater extent the number of women in the university. Aderemi (2013) further observes that there has been a greater awareness among female secondary school students to be enrolled and excel in science and technology courses. The study concluded that there should be a more enlightenment programs in the society to change the attitude on gender roles so as to improve and enhance

acceptability of women to join professions that are male dominated. Female enrolment into science related courses is viewed by the stakeholders especially the students as being very hard and masculine; hence this study established how negative perceptions contribute to low female enrolment in Abubakar Tafawa Balewa University, Bauchi especially in STEM courses.

A research by Afia (2014) in Ghana on the inequality of gender participation of females in STEM courses in higher institutions of learning found out that gender differences greatly affect the choice of a student' program to pursue especially in STEM courses. This was observed in most families and societies in the country. The study pointed out that in Ghana their traditional belief of women' roles and the preference to boy child education is at the detriment of the girls and women. It greatly influenced the opportunities to girls and women have in the society. This creates a sense of girls and women marginalization in the African societies, Nigeria included. This study established if the same perceptions contributed to low female enrolment in Abubakar Tafawa Balewa University, Bauchi in STEM courses.

Cultural practices in societies in Africa like Ghana, views STEM courses as difficult and sometimes complex to study, hence males enrolled in those disciplines and living the arts, social sciences and vocational to the girls and women. This is accelerated by cost of STEM courses and duration it takes before graduation. This delay encourages low enrolment of females in these courses. Basically, since it is seen as a waste of resources girls may end up in her husband home, (Afia, 2014). This study tried to

establish whether the same negative perception contributed to low female enrolment in STEM in Abubakar Tafawa Balewa University, Bauchi.

2.5 Motivation

Motivation could be considered being a catalyst to learning and that is why students must be well motivated by both parents and teachers. According to Hermit (2007) students must be motivated to learn because children are naturally inclined to be curious and enthusiastic about learning new things. Tella (2007) observed that motivation of students in education and the impact on their academic performance is very important to effective learning therefore, students must be well motivated by both parents and teachers.

A study conducted by Aguele and Uche (2007) on female participation in Science, Technology and Mathematics (STM) education in Nigeria and national development identified attitudes and expectations of parents and teachers as being responsible for low participation of females in mathematics and science. This study established the extent to which motivation by parents and teachers contribute to female students; enrolment in STEM in Abubakar Tafawa Balewa University, Bauchi.

Education is the process of becoming critically aware of one's reality in a manner that leads to effective action upon it. The plight of women, in terms of education is further compounded by the negative attitude of parents toward female education. Some parents are usually reluctant to send their girl child for formal education especially to

higher levels like their male counterpart. This study established that parents attitude to a greater extent contribute to their enrolment in STEM courses.

Family and community's outlook on life impacts girls' education, such as their academic choices and career aspirations. However, it is essential to mention that generally, educated parents value education greatly. However, there can be gender differences in how they influence their children's educational choices, consciously, or unconsciously. They might not inspire their daughters, for instance, to pursue science and engineering disciplines, or they may influence them to believe that these are unsuitable occupations for females.

Furthermore, Udeani (2012) reports that by the end of schooling the number of females with the motivation and background to progress into further studies in sciences or careers in science and technology and into activities integral to the application of science and technology for development is much smaller than that of males with similar motivation and background. This study established the extent to which parents and teachers' motivation contribute to female enrolment in STEM courses.

Alade (2012) blamed poor women participation in STEM courses on religious and cultural beliefs surrounding the role of women in the society. Danjuma (2010) opines that the girl-child's access to STM is hindered by large family size, poverty and parents' low educational background. It is expected that children from parents who

have a good educational background usually received more motivation to enroll in education. Therefore this study established the extent to which motivation from parents contribute to their enrolment in STEM courses.

According to Joseph, (2014) female students are discouraged by their parents from pursuing science related subjects which they perceive as masculine. They instead encourage them to train in humanities. This aspect contributes to poor science performance and low enrolment. Another contributing factor as underscored by Joseph is parents' perception on subject area to the child's future, have profound implications. The Perceived importance could directly influence the amount of parental encouragement and the opportunities provided to the child that can be exhibited in the kind of activities, toys, and reading materials provided.

Furthermore, a study by Joseph (2014) on the factors influencing girls' low enrolment and poor performance in Physics in secondary schools in Nandi South District, Kenya remarked that, innovative and creative teachers ease the learning of physics. This study established teachers motivation contribute to female students' enrolment in STEM courses in Abubakar Tafawa Balewa University, Bauchi.

A study by Appiah-Castle *et al.*, (2020) on female enrolments in STEM in higher education in Ghana opined that the belief that Science and Math are male subjects and as a result, people often have negative attitudes to women in 'masculine' STEM careers. Saucerman and Vasquez (2014) conducted a literature review to identify

socio-psychological barriers to STEM field participation for women and observed that parents trust that boys are more engrossed and proficient in STEM subjects and that STEM subjects are more challenging and less important for girls than boys. This study established that parent attitude influence the decision of girls to enroll in STEM courses.

Ekine (2013) believes that the persistence of stereotypical attitudes towards the gender roles of women and men has created a pervasive climate of discrimination and entrench stereotypical roles of women in the family and their participation in public life as responsible for the obvious gender inequalities in the preference for science based subjects at various levels of learning.

Salman, Olawoye and Yahaya (2011) pointed out that the preference of some parents toward certain disciplines, girl negative attitude towards mathematics, teachers' negative attitude to students, poor methods of teaching and inadequate importance attached to girl-child education by the government and the society as some of the factors. Hence this study established the extent to which teachers motivation to female students contribute to their enrolment in STEM courses.

Parents & government have failed to provide the conducive learning environment for the female children. Some parents due to misplaced priorities and other petty reasons have left their children in the hands of house help and their teachers alone; they don't have time for their children to encourage them nor teach them anything that will help

them in life. The children are left to their fate amidst environmental distractions (Motunruyo 2010).

In most cases family members hold females' responsibilities above career or education hence they may discourage a woman from STEM programmes (Aja-Okorie, 2013). Family responsibilities of the woman can hinder or slow down career advancement especially when family support is minimal or non-existent (Akinsowon and Osisanwo, 2014). Nevertheless, this study intended examine the level to which parents' attitude and motivation contribute to the enrolment of females in STEM disciplines.

Moreover, Mugo (2012) posits that the learning environment such as the teaching pattern, school facilities and resources can also affects women's career choice and academic performance. Hence this study tries to establish the extent to which teachers motivation contribute to the enrolment of females students in STEM courses.

According to Angeline (2011) the technique teachers employ in school setting can be disheartening to girls and cause them to drop out of school. Angeline also noted that teachers in some countryside part of Africa consider that boys go to university to pursue disciplines like engineering, medicine and architecture and so on. On the other hand, girls take course like teaching, designing and so on. This stereotyping informs how teachers attend and teach girls in classes, especially Science and Mathematics. This scenarios impact the performance of the girls. It is on this record that one out of every three women in the world is illiterate. This implies that boys are more in the

school than girls. There are also established facts that, teachers give more attention to boys and provide them with more opportunities for hands-on work while the girls are almost overlooked or not given as much attention as the boys (Maryann & Patience 2017 and UNESCO, 1999). Hence, this study established the extent to which teachers attitude contribute to female students' enrolment in STEM courses.

According to Khaguya (2014) some parents are usually unwilling to send their daughters to school because of the belief that education and school may be a corrupting influence. Khaguya asserts that, in some communities, there is the belief that in co-educational schools, as most primary schools are, girls' morals would be corrupted because of the amount of time they spend with boys. Additionally, there is a fear for the sexual and physical safety of girls in school due to cases of physical and sexual harassment and abuse from peers and teachers in the school. Khaguya also notes that, where schools are situated long distances away, parents are usually worried about their daughters' safety while traveling to and from school.

Moreover, Khaguya (2014) further established that, many parents and community members have an attitude that enlightening girls is a waste of time and resources, because they will ultimately get married off and their education would only benefit their husbands and the families they marry into. Besides, the money used in educating girls would thus be considered lost to the girls' family. This study established that parents lack of motivation negatively contribute to female students enrolment in STEM courses in Abubakar Tafawa Balewa University, Bauchi.

Parents and community members expect boys would become the breadwinners of their future families, it is for this reason boys are provided with every advantage to help them fulfill this role. This includes providing education to them as far as possible. On the other hand, girls are expected that they will have husbands to provide for them and therefore education is not vital for them.

Girls are responsible for such a diverse number of household tasks; some parents prefer to keep their daughters at home. This is especially true in areas where girls engage in income earning activities to supplement family income. Many parents therefore find that the opportunity cost of education is too high. Ghana for instance has a number of examples of cultural practices that compromise girls' access to education and therefore their participation in technical subjects, (Khaguya, 2014).

Kola, (2013) study on perceived causes of students' low enrolment in science in secondary schools in Nigeria suggested that Parents and teachers should always motivate students to enroll for science courses by exposing them to various career opportunities available in science. This study focused on how motivation from parents and teachers contribute to their enrolment in STEM programs.

Najib et al (2019) study on gender gap in science and technology education in Nigeria. Revealed that female students in most educational system in Nigeria are underrepresented particularly in the area of mathematic, physics, chemistry and technology i.e. electrical, mechanical, and civil engineering. The study further

observed that these differences in gender enrolment were as a result of cultural belief, traditional, early marriage, parental educational background among others and recommended that community should encourage and sponsor their member to study science and technology particularly girls. This study investigated the extent to which motivation from parents and teachers can influence the enrolment of females in STEM courses.

However, a study by Lawal and Muhammed (2014) found that the socio-economic status of parent, parental occupation, cultural factors, socialization and early marriage, academic factor are the courses of gender gap in science and technology education. This study found out how the parent socio-economic status and parental occupation would motivate the females to enroll in STEM courses in Abubakar Tafawa Balewa University, Bauchi.

Alhassan (2008) in a study conducted in the northern region of Ghana on socio-economic and cultural factors of girls' education revealed that poverty, low parental income, low parental level of education, early marriage, male child preference, religious practices, and polygamy were the major factors affecting girl's education at primary and secondary levels. Further, a research by Okafor and Arinze, (2012) on gender accessibility and equality in education in Nigeria, identified factors such as cultural beliefs and practices as factors that influence enrolment into schools. They observed that culture had continued to play an important role and was an obstacle to gender equality in education in Nigeria. The studies observed that, this could be traced

back to the patrilineal nature of Nigerian society that is male-dominated. Some of the cultural challenges include: subjecting women to early marriage, preference to boys' education, inferiority complex and a destined role of being wives. The research restricted itself to enrolment of females in STEM at the university level.

Olukayode (2015) conducted a research on gender disparity in enrolment in Nigerian basic formal education and identified households and families' constraints as some factors that brought about gender enrolment disparity. The household and family constraints identified include: the rate of poverty in the home, preference to the male-child, overstraining of the girl-child with house hold chores and labor, insecurity of the girl child, especially in case of long distance between home and school. It was also observed that poverty compels many parents to marry off their daughters to wealthy men and withdraw girls from school. This study established male child preference influence the enrolment of females in STEM based courses in Abubakar Tafawa Balewa University, Bauchi.

2.6 Summary and Gap Identification

Studies conducted on admission policies and criteria of admitting students in many countries of the world emphasized on improving female access to university education and sometimes emphasized setting a given ratio of Arts to Sciences in admission so as to improve the number enrolled in STEM related disciplines and even assigning gender proportions, (Agboola & Ofoegu, 2010, Kalai, 2010, Kanyip, 2013, and Odigwe & Swem, 2016). The current Nigerian admission policies do not include

gender policy, or a specific proportion to gender in the admission criteria. It is in this regard that, the study established the extent to which Nigeria admission policy contribute to female enrolment in STEM courses in Abubakar Tafawa Balewa University, Bauchi.

Studies have shown that in some societies like Ghana, parents usually tend to support and encourage males more than the females to pursue an educational career basically because of some socio-cultural factors, (Afia, 2014). Consequently, others see it as a waste of resources as the girls may end up in their husband's families (Mcdonald, 2004; Aderemi et al., 2013). These negative perceptions have greatly affected the level of girls and women enrolment in universities and STEM courses particularly in most African countries. Hence, this investigation examined the extent to which a combination of students', parents' and lecturers' perception contribute to low female enrolment in Nigerian universities especially in STEM disciplines in Abubakar Tafawa Balewa University, Bauchi, Nigeria as the only university of technology.

Studies conducted on how motivation from parents and teachers contribute to the female enrolment in STEM include parental attitude, less emphasis on the education of the girl child, male child preference and the attitude of teachers. (Udeani, 2012; Alade, 2012; Danjuma,2010; Joseph, 2014; Appiah-Castle et al (2020; Ekine, 2013; Akinsowon and Osisanwo, 2014; Angeline, 2011; Maryann & Patience. 2017; Khaguya, 2014; Najib et al 2019; Lawal and Muhammed, 2014; Alhassan, 2008; Okafor and Arinze, 2012; and Olukayode,2015). Even though so many factors were

identified as some of the determinants for low female enrolment in university education in Nigeria and some countries of the world, this study aims to establish the extent to which motivation from parents and teachers contribute to low female enrolment specifically in Abubakar Tafawa Balewa University. Further, many studies about female in STEM were conducted more than five years ago, but this study established what is the current situation.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter describes the research design, study locale, target population, sample and sampling procedures, research instruments, piloting, validity and reliability, data collection procedures, methods of data analysis and logistical and ethical considerations.

3.2 Research Design

This study employed a descriptive survey design. The purpose of the study was to establish the various determinants that contribute to low female enrolment in STEM in Abubakar Tafawa Balewa University, Nigeria. In order to achieve the objectives of the study, the descriptive survey design was used because the design would help on gathering information on the extent to which admission policy, students, teachers and parent's perceptions and motivation contribute to female enrolment in STEM courses.

Descriptive survey design can also be used when collecting information on attitude, views, habits or any of the variety of social issues of people, (Orodho and Kombo, 2002). The descriptive survey design was appropriate and suitable for this study because it would help the researcher collect data from the members of a population so as to determine the current situation and where possible to draw conclusion. It is also appropriate when the study purpose is to establish a detailed description of an issue (Mugenda & Mugenda 2003). Besides, it gives a research the confidence to explain

social phenomena. And sometimes is seen as the best method through which respondents can freely express their feelings, opinions and thoughts, (Trochim and William 2006).

Mixed method was also used in the study for both quantitative and qualitative data. Quantitative data was analyzed using descriptive statistics and regression analysis and the quantitative data was analyzed thematically based on the objectives of the study. Thus triangulation was adopted.

3.2.1 Variables

The study has both the dependent and independent variables.

3.2.1.1 Independent Variables

The independent variables of this research were the determinants of female enrolment in STEM courses at the university education, namely, the admission policies, students, parents and lecturers' perceptions as well as parents and teachers' motivation influencing female enrolment in STEM.

3.2.1.2 Dependent Variable

This is a characteristic or attribute that depends on or is influenced by the independent variables (Creswell, 2012). Thus, the dependent variable of this research work is female enrolment in STEM courses at the university.

3.3 Location of the Study

This study was carried out in Abubakar Tafawa Balewa University (ATBU), Bauchi, Nigeria. There are ten (10) federal universities of Science and Technology in Nigeria. It is situated in the North-East zone of Nigeria that comprised of six (6) states, namely: Bauchi, Gombe, Borno, Yobe, Adamawa and Taraba States. The zone is one of the six (6) geo-political zones of the country, others include: North-West, North-Central, South-West, South-South and South-East. North-East zone of Nigeria is considered to lag behind in education, (JAMB 2015) because of its poor performance recorded in Senior Secondary School Examinations (SSCE).

The study was conducted at ATBU basically because of the influence of culture and religion of the people of the area. Which might influence the parents not to allow their female children to pursue STEM courses as a result of cultural or religion affiliations, (Garba, 2013).

Bauchi State was chosen because it has the largest population among the states of Gombe, Borno, yobe, Adamawa and Taraba in the North-East region of Nigeria. Bauchi State has a population of about 5.6 million according to the 2006 national census and almost all the population characteristics of the zone are found in the State. Therefore, with large population it could provide diverse, adequate, convincing and sufficient data to enable the study to achieve all its objectives. Each state has at least one federal and one state university. Further, the choice of the Abubakar Tafawa Balewa is because it is one of the two (2) only Federal Universities of Technology in

the North East zone of Nigeria and there exist a wide disparity in enrolment in favor of the males in the university with only about 30% females (ATBU, 2016). The other University of Technology is situated in the neighboring state of Adamawa which currently is facing the Boko Haram insurgency. Abubakar Tafawa Balewa University is also one of the federal universities in the zone which was established long ago before the introduction of Universal Basic Education in 2000 as a result of the declaration of Education for All (EFA).

3.4 Target Population

The study targeted six (6) Deans of Faculties at the University, 77 lecturers of fifth year students, 60 parents/guardians and 2025 fifth year students of the various departments of the university. There are thirty-seven (37) departments from the six (6) faculties of the university (ATBU, 2016). Hence, the study used 2385 subjects comprising 6 deans, 60 parents, 77 lecturers and 2025 students from 15 departments of the 6 faculties of the University. Fifth year students of each department selected were targeted because they are stable, focused and through with their industrial attachment and have chosen and specialized in their courses. Sixty (60) parents were target purposefully because according to According to Jen (2002) in purposive sampling, samples are picked and studied not necessarily based on the representativeness of the sample of the population.

Table 3.1: Target Population

| | No. of Students | No. of Lecturers | No. of Parents/Guadian | No. of Deans | Total |
|--------------|-----------------|------------------|------------------------|--------------|--------------|
| | 2025 | 77 | 60 | 6 | 2385 |
| Total | 2025 | 77 | 60 | 6 | 2385 |

Source: Academic Planning Records, Abubakar Tafawa Balewa University, Bauchi (2016).

3.5 Sampling Techniques and Sample Size

3.5.1 Sampling Techniques

This study employed purposive and simple random sampling techniques to determine the sample size. There are six (6) faculties in the university. Fifteen departments from the faculties were selected purposively, Jen (2002). To ensure unbiased each of the departments were sampled.

From each department a sample size of 20% of fifth year students were selected randomly totaling to 405 as suggested by Mugenda (2003). Mugenda (2013) suggests 20% and 10% as representative enough when the population is small and large respectively. A different sample percentage was used in this study because of the number of the students in the study. Jen (2002) & Mugenda (2013) opine that if the population of the study is in thousands, the sample should be a minimum of 10% and 20% if the population is small will do for a descriptive research design. Simple random sampling technique was used to select the 405 students because it gives each respondent a chance to be selected thus avoiding biasness (Mugenda, 2003 & Orodho,

2009). Hence 20% of the students were drawn as the sample comprising male and female students from the 15 departments of the university.

Twelve (12) parents of students were drawn at 20% and fifteen (15) lecturers were also drawn at 20% with at least one lecturer from each department and the Head of Departments of the selected 15 departments were taken as they are also lecturers of the department. Twelve (12) parents were sampled at 20% with atleast one from each faculty.

Table 3.1: Sampling Techniques

| Sample | Sampling techniques | Sample size (%) |
|---------------|----------------------------|------------------------|
| Lecturers | Simple Random | 20% |
| Deans | Purposive | 100% |
| Students | Simple Random | 20% |

Source: Researcher, 2019

3.5.2 Sample Size

The 6 deans of faculties were taken as census. Whereas 15 lecturers were drawn from the 77 lecturers of fifth year students and 12 parents were selected using simple random sampling technique from 60 parents all at 20%. A total number of four hundred and five (405) students were drawn from 2025 students targeted for this study which represents 20% (Mugenda, 2013) as shown below:

Table 3.2: Sampling Size for Dean, Parents and Lecturers

| Respondents | Target Population | Sample Size | Percentage | Procedure |
|-------------------|-------------------|-------------|------------|-----------|
| | N | N | Sampling | |
| Deans | 06 | 06 | 100% | Purposive |
| Lecturers | 77 | 15 | 20% | Simple |
| Parents/Guardians | 60 | 12 | 20% | Simple |
| Total | 143 | 33 | | |

Source: Abubakar Tafawa Balewa University, Bauchi (2016).

Table 3.3: Sampling Size for Students

| Faculties/Departments | Target Population | | Sample Size | | Percentage (%) |
|--|-------------------|------------|-------------|------------|----------------|
| | Males | Females | Males | Females | |
| <i>Faculty of Agriculture</i> | | | | | |
| Agric. Economics | 76 | 37 | 15 | 7 | 20 |
| <i>Faculty of Engineering</i> | | | | | |
| Chemical Engineering | 54 | 14 | 11 | 2 | 20 |
| Civil Engineering | 118 | 42 | 24 | 8 | 20 |
| Computer Engineering | 48 | 12 | 10 | 2 | 20 |
| Electrical & Electronics | 94 | 38 | 19 | 8 | 20 |
| <i>Faculty of Env. Technology</i> | | | | | |
| Estate Management | 81 | 25 | 16 | 6 | 20 |
| Quantity Surveying | 113 | 31 | 23 | 6 | 20 |
| Urban & Regional Planning | 68 | 14 | 14 | 2 | 20 |
| <i>Faculty of Mgt. Technology</i> | | | | | |
| Accounting | 108 | 48 | 22 | 10 | 20 |
| Business Management | 163 | 69 | 33 | 14 | 20 |
| <i>Faculty of Science</i> | | | | | |
| Biological Sciences | 121 | 78 | 24 | 16 | 20 |
| Micro Biology | 93 | 42 | 19 | 8 | 20 |
| Physics and Applied Physics | 34 | 10 | 7 | 2 | 20 |
| <i>Faculty of Tech. Education</i> | | | | | |
| Educational Foundation | 134 | 49 | 27 | 10 | 20 |
| Science Education | 148 | 63 | 30 | 12 | 20 |
| | 1453 | 572 | 292 | 113 | |
| TOTAL | 2025 | | 405 | | |

Source: ATBU, 2016

3.6 Research Instruments

Questionnaire and interview were employed to seek respondents' responses. based on the research objectives. The main instruments for data collection in this study were questionnaire for students and lecturers as well as scheduled interview for the deans and parents. The reason for using multiple tools in this study is to allow triangulation.

a) Students' Questionnaire

A questionnaire was used for students in this study as it is easy to be administered to a large number of respondents, enhance data collection, analysis and ensures respondent's confidentiality. This study used both open and closed ended questionnaires. Further, the study used the questionnaire as it is very efficient in descriptive statistics as well economical in terms of time and it has a standardized way of answering that makes it simple to compute and analyze (Begi, 2009). Moreover, questionnaires give respondents the freedom to express their views and make suggestions concerning the matter under study, (Gay, 1992).

The students' questionnaire was in three sections: Section 'A' sought personal information on demographic, educational and family background of the students; Section 'B' sought information on the determinants of female enrolment in STEM courses in universities.

b) Lecturers' Questionnaire

A questionnaire was also be given to lectures of the students in the university so as to have their opinions and views with regards to low female enrolments in the university

because they also constitute critical stakeholders. Questionnaires were considered for the lecturers as they are relatively convenient, confidential, cheaper and quickest method of data collection (Smith, 2012). The questionnaire has three sections. Section A, sought personal information on the Lecturer's information on gender, qualification and working experience. Section B sought information on the determinants of female enrolment in STEM courses in universities.

c) Dean's Interview Schedule.

An interview schedule was used to gather comprehensive information from the Deans of faculties of the university. An interview schedule was preferred because it made it possible for the study to find the essential data to achieve the objectives of the study. It provided a room for the interviewer to standardize the interview by asking same question in different manner.

An interview was administered to the Dean as it has a higher response rate because respondents are more involved and motivated and they know more about the research problem thus tend to give insightful information (Cohen, & Manion, 1994).

A structured interview schedule for the Deans allowed the researcher to collect information regarding the phenomenon from individuals who observed and experienced it. Further an interview gives the researcher the opportunity to probe for deeper answers and ask for details, elaborations and examples (Guest, 2008). The data

obtained from the interviews were used to supplement data obtained through questionnaires (Mugenda & Mugenda, 2012).

Interview essentially consists of asking questions, listening as well as recording the responses of the interviewee. Hence, it is more advantageous to ask few individual questions as an alternative of conducting an extensive questionnaire-based research study. See appendix C attached.

d) Parent's Interview Schedule.

An interview schedule was also used to gather comprehensive information from the parents of students in the four schools. Parents are major decision makers in the students' decision to enroll in university education and STEM programs as well. An interview schedule was preferred to the parents because it gives room for interpretation in case of language barrier as some of the parents interviewed could not effectively communicate in English. Further, interview was used because it helped the researcher to explain, better understand and explore research subjects' attributes, experience, opinions, behavior phenomena and so on. See appendix C attached.

3.7 Pilot Study

Piloting was carried out before the actual research in order to identify the inadequacies and ambiguities in the instrument to be used, Amin (2005). In this case, pre-test was conducted in one (1) department that is not part of the study sample, as they are likely to have similar features or characteristics with those that were used in the final study. The pilot study enabled the researcher to determine the extent to which the research

instruments were able to provide reliable and valid information (Kombo & Tromp, 2006). This helped in determining the practicability of conducting the research and also established the reliability of the instruments using test re-test method.

Mugenda and Mugenda (2013) recommended that 1% to 10% of the sample size is adequate for pilot study. Questionnaires were administered to lecturers and fifth year students of the department of Mathematics to fill before and after a period of 2 weeks. The fifth-year students of this department were used because they share similar characteristics with the sampled students and hence this department was included in the main study. Purposive sampling method was used to pick the lecturers and students of the departments where 4 lecturers and 16 students were selected which give a total of 20 respondents.

The Piloting revealed that some of questions in the questionnaire for determinants of low female enrolment in STEM were too lengthy, ambiguous or repetitive. Furthermore, some items on the interview schedule were found unclear on the information they sought. Consequently, after the piloting, adjustments, review and modifications were made to each of the items in the relevant research instruments.

3.7.1 Validity of the Instruments

Face validity refers to the researchers' subjective assessment of the presentation and relevance of the measuring instrument as to whether the items in the instrument appear to be relevant, unambiguous, reasonable and clear, (Oluwatoye, 2012). However,

Cohen's Kappa Index (CKI) was adopted to ascertain the face validity of the instrument and the Kappa index obtained was 0.7. This is in line with what DM et al. (1975) recommended that a minimally acceptable Kappa is 0.60.

Judgmental approach was adopted to establish the content validity of the research instruments. The approach involved literature review and a follow up evaluation of expert judges or panels (Hamed 2016). The content validity ratio (CVR) proposed by Lawsher (1975) was used to establish the content validity of the instrument. This is a linear transformation of a proportional level of agreement on how many experts within a panel rate an item 'essential'. Hence calculated as follows:

$$CVR = \frac{n_e - (N/2)}{N/2}$$

Where CVR = Content Validity Ratio

n_e = number of panel members indicating 'essential'

N = Total number of panel members

$P = .05$

The final evaluation to retain an item is based on the CVR which depends on the number of panels. Hence a presented table that guide for a valid value of CVR for the evaluated item(s) will be retained.

3.7.2 Reliability of the Instruments

The study re-administered questionnaires to the students and lecturers of the Mathematics department, twice after two weeks. Cronbach's alpha reliability analysis was used to get the coefficient in order to estimate the reliability of the instruments.

Hence, Cronbach's alpha reliability analysis was carried out to measure the internal consistency of the questionnaire items. The results of both pilot one and two for both the students and the lecturers show that all the measure possess high reliability standards i.e. > 0.7. This is in line with the standard that an instrument with Cronbach's alpha coefficient of 0.6 is regarded to have an average reliability while a coefficient of 0.7 and above shows high reliability standard of the instrument (Tatham et al, 2006).

3.8 Data Collection Procedure

This stage involves three major logistic phases Orodho, (2005).

3.8.1 Phase One

The researcher obtained a research permit from Kenyatta University Graduate School, drafted an implementation and work plan for the research process and a budget to take care of the research expenses in the field. Instruments were also prepared as well as recognizance visit to the university. A research assistant was also identified and trained appropriately.

3.8.2 Phase Two

This is the actual field work where the researcher visited the area of the study and sought permission from Abubakar Tafawa Balewa University, Bauchi and after establishing a good relationship with the respondents, questionnaire was administered with the help of the research assistant and confidentiality of the respondents' responses was also discussed.

3.8.3 Phase Three

This is the retrieval stage of the duly filled questionnaires. The information gathered was used as first-hand information. Interview was also conducted concurrently while administering the questionnaire.

3.9 Data Analysis

Descriptive statistics was used to analyze the quantitative and qualitative data. Quantitative data was analyzed using regression analysis and qualitative data was analyzed thematically as per the study objectives.

Table 3.4: Data Analysis

| S/N | OBJECTIVE | INDEPENDENT VARIABLE | DEPENDENT VARIABLE | ANALYTICAL TOOL/MEASURES |
|-----|-----------------|----------------------|--------------------------|------------------------------------|
| 1 | Objective One | Admission Policies | Female Enrolment in STEM | Percentage and Regression Analysis |
| 2 | Objective Two | Perceptions | Female Enrolment in STEM | Percentage and Regression Analysis |
| 3 | Objective Three | Motivation | Female Enrolment in STEM | Percentage and Regression Analysis |

Objective One: To establish the extent to which admission policies contribute to female enrolment in Abubakar Tafawa Balewa University.

Quantitative data was generated from the questionnaire on extent to which admission policy contributes to female enrolment in STEM courses. Regression analysis was

used to analysis the data and presented in tables and charts. Qualitative data from interview were also analyzed thematically according to the study objectives.

Objective Two: To determine the extent to which Students, Parents and Lecturers' perceptions contribute to female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria

Quantitative data was generated from the questionnaire on the extent to which students, lecturers and parents' perceptions contribute to female enrolment in STEM courses. Regression analysis was used to analysis the data and presented in tables and charts. Qualitative data from interview were also analyzed thematically according to the study objectives.

Objective Three: To establish the extent to which motivation contribute to female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria

Quantitative data were generated from the questionnaire on motivation determinants of female enrolment in the university. Regression analysis was used to analyse data and presented in tables and charts. Qualitative data from interview were also analyzed thematically according to the study objectives.

3.10 Logistical and Ethical consideration

The researcher ensured strict adherence to ethics and operated within the moral considerations of Kenyatta University especially with regards to research on individuals and tries to maintain the confidentiality of information given by the

respondents and ensuring the anonymity of the respondents. Further, the researcher also tried to be honest and very objective with no any element of being bias with regard to the design, data analysis, interpretation and discussions.

The rules and guidelines of academic fraud, plagiarism and others were taken into consideration. To ensure the safety and rights of the respondents, all the prevailing ethical considerations were explained to them. Further, the respondents were informed that their participation is voluntarily and they assured of total confidentiality of their responses. Lastly, recording of interviews were done with the express consent of the respondents concerned. After collecting the data, the researcher sent an appreciation note to the respondents to show appreciation.

CHAPTER FOUR

PRESENTATION OF FINDINGS, INTERPRETATION AND DISCUSSION

4.1 Introduction

The purpose of the study was to establish various factors that contribute to low female enrolment in Science, Technology, Engineering and Mathematics (STEM) in Abubakar Tafawa Balewa University, Bauchi, Nigeria. Qualitative data were analyzed thematically. Quantitative data from the questionnaire that were in Likert scale and open-ended questions were analyzed by the use of SPSS version 20 and presented in tables. Interview guide was used to collect qualitative data that were analyzed and discussed thematically.

Data were analyzed and discussed under the following sub-headings; Questionnaires return rate, demographic information of the respondents, Nigeria's admission policy, students, lecturers and parents' perceptions, and parents and teachers' motivation on female enrolment in STEM.

The objectives of the study are to:

1. Establish the extent to which admission policies contribute to female enrolment in Abubakar Tafawa Balewa University.
2. Determine the extent to which Students, Parents and Lecturers' perceptions contribute to female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria.

3. Establish the extent to which motivation contribute to female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria.

4.1.1 Questionnaire Return Rate

A total of four hundred and five (405) questionnaires were distributed to the fifth-year students of the 15 selected departments of Abubakar Tafawa Balewa University, Bauchi. 391 students' questionnaires were filled and returned, with 14 questionnaires returned unfilled. This gave a respondents' rate for 391 students' equivalent to 96.5% which is a good response rate for a study according to Hagger et al., (2003). The response rate for teachers was 100% (15 lecturers) as shown in Table 4.1.

Table 4.1: Questionnaire Return Rate

| Target respondents | Sampled | Respondents | Response Rate |
|---------------------------|----------------|--------------------|----------------------|
| Students | 405 | 391 | 96.5% |
| Lectures | 15 | 15 | 100% |

Source: Students and Lecturers Questionnaires

The findings in Table 4.1 indicate that the study achieved questionnaire return rate of 96.5% and 100% for students and lecturers respectively of the response rate. This agrees with Hagger et al. (2003) who argued that a response rate of 50%, 60% or 75% gives adequate data to draw a conclusion about a study.

4.2 Demographic Information of Respondents

This section presents the distribution of the respondents by faculty, department, gender, age, parental occupation, and parental level of education, family size and the qualification of the lecturers.

4.2.1 Students' Distribution by Faculty

The study question tried to answer what the distribution by faculty in Abubakar Tafawa Balewa University, Bauchi is. The data is important because it shows the distribution of the students by faculty in order to show the number of respondents from each faculty in the university. Table 4.2 presents the findings on the distribution of the students by faculty.

Table 4.2: Students' Distribution by Faculty

| Faculty | Number of Students | of Sampled Students/Frequency | Percentage (%) |
|---------------------------------|---------------------------|--------------------------------------|-----------------------|
| Agriculture | 113 | 22 | 05 |
| Engineering | 420 | 84 | 21 |
| Environmental Technology | 332 | 66 | 16 |
| Management Technology | 388 | 78 | 19 |
| Sciences | 378 | 75 | 19 |
| Technology Education | 394 | 79 | 20 |
| Total | 2025 | 405 | 100 |

Source: ATBU, Bauchi (2016)

Findings in Table 4.2 showed that majority of the students were from the faculties of Engineering 84(21%), Technology Education 79(20%) and Science 75(19%). Others were Management technology 78(19%), Environmental Technology 66(16%) and Agriculture 22(5%). The variation here reveals the real scenario of admission in the university as many applicants do not apply for admission in Environmental Technology and Agricultural Sciences which might be probably due to the perception that its graduates are not easily employed

4.2.2 Students' and Lecturers' Distribution by Department

This is an attempt to answer the question on distribution by departments in Abubakar Tafawa Balewa University, Bauchi. The data is important because it shows the distribution of the students by department. The findings of the distribution of students and lecturers by department is summarized in Table 4.3.

Table 4.3: Students' and Lecturers' Distribution by Department

| Department | Students Frequency (f) | Percentage (%) | Lecturers frequency (f) | Percentage (%) |
|-----------------------------|-----------------------------------|---------------------------|--|---------------------------|
| Agric. Economics | 22 | 5.4 | 1 | 6.67 |
| Chemical | 13 | 3.2 | 1 | 6.67 |
| Engineering | | | | |
| Civil Engineering | 32 | 7.9 | 1 | 6.67 |
| Computer | 12 | 3.0 | 1 | 6.67 |
| Engineering | | | | |
| Electrical & Electronics | 27 | 6.7 | 1 | 6/67 |
| Estate | 22 | 5.4 | 1 | 6.67 |
| Management | | | | |
| Quantity | 29 | 7.2 | 1 | 6.67 |
| Surveying | | | | |
| Urban & Regional | 16 | 4.0 | 1 | 6.67 |
| Panning | | | | |
| Accounting | 32 | 7.9 | 1 | 6.67 |
| Business | 46 | 11.4 | 1 | 6.67 |
| Management | | | | |
| Biological | 40 | 9.9 | 1 | 6.67 |
| Sciences | | | | |
| Micro Biology | 27 | 6.7 | 1 | 6.67 |
| Physics and Applied Physics | 9 | 2.2 | 1 | 6.67 |
| Educational | 36 | 8.9 | 1 | 6.67 |
| Foundation | | | | |
| Science Education | 42 | 10.4 | 1 | 6.67 |
| Total | 405 | 100.0 | 15 | 100.0 |

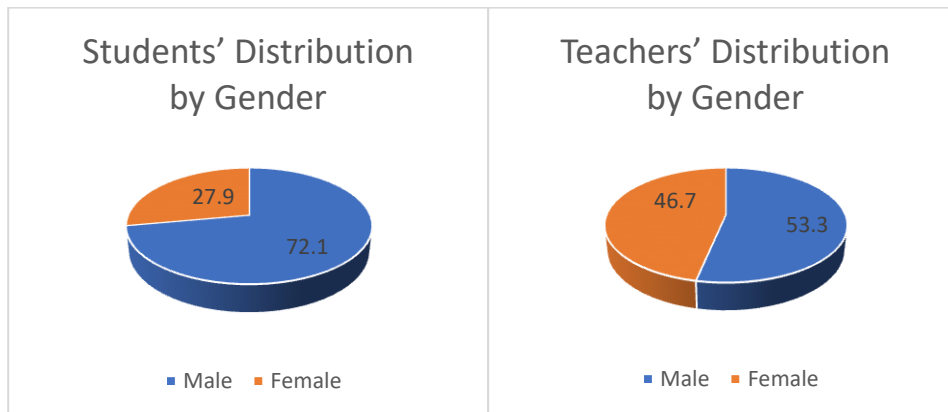
Source: ATBU, Bauchi (2016)

There were 15 departments that were involved in the study and from the findings in Table 4.3 it shows that Agricultural Economics department had only 22 students representing (5.6%) of the total number of students in the departments selected. Chemical Engineering 12(3.1%), Civil Engineering 29(7.4%), Computer Engineering 12(3.1%), Electrical and Electronics 26(6.6%), Estate Management 21(5.4%), Quantity Surveying 28(7.2%), Accounting 32(8.2%), Business Management 42(10.7%). Others are Biological Sciences 40(10.2%), Micro Biology 27(6.9), Physics and Applied Physics 8(2.0%) and Science Education 40(10.2%). Moreover, one lecturer each from the 15 departments that were involved in the study were selected from each department.

4.2.3 Students and Lecturers' Distribution by Gender

The outcome of the distribution of students and lecturers by gender is important so as to reveal if there exists gender disparity in Abubakar Tafawa Balewa University, Bauchi. The findings by the gender of the respondents are summarized and presented below in Figure 4.1.

Figure 4.1: Students and Lecturers' Distribution by Gender



Source: Students and Lecturers' Questionnaires

The results of the analysis in Figure 4.1 reveals that out of 391 students who were involved in this study, about three quarters 281 (72.1%) were male and 109 (27.9%) were female. And out of the 15 lecturers sampled for the study more than half 8 (53.3%) were male while 7 (46.7%) female.

A large proportion of respondents both students and lecturers were males. It was observed that although there is a variation in the composition in the students' gender, the composition in the lecturers' gender shows less gap. The variation witnessed reflects the nature of the composition that exists in the educational institution in Nigeria (Garba, 2014).

However, there were several efforts in Nigeria towards enhancing the number of female enrolments in STEM that have been proposed. This is seen in the National Policy in Education (NPE), (FRN, 2004) which stipulates that admission ratio into technology and business courses shall be weighed according to the ratio of 70:30, and

that 60% of admissions into conventional universities shall be allocated to STEM oriented courses, while at least 80% of admissions into universities of technology shall be allocated to STEM oriented disciplines, Akanwa and Kalu (2018).

Moreover, Abe (2012) observed that despite the NPE (FRN, 2004) declaration of equal right and opportunity for all Nigerian children to education, irrespective of their real or imagined disabilities, the gender difference in enrolment in STEM courses shows a great disparity resulting to low enrolment of female in these disciplines.

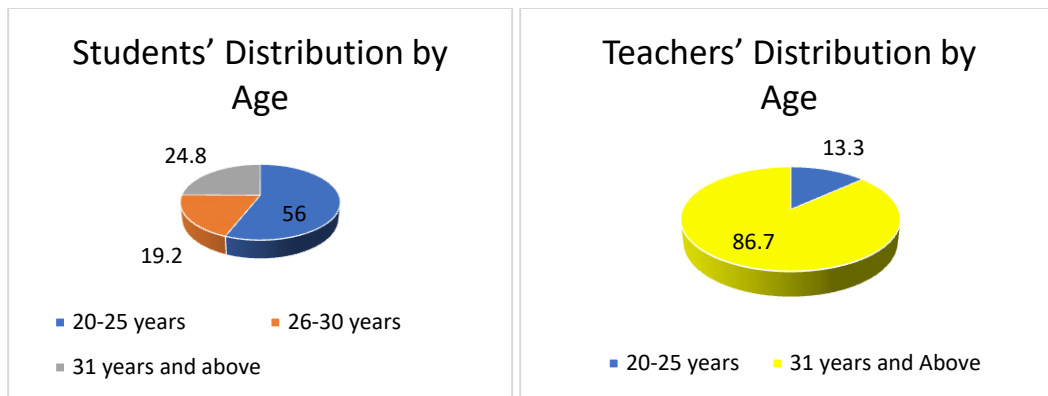
The findings of the study on the distribution of the respondents by gender is in line with what Abe (2012) and Akanwa and Kalu (2018) observed, that even though there were some efforts and polices to enhance the number of females in STEM related disciplines, a wide gap still exist in enrolment leading to low females in the areas. The continued low enrolment of females in STEM undermines the dream of Nigeria of seeing science and technology as fundamental to national development and transformation.

4.2.4 Students and Lecturers' Distribution by Age

The finding in Figure 4.2 sought to establish the students and lecturers' distribution by age. The data on the age of the respondents is crucial so as to reveal various age classifications of the respondents and whether they are old enough to understand and appreciate the determinants of low female enrolment in STEM in Abubakar Tafawa

Balewa University, Bauchi. The findings of the age distribution of the respondents were summarized and presented below in Figure 4.2.

Figure 4.2: Students and Lecturers' Distribution by Age



Source: Students and Lecturers' Questionnaires

The results of the analysis in Figure 4.2, shows 219 (56%) of the students were aged between 20 and 25 years, 75 (19.2%) were 31 years and above and 97 (24.8%) were between 26 and 30 years of age. Moreover, more than three quarters 13 (86.7%) of the lecturers were 31 years and above while only 2 (13.3%) were aged between 20 and 30 years.

This shows that majority of the were between the age bracket of 20 to 25 years and fewer were falls in the age bracket of 31 years and above. This indicates that most of the students were young, active, matured and energetic to be enrolled and perform well in STEM courses. Further, it shows majority of the students were at their legal age of university education as stipulated in the 6-3-3-4 system of education in the

country. The lecturers' age distribution also showed that they might be able to comprehend the challenges of female enrolment in STEM related disciplines.

4.2.5 Students and Lecturers' Distribution by Parental Occupation

The outcome in Table 4.6 sought to establish the students and lecturers' distribution by parental occupation. The data on the parental occupation of the respondents is important so as to inform the study of the various parental occupations of the respondents. The findings of the respondents' parental occupation are as shown in the Table 4.6.

Table 4.4: Students and Lecturers' Distribution by Parental Occupation

| Parental Occupation | Students Frequency (f) | % | Lecturers' Frequency (f) | % |
|----------------------------|-------------------------------|--------------|---------------------------------|--------------|
| Businessmen | 139 | 35.5 | 4 | 26.7 |
| Farmers | 41 | 10.5 | 5 | 33.3 |
| Civil Servants | 191 | 48.8 | 6 | 40.0 |
| Others | 20 | 5.1 | - | - |
| Total | 391 | 100.0 | 15 | 100.0 |

Source: Students and Lecturers' Questionnaires

Table 4.4 indicates that, about a half 191(48.8%) of the parents of the students were Civil servants, 139 (35.5%) were Businessmen, 41 (10.5%) were farmers and 20 (5.1%) had other occupations. This shows that majority of the students' parents were in a certain form of employment and they may be in a position to educate their children.

In addition, Table 4.4 shows that majority 6 (40%) of the lecturers' parents were civil servants, 5 (33.3%) were farmers and 4 (26.7%) were businessmen. This implies that majority of the lectures' parents were civil servants, followed by the businessmen. This might be the reason why they had the opportunity to be in schools and acquired education.

This also shows that majority of the students and lecturers came from educated families. This is in line with a study conducted in Nigeria by Hassan (2011) on gender inequality on industrial and technical education in Nigeria. The study found out the parental educational background contributes to gender gap in science and technology courses in Nigeria.

Moreover, the respondents' distribution by parental occupation is in support of what Samuel (2014) observed in his study on parental education and enrolment in STEM in South Western part of Nigeria. The study established that, parental level of education affected children education positively. Majority of the educated parents tend to support their children to acquire the best education they can afford. Hence most of them are enrolled in STEM courses.

4.2.6 Educational Qualification Distribution of Parents, Lecturers and Students'

The information in Table 4.7 sought to determine the qualifications of the students' parent and lecturers. The data on the educational qualifications of the parents of students and the lecturers were crucial so as to inform the study of the various qualifications of the parents and lecturers of the students and how they affect the number of female enrolments in STEM in Abubakar Tafawa Balewa University, Bauchi. Table 4.5 provide the summary of the findings of the students' distribution by parental and lecturer's educational qualification.

Table 4.5: Distribution by students' Parental and Lecturers Educational Qualification

| Parental Educational Qualification | Students' Frequency (f) | Percentage (%) | Lecturers Frequency (f) | Percentage (%) |
|---|--------------------------------|-----------------------|--------------------------------|-----------------------|
| Diploma | 49 | 12.5 | - | - |
| Degree | 196 | 50.1 | - | - |
| Masters | 49 | 12.5 | 5 | 33.3 |
| PhD | 73 | 18.7 | 10 | 66.6 |
| Other | 24 | 6.1 | - | - |
| Total | 391 | 100.0 | 15 | 100.0 |

Source: Students and Lecturers' Questionnaires

Results from the analysis in Table 4.5 demonstrate that half 196 (50.1%) of the student' parents had attained degree level of education, 73 (18.7%) had PhD, 49 (12.5%) had masters and 49 (12.5%) had diploma while only 24 (6.1%) had other

levels of education. Moreover, more than half 10 (66.7%) of the teachers were PhD holders, and 5 (13.3%) were masters' degree holders.

Based on the findings, majority of the lecturers were PhD holders and thus qualified to teach at the university as enshrined in the scheme and conditions of services of the Nigerian Universities (NUC, 2009). Moreover, majority of the students' parents also had the first degree as their qualification and thus they are more enlightened and informed about STEM disciplines and their importance, (Okar, 2012). Parental level of education is very important in the child's decision to enroll in STEM as their parents are educated and appreciates the role of STEM in national development (Akpogbol & Ugo, 2016) and might not see it as a waste of resources investing in girls' education.

4.2.7 Students and Lecturers' Distribution by Family Size

The Table 4.8 sought to establish the family size of the students and the lecturers. The data about the family size of the students and the lecturers were crucial in this study because it gave an insight on how a house hold could be able to educate their children enrolling in STEM Courses. The findings of the family size of the respondents are shown below in Table 4.6.

Table 4.6: Students and Lecturers' Distribution by Family Size

| Family Size | Students Frequency (f) | Percentage (%) | Lecturers Frequency (f) | Percentage (%) |
|--------------------|-----------------------------------|-----------------------|--|---------------------------|
| 3-6 | 98 | 25.1 | 8 | 53.3 |
| 7-10 | 244 | 62.4 | 6 | 40 |
| Above 10 | 49 | 12.5 | 1 | 6.7 |
| Total | 391 | 100.0 | 15 | 100 |

Source: Students and Lecturers' Questionnaires

The results in Table 4.6 the study found that more than half, 244 (62.4%) of the students were from a family of size 7-10, only a quarter 98 (25.1%) were from family size of 3-6 and 49 (12.5%) were from a family of size above 10. Slightly more than half, 8 (53.3%) of the lecturers were from a family of size 3-6, 6 (40%) were from family size 7-10 and only 1 (6.7%) was from a family of size above 10.

The study depicts that majority of the students come from families that are of 7 to 10 members and this reflect the real scenario of the people living in the area under study. The family size explains the number of children in a given household. Family size is an important factor that contributes to students' access to school in general. The limited available resources of the family have to be shared to all the siblings. Consequently, students from small families have a better chance of being enrolled and participate in university education especially in STEM related courses, (Murrieth, 2015).

The study findings on students and lecturers' distribution by family size concur with a study conducted by Murrieth (2015) on family school determinants in relation to access and participation in public day secondary schools in Kenya. The study found out that the family size of students affects the chances of children access to secondary schools' education. The respondents' family size is important in this study as it can help interpret if there exists any relationship between the number of dependents of a parent or guardian and the number of siblings' that access education particularly in STEM.

4.3 Admission Policies

The first objective of the study sought to find out if admission policies in Nigeria contribute to low female enrolment in Abubakar Tafawa Balewa University. To achieve this objective, the study used questionnaires to gather information from students and lecturers. Interview guide was used to gather qualitative data from the deans and students' parents. The findings are as shown in Table 4.7.

Table 4.7: Admission Policy

| ITEMS | RESPONDENTS | DISAGREED | | UNCERTAIN | | AGREED | |
|--|-------------|-----------|------|-----------|-----|--------|-----|
| | | F | % | F | % | F | % |
| Awareness of the admission quota in the Universities based on merit (45%), catchment area (35%), and disadvantaged states (20%). | Students | - | - | - | - | 391 | 100 |
| | Lecturers | - | - | - | - | 15 | 100 |
| Female students are given a specific percentage in the admission policy | Students | 391 | 100 | - | - | - | - |
| | Lecturers | 15 | 100 | - | - | - | - |
| Nigerian University admission policy on catchment area contribute to more female enrolment in Abubakar Tafawa Balewa University Bauchi | Students | 381 | 100 | - | - | - | - |
| | Lecturers | 15 | 100 | - | - | - | - |
| Admission Quota given to the Education less Privileged States (ELPS) help in enrolling more female students in Abubakar Tafawa Balewa University, Bauchi | Students | 98 | 25.1 | 49 | 12. | 244 | 62. |
| | Lecturers | - | - | - | 5 | 15 | 4 |
| Not giving a specific number to females in the admission policy contributes to low female enrolment in STEM courses | Students | 273 | 69.8 | 98 | 25. | 20 | 5.1 |
| | Lecturers | 13 | 86.7 | - | 1 | 2 | 13. |
| | | | | | - | | 3 |

Source: Students and Lecturers Questionnaires

To answer the question that “ the admission quota in the Universities is based on the merit (45%), catchment area (35%), and Education less Privileged States (ELPS) (20%).” The results from the analysis in Table 4.7/1 revealed that all the students 391 (100%) and the lectures 15 (100%) agreed that they were aware of Nigeria's university admission policy to university education. Also, they are aware of the distribution formula for admission to universities in Nigeria. As follows; merit (45%), catchment area (35%), and Education less Privileged States (ELPS) (20%).

The admission policy of Education Less Privileged States (ELPS) exists due to the inequality that exists in some levels of education across the country. Some 19 States (mostly States from the Northern Nigeria) are regarded as ELPS. The policy states that 20% admitted students should go to these States. Whereas the catchment policy addresses the issue of indigeneity, it states that 35% of applicants should be indigenes or close neighbors of the State where the school resides.

The finding shows that the students and the lecturers were cognizant of the university admission policy as well as the distribution of the admission formula in Nigerian universities. This is because all the students were admitted into the university through the Joint Admission and Matriculation (JAMB) examination, which has the responsibility of conducting the examination as well as the admission and placement of the students in their various courses of study.

The findings of the study on whether the respondents are aware of the university admission policy in Nigeria through merit distribution is (45%), catchment area (35%) and Education Less Privileged States (20%) is supported by NUC (2009) which has categorically spelled out the admission guidelines in Nigeria. It explains the distribution by proportions of Merit (45%), Catchment area (35%) and Education Less Privileged States (20%), (Omeje 2016).

On whether Female students are given a specific percentage in the admission policy, the findings of the study were shown in Table 4.7/2. The study found out that all the students 391 (100%) and lecturers 15(100%) disagreed that female students are given a specific quota in the admission policy of the country. This is because the Nigerian admission policy into universities does not specify any number or proportion to be assigned to females.

This is seen during the admission of students in ATBU in the last few years which showed a wide disparity in the number enrolled with the majority of those admitted being males. This is in agreement with sentiments of Najib et al. (2019) which noted that female students in the most educational system in Nigeria are underrepresented particularly in the area of Mathematics, Physics, Chemistry, and Technology i.e. electrical, mechanical, and civil engineering.

As to whether there is a specific number for the females admitted according to the policy is also in congruent with the Musa (2015) and Omeje (2016) who stressed that

the admission policy in Nigeria though adopted and emphasizes 60: 40 Science to Arts ratio, does not set aside specific ratios to the females.

To answer the question *whether Nigerian admission policy on students' admission within the catchment area contributes to more female enrolment in Abubakar Tafawa Balewa University*. The results of the study in Table 4.9/3 reveals that all the students 391 (100%) and lecturers 15 (100%) disagreed that Nigerian students admission policy within the catchment area contributes to more female enrolment in Abubakar Tafawa Balewa University Bauchi.

Both students and lecturers strongly disagreed that Nigerian admission policy of students' admission in the catchment area led to fewer females being admitted. This is observed as more and more applicants were denied admission basically because of the policy. The policy stipulates that the states close to each university should receive special quota in the admission. The situation in Abubakar Tafawa Balewa University showed that many of the applicants (including females) were not from the catchment areas of the university.

It is worthy acknowledging that some countries in Africa like Kenya and South Africa adopted policies that ensure maximum opportunities for females to access higher education in STEM courses in their countries but Nigeria emphasizes more on equal opportunity for enrolment in universities based on their geographical location with no

specific ratio for female in STEM. Hence the reason for low female in STEM courses in the country, (Kalai,2010).

During an interview with the Deans of students on whether Nigerian admission policy on students' admission within the catchment area contributes to more female enrolment in Abubakar Tafawa Balewa University. The response of the majority obtained was represented by one who had this to say:

The quota policy on the catchment area which allows students from the states around where the university is located is negatively affecting enrolment of girls in this university. This is because many parents are not willing to send their daughters to other states for studies. They prefer to send them for studies at universities close to them. As a result, very few were admitted into the university from the non-catchment areas, thus blocking much more qualified female to be admitted in the university. (Dean, Male, ATBU, July, 2019)

Also, the response of the majority of the parents of students obtained was represented by one who had this to say:

I will not let my daughter be far away from me, especially because of the current insecurity situation of the country. She might be abducted or kidnapped in the process. But if it's a male child, I have no problem. (Male, July, 2019)

To answer the question as to whether *Admission Quota given to the Education Less Privileged States* help in enrolling more female students in Abubakar Tafawa Balewa University, Bauchi. Table 4.7 demonstrate that more than half 244 (62.4%) of the students strongly agreed that admission quota given to the Education Less Privileged States of the country help in enrolling more female students in Abubakar Tafawa

Balewa University, Bauchi, 98 (25.1 %) of the students disagreed and only 49 (12.5%) of the students were neutral. All the lecturers 15 (100%) agreed that the admission quota given to the Education Less Privileged States helps in enrolling more females in Abubakar Tafawa Balewa University, Bauchi.

All the North East states in Nigeria are classified as among the Education Less Privileged States, hence they are given a specific number of students to enroll from the region. The educationally backward states as provided by NUC, (2009) include Adamawa, Bauchi, Benue, Borno, Niger, Plateau, Yobe, Jigawa. Taraba, Zamfara Kano, Kaduna, Katsina, Kebbi, Kwara, Gombe, Bayelsa, Ebonyi, Kogi, and the Sokoto States.

The finding shows that all the lecturers (100%) and majority of the students (62.4%) strongly agreed that given a quota to the Education Less Privileged States may help in enrolling more female students in Abubakar Tafawa Balewa University, Bauchi. This is seen in the admission list of the students as a significant number of those admitted were from the Education Less Privileged States. This is in support of what the NUC (2009) in Musa (2015) and Najib (2019) that 20% of the overall admission should be assigned to the educationally less advanced states of the federation. The quota system and the catchment areas are federal government policies formulated to bridge the gap between the educationally developed states and the educationally less developed states, (Omeje, 2016). Hence, it can be observed that this policy works in ensuring

more students especially the females are enrolled in universities of technology like Abubakar Tafawa Balewa University, Bauchi.

The response of the majority of the Deans obtained was represented by one who had this to say:

Because of the policy that stresses giving admission quota of 20% to the Education less privileged states in the country, the universities are witnessing an increase in the number enrolled from these states. This invariably helps in enrolling more females from the states as well. (Dean, Male, ATBU, July, 2019)

The response of the majority of the parents on whether *Admission Quota given to the Education Less Privileged States* help in enrolling more female students in Abubakar Tafawa Balewa University, Bauchi, was represented by one who had this to say:

The quota system to the educationally backward states help in no small measure in ensuring more of our daughters got admitted to the university. Many of our daughters could withstand the competition for admission into the university as there are so many applicants from the educationally advanced states of the country. (Male, July, 2019)

The quota given to the educationally backward states helps in enrolling more females in the universities as well as in the STEM-related course. The study observed that were it not for the policy, many students would not be given admission to the university. This is because the applicants from the educationally disadvantaged states may not withstand the competition from other applicants from other regions of the country that might be having more qualified female students.

The finding of this study on quota admission to the education less privileged states help in enrolling more female students in Abubakar Tafawa Balewa University, Bauchi is in contrast to the study by Odigwe and Swem (2016). The study observes that assigning a specific quota to the educationally disadvantaged states of the federation negates the principle of equality and thus it should be open to all.

Another question on *whether stating a specific number of females in the admission policy contributes to low female enrolment in STEM course* shows from the Table 4.7 that majority of the students 273 (69.8%) and lecturers 13 (86.7%) agreed that not giving a specific number stated in the students' admission policy to universities by gender contributes to low female enrolment in STEM courses. Only 20 (5.1%) of the students and 2 (13.3%) of the lecturers disagreed and a quarter of the students 98 (25.1%) were undecided. That is, they remained neutral as they were not sure that lack of stating a specific number to females in the admission policy contributes to low female enrolment in STEM courses.

This means that the admission policy does not set aside any specific number of students to be admitted by gender. This is seen as majority of the students (69.8%) and lecturers (86.7%) strongly agreed with the notion that lack of assigning a specific figure by gender to be enrolled in the university by the Joint Admission and Matriculation Board (JAMB) contributes to low female enrolment in STEM courses. The students and the lecturers believe that if a specific number of females are stated, it

will give room for more females to be enrolled in the university and STEM courses in particular.

The findings are in agreement with the findings of Garba (2013) on gender enrolment in higher education in Nigeria. The study noted that to witness an increase in enrolment and participation of females in STEM programmed females should be given a specific ratio in the admission policy of Nigeria. It is also clear that in the NUC (2009) distribution of the admission quota there were no specific gender ratio in the policy. Hence, it tends to affect the number of females to be admitted in the universities as a whole and ATBU in particular.

Further, the study used the regression analysis to establish the extent to which Nigerian admission policy contribute to the enrolment of females students in STEM related courses in Abubakar Tafawa Balewa University, Bauchi and the regression coefficient results is as follows:

Table 4.8: Coefficients Results

| Mode I | | Unstandardized Coefficients | | Standardized Coefficients | | |
|-----------|-----------------------|--------------------------------|------------|------------------------------|---------|------|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | (Constant) | -1.659 | 0.046 | | -36.023 | .000 |
| | Admission Policies | 0.392 | 0.027 | 0.444 | 14.313 | .000 |

a Dependent Variable: Low female enrolment

The regression of coefficient outcome in Table 4.8 reveal that admission policies have a positive and significant relationship with low female enrolment ($\beta = 0.392$, $P = .000$). The finding implies that lack of proper admission policies contributes significantly towards low female enrolment to STEM.

4.4 Students, Lecturers and Parents' Perceptions

The second objective of the study sought to find out the extent to which Students, Parents and Lecturers' perceptions towards female enrolment in STEM contribute to low female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria. To achieve this objective, questionnaire for students and lecturers was used to gather information on the perception of female enrolment in STEM and interview guide for deans and students' parents. The findings for the questionnaires are in Table 4.9.

Table 4.9: Students, Lecturers and Parents’ Perceptions of Female Enrolment in STEM

| ITEMS | RESPONDENTS | DISAGREE | | UNDECIDED | | AGREE | |
|--|-------------|----------|------|-----------|-----|-------|------|
| | | F | % | F | % | F | % |
| According to me, female students are supposed to enrol in STEM courses | Students | - | - | - | - | 391 | 100 |
| | Lecturers | 01 | 6.7 | - | - | 14 | 93.3 |
| Female students like STEM courses | Students | 205 | 52.4 | - | - | 186 | 47.6 |
| | Lecturers | 9 | 60 | - | - | 6 | 40 |
| Lack of lecturers’ motivation to the student lead to low enrolment of female students | Students | 86 | 22 | - | - | 305 | 78 |
| | Lecturers | 9 | 60 | - | - | 6 | 40 |
| Parents perception lead to low female enrolment in STEM courses | Students | 81 | 20.7 | 16 | 4.1 | 294 | 75.2 |
| | Lecturers | 4 | 26.7 | - | - | 11 | 73.3 |
| Girls and women are regarded in the community as home makers only and not to be educated | Students | 56 | 14.3 | 25 | 6.4 | 310 | 79.3 |
| | Lecturers | 3 | 20 | - | - | 12 | 80 |
| Female students pursue arts courses because they consider science subjects as hard courses | Students | 33 | 8.4 | - | - | 358 | 91.6 |
| | Lecturers | - | - | - | - | 15 | 100 |
| STEM courses are generally considered masculine courses and that is why less female enrolled in these courses | Students | 50 | 12.8 | 25 | 6.4 | 316 | 80.8 |
| | Lecturers | - | - | - | - | 15 | 100 |
| Stereotype influences choice of STEM courses | Students | 23 | 5.9 | 16 | 4.1 | 352 | 90.0 |
| | Lecturers | | | | | 15 | 100 |
| Parent are major decision makers in their female children career choice | Students | 122 | 31.2 | - | - | 269 | 68.8 |
| | Lecturers | 1 | 6.7 | - | - | 14 | 93.3 |
| Girls can do very well in STEM courses but they are discouraged by their parents, lecturers and other students | Students | 58 | 14.8 | - | - | 333 | 85.2 |
| | Lecturers | 1 | 6.7 | - | - | 14 | 93.3 |

Source: Students and Lecturers’ Questionnaires

As pertaining to the question that *female students are supposed to enroll in STEM courses*. Results in Table 4.9 revealed that, all the students 391(100%) and lecturers

14 (93.3%) agreed that, according to them, female students are supposed to enroll in STEM courses. This demonstrates that majority of the lecturers and students of Abubakar Tafawa Balewa University recognize the fact that female students are supposed to be enrolled in STEM related courses. This is as a result of the importance attached to STEM subjects, which currently is the key to every nation's development. Hill et al., (2013) argue that STEM disciplines should help students to be, problem-solvers, inventors, self-reliant, logical thinkers and technologically literate so as to apply technology appropriately. Accordingly, the United Nations, Economic and Social Council Report on the Status of Women (2010) argues that STEM and innovation can be a tool with which to accelerate the achievement of vision 2030 and the internationally agreed development goals, including the Sustainable Millennium Development Goals.

The outcomes of this study, is in line with Ngozi (2014) observations in a study on gender enrolment disparity in secondary level of education in Nigeria. The study observed that by enrolling more women in STEM courses it ensures a better nation where the nationals will be having healthier lives, more educated, improved empowerment and a more productive country due to women education externalities, Akpoghol and Ugo (2016) observes that integration of STEM courses is an effective means of the continuing of the technology in our daily activities. The study stressed that STEM education offers students a great opportunity to understand the relationship between school, community work and the global enterprises so as to favorably compete in the new and changing world. Beede et al., (2011) established that the

gateway to any high paying job is a STEM degree and consequently STEM degree leads to a higher earning in life.

Knowledge and skills gained through the study of STEM facilitate efforts to eradicate poverty, achieve food security, fight diseases, improve education and respond to the challenges of climate change (Onsongo, 2009). Further, empowering women in STEM can widen the pool of human resources available to perform the tasks that will help in actualizing Kenya's development vision Year 2030 (KNBS, 2013) Therefore, it is critical that female students access education at all levels and acquire relevant work skills, particularly in STEM disciplines, (Mbirlanjau, 2018).

As regards to the question whether *Female students like STEM courses*. The results of the analysis in Table 4.9 presented that more than half 205 (53.4%) of the students and lectures 9 (60%) strongly disagree to the fact that female students like STEM courses, with less than half of the students 186(47.6%) and lecturers 6(40%) agreeing that female students like STEM courses. This denotes that fair number of the female students did not want to enrolled in STEM related courses possibly because of the negative perception they hold about STEM.

The findings are in agreement with the observations of Egun and Tibi, (2010) who indicated, that most African societies fail to appreciate the role of women in the society as a whole, bearing the importance on the traditional role played by men in the society. Most parents tend to support males more than the females to pursue

educational career. Sometimes, culturally, girls were encouraged to take up courses that correspond to their traditional roles as wives and mothers. Hence many do not want to enroll in STEM related disciplines; instead they go for feminine courses like arts, home economics among others Egun and Tibi (2010).

In addition, in a study conducted by Aremu & Micheal (2014), it was found out that male and female students differ in the way they perceived technology courses. Whereas the male students perceived it not to be difficult, the female students consider technology courses as been very difficult and hence, the reason for the low participation of the female in these courses.

Further, as par the question that *lack of lecturers' motivation to the female students lead to low enrolment of female students*. The results of this question are in Table 4.9. The findings revealed that more than three quarter of the students 305(78%) agreed that lack of lecturers' motivation to the students led to low enrolment of female students, with only less than a quarter 86(22%) who disagree with the notion. However, 9(60%) of the lecturers agree to the fact that lack of their motivation towards female students led to low enrolment of female students. Only less than a quarter of the students 86(22%) disagreed with the notion lack of lecturers' motivation to the female students lead to low enrolment of female students However, 9(60%) of the lecturers agreed that lack of motivation from the lecturers encourages low female enrolment in Abubakar Tafawa Balewa University.

The study finding is supported by Murrieth (2015) who conducted a study on family and school determinants in access and participation to public day secondary school in Kenya. The study identified school related factor that influence access to secondary school to include effective administration, physical facilities and learning materials. In addition, teachers' attitude and competence will motivate students to enroll in secondary schools. Hence motivation is seen as one of the factors that encourage students to go for courses that are science based. Most of the times, many students were discouraged to go for STEM related disciplines due the negative attitude of their teachers and lecturers. This may be as a result of lack of motivation on the part of their teachers at lower levels of education and even the lecturers at the university level of education (Ngozi, 2014).

A study conducted in Ghana by Afia (2014) on inequality in gender participation of females in STEM disciplines in higher education found out those even female instructors who are supposed to be motivating agents for the generation to come rather discourages females. Further, the study suggested that there is need for the instructors to create an opportunity for the female students to develop interest and to pursue STEM related disciplines in order to encourage them to excel and contribute in nation building.

Further, it was also established by UNESCO (1999) that teachers are more observant to boys and provides them with more chances for hand-on work while the girls are almost overlooked or not provided with much attention as the boys. The perception and attitude of the teachers may be discouraging as some believed that the boys enroll

to university to pursue courses engineering, medicine, architecture and so on. The girls on the other hand only pursue courses to become secretaries, teachers, designers and so on, (Angelina, 2011 and Ekene, 2013).

On whether parents' negative perception lead to low female enrolment in STEM courses. Table 4.9 revealed that about three quarters of the students 295(75.2%) and lecturers 11(73.3%) agreed that parents' negative perception led to low female enrolment in STEM courses. Only about a quarter of the students 81(20.7%) and the lecturers 4(26.7%) disagreed and only 16(4.1%) of the students were undecided.

An interview with a parent of a student yielded this opinion with regards to the negative parents' perception and thus--:

Most of our brothers that are not educated until now and are very much reluctant to send their female daughters to the universities because we see it as a waste of resources. We believed that women will end up to be mothers and consequently be at their husband's family and spending much of their time on family responsibilities.
(Male, July, 2019)

Danjuma (2010) stressed that access to STEM by girl child is influenced by negative perception which place restrictions on the girl child involvement in STEM courses. Basically, this might be one of the reasons for low females in STEM courses in Abubakar Tafawa Balewa University, Bauchi.

Findings are supported by Egun and Tobi, (2010) who explained that most parents in Nigeria tend to support males more than the females because they perceived girls and women sometimes are likely to marry early and bear children to whom they devote

much of their time. Hence it is a waste of resources and misplacement of priority educating female students, (Akinsowo & Osaso, 2014).

Further, a study also conducted in Nigeria by Adebayo (2012) pointed out that perception held about STEM by some parents tend to discriminate and discourage females to pursue STEM programs. Discriminations usually start from home where females are not equally and fairly treated as their male counterparts. Bukola (2019) study on comparative empirical analysis of female university enrolment in STEM Courses in the geopolitical zones in Nigeria pointed out that some parents had higher perceptions of science abilities and higher expectations of success in Science education for their male children than for the female. Parents with the right perception encourage their daughters' right from tender ages to embrace science related subjects. Hence, parent with the right perception will encourage their girl's right from tender ages to embrace science related courses, (Bukola, 2019).

The other question asked whether *“Girls and women are considered in the community as home makers only and not to be educated”* The results of the analysis in Table 4.9 showed that majority of the students 310 (79.3%) and lecturers 12(80%) agreed that girls and women are considered by the community as home makers only and not to be educated. While 56 (14.3%) of the students and 3 (20%) of the lecturers were of the contrary opinion. Only 25 (6.4 %) of the students were neutral. This displays that majority of the students and the lecturers recognized the fact that females are

considered in the community as home makers only instead of being allowed to enroll in University STEM courses.

The findings are in line with the view of McDonald (2004) and Adebayo (2012). These studies observed that, girls are usually encouraged in the society to take up fields of study that correspond to their traditional roles as wives and mothers as a result of the erroneously conception that ‘women education ends in the kitchen’. This likely results to low enrolment of females in science related courses.

More so, a study conducted by Lalong (2013) explained that because of the negative perception held by some parents they are sometimes not willing to allow more females to go for studies. They have made the females as conformers to traditional norms. Women and girls are given and assigned to be home-makers, and baby sitters. In some societies in Nigeria, some elderly use patriarchal cultural pattern when dealing with females to deny them their rights to educational opportunities as a whole.

Moreover, pertaining to the question that *female students pursue arts courses because they consider sciences as difficult, hard and masculine courses*. The result of the analysis in Table 4.9 found out that majority 358(91.5%) of the students and 15(100%) of the lecturers agreed that female students pursue arts courses because they consider science subjects as hard courses while only 33(8.4%) of the students disagreed. More so, majority 316(80.8%) of the students and 15(100%) of the lecturers of the university agreed that STEM courses were generally considered masculine courses

and that is why less female enrolled in these courses. Only about a quarter 50(12.8%) of the students disagreed and 25(6.4%) were undecided.

The analysis shows that majority of the students and the lecturers of Abubakar Tafawa Balewa University recognised the fact that female students pursue arts courses because they consider science subjects as hard courses. They also view STEM courses as generally masculine and that is the reason why few females enrol in STEM related courses.

The response of the majority of the Deans was represented by one and he had these to say:

In North Eastern region of Nigeria many female students prefer to go for arts courses solely because they believed that sciences are very hard, difficult and takes much longer time to graduate. They also believe that due to these reasons, sciences should be left to males. (Dean, Male, ATBU, July, 2019)

A parent also remarked that:

Many parents decided not to allow their daughters choose Sciences and technology courses because it usually takes much longer time to graduate and they always want to marry their daughters off as early as possible. (Female, July, 2019)

The finding of this study question is supported by Egun and Tibi (2010) study on gender gap in vocational education in Nigeria. The study observed that the society perceived STEM courses as masculine fields of study. In addition, women do not possess the energetic and mental capabilities required to succeed in these fields.

Besides the Nigerian society believe that the program structure of STEM disciplines is too complex and difficult for females to study. This encourages males to study it while discouraging females who are not privileged to be guided by parents with sound educational background from pursuing it, (Kwari, 2015).

Moreover, a study among high school students in US has shown that girls reported lower self-efficacy in mathematics and sciences compared to boy (Hand et al., 2017). This could be the reason for low female students in STEM in Abubakar Tafawa Balewa University, Bauchi.

Further another response from a question that asked *whether Parents are major decision makers in their female children's career choice*. Table 4.9 reveals that the majority 269(68.8%) of the students and 14(93.3%) of the lecturers agreed that parents are major stakeholders in their children's career choice while insignificant 1(6.7%) of the lecturers and 122(31.2%) of the students at the university hold a contrary opinion. This illustrated that majority of the students and lecturers strongly agree and recognise that parents are major stakeholders in their female children's career choice. This implies that negative perception by parents lead to fewer females enrolled in STEM related disciplines.

A parent lamented that:

I nursed, encouraged and motivated my children in the choice of their study course. This I started at the primary school level, the more reason why all my four children are in the STEM related courses. (Female, July, 2019)

This finding is supported by Samuel (2014) who did a study on factors that enhance interest in STEM for the females in Nigeria. Samuel (2014) maintained that parents influence what their children choose to study. However, sometimes they do not necessarily take into consideration the mental capabilities of the children.

A study conducted by Plasman et al., (2020) on parents' occupations and students' success in STEM fields it was concluded that there was a positive association between parents' professionalism and high school students' success in STEM fields. It was also found that positive relation exists between parents employed in STEM occupation and high school students' success in STEM fields. Therefore, parents play an important role in deciding in deciding a career for their children especially females in STEM.

Lastly the responses from the question that *Girls can do very well in STEM courses but they are discouraged by their parent, lecturers and other students*. The results of the analysis in Table 4.9 revealed that majority of the students 333(85.2%) and 14(93%) of the lecturers agreed that girls can do very well in STEM courses but they are discouraged by their parents, lecturers and other students. Only a minority 1(6.7%) of the lecturers and 58(14.8%) of the students disagreed with the fact that girls can do very well in STEM courses, and that they are discouraged by their parent, lecturers and other students.

This implies most of the students strongly agreed that girls can do very well in STEM courses but they are discouraged by their parents, lecturers and other students. According to Egun and Tibi (2010). Sometimes they are told that STEM is very hard, difficult and complex and it takes longer time to graduate, it is masculine and mainly dominated by males, the attitude of the teachers and lecturer, less female role model and the rest. All these lead to low female enrolment on STEM related courses.

The study findings are in line with Yusuf (2015), Egun & Tibi (2010) and (Afia 2014). They observed that due to the misconceptions held by the parents, teachers as well as other students, the STEM programs witness fewer female students.

Further, the regression analysis that was employed to establish the extent to which motivation contribute to the enrolment of females in STEM related courses in Abubakar Tafawa Balewa University, Bauchi and the regression coefficient results is as follows:

Table 4.10: Coefficients Results

| Model | Unstandardized Coefficients | | Standardized Coefficients | | |
|--------------|-----------------------------|------------|---------------------------|---------|------|
| | B | Std. Error | Beta | t | Sig. |
| 1 (Constant) | -1.659 | 0.046 | | -36.023 | .000 |
| Perceptions | 0.126 | 0.022 | 0.268 | 5.707 | .000 |

a Dependent Variable: female enrolment

The regression of coefficient results in Table 10 indicates or reveal that students, parents and lecturers' perceptions have a positive and significant relationship with low

female enrolment ($\beta = 0.126, P = .000$). The finding implies that negative perceptions from students, parents and lecturers contribute significantly towards low female enrolment to STEM.

4.4.1 Students' Views for Few Girls in STEM

As regards to the question that *according to you, why you think there are few girls doing STEM courses in the university*. Results from the analysis were summarized and presented in Table 4.11

Table 4.11: Students' Views for Few Females in STEM

| Reason | F | % |
|---|----------|----------|
| Teachers attitude | 304 | 77.7 |
| STEM courses are usually dominated by males | 199 | 50.9 |
| Family responsibilities | 211 | 54.1 |
| Poor method of teaching | 288 | 73.7 |
| Others | 264 | 67.5 |

Source: Students' Questionnaires

The results in Table 4.11 indicate the responses the students gave when they were asked why they thought there were a few girls doing STEM courses in the University. The responses of students revealed that teachers' attitude had 304(77.7%), on poor method of teaching there were 288(73.7%) and family responsibilities had 211(54.1%). Other reasons included that they are usually dominated by males 199(50.9%) while a different category of respondents 264 (67.4%). This implies that

majority of the students identified teachers' attitude, poor method of teaching, family responsibilities and dominance of males in STEM courses as the major reasons for low female enrolment.

The findings of the study are supported by UNESCO (1999) and Murrieth (2015) who conducted a study on family and school-based determinants of access and participation in public day secondary schools in Kenya. The study remarked that teachers' attitudes and competences as well as child labor are some of the school determinant of access to education in general.

Akinsowon et al. (2014) study on enhancing interest in Sciences, Technology and Mathematics (STEM) for the Nigerian female folk remarked that the perception or attitude of teachers enlighten how they attend and teach the girls in classes especially Mathematics and Science. These negative perceptions end up influencing the performance of the girl child. The study summarized the factors to be Institutional, situational, individual, curriculum and home factors as the major factors as to why there are few girls in Nigerian STEM programs.

Further, Staphanine (2013) conducted a study on science gender gap and concluded that women are hit hard with household duties just when they need to meet research goals. This invariably affected their access and participation in STEM courses.

Society has a pervasive view that STEM professions are "male-dominated" thereby causing negative attitudes toward these disciplines among women. Relative to men, women tend to have less overall interest and perceive fewer educational and career benefits by pursuing STEM disciplines (NSB, 2010; Mbirianjau, 2016).

Male dominance in STEM courses and much family responsibilities to give to the girls were identified as some of the factors responsible for low female enrolment in STEM (Mbirianjau, 2018). Therefore, it is evidently clear that having much family responsibilities tend to give less time to the girls to study and this leads to poor performance at the lower level of instruction which is a prerequisite for their enrolment at the university level of education.

4.4.2 Lecturers' Views for Few Girls in STEM

As regarding to this question that, *according to you, why do you think there are few girls doing STEM courses in the university.* Results from the analysis were summarized in Table 4.12.

Table 4.12: Lecturers' Views for Few Females in STEM

| Reason | F | % |
|--|----------|----------|
| Girls perform lower than boys in Math and Sciences | 12 | 80 |
| STEM courses are usually dominated by males | 11 | 73.3 |
| Negative cultural attachment on female education | 9 | 60 |

Source: Lecturers' Questionnaires

The lecturers were asked to mention the reason why they thought that there were a few girls doing STEM courses in the University. The results of the analysis in Table 4.12 indicated that majority of the lecturers highlighted that girls achieve lower than boys in Math and Sciences 12(80%), further STEM courses are usually dominated by males and 11(73.3%) have negative cultural attachment on female education 8 (60%).

This implies that lecturers were of the opinion that girls perform lower than boys in Math and Sciences. That STEM courses are usually dominated by males and negative cultural attachment on female education as the other reasons for low female enrolment in Abubakar Tafawa Balewa University.

The reasons why lecturers thought that there were few girls doing STEM courses in the University are in agreement with a research conducted by Okafor and Arinze (2012) on gender accessibility of quality education in Nigeria. The study identified cultural beliefs and practices as factors that influence enrolment into schools. The negative perceptions and cultural belief and practices still posed as a great threat to the gender enrolment disparity in STEM in favor of the males in this part of the country (Najib et al., 2019).

Another study conducted by Mbiiranjau (2018) on female participation in STEM discipline at Kenyan public universities between 2009 and 2013, revealed that socio-cultural barriers contributed to poor performance of female students in STEM courses. The study identified family responsibilities as one of these factors. Masculinity of the

discipline was also attributed to the dominance of males in these fields. Hence, this might be a reason of few females in STEM programs in Abubakar Tafawa Balewa University, Bauchi.

4.5 Motivation from Parents and Teachers

The third objective intended to establish the level to which motivation contribute to female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria. These determinants included: less emphasis on the education of daughters in the society, parental attitude, male child education preference and lecturers motivation. A multiple linear regression analysis was therefore carried out to test the relationship between the variables. The independent variables (motivation) was regressed on the dependent variable (female enrolment). Tables 4.14 coefficient results.

Table 4.13: Motivation Determinants of Female Enrolment

| ITEMS | RESPONDENTS | AGREE | | UNDECIDED | | DISAGREE | |
|--|-------------|-------|------|-----------|-----|----------|------|
| | | F | % | F | % | F | % |
| Less emphasis on the education of daughters in the society contribute to low female enrolment | Students | 314 | 80.3 | 16 | 4.1 | 61 | 15.6 |
| | Lecturers | 15 | 100 | - | - | - | - |
| Parents' attitude towards the education of girls do contributes to low female enrolment in the university education. | Students | 377 | 96.4 | - | - | 14 | 3.6 |
| | Lecturers | 15 | 100 | - | - | - | - |
| Male child preference contribute to low female enrolment in STEM | Students | 391 | 100 | - | - | - | - |
| | Lecturers | | 93.3 | - | - | 1 | 6.7 |
| Lack of lecturers motivation to the student lead to low enrolment of female students | Students | 280 | 71.6 | 31 | 7.9 | 80 | 20.5 |
| | Lecturers | 13 | 86.7 | 1 | 6.7 | 1 | 6.7 |

Source: Students and Lecturers' Questionnaires

As regards to the statement that less emphasis on the education of daughters in the society contribute to low female enrolment in STEM courses. The results of the analysis in Table 4.13 showed that more than three-quarter 314 (80.3%) of the students and all the lecturers 15 (100%) strongly agree to the fact that less emphasis on the education of daughters in the society contribute to low female enrolment in STEM courses, with only a quarter of the students 61(15.6%) and only 16(4.1%) of the students undecided. This implies that less emphasis was given to the education of the females in the society, quite a number of the female students this might affect their enrolment in STEM courses.

Danjuma (2010) emphasizes that the girl-child's access to Science, Technology and Mathematics (STM) is stalled by big family size, poverty and parents' low educational background. It is expected that children from parents who have a good educational background usually received more attention and motivation to enroll in education.

The findings of the study on less emphasis given to the education of the females in the society is in line with a study conducted by Joseph (2014) which observed that parents discourage female students generally from pursuing science subjects which they stereotype as masculine and inspire them to study humanities instead. This only helps make worse an already bad situation in terms of science performance and enrolment. Joseph further emphasizes that, significance of a subject area to the child's future as perceived by the parents may have deep implications. Perceived importance may directly disturb the amount of encouragement a parent would provide to the child and

the opportunities presented to the child that may be manifest in the type of activities, toys, and reading materials provided (Joseph, 2014).

Further, a study by Appiah-Castle et al (2020) on female enrolments in STEM in higher education in Ghana opined that the belief that Science and Math are male subjects and as a result, people often have negative attitudes to women in ‘masculine’ STEM careers. In the same vein, Saucerman and Vasquez (2014) conducted a literature review to identify socio-psychological barriers to STEM field participation for women and observed that parents trust that boys are more engrossed and proficient in STEM subjects and that STEM subjects are more challenging and less important for girls than boys.

Moreover, Aja-Okorie, (2013) stressed that, in most cases family members hold females’ responsibilities above career or education hence they may discourage a woman from STEM programs, Also, family responsibilities of the woman can hinder or slow down career advancement especially when family support is minimal or non-existent (Akinsowon and Osisanwo, 2014).

As indicated by Khaguya (2014) many parents and community members also have the attitude that educating girls is a waste of time and money, because they will eventually be married off and their education would therefore only benefit their husbands and the families they marry into. Money spent on the girl's education would thus be

considered lost to the girls' family (Khaguya, 2014). This might led the parents to care less about the education of their daughters.

Since there is also the expectation that boys will become the breadwinners of their future families, Khaguya (2014) maintains that many parents and community members feel that boys should for this reason be provided with every advantage to help them fulfill this role, this includes educating them as far as possible. Girls, on the other hand, it is expected, will have husbands who will provide for them and an education is therefore not essential for them.

Because girls are responsible for such a diverse number of household tasks, some parents prefer to keep their daughters at home. This is especially true in areas where girls engage in income earning activities to supplement family income. Many parents therefore find that the opportunity cost of education is too high. Ghana for instance has a number of examples of cultural practices that compromise girls' access to education and therefore their participation in technical subjects, (Khaguya, 2014).

More so, Najib et al (2019) conducted a study on gender gap in science and technology education in Nigeria. The study revealed that female student in most educational system in Nigeria are underrepresented particularly in the area of mathematic, physics, chemistry and technology i.e. electrical, mechanical, and civil engineering. The study further observed that these differences in gender enrolment were as a result of cultural belief, traditional, early marriage, parental educational

background among others and recommended that Community should encourage and sponsor their member to study science and technology particularly girls.

On parents' attitude towards the education of girls do contributes to low female enrolment in the university education, the results of the analysis in Table 4.13 showed that almost all the students 377 (96.4%) and all the lectures 15 (100%) strongly agree to the fact that parents' attitude towards the education of girls do contributes to low female enrolment in the university education, with only 14 (3.6%) of the students and only 16(4.1%) of the students disagreed. This implies that parents' attitude towards the education of girls do contributes to low female enrolment in the university STEM education.

The findings of the study on parents' attitude towards the education of girls is supported by Hassan 2011 & Lawan & Muhammad (2014) which remarked that most parents in this part of Nigeria emphasizes more on the education of the male child and care less with the education of the girl child. This is basically because of some cultural factors and the perception of the parent on the education of the girl child.

Further, some parents are usually very reluctant to send their daughters to school because of the belief that education and school could be a corrupting influence. In some communities, there is the view that in co-educational schools, as most primary schools are, girls' morals would be corrupted because of the amount of time they spend with boys (Khaguya, 2014). There is also fear for the physical and sexual safety

of girls in school due to cases of physical and sexual harassment and abuse from peers and teachers in the school. Where schools are situated long distances away, parents are usually worried about their daughters' safety while traveling to and from school (Khaguya, 2014).

In regard to male child education preference, the results of the analysis in Table 4.13 showed that all the students 391 (100%) and almost all the lectures 14 (93.3%) strongly agree to the fact that male child preference contribute to low female enrolment in STEM, with only 1 (6.7%) of the lecturers disagreed. This implies that male child preference might contribute to low female enrolment in STEM.

A dean of a faculty summarized the view on this and observes that:

Most parent are very much reluctant towards the education of their daughters especially in motivating them to enroll in STEM courses, mainly because of their negative perception about girl's education as well as university and STEM courses. This invariably leads to fewer females in STEM disciplines. (Dean Male, July 2019).

The study findings is in line with the findings of McDonald (2004) who observed that, girls are usually encouraged in the society to take up fields of study that correspond to their traditional roles as wives and mothers as a result of the erroneously misconception that 'women education ends in the kitchen'. This results to low enrolment of females in science related courses.

Bukola (2019) observed that some parents had higher expectations and positive perceptions of science abilities and higher expectations of success in science education

for their male children than for the female children. This could also be identified as a reason for few females in STEM related disciplines in Abubakar Tafawa Balewa University, Bauchi.

Further, Alhassan (2008) in a study conducted in the northern region of Ghana on socio-economic and cultural factors of girls' education revealed that male child preference among other factors were the major factors affecting girl's education at primary and secondary levels. A research by Okafor and Arinze, (2012) on gender accessibility and equality in education in Nigeria, identified factors such as cultural beliefs and practices as factors that influence enrolment into schools. They observed that culture had continued to play an important role and was an obstacle to gender equality in education in Nigeria.

In addition, Olukayode (2015) conducted a research on gender disparity in enrolment in Nigerian basic formal education and identified households and families' constraints as some factors that brought about gender enrolment disparity. The household and family constraints identified include: the rate of preference to the male-child, poverty in the home, overstraining of the girl-child with house hold chores and labor, insecurity of the girl child, especially in case of long distance between home and school.

In regards to teachers' motivation, the results of the analysis in Table 4.13 showed that about three quarter of the students 280 (71.6%) and almost all the lectures 13 (86.7%)

strongly agree to the fact that lack of lecturers' motivation to the student lead to low enrolment of female students, with less than a quarter of the students 80 (20.5%) of the students disagreed and only 31 (7.9%) undecided. Also only 1 (6.7%) of the lectures were undecided and disagreed respectively. This implies that lack of lecturers' motivation to the student results to low enrolment of female students in STEM related courses.

This teachers are inform how they teach and attend to the girls in classes especially mathematics and science, and these end up affecting the performance of the girl child. It is on record that one out of every three women in the world is illiterate, meaning that boys are more in the school than girls (Olukayode, 2015).

There are also established facts that show that teachers' are more observant to boys and provide them with more opportunities for hands-on work while the girls are almost ignored or not given as much attention as the boys (UNESCO, 1999, Maryann & Patience 2017).

Further, a study on the factors influencing girls' low enrolment and poor performance in Physics in secondary schools in Nandi South District, Kenya by Joseph (2014) remarked that creative and innovative teachers facilitate the learning of physics.

The findings of the study on teachers' motivation is also supported by Salman, Olawoye and Yahaya (2011) which pointed out that the preference of some parents

toward certain disciplines, girl negative attitude towards mathematics, teachers' negative attitude to students, poor methods of teaching and inadequate importance attached to girl-child education by the government and the society as some of the factors.

The way teachers are teaching in school may be discouraging. According to Angeline (2011) this attitude often makes girls to drop out of school. Teachers in some rural part of Africa believe that boys will go to university to take courses like medicine, engineering, architecture and so on, while girls will only study to become secretaries, teachers, designers and so on.

More so, Kola, (2013) study on perceived causes of students' low enrolment in science in secondary schools in Nigeria suggested that Parents and teachers should always motivate students to enroll for science courses by exposing them to various career opportunities available. In this regard regression analysis was used to establish the extent to which teachers and parents' motivation contribute to the enrolment of females students in STEM related courses in Abubakar Tafawa Balewa University, Bauchi and the regression coefficient results is as follows:

Table 4.14: Regression Coefficients Results

| Model | Unstandardized Coefficients | | Standardized Coefficients | | |
|--------------|-----------------------------|------------|---------------------------|---------|------|
| | B | Std. Error | Beta | T | Sig. |
| 1 (Constant) | -1.659 | 0.046 | | -36.023 | .000 |
| Motivation | 0.157 | 0.02 | 0.291 | 7.976 | .000 |

a Dependent Variable: Low female enrolment

From the analysis of the regression, Table 4.16 demonstrate that motivation has a positive and significant relationship with low female enrolment ($\beta = 0.157$, $P = .000$). The finding implies that lack/negative motivation contribute significantly towards low female enrolment to STEM.

4.5.1 Reasons why female students choose to do STEM courses as opposed to Arts

As regards to the question on the reasons why female students choose to do STEM courses as opposed to arts courses, the results from the analysis were summarized and presented in Table 4.15:

Table 4.15: Reasons why Females Students Choose to do STEM Courses as Opposed to Arts

| Reason | f | % |
|--|----|------|
| It usually pays better than non-STEM courses | 46 | 42.2 |
| Future opportunities after graduation | 76 | 69.7 |
| Shortage of STEM graduates in the society | 81 | 74.3 |
| Less females in STEM disciplines | 59 | 54.7 |
| Encouraged by my parents/family | 91 | 83.5 |
| Motivated by my secondary school teachers | 53 | 48.6 |

Source: Students Questionnaires

The result of the analysis in Table 4.15 shows the responses of the female students on why they choose to do STEM courses as opposed to Arts. Majority of the female students 91 (83.5%) indicated that they were motivated by their parent and other members of the family, 81 (74.3%) shortage of STEM graduates in the society was their motivation for taking STEM courses. Fairly a large number 76 (69.7%) said it was because it gives better opportunities after graduation, 59 (54.7%) mentioned that the reason is because there are less females in STEM disciplines, 53 (46.6%) said they were motivated by their secondary school teachers and lastly, 46 (42.2%) mentioned that because it usually pays better than non-STEM courses.

This shows that majority of the students identified being motivated by their parents and family members, shortage of female STEM graduates and better opportunities after graduation as the major reasons why they choose to do STEM courses as opposed to arts. The findings of the study on the reasons why female students choose to study STEM was because they were encouraged by their parents contradicts a study by Okafor and Arinze (2012) which observed that, less emphasis on the education of daughters in the society contributes to low female enrolment. However, it also contradicts what Egun & Tibi (2010) observed that most parents tend to support males more than the females to pursue educational career especially in STEM.

Further, as far as the reasons for shortage of female STEM graduates in Nigeria are concerned, the study is supported by a study conducted by Aderemi (2013) on the enrolment, graduation and staffing in science and technology in tertiary institutions in

Nigeria. The study observed that few females were enrolled in university education and specifically in science and technology. A study by Akanwa and Kalu (2018) supports the finding that female students choose to do STEM because of the shortage of STEM graduates as there are very few females that are in STEM related courses. The study stressed the wide gap that still exists in enrolment leading to low females in STEM areas. This means that few will graduate in the STEM related disciplines and thus the continued low enrolment of females in STEM undermines the dream of Nigeria of seeing science and technology as fundamental to national transformation and development.

In addition, the finding that female students were motivated by their teachers is supported by Murrieth (2015) who in Kenya observed that motivation by teachers is one of the major factors that encourage students to go for courses that are science based. Ngozi (2015) remarked that motivation on the part of their teachers at lower levels of education and even the lecturers at the university level could encourage more females to enroll in STEM courses.

Lastly, the findings that female students choose to study STEM courses because it pays better than non-STEM courses is in line with a study conducted by Beede et al., (2011) which remarked that STEM courses serve as a gateway to many high paying jobs and concluded that receiving a STEM degree leads to in higher earning later in life.

4.5.2 Reasons why Female Lecturers choose to do STEM as Opposed to Arts by Lecturers

Regarding to the question as to why female lecturers decided to choose STEM courses as opposed to Arts courses, the results were summarised in Table 4.16.

Table 4.16: Reasons why Female Lecturers choose to do STEM courses as opposed to Arts

| Reason | f | % |
|---|----------|----------|
| Job satisfaction | 7 | 100 |
| Many different areas of specialization | 5 | 71.4 |
| Because of its impact on the society | 6 | 85.7 |
| It offers professional development and assistance schemes | 7 | 100 |
| Finding innovative solutions to real world challenges | 4 | 57.1 |

Source: Lecturers' Questionnaires

The results of the analysis in Table 4.16 showed that the female lecturers identified their reasons why they chose to do STEM courses as opposed to Arts. The reasons included that STEM programs offer job satisfaction 7(100%). It was also observed that STEM offers professional development and assistance schemes 7(100%). 6(85.7%) mentioned the reason as due to its impact on the society. It also provides many different areas of specialization 5(71.4%) and 4(57.1%) of the female lecturers mentioned that STEM courses lead to finding innovative solutions to real world challenges.

The study outcome are in line with the finding of (Morrison, 2006, Beede et al., 2011; Edsie, 2014 & Najib et al., 2019) on the importance and roles STEM played by an individual, professional development and its impact on the society at large.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.1 Introduction

This chapter presents the summary of the research findings, conclusions and, recommendations of the study and suggestions for further research.

5.2 Summary of Findings of the Study

The study sought to establish the factors that contribute to low female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria.

The study intended: to establish the extent to which admission policies contribute to female enrolment in Abubakar Tafawa Balewa University; to determine the extent to which Students, Parents and Lecturers' perceptions contribute to female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria; and to establish the extent to which motivation contribute to female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria.

To achieve this, the study employed a descriptive research design where both quantitative and qualitative data were gathered from 391 students, 15 lecturers, 6 deans and 6 parents of students. The quantitative data was analyzed by the use of percentages and regression analysis and the qualitative data was analyzed thematically. The findings of the study were summarized as per the study objectives.

5.2.1 To establish the extent to which admission policies contribute to female enrolment in Abubakar Tafawa Balewa University

This objective sought to find out if the respondents are aware that the admission quota policy in the universities is based on the following distribution; merit is (45%), catchment area (35%), and disadvantaged states (20%). Also if female candidates are given a specific percentage in the admission quota policy; and if Nigerian University admission policy on catchment area contribute to more female enrolment in Abubakar Tafawa Balewa University Bauchi. Besides, whether admission quota given to the Education Less Privileged States (ELPS) help in enrolling more female students in Abubakar Tafawa Balewa University, Bauchi and lastly, whether by not giving a specific number of females in the admission policy contributes to low female enrolment in STEM courses.

The finding implies that lack of proper admission policies contributes significantly towards low female enrolment to STEM.

5.2.2 Students, Parents and Lecturers' perceptions

The second objective sought to establish the extent to which students, parents and lecturers' perceptions contribute to female enrolment in Abubakar Tafawa Balewa University, Bauchi, Nigeria.

In this objective, the findings of the study revealed that that negative perceptions from students, parents and lecturers contribute significantly towards low female enrolment to STEM.

Despite the fact that, all the respondents agreed that females are supposed to be enrolled in STEM and their dreams to be there, the negative perception of their parents, lecturers and students alike on female education and STEM disciplines, negatively affected their enrolment in STEM courses. These perceptions among others include lack of motivation from the parents and lecturers. Girls are usually considered to be home makers and deserved not to be educated. There are perceptions that science courses are very hard and difficult and therefore considered to be masculine. There is stereotype influence on the choice of STEM, and the perception that education of a female child is rather a waste of resources.

5.2.3 Motivation Determinants of Female Enrolment in STEM

The third objective sought to establish the extent to which motivation contribute to female enrolment in STEM in Abubakar Tafawa Balewa University, Bauchi, Nigeria. In this objective the study finding showed that lack/ negative motivation contribute significantly towards low female enrolment to STEM.

5.3 Conclusions of the Study

The study sought to examine the extent to which admission policies contribute to female enrolment in Abubakar Tafawa Balewa University. Based on the findings of the study, it is logical to conclude that lack of proper admission policies contributes significantly towards low female enrolment to STEM. While quota admission policy to the education of the less privileged states help to a greater extent in enrolling more females in STEM-related courses, the general quota admission policy on catchment areas has a negative influence on the enrolment of female in STEM courses. The finding implies that.

Secondly, based on the findings of the study, it can be concluded that the negative perceptions of the students, lecturers and parents of students of Abubakar Tafawa Balewa, University greater extent contributed significantly to low female enrolment in STEM courses. This is seen as majority of the students and lecturers agreed that girls are usually considered to be home makers and deserved not to be educated. There is a perception that science courses are very hard and they are considered to be masculine. There is a stereotype influence on the choice of STEM and that the perception that education of a female child is rather a waste of resources is evident.

Thirdly, it is logical to also conclude that lack/negative motivation contribute significantly towards low female enrolment to STEM in Abubakar Tafawa Balewa University, Bauchi,

5.4 Recommendations from the Study

Based on the analysis of the data presented and the conclusion made, the study therefore recommends policy and practice recommendations as:

- i. The Federal government should review and amend the National Policy on Education, to create a section of female quota, in order to expanding access and equity for female education in higher education, especially at the university level and STEM in particular.
- ii. More sensitisation programmes should be organised for the communities and the society at large on the need and importance of STEM education for the females because of the role they play in nation's building. This is should change their negative perceptions of girl's education in STEM.
- iii. Sensitisation programmes should also be organised for both the parents and teachers so as to have a change in attitude towards the education of the females so as to motivate more females to enrol in STEM related courses

5.4.1 Recommendations for Further Research

From the outcome of this research work, and since the study sought to establish the determinant of low female enrolment in STEM courses in Abubakar Tafawa Balewa University, Bauchi, similar research should be conducted on:

- The effect of admission policies of female across the federal universities Nigeria.
- What influences female choices of STEM courses?
- The effectiveness of the set policies and programmes on female enrolment and participation in STEM in secondary schools

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APPENDICES

Appendix A

Introductory Letter to Respondents

Dear respondents,

I am a graduate student from Kenyatta University, Nairobi, Kenya, pursuing a master's degree and conducting a study on: **Determinants of Low Female Enrolment in STEM courses in Abubakar Tafawa Balewa University, Bauchi.** I hereby request you to respond to the questionnaire to the best of your knowledge and sincerely.

It is worthy to note that, the questionnaire is purposely designed for this research only and hence your responses will be treated with confidentiality.

Thank you for the anticipated cooperation.

Your Sincerely

Isah Magaji
M. Ed Student
Kenyatta University, Nairobi
Magaji.isah1@students.ku.ac.ke
+2348036177837; +254715452625

Appendix B

Questionnaire for Students and Lecturers

Introduction and guidelines

I am a graduate student from Kenyatta University, Nairobi, Kenya, pursuing a master's degree and conducting a study on: **Determinants of Low Female Enrolment in STEM courses in Abubakar Tafawa Balewa University, Bauchi.** . I hereby request you to respond to the questionnaire to the best of your knowledge and sincerely.

This questionnaire is designed for the purpose of this research only, thus your responses will be absolutely confidential. **DO NOT** write your name, please

INSTRUCTIONS

Fill in the information on bio-data by completing and ticking where appropriate

Section A. Bio-data

Please fill in the columns and tick () where appropriate:

- i) Faculty_____
- ii) Department _____
- iii) Gender_____
- iv) Age bracket_____

| | | |
|---------------|---------------|---------------|
| 20 - 25 years | 25 - 30 years | 30– and above |
|---------------|---------------|---------------|

- v) Parent's Occupation_____
- vi) Parent educational qualification

vii) Diploma [] Degree [] Master []
 PhD [] Others specify _____
 Family size _____

Section “B”

You are also kindly requested to choose and indicate whether your response to an item in section B is **Strongly Agree (SA)**, **Agree (A)**, **Undecided (UD)**, **Strongly Disagree (SD)** or **Disagree (DA)**.

Please fill in please the columns and tick () where appropriate:

NIGERIAS ADMISSION POLICY

| S/N | Statement Items | S | A | A | D | S D | UD |
|-----|--|---|---|---|---|-----|----|
| 1. | The admission quota in the Universities is based on the distribution that merit is merit (45%), catchment area (35%), and disadvantaged states (20%) | | | | | | |
| 2. | Female students are given a specific percentage in the admission policy | | | | | | |
| 3. | Nigerian University admission policy on catchment area contribute to more female enrolment in Abubakar Tafawa Balewa University Bauchi | | | | | | |
| 4 | Admission Quota given to the Education less Privileged States (ELPS) help in enrolling more female students in Abubakar Tafawa Balewa University, Bauchi | | | | | | |
| 5 | Not giving a specific number to females in the admission policy contributes to low female enrolment in STEM courses | | | | | | |

**Students, Lecturers and Parents' Perception on Female Enrolment in Science,
Technology, Engineering and Mathematics Courses**

| | Please tick as appropriate | S | A | A | D | S D | UD |
|----|--|----------|----------|----------|----------|------------|-----------|
| 1. | According to me, female students are supposed to enrol in STEM courses | | | | | | |
| 2. | Female students like STEM courses | | | | | | |
| 3. | Lack of lecturers' motivation to the student lead to low enrolment of female students | | | | | | |
| 4. | Parents perception lead to low female enrolment in STEM courses | | | | | | |
| 5. | Girls and women are considered in the community as home makers only and not to be educated | | | | | | |
| 6 | Female students pursue arts courses because they consider science as difficult and hard courses | | | | | | |
| 7 | STEM courses are generally considered masculine courses and that is why less female enrolled in these courses | | | | | | |
| 8 | Parent are major decision makers in their children's career choice | | | | | | |
| 9 | Girls can do very well in STEM courses but they are discouraged by their parents, lecturers and other students | | | | | | |

10. According to you ,why do you think there are few girls doing STEM courses in the university

.....

.....

.....

OTHER DETERMINANTS OF LOW FEMALE ENROLMENT

| S/N | Statement Items | S | A | A | D | S D | UD |
|-----|--|---|---|---|---|-----|----|
| 1. | Poor performance at the senior secondary school certificate examination dictates leads to low enrolment of females in the university | | | | | | |
| 2. | Inadequate female scientist and engineer's role models to be emulated in the society and to encourage girls to pursue university education contribute to the low enrolment of females in the university education. | | | | | | |
| 3. | The university curriculum and the nature of instruction do not encourage females to enrol in the university level of education in STEM courses | | | | | | |
| 4 | University environment is usually unfriendly to the women and girls as a result of lack of mechanisms for checking sexual harassment contribute to low female enrolment in STEM at the university | | | | | | |
| 5 | High value placed on marriage and motherhood by the society that sometimes lead to early marriage contributes low female enrolment in the universities. | | | | | | |
| 6 | Less emphasis on the education of daughters in the society contribute to low female enrolment | | | | | | |
| 7 | Parents encouraging early marriage practices contributes to low enrolment of females in the Abubakar Tafawa Balewa University | | | | | | |
| 8. | Parents' attitude towards the education of girls do contributes to low female enrolment in the university education. | | | | | | |
| 9. | High school fees and cost of materials in STEM at the university contributes to low to enrolment of females in STEM disciplines | | | | | | |

I0. If you are a girl/female student/lecturer/parent, indicate reasons why you chose to do STEM courses as opposed to Arts

A:

B:

C:

D:

SECTION C
STRATEGIES TO ENHANCE FEMALE ENROLMENT

| S/N | | S | A | A | D | S D | UD |
|-----|--|---|---|---|---|-----|----|
| 1. | Establishment of remedial (Science) programmes will enhance female enrolment in STEM | | | | | | |
| 2. | Interventions to combat sexual harassment and violence will enhance female enrolment in STEM | | | | | | |
| 3. | Provision of women accommodation and women (only) universities will enhance female enrolment in STEM | | | | | | |
| 4 | Increasing number of women academics and administrators will enhance female enrolment in STEM | | | | | | |
| 5 | Establishing gender studies units | | | | | | |
| 6 | Establishing more gender sensitisation programmes will enhance female enrolment in STEM | | | | | | |

End of questions.

Thank you for providing the study with valuable data.

Appendix C

Interview Schedule for Deans

Section one

1. How long have you been in the service of Abubakar Tafawa Balewa University, Bauchi?
2. How long have you been the Dean of this faculty?
3. What is your educational qualification?

Section two

4. Give your views on the effects of the following admission policy as they affect educational equity in this university
5. Quota to catchment areas
6. Quota to education less privileged states developed states
7. What is your opinion on how the following contributes to low female enrolment in STEM courses in ATBU?
8. Which factors do you think can contribute most to low female enrolment in ATBU
 - i. Socio-economic factors
 - ii. Socio-cultural factors
9. What measures will you suggest to enhance female enrolment in ATBU.....
.....
.....

End of questions

Thank you for providing the study with valuable data

Appendix D

Interview Schedule for Parents

Section 1

1. What is your educational qualification?

Section 2

2. Give your views on the effects of the following admission policy as they affect educational equality and equity in this university

Quota to catchment areas.....

Quota to less educationally developed states.....

3. What is your opinion on how the following contributes to low female enrolment in STEM courses in ATBU?.....

4. Which factors contribute most to low female enrolment in ATBU

Socio-economic factors

Socio-cultural factors

5. What measures will you suggest to enhance female enrolment in ATBU.....

.....

.....

End of questions

Thank you for providing the study with valuable data

Appendix E

Research Permit



KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke

Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Our Ref: E55F/29141/2014

DATE: 1st October, 2018

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MR. ISAH MAGAJI – REG. NO. E55F/29141/14

I write to introduce Mr. Isah Magaji who is a Postgraduate Student of this University. He is registered for M.Ed. degree programme in the Department of Educational Management, Policy & Curriculum Studies.

Mr. Magaji intends to conduct research for a M.Ed. thesis Proposal entitled, “Determinants of Low Enrolment of Female Students in Science, Technology, Engineering and Mathematics (Stem) in Abubakar Tafawa Balewa University, Nigeria.”

Any assistance given will be highly appreciated.

Yours faithfully,

A handwritten signature in blue ink, appearing to be the name of the Dean of the Graduate School.

Appendix F

Approval

ABUBAKAR TAFAWA BALEWA UNIVERSITY, BAUCHI

Vice Chancellor

PROF. MUHAMMAD AHMAD ABDULAZEEZ

NCE, B-Tech (Physics) FUTY, Msc (Physics) U.I
PHD (ATBU, Bauchi) FNIP, MSESN

Registrar

A.G. HASSAN, Ph.D

B.Sc (MAID) M. Sc, PhD (ABJ) FCAI, MNIM
sirahmadu007@gmail.com



P.M.B 0248,
Ningi/Kano Road,
Gubi, Campus,
ATBU, Bauchi, Nigeria.
registrar@atbu.edu.ng

Office of the Registrar

Our Ref: _____ *Your Ref:* _____ *Date:* 15th October, 2019

The Dean,
Graduate School,
Kenyatta University,
Kenya.

Sir,

RE: REQUEST FOR APPROVAL

I am directed to convey the Management's approval to you "Isa Magaji" of Department of Education: Management Policy to conduct a research in our Institution Abubakar Tafawa Balewa University, (ATBU), on the topic "Determinants of Low Enrolment of Female Students in science, Technology, Engineering and Mathematics (STEM)" in ATBU, Bauchi – Nigeria.

By this letter, Kenyatta University, Kenya is hereby informed that approval has been granted to you to conduct the research as you requested, please.

Thank you.



Ahmed Y. Haruna

PAR/ACADEMICS

Appendix G

Budget

| Budget | | | |
|---------------------------------|--------------------------------|----------------------|-------------------|
| EQUIPMENTS & ACTIONS | TIME & QUANTITY | COST PER UNIT | TOTAL COST |
| MATERIAL SUPPLIED | | | |
| Stationeries | | | 2,000.00 |
| Proposal expenses | | | |
| Typing & printing | 70 pages | (5 x 70) 10 | 3,500.00 |
| Photocopy | 10 copies of 70 pages | (3 x 70) 10 | 2,100.00 |
| Binding | 10 copies | 50 x 10 | 500.00 |
| | | Sub – Total | 6,100.00 |
| Travels % survival | | | |
| Surviving Expenses | 6 month | 2,000.00 per month | 12,000.00 |
| Transportation | | | 200,000.00 |
| | | Sub-Total | 212,000.00 |
| Equipment | | | |
| Flash drives | 2 | 500 | 1,000.00 |
| Compaq Disks | 10 | (25 x 100) | 250.00 |
| | | Sub-Total | 1,250.00 |
| Collection of Data | | | |
| Printing of Questionnaires | 10 pages | (5 x 10) | 50.00 |
| Photocopy of Questionnaires | (606 copies x 10 pages) = 6060 | (6060 x 3) | 18,180.00 |
| | | Sub – Total | 18,230.00 |
| Communication | | | |
| Internet browsing | | | 3,000.00 |
| Calls | | | 2,500.00 |
| | | Sub – Total | 5,500.00 |
| Thesis Production | | | |
| Printing | (120 pages x 7 copies) = 840 | (5 x 840) | 4,200.00 |
| Photocopy | (10 copies x 120 pages) = 1200 | (3 x 1200) | 3,600.00 |
| Binding | 10 copies | (100 x 10) | 1,000.00 |
| | | Sub – Total | 8,800.00 |
| | | Total | 245,960.00 |
| 10% Contingencies | | | 24,596.00 |