# ANALYSIS OF 60:40 RATIO ADMISSION POLICY IMPLEMENTATION FOR SCIENCE AND ARTS RELATED COURSES IN KWARA STATE TERTIARY INSTITUTIONS

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## ABSTRACT

*This study analysed 60:40 ratio admission policy implementation for science and arts related courses in Kwara state tertiary institutions between 2011/2012-2015/2016 academic sessions. Content Analysis Research Design Approach (CARDA) was adopted for the study. The population of the study comprised of Thirty-Six Thousand Two Hundred and Eighty-Seven (36287) candidates offered admission for five academic sessions (2011-2016) was used. Purposive sampling technique was used for the study. Three research questions were raised and three hypotheses were formulated and tested at 0.05 level of significance. The data collected were analysed using One-way Analysis of Variance (ANOVA) with the aid of computer Statistical Package for the Social Sciences (SPSS) version 21.00. The result of the study revealed that an average of 48.35% candidates offered admission into Kwara State tertiary institution were in the area of science related courses as against 51.65% offered admission in area of art related courses. This fall short of 60% policy in favour of science courses as against 40% in favour of art courses by the Federal Government of Nigeria through the National Policy on Education. The finding revealed that there was not significance difference between students offered science related courses and student offered art related courses in Kwara state tertiary institutions between 2011-2016. There is need to showcase successful female scientists and engineers and create a culture of mentorship and role models.*

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# CHAPTER ONE

## 1.0 INTRODUCTION

### 1.1 Background to the Study

Today the significance of science in human life cannot be over emphasized, because science is everywhere and it make our life more secure and convenient than it used to be. Science and Technology plays an important role in human. For example, in natural calamities, Science and Technology helps in timely informing, warning and so no. with an end goal to help prevent disasters. On the other hand, along with the experiment, science likewise to help generate new medicines, antibiotics and vaccines and so on to tackles diseases and much more. We all accept that science has changed the world we live today with scientific experiments, researches, innovation, and inventions. Science has made human life much more convenient and easier by saving labor time and much more with new technologies. Indeed, its series of discoveries has helped understand the nature of the world and has improved for the betterment of the society. (Akpan, 2010). Science and Technology are very important in the development of any country.

In the development of any nation, science technology and mathematics plays a vital role (Ukeje, 2011) observes that without mathematics there is no science, without science there is no modern technology and without modern technology there is no modern society. In other words, mathematics is the precursor and the queen of science and technology and the indispensable single element in modern societal development. So, if any nation must develop, the study of science, technology and mathematics should be given adequate attention in the various levels of her education. Nigeria as a developing nation appears to have been prepared to resolve the issue of developments in science, technology and mathematics through her policy on education. The policy provides for a

60: 40 admission ratio in the tertiary institutions in favour of science, technology and mathematics (FRN, 2013). Efforts in this direction appear to be yielding dividends as indicated by the admission ratio of Art to Science of 46:54, 34: 66 and 33: 69 for 2005/2006, 2006/2007 and 2007/2008 academic years respectively (Aguele and Uhumuavbi, 2013). This is an improvement over what it used to be in the past where the ratio was in favour of Arts related subjects.

According to Bajah (2010), it is critically important that the nation's work force attain and maintain a state of technological and scientific readiness that will enable it to thrive in the global economy. Nigerian educational system prioritized Science and Technology with policies that are favorably disposed to Science and Technology Education. Policies can be defined as sets of principles, rules, and guidelines formulated or adopted by an organization to reach its long-term goals, and those are typically published in a booklet or other form that is widely accessible (Ziman, 2010). The National Policy on Education (2004) and the National Policy on Science and Technology (FRN, 2013) made good provisions for Science and Technology Education. Government through the education policy empowered the Early Childhood Care and Education (ECCE), the Basic Education, the senior secondary education, technical and scientific education and tertiary education with robust plan for science and technology education in the programmes (FRN, 2013).

Meanwhile, the aims and objectives of Nigerian education according to the policy include:

i. The inculcation of national consciousness and national unity.
ii. The inculcation of right type of values and attitudes for the survival of the individual and the Nigerian society.
iii. The training of the mind in the understanding of the world around.

iv. The acquisition of appropriate skills, abilities and competencies both mental and physical as equipment for the individual to live in and contribute to the development of the society.(NPE, 2004)

The Federal Government specified the goals of science education in the policy and states as follows; “Special provisions and incentives shall be made for the study of the sciences at each level of the National education system. For this purpose, the functions of all agencies involved in the promotion of the study of sciences shall be adequately supported by government. In addition, Government shall popularize the study of the sciences and the production of adequate number of scientists to inspire and support national development” (FRN, 2013). It further states that “science and technology shall continue to be taught in an integrated manner in the schools to promote in the students, the appreciation of basic ideas”. (FRN, 2013). These are clear indications that the national policy on education gives premium to science and technology education (NPE, 2013).

The gap that often exists between policy formulation and implementation provokes inquiry to identify factors that constrain the effective implementation of educational policies. The problem of policy implementation is traceable to the planning stage which comes immediately after policy formulation. Okeke *et al.* (2008) and Ukeje (2011) have stated clearly that good planning will ensure effective implementation. Good planning that can facilitate effective implementation ought to consider such factors as the planning environment, social environment, political environment, and financial and statistical problems. It is in recognition of this observation that (Aghenta 2009) noted: For education to achieve all ends, it has to be carefully planned. The plan must take into consideration: the needs of the society; the political, socio-cultural, economic, military, scientific, and technological realities of the environment are very important to its

survival. Adesina (2010) notes that planned implementation is constrained by the following factors.

1 Over-estimation of available resources – this is a situation where estimated resources are greater than actual available resources to implement a program

2 Under-estimation of the costs of implementing a plan – this happens when cost-estimates do not make adequate provisions for inflation and actual implementation costs become unmanageable

3 Over-reliance upon external assistance – plans that substantially rely upon assistance from foreign sources for their implementation run into hitches when such aid fails to come, and

4 Inaccurate statistical data – planning education requires accurate and up-to-date data. Plans that do not adequately provide for this usually have implementation problems.

Furthermore, (Aina, 2010) have also advanced three general explanations for unsuccessful implementation of programs, namely:

1. The communication process – effective implementation requires that implementers know what they are expected to do; as messages pass through any communication network, distortions are likely to occur which can produce contrary directives, ambiguities, inconsistencies and incompatible requirements;
2. The capability problem – ability to implement policies may be hindered by such factors as incompetent staff, insufficient information, political support, inadequate fi nancial resources and impossible time constraints.
3. Dispositional conflicts – implementation of a policy may fail because those charged with the responsibility of implementation refuse to carry out their own assignments.

The researcher is motivated by these problems to carry out an investigation into 60-40 admission policy implementation in Kwara State tertiary institutions. With the continuous rise in tertiary education in Nigeria, admissions into tertiary institutions have been very contentious (Aina, 2010). Ogbonnaya (2009), opines that students' admission into tertiary institutions is the formal acceptance into school or program of study for which certain requirements must be met.

Tertiary institutions are guided by admission policies such as quota system, catchment area, carrying capacity, and educationally less developed states, among others. Obielumani (2008) defined quota system as any selection method whereby a certain set of percentage of those selected must be of a given ethnic or racial background and/or of a particular sex. According to Federal Government of Nigeria (FGN; 2011), Catchment Area refers to the geographical and/or sociocultural areas contiguous to the institution candidates apply to. Some consider the quota and catchment area policies equitable while others consider it inequitable.

According to Enemuo (2012), the quota and catchment area policies encourage social discrimination of a group against another. Akani (2011) believes that as a result of the Federal Government admission policies which apparently do not emphasize quality, the quality of University education in Nigeria has consequently been lowered. Akindutire (2010) also stated that: The quota system of admitting candidates into Federal Government institutions gives room for inequality which affects the much talked about standards in education. It seems there is no definite cut-off line for all candidates. A candidate from State Y may score 65% and may not be offered admission because there are many others from the same State with higher scores; while another candidate from State X who scored 45% is admitted because only a few candidates from that State

scored above 45%. The system seems to contradict some of the major national objectives such as free and democratic society; just and egalitarian society.

Ajayi (2009) opined that these policies ensure equity and fairness in admission processes. Another policy that guides the admission process into tertiary institutions in Nigeria is the 60-40 ratio of admission to the science and liberal arts disciplines, respectively in the university.

The rationale behind 60:40 ratio of admission to the science and liberal arts disciplines, respectively in the Nigeria universities and colleges of education is that the country needs more scientists in all sectors of the country, especially in the oil industries and for economic development and transformation. The Federal Government is responsible for the overall policy framework for the education sector. The attainment of universal basic education by 2015, in line with the international Millennium Development Goals for education is the main objective of the National Education Policy which was adopted in 2004. The state and federal ministries of education have recognized the problem of getting an accurate data on the enrolment in schools and have made an effort to solve this problem through an annual censor in schools and data collected has shown a gradual increase in enrolment at both primary and secondary school levels between 2009 and 2013.

In Africa, Okojie (2011) reported the existence of disparity between science and arts education and gender disparity in education. She asserts that, in general, primary school enrolment rates are higher in the Middle East and Northern Africa as well as in Southern Africa than in sub-Sahara Africa. The sub- Sahara Africa has performed very poorly compared to other region in Africa with respect to Gross Enrolment ratio at the primary and secondary levels combined; the same is equally true of third-level

enrolment (tertiary education). Thus there is a gender gap in enrolment at all levels of education (United Nation, 2009). In Nigeria, the Universal Basic Education (UBE) law was enacted to fast-tract attainment of Education For All (EFA) goals. The legislation provides for a 9 year continuous education (6-year primary and 3 – year junior secondary) known as basic education. The 2012 National School Census (NSC) exercise revealed a net primary enrolment ratio (NER) of 83.71% (male = 87.01% and female = 81.39%)

The Federal Government of Nigeria made several efforts to increase access to science and technology education in the following ways: create more science secondary schools, science and technical colleges, university of science and technology, university of technology, increase enrolment into science and technology through 60:40 admission policy among others.

Because STEM degrees are growing increasingly popular, many look at Humanities as not popular and very cheap to study. Studying humanities is as good as studying sciences. Many people studied humanities because of the following reasons.

1. The humanities help us understand others through their languages, histories and cultures.
2. They foster social justice and equality.
3. They reveal how people have tried to make moral, spiritual and intellectual sense of the world.
4. The humanities teach empathy.
5. They teach us to deal critically and logically with subjective, complex, imperfect information.

6. And they teach us to weigh evidence skeptically and consider more than one side of every question.
7. Humanities students build skills in writing and critical reading.
8. The humanities encourage us to think creatively. They teach us to reason about being human and to ask questions about our world.
9. The humanities develop informed and critical citizens. Without the humanities, democracy could not flourish.

It was discovered from the Kwara Annual Education Sector Performance Report of 2010 that in Kwara State 12 out of 16 LGAs have gender parity index greater than 0.95 at the primary level meaning most LGAs have either achieved or are very close to achieving gender parity. The overall gender parity index is 0.94 at the primary level and is 0.90 at the junior secondary level suggesting a lower transition rate to junior secondary level for girls. In junior secondary education, the gender parity index is above 0.95 in only 6 out of 16 LGAs. The aforementioned background motivates the need for this study having seen that Kwara state tertiary institutions has an important role to play in the effort to produce more scientists in all sectors of the country and closing the gender gap in science and technology education particularly in Kwara state.

## 1.2 Statement of the Research Problem

Economic and Technological advancement of nations are driven by human resources in Science, Technology and Mathematics. In recognition of this, many nations in the world and the Federal Government of Nigeria (FGN) established the 60:40 ratio in admission policy between Science, Technology and Mathematics (STM) and Arts and social sciences related courses respectively (Ajakaye, 2011). Nevertheless, the extent to which this policy has achieved its set objectives has not been extensively researched, hence

there is limited studies on the extent of the implementation of the policy. The lack of effective implementation of this policy will have negative implication for manpower development in Science, Technology and Mathematics in Nigeria. It will also jeopardise the aspiration of Nigeria to be one of the top twenty (20) economies by the year 2020. The Federal Government of Nigeria in an effort to bridge the educational gap between the states introduced some educational polices which includes: The quota system, catchment area and in the National policy on Education (NPE) the 60:40 ratio admission policy (NPE, 2004). In the North Central region there has been low number of Science and Technology Education professionals with Kwara state having the lowest number of professionals in the region, (Olabode, 2015). According to Babatunde (2014), Kwara state has low and unqualified professionals like Medical doctors, Pharmacists, Engineers, Nurses, Science and Technology Education teachers which make one wonder if the 60-40 ratio admission policy in favour of science related courses are strictly adhered to and its impact felt in the society. This research will therefore investigate the extent of the implementation of 60:40 ratio admission policy for Science and Arts related courses in Kwara State tertiary institutions between 2011 and 2016 academic sessions.

## 1.3 Aim and Objectives of the Study

The aim of this study is to investigate the extent of implementation of 60:40 ratio admission policy for science and Arts related courses in Kwara State tertiary institutions. The study strives to achieve the following objectives.

1. To determine the extent to which 60:40 ratio admission policy for science and arts related courses in kwara state tertiary institutions have been implemented between 2011 to 2016.

2. To determine the difference between male access to science related courses and male access to arts related courses in Kwara State tertiary institutions between 2011 to 2016 academic sessions.
3. To determine the difference between female access to science related courses and female access to arts related courses in Kwara State tertiary institution, between 2011 to 2016 academic sessions.

## 1.4 Research Questions

The following research questions were addressed in the study.

1. What is the extent of implementation of 60:40 ratio admission policy into Science related courses and Arts related courses in Kwara state tertiary institutions.
2. Would there be difference between male access to Science related courses and male access to Arts related courses in Kwara state tertiary institutions.
3. Would there be any difference between female access to Science related courses and female access to Arts related courses in Kwara state tertiary institutions?

## 1.5 Research Hypotheses

The following null hypotheses were tested at 0.05 significant level.

HO1: There is no significant difference between students access to science related courses and students access to arts related courses in Kwara State tertiary institutions..

HO2: There is no significant difference between male access to Science related courses and male access to Arts related courses in Kwara state tertiary institutions.

HO3: There is no significant difference between female access to Science related courses and female access to Arts related courses in Kwara state tertiary institutions.

## 1.6 Significance of the Study

This study is meant to investigate the level of implementation of 60-40 ratio admission policy for science and arts related courses into Kwara State tertiary institutions. The study will be of benefit to the following; students, policy makers, state government and education planners. The study will encourage students' participation in science and technology which will have positive impact on the Nation's economic development.

The findings of this study will help policymakers and administrators to re-evaluate admission criteria. The study can also provide insight into the pressing issues in Kwara State tertiary institutions regarding admission and ways to improve admission policy.

The study may benefit higher education planners by helping them to formulate policies for higher education that will increase access to science and technology education. The results of this study may contribute to persuade the state government to provide more incentives to science and technology education profession.

## 1.7 Scope of the Study

The scope of this study is limited to Kwara State which is a State in North Central Geo political zone and part of Northern Nigeria with capital at Ilorin and with $8^0$30'N and $5^0$00'E. The study is limited to admission placements into five tertiary institutions in Kwara State (Kwara State University, Kwara State College of Education Technical Lafiagi, Kwara State College of Education Ilorin, Kwara State College of Education Oro) for the period of five academic sessions (2011/12-2015/16).

# CHAPTER TWO

## 2.0 LITERATURE REVIEW

### 2.1 Conceptual Framework

#### 2.1.1 Science and Technology Education

Science and Technology education is very important for the economic development of any nation. The International Test and Evaluation Association (2012) defined technology education as the study of technology in which students learn about the process and knowledge related to technology. As a field of study, it covers the human ability to shape and change the physical world to meet needs, by manipulating materials and tools with techniques. As a concept, it is concerns an array of tools such as media, machines and networking hardware, as well as considering underlining theoretical perspectives for their effective application (Aina, 2009). It is a means of preparing for occupational fields and for effective participation in the world of work, an aspect of lifelong learning a preparation for responsible citizenship and an instrument for promoting environmentally sound sustainable development. It provides trained manpower in the applied sciences and technology. It proffers the technical knowledge and vocational skills necessary for agricultural, commercial and economic development (Odu, 2011).

Science and Technology is the teaching and learning of science and technology process and principles that will lead to fundamental and applied research in the sciences and technologies at all levels of education. In other words, science and technology education can as well be described as training or retraining which is given in schools or institutions, and is conducted as part of a programme designed to produce scientists and technologists for national development.

However, the term science and technology education has been variously defined as All the learning experiences, activities, planned, designed, and organized for the disciplines-Biology, Microbiology, Bio-chemistry, Chemistry, Physics, computer science, Health science, Agricultural science, Basic science, Integrated science, Basic technology, Introductory technology and so on by the school or an institution to achieve not only the aims and philosophy of science and technology but also the over-all goals of the national development.

### 2.1.2 Science and Technology Education Development in Nigeria

Development is central to all educational sectors, their evolutions, techniques and technologies that tend to their establishment. Therefore, science and technology educational development connotes improvement from a certain point of initial growth to a higher level of growth which is a demonstration of improvement from a primary education level to secondary education level and higher education level along approved continuum. The Encyclopedia of Education (2010) sees science and technology educational development as programmes of Science and technology which begin in the elementary school and extend through the secondary school to tertiary institution. Development in science and technology education tends to encourage further development in other facets of life. It connotes not only on the establishment of institutions for science and technology, but it is the pivot on which advancement of science and technology subjects or courses rest.

Developments in Science and Technology according to (Akpan, 2011) start with education of the people in science and technology. Science and technology education development as a way of life in which the main human activities-biology, chemistry, physics, agricultural science, integrated science, basic technology and introductory

technology are divided and sub-divided, for the convenience of learners and teachers, into subjects of the curriculum. Development in science and technology education can be defined as all the novel introductions (new teaching methods, new science teaching materials and new curriculum content) that enhance efficient and effective teaching and learning of science and technology. As in other parts of African formal education was introduced into Nigeria by the Christian Missions which arrived in the country in 1842. As soon as they came, the missionaries opened a number of primary schools, the general education of the converts. (Falana, 2012) affirmed that the missionaries devoted attention, initially to the development of elementary (primary) education in the country. He stressed that the reason for this initiation was inadequate resources the missions depended upon from their overseas headquarter. It was only later that the few educated Nigerians in Lagos began to clamor for a kind of post primary academic education that would enable their children to become doctors, engineers, scientists, technologists and the like.

Consequently, the realization that, "changing times, demand a change in any kind of education (Hurd, 2010). With the introduction of the Western system of education by the European Christian missionaries in 1842, science and technology education had been treated as a relatively insignificant appendage of the country's education system. This was firstly due to the motives of the missionaries which were mainly for evangelization and production of clerks that could assist them in their commercial enterprise. The motive of the missionaries was not to develop Nigerian citizens scientifically and technologically. Secondly, the British rulers did not want to educate Nigerians for positions which provided jobs for themselves. Many of them knew that if they intensified the education of Nigerians they would hasten the end of occupation. So they rationed education cautiously, hoping that it would be many centuries before the

Nigerians would be able to govern themselves. They feared that educated Nigerians would agitate over many things.

Thirdly, the British Colonialists applied measures, albeit surreptitiously, that stultified science and technology development. This was done deliberately to strengthen the hold of Britain on the socio-economic life of the nation, thereby perpetuating the Nigerian peoples' dependence on British products and services (Rodney, 2010). As a result, they gave Nigerians more of literary education. Fourthly, according to Abdullahi (2009), some colonial administrators had misgivings about rapid development of interest in science and technology education in Nigerian schools. He quoted Lord Lugard as saying that "African versed in science and technology was a suspect to; and some colonial masters believed that given the specialized vocabulary of science and its mode of inquiry, that Africans, who are biologically inferior to the whites are incapable of understanding science and technology". It is a fallacy to believe that the early pioneers in Western education of Nigeria moved into a complete science and technology educational vacuum. This does not mean that the association of the Nigerians with the British was a total evil. Later, despite all these hurly- burliest, which were made to block the development of science and technology education, the British government relinquished to the development.

Broadly, the western education in Nigeria serves as landmark for the origin and development of modem science and technology education. The expanding colonial government and the economy in Nigeria created the high demand for both tradesmen and higher level of technological manpower. The subsequent required the services of technologists by the colonial administration, whose importation from Europe will increase their financial cost of running the colony and the issue of recruiting junior technical workers from Britain who will obviously come from the lower socio-

economic class would have negative effect on their assumed superior image of the white men whose instrument of governance was hinged on prestige. So, the colonial administration encouraged poorly financial and morally the missionary schools as it concerned technology education, even when it was used as a condition for financial assistance, particularly as in secondary and higher institutions so that Nigerians would do the mean practical jobs. Therefore, formal technological programme in school setting had to be developed and this marked the inception of trade centre college system. This development, in the opinion of Nigerian educational historians, was motivated by the socio-economic situation of the era which was firmly under the control of the missionaries and colonialists and whose dire need the institutional training served (Ajayi, 2010; Odubunmi, 2011).

In 1856, the church missionary society (C.M.S) established an industrial school at Abeokuta. Since there was emphasis on practical education hence its introduction in primary schools and later extended to secondary education In line with the policy from 1856 upwards, some Christian missions like the CMS began to establish institutions which offered some kinds of vocational training in town like Abeokuta, Lokoja and Onitsha in the country (Falana, 2010, Odubunmi, 2011). Before the independence, Nigerian Railways started technical training in 1901; Survey school was established in 1906, for the training of survey assistants Marina Department, the Public Works Department (PWD), the Department of Agriculture, the Department of Health, and the Department of Posts and Telegraphs (P$T). In the sameness, three years after the development of technology education, science teaching was introduced in Nigeria secondary schools.

The establishment of church missionary secondary school, at Lagos in 1859 was the significant step which resulted in marked the introduction of rudiments of science in the

school curriculum. Likewise, at the introduction of Primary Science in Nigeria in 1859 during the colonial era, there seems to have been no defined method since what was taught depend on out-door activities (Bajah, & Yoloye, 2010). Shortly afterwards, the following secondary schools were established, Science and Technology were taught there: C.M.S. girls school, Lagos, founded in 1869; St. Gregory's College, Lagos opened by Roman Catholic Mission in 1876; Methodist Boys High School, Lagos (opened by the Methodist Mission in 1878); Baptist Boy's High School, Lagos (established in 1885 by the Baptist Mission); St, Andrews College, Oyo (founded by the C.M.S in 1876); Hope Waddel Institute, Calabar opened in 1861; the Baptist Training College, Ogbomoso (opened in 1899) and the Wesleyan Training Institute founded in 1905 (Ogunleye, 2012). Similarly, according to (Ekpo, 2012) the history of science teaching in Nigeria begins with the teaching of Nature study in the school in 1859.

Emphasis on Nature study was in the areas of personal Hygiene and environmental sanitation. In particular, the United State of America, Bairley and associates at Cornell University and later Comstock, were prime movers of Nature study. They on their part were motivated by the need to improve agriculture and "to half the increasing migration of young people from farms to cities" (Bajah, 2010). Science and technology developed by them were not given desired support. Thus, science and technology education did not enjoy as much attention as the religious education.

However, not much was done to implement the policy to the letter. As a result, they gave Nigerians more of literary education than practical and scientific education. Moreover, practical education was part of their curriculum but it did not have a pride of place in their education system. It was not until 1882 that the colonial government started to co-ordinate the curriculum. The government thought the schools would stop functioning but they did not and so the government began to grant aid to them on

science and technology programmes. In addition, the education ordinance of 1887 recognized the importance of science and technology education; hence its provision became a condition for the government financial assistance. The colonial masters planned for science and technology education in Nigeria, but its implementation suffered. With the passing of the Education Ordinance of 1908, some of missionary schools were able to acquire science equipment for laboratory instruction. King's College Lagos was the first to offer science and technology education to the standard of Cambridge University Senior Local Examination (Taiwo, 2011). But with the establishment of more schools in Lagos and the Southern part of the country, the teaching of science spread to the Northern part. In 1920 Phelp-Stokes Commission was set up to examine the process of education in Africa and then made recommendations. In 1922 the report was out. It recommended the inclusion of agricultural science and some other subjects on the curriculum. With the commission's report in 1925, a memorandum was set up. The memorandum was very important in the sense that, it made provision for studying science and technology education in higher institutions.

This led to the establishment of Yaba College Lagos in 1934 with courses in medicine, engineering, agriculture science, and teacher education which led to the award of the college diploma which lasted at least four years (Oyedeji, 2012; Reform Agenda, 2010). It shows that, science and technology were not taught in the higher institution in Nigeria up to the 1930s. From 1931 to 1945 private individuals, participated in the contributions to the development of science and technology education in Nigeria. The period indicated above witnessed a lot of local community efforts at spreading science and technology education in the country as individuals, groups, communities or tribal unions set out to establish more secondary schools in the country. For example, Ozoro (2011) reported that many Nigerians such as Professor Eyo Ita, professor Oyerinde N.D, Chief

Daniel Henshaw, Rev. O. Offiong and Professor Alvan Ikoku opened secondary and technical schools in different zones in the country. This made the science and technology teaching at the primary and secondary school level possible.

The introduction of science teaching in Nigerian high school curriculum was put at late 1940s (Abudullahi, 2009). Between the 1940s and 1950s, there have been a number of governmental sponsored or institutionalized innovations in our educational system. Science and technology education and activities were handled mainly by foreigners before Nigeria got independence. Even in educational institutions sciences and technology were taught mainly by expatriates. Engineers, doctors and other high-level manpower were expatriates. The scientific/technology equipment that were used at that time were usually imported from abroad. This turned out to be the cradle of higher level production of practitioners of science and technology, leading to the production of the first generation of scientists and technologists in the mid-forties. Nigerian government prior independence operated on regions. The 1948 Education ordinance was the first comprehensive publication of an educational policy and practice in Nigeria. The primary purpose of this ordinance was designed to put into effect the educational provisions of the 1947 constitution of Nigeria which put the country into three regional administrative units. It further decentralized educational administration by classifying education as a regional service. The ordinance re-echoed the provisions of the Phelp-Stokes recommendations. During the ordinance science and technology curriculum content became more expanded and the training of indigenous teachers was vigorously pursued. The University College, Ibadan was established in 1948 as an outpost of the University of London in 1949 Nigerian government set up a commission to conduct a feasibility survey of the polytechnic idea in terms of Nigeria needs. Thus, the commission recommended the establishment of a Nigerian college of Arts, Science and

Technology with branches in each of the three regions into which the country was then divided.

A Bill for the founding of the college was introduced into the Nigerian legislature in April, 1952. The first branch of the college opened in Zaria in January 1952. The Ibadan branch opened in February, 1954 and was to offer courses in agriculture and forestory, bookkeeping and accountancy, education, science, arts, and engineering. The Enugu branch opened in 1955 and was to offer courses in mining, surveying, science and Arts. In 1959, the government appointed another commission headed by Eric Ashby to conduct an investigation into the Nigeria's need in the field of post-secondary school certificate and higher education over the next twenty years,1960 to 1980 (Falana 2007). The recommendations of the commission paved way for the offering of courses in Engineering, Medicine, and Agriculture and teacher education in sciences and technology in higher institutions. The three branches of the Nigerian college of Arts, science and technology were closed in 1962 and absorbed into the three new universities: The Enugu branch became part of the University of Nigeria, Nsukka, the University of Ife absorbed the Ibadan branch. While Ahmadu Bello University absorbed the Zaria branch. The picture of the closing years of colonial education in Nigeria was characterized with situations where elites, politicians and so on began an intensified quest for a redefinition of the goals of Science and technology education in Nigeria. On the eve of independence, the science and technology education in the land was in embryonic state. According to Lewin (2010) educational planning in Africa in the 1950s and 1960s had been preoccupied with the urge for decolonization.

To help the country to achieve its lofty Science and Technology objectives, the following professional organizations contributed to the development. The Science Teachers' Association of Nigeria (STAN), the Science Association of Nigeria (SAN),

the Joint Admissions and Matriculation Board (JAMB) and the WAEC. The current senior secondary school science and technology curriculums grew out of draft developed by the Comparative Education Study and Adaptation Centre (CESAC) and was presented to a national critique workshop (which included STAN members). The Science Teachers' Association of Nigeria (STAN) was formed on November 30, 1957. Some of the aims of the association include helping science teachers to keep in touch with development in science and its application in industry and commerce and to popularize science in the community (STAN, 2010). In terms of systematic change, the science Teachers Association of Nigeria was perhaps the most consistent agent of change. Early in 1968 a request was received by STAN from the West African Examinations Council (WAEC) to the effect that STAN should make recommendations to WAEC for revision and improvement of the current West African School Certificate (WASC) science syllabuses. A revision of the syllabuses was felt to be necessary in the light of modern developments in science education.

### 2.1.3 Teaching and Learning Process in Science

Teaching is academic processes by which students are motivated to learn in ways that make a sustained, substantial, and positive influence on how they think, act, and feel; a process that elevates students to a level where they learn deeply and remarkably because of teacher attributes (Falana, 2010). (Akudolu,2009) explained that teaching involves the setting up of activities to enable somebody learn something which can improve the person's knowledge, skills, attitudes and values. This is to say that learning can take place without teaching but teaching facilitates learning. When teaching is analysed inform of its components, it proves to be a highly complex system of verbal and nonverbal operations that interrelate and that often occur simultaneously. It covers all the activities the teacher engages in to ensure that the intended learning results. (Nzeribe

and Sawa, 2013) defined teaching as an art and science. As an art according to him, no two teachers teach alike, and as a science it is possible to perfect the act of teaching within given parameters of the act.

This means that teachers teach differently depending on the type of method used. Thus for teaching to contribute positively to learning, Bain (2008), suggest that a teacher should be subject matter expert, pedagogical expert, excellent communicator, student centred mentor, systematic and continual assessor. A teacher hardly possesses all the attributes listed above, and lack of any or their misuse may be detrimental to students learning outcome. Learning is generally defined as a process that causes gradual change in behaviour of an individual. (Ngwoke, 2013), defined learning as activity or something the learner does and not what the teacher does to the learner. In line with this definition, (Nzeribe and Sawa, 2013) explain that learning takes place as the individual interact with the environment. Hence learning process that encourages active participation of the learner is often advocated and preferred in modern instructional procedure. These definitions can be said to be suitable to definition of teaching and learning of science. This is because the definitions are in line with the statement of (Ali, 2011) that science involves ‘’doing’’. He went further to explain that science is more concerned with the various processes and activities by which reliable and verifiable knowledge is obtained than with the obtained knowledge itself. This implies that in science, learning is not necessarily an outcome of teaching rather, people learn to do well only what they practice doing. This does not mean that there is no process in doing science. The processes of doing science are the science process skill that scientists use in the process of doing science. (Yocky, 2010), outlined six basic process skills in a logical order of increasing sophistication as follows; Observation, communication, classification, measurement, inference and Prediction.

This is to say that observation comes first in any science skill. Though all the processes are important individually as well as when they are integrated together. (Nzewi, 2010) replicated science process skills in another form to include the following; Observation, questioning, measuring, inferring, manipulating instruments, controlling variables, classifying, interpreting data, communicating, formulating hypothesis, experimenting, counting, predicting, formulating models and making operational definitions. These processes are not always instilled in students especially female students who are hardly allowed to ask questions in the class or to lead in practical activities. This idea was noted by (Okeke, 2007 and Nzewi, 2010) statement that teachers promote gender stereotype by marginalizing female students in the classroom, laboratory and other related science activities. Since science cannot be science without its process skills, according to Nzewi 2010), science teachers should try as much as possible to inculcate in both male and female these processes to bridge the long existed gender gap in science. It has been stated clearly by Science for All America online (SFAM) that science process skills are more effective in science learning when teaching is consistence with the nature of scientific inquiry, reflect scientific values, aim to reduce learning anxieties, extend beyond the school and should take its time for exploring. Thus during theoretical aspect of science, teachers should utilize most of the science process skills to promote a healthy teaching learning outcome.

However theoretical aspect of teaching science involves explanation of facts, concepts, event principles and laws by the teacher to help students understand the body of knowledge. In science, facts are observable phenomena, while concepts are mental constructs which the learner has formed as result of classifying and synthesizing facts or information. Students are expected to learn these processes in the classroom through lectures (teacher centred/expository) method, laboratory investigation, house hold

activities and demonstrations. Science teaching in Nigerian secondary schools is dominated by teacher centred/expository method (Ali,2011). The phrase teacher centred arose from the fact that in a traditional classroom, the teacher assumes the position of professor of knowledge and makes decision on how the is to be transferred. Guisti (2009) described teacher centred approaches to learning as approaches centred on one fact-laden text, consisting of assign, recite, test and then discuss the test. Giovanvanetto, Friedrick and Hammagren, 2010) listed some of the advantages of lecture method to include;

1. Gives the instructor the chance to expose students to unpublished or not readily available materials.
2. Allows the instructor to precisely determine the aims, content, organization, pace and direction of a presentation.
3. Can be used to arouse interest in a subject can complements certain individual learning preferences. Some students depend upon the structure provided by highly teacher-centred methods.
4. Facilitates large-class communication.

Despite advantages of lecture/traditional method of teaching listed above, lecture method has been criticized by many researchers as a poor method of teaching (Ali, 2010 and Ibe, 2011). Their argument lies in the fact that this method allows unidirectional flow of information, making learners to be less active in the leaning process, limits the amount of students' participation, hence is not adequate for teaching hands-on skills and maintaining students' interest in the learning process. Sellerset.al (2012), also listed disadvantages of lecture method as follows;

1. Places student in passive rather than an active role which hinders learning.

2. Encourages one-way communication; therefore, the lecturer must make a conscious effort to become aware of student problems and student understanding of content without verbal feedback.
3. Requires a considerable amount of unguided student time outside of the classroom to enable understanding and long-term retention of content.
4. Requires the instructor to learn effective writing and speaking skills.

Thus lecture method may hinder students from acquiring science process skills, reason critically and be able to transfer what is learnt to new but similar situations. However, students' attention can be maintained in a lecture setting using the following techniques recommended by (Rodney, 2012);

1. Begin and end each class with something familiar and important to students so as to arouse their interest.
2. Avoid direct representation of material from the textbook, so that it remains a useful alternative resource.
3. Use paradoxes, puzzles, and apparent contradictions to engage students. To avoid these discrepancies there is need to follow principles of teaching and learning.
4. Make connections to current event and everyday phenomena.
5. Begin and end each class by summarizing main point of the lecture.
6. Adopt a reasonable and adjustable pace that balances content coverage and student understanding.
7. Relate lecture materials to past and future presentations.
8. Throughout the lecture, check on student understanding by;
9. Asking students to answer specific questions, present a problem or situation which requires use of lecture materials to find a solution.

10. Asking for student questions and waiting at five seconds for responses.
11. Watching the class for nonverbal cues of confusion, such as loss of eye contact, talking, clock watching, etc.

To avoid shortfall of lecture methods, most researchers (Bannon, 2010; Campell, 2012 and Guisti, 2012) have recommended using student-centred approach which view the teacher as a facilitator/guide as learners construct their understanding. Student-centred approaches are characterized by students sharing some degree of the responsibility for making decision in the classroom (Campbell, 2012 and Guisti, 2012). In student centred classroom, the role of teacher is less defined than with the traditional teacher centred approaches. The teacher in student centred approach is seen as a facilitator, a mentor, a coach or a consultant as the students construct their learning (Kirshner, Sweller and Clark, 2010. In the classroom, terms such as student-centred, constructivism, inquiry and discovery learning are used interchangeably (Guisti, 2008), but share some commonalities. Another student-centred approach is Science Technology and Societal approach (STS). According to (Yager, 2008) STS means focusing on real world problems which have science and technology components from the students' perspectives, instead of starting with basic concepts and processes. Therefore, STS approach includes science content and STS content. The STS content comprises among others, social issues (external to the scientific community) that connect science with societal problems (e.g. overpopulation, pollution, war technology) and social aspects of science (internal to scientific community, e.g. the epistemology of science, the sociology of science, history of science) (Aikenhead, 2009) STS employs a wide range of teaching methods/strategies like simulations, debates role-play, student centred class discussion, problem-solving, decision making, using the media and other community resources. Mbajiogu (2011) recorded higher students' achievement in biology when

thought with STS approach than when thought with lecture/expository method. The STS approach has also been reported to promote inquiry process, especially to those that were marginalized during early childhood stage (Mbajiogu, 2011).

### 2.1.4 Factors Influencing Enrollment of Female Students in Science Oriented Courses

1. Outcomes expectation and female student's enrolment in science oriented courses. The development of a country depends on the developmental level of its people. At present, Nigeria has a high unemployment rate, currently standing at 33.8%. On top of that, according to the Ministry of Labour's survey in 2010, most of the unemployed People in Nigeria are young (Ministry of Labour, 2012). Many of these young people fail to find a job after completing their schooling despite having passed with good marks. Unfortunately, they find themselves sitting at home doing nothing. They fail to both find work or to make plans to further their studies. The Ministry of Labour confirmed that the Unemployment rate in the age group 15 – 24 years stands at between 46 – 65 %. This age group consists of adolescents and young adults. This is a very alarming rate for any country.

   According to Gonzo & Plattner (2003), unemployment does contribute to poverty, which in turn contributes too many other psychological effects on individuals who are unemployed. The question is what contributes to the high unemployment rate in Nigeria, especially amongst the youth? Also, what can Nigeria people do in order to help alleviate the high unemployment among our youth? There may be many reasons, which contribute to unemployment. One reason could be that the country's economy is unable to offer enough employment to all young people who may need it. Another reason could be that

there are not enough funds available for those who wish to study further. Unemployment could also be attributed to the fact that the youth of Nigeria may not be motivated to find a job. There are many examples of young people who even after passing with good marks and having much potential for the future, seem to wait for jobs to find them. Some may be idle for years. Long periods of waiting and idleness can take a psychological toll on people.

2. Female student attitude and enrolment in science oriented courses. Attitudes largely determine what students learn and their willingness to learn. (Lingren 2010) supported this view by stressing the importance of students holding favourable attitudes if learning experiences are to be successful. Several definitions have been offered as to what attitudes are. (Falana, 2012) stated that an attitude is one's general feeling of favour or otherwise toward some stimulus object. However, caution must be taken as to what attitudes students have as fears passed on to students stay with them for the rest of their education (Philips, 2010).

   In the secondary school, (Fakuede, 2013) found that it is common knowledge that the majority of the students in Nigerian Secondary school's dislike mathematics when comparing the two sexes. Internationally females have been noted to have more negative attitudes (Oyewole, 2012). Differences between the attitudes of males and females increase as students' progress in school (Lewy, 2010). According to Mukherjee and Umar (2010) of Kano state polytechnic, Nigeria, attitudes can be changed as theories of attitude change have shown. Research on attitudes change of individuals and their subsequent behaviour has been mainly in fields other than education. Attitudes like values are products of the social interactions a child is likely to experience with his parents, teachers

and neighborhood community. Successful interactions depend on positive reinforcements, which in their turn lead to ego- involvement of the persons concerned.

3. Social economic factors and female students' enrolment in science oriented courses Perhaps one of the most comprehensive of recent investigations into subject choice has been the Australian Center for Educational Research (ACER) longitudinal reports on subject choice (Fullarton & Ainley 2000). Analysis of the Australian data collected in 2010 provided comprehensive statistical profiles of subject choice by senior high school students. The studies report that enrolments in science course are strongly associated with a number of background factors, including gender, peer influence, socio economic status, parents' education levels and ethnic identity.
4. Instructional Materials Available and Female Students Enrolment in Science Oriented Courses Instructional materials are materials which assist teachers to make lesson explicit to the learners. They also transmit information, ideas and notes to learners (Ijaduola, 2012), (Aina, 2010) asserts that instructional materials are those materials or resources used in any teaching exercise to promote greater understanding of the learning experience. They are used to provide the richest possible learning environment which helps the teacher and learners to achieve specific objectives. They also assist the teachers to communicate more effectively and the learners learn more meaningfully and permanently. The same is amplified by (Ogunsanya, 2011) who describes teaching materials as anything that helps the teacher to promote teaching and learning activities.

It should be noted that subject vary in nature, context and depth. A tool that is suitable for one subject may not be suitable for another. For example, in 2008 Jerome Brunner carried out a research in Canada with the aim to standardize the application of instructional materials. The instructional materials used for mathematics are virtually not suitable in the class of economic or government. Brunner also noted the difference when social science subject like economics was taught through vocalization only and later visualizations only and then the combination of both. The results are as follows: Rate of assimilation was 52% for vocalization only, Rate of assimilation was 22% for visual aids only and Rate of assimilation was 76% when both vocalization and visual aids were used. Later in 2013, Arnold Smith of the educational resources and technology institute Canada carried out his own research on the same field and suggests that Prof. Jerome's work was unworkable in real life situation. Arnold Smith (2013) concluded that the best instructional materials in the world become useless when they are improperly used.

Instructional materials according to (Ajelabi, 2010) are teaching learning material that constitutes an integral component of classroom instructions which are utilized in dealing educational information to the learner. He further strikes that it makes the lesson real, concrete and effective as learners are motivated to learn at their own pace, rate and convenience. According to research findings, our perception and understanding of our environment vary as follows: 75% of all information perceived is absorbed by the eye, 15% is absorbed by the ear and 10% is equally distributed among the remaining senses-touch, smell and taste. According to a Chinese dictum, what I hear I forget, what I see I remember and what I do I understand? Essentially, the way to facilitate learning is by doing. This is the more reason why teachers should employ the use of instructional material and also use variety of methods such as simulation and games, field trips and

role playing. The role and impact of instructional material on subject enrolment needs not be over emphasized. It is through instructional materials that the teacher drives home his or her point during lesson. In the process of using instructional material, students can see, feel and touch the material and this aids retention. (Christopherson, 2010) views the instructional materials as having vital role to play towards the subject enrolment in secondary schools. Instructional materials are employed to widen the scope of understanding in teaching-learning encounter, (Onyejemezi, 2010, Ruickshark 2012) sees instructional material as beneficial to the learner. Onyejemezi (2011) lists seven benefit of Instructional material, which is in agreement with Maduekwe (2010).

They are: It supplies concrete basis for conceptual thinking and reduce meaningless respond of student, it makes lesson more permanent, and it has a high degree of interest since they are shown physically to aid self-understanding and explanation, it offers reality to experience, it contributes to the depth and variety of learning, it gives readymade answers to questions in the teaching learning process and it adds meaning and explicitness in the teaching learning process. Looking at the importance and advantage of instructional materials in the teaching learning process, we conclude that the students stand to gain more if they make career choices based on the available instructional materials. We can therefore say that there is positive relationship between instructional material and students' subject enrolment (Maduekwe, 2010).

### 2.1.5 Importance and Problems of Science Education to National Development

Science education is very important to the development of any nation in many areas. A graduate of physics education can be self-employed as opined by Tunde, (2012). Many of the physics graduates have some knowledge of electronics that is enough for them to be able to have a little period of training as apprentices and then stand alone as

electronic technician. For instant, Semiconductor is very important in the modern technology that if properly learnt it is enough for one to stand upon for a living; semiconductor physics is part of what any graduate in physics will learn and should learn. In Aina, J. K (2011) semiconductor is very important in a growing economy like ours in Nigeria; it is useful in ceramic industry and a well-trained physics education graduate can be well established in ceramic industry. Without science education Information and Communication Technology would be impossible. Science and technology will not be possible without science education; for instance, engineering, medicine, architecture etc. will not be possible if there is no one to teach the students the core subjects needed for these courses. Biology education is very important to any growing economy like Nigeria. Many graduates of biology education are self-employed and employers of labour; many owned schools for themselves where people works and earn their living while some are in to fish business. There are colleges of education where students of chemistry department are taught how to make dye and chalk; graduates of these departments can establish their own chalk business as soon as they graduate. If supported with fund many schools do not need to buy chalk outside anymore and they can equally produce for other schools.

1. **Security**: Security issue in Nigeria has been worrisome for more than two years now because of insurgence of Niger Delta and Boko Haram as averred by Horsfall, A. K (2014) Stretching the averment further, the former is politically motivated while the latter is religiously motivated; the reason for the insurgence is trivial to this paper but the effects on science education development is very germane. People in Nigeria lives in fear of uncertainty of death from bomb explosion: of gunshot from terrorist or armed robber and many a time from kidnappers. The lives of nationals living in Nigeria are in perpetual danger of

abduction or kidnapping. Lecturers and students don't know their fate every day until they retired to bed at night; even while sleeping they cannot sleep and close their two eyes because of armed robbers. The recent attacked on a northern university where students and lecturers were cold bloodedly murdered including a professor of chemistry still remains an insomnia in academic arena. Science infrastructures built with huge amount of money for schools had been destroyed while gas and oil installations vandalised; the resultant effects of these is on education. Many parents have lost their job and the effect is on the children; these children could not complete their education and eventually drop out of schools.

2. **Corruption**: - Corruption has eating deep into Nigeria system and it is manifesting in every sectors including education. In Nigeria today it is not what you know but whom you know, that is why Mfon, E.E (2013) said recruitment to job is tied down to criteria such as political favouritism, geographical area or quota system. Many of the teacher training institutions and universities cannot boast of the best academic staff because the best probably do not have godfather who can help them. Appointment is no longer based on merit but on whom you know and the amount you can offer for such job. Admission into higher institutions of learning is not on merit but on whom you know also. Purchases of science equipment to schools are no longer done transparently since it is either the chief executive of the school or any of his or her relation who do the supply. In this case they neither supply the required specification nor the required quantity; in most cases they don't even supply anything. Most of the science laboratories are empty building or buildings filled with fake or obsolete science equipment which are useful for nothing but mere demonstration. Money meant

for staff training are diverted to personal account while selections of those who benefit in staff training is on whom you know syndrome. All these bounced back on the quality of science education the nation produces.

Nigerian leaders are corrupt that is why we lack stable political system of government which affect science education as posited by Oloyede, E. O (2011)] that in any stable political system, teachers and their education system are well catered for. Science teachers are not well catered for in Nigeria instead they are looked upon by the politicians as beggar. Corruption is the greatest challenge to development of science education in Nigeria; corruption leads to many problems the country is facing presently. corruption leads to slow movement of files in offices, extortion in highways, ghost workers in work places, election irregularities and many more. Corruption makes school administrator mismanaged fund meant for purchasing science equipment and asked science teacher to make sure student still pass in examinations by all means. In many universities and research institutes, research has become history because government preferred to use research money for election or hire security for the family of government officials than science education research. Nigeria is a multi-ethnic country; this is affecting the country in many ways especially in education. The world is in era of science and technology; every nation is craving for development in Information and Communication Technology [ICT] which cannot be fully achieved without science education. Parents encourages their children to study science oriented courses which is good; children who have no ability for such courses opted for courses in humanity and art. When the time of employment come those who opted for humanity and art courses would be given job related to sciences without prerequisite qualification. Those who originally

studied sciences are schemed out of the job because of ethnicity; the attitude discourages young ones from studying science education. Employment is no longer based on merit; those who are qualified for teaching science are not given employment because they don't have 'godfather' in the government. Teaching appointment is done based on nepotism and favoritism.

This is affecting the development of science education in the nation. There is corruption in the land and no one is spared neither is any organ of government spared. Aina, J. K (2011) Lecturers in higher institutions have turned colleges and universities to supermarket shops where they sell books at outrageous prices. Staffers of many polytechnics have taken over the affair of the institution because the chief executives are corrupt in awarding contract that never existed and mismanaged fund meant for science equipment. They sell books at a 'cutthroat' price without being checked. Male lecturers molest female students who are not willing to dance to their music of promiscuous life style. All these discouraged students who want to study science education and killed the morale of those who are studying the course already. Scholarships and bursary meant for science students are diverted to non-science students because of ethnicity. Where the scholarship is given to science students they introduce unnecessary bureaucracy into it that students may not get the money for many years or give up of the scholarship.

3. **Economy**: Nigeria is blessed with many natural resources on which her economy rest upon; however, over dependent on petroleum has seriously affected the economy. The effect is on science education since science equipment and apparatus are inadequate in the country and the cost of importing these materials is high because of exchange rate. According to Babatunde, M. A.

(2010) all effort to shift focus of economy from oil industry to other economic activities has not yield positive result because of corruption. Science teacher's salary and other allowances are not paid. science equipment is not supplied due to declining in output and slow economic growth because of labour distortions, redundancy of the workforce, brain drain among others Ndiyo, N. A. (2014).

4. **Teacher: -** Science teachers are key factor to be considered when talking about the development of science education in any nation. There are shortages of qualified science teachers in Nigerian schools. So called science teachers are not professionally qualified. They may have the knowledge of the subject but lack the method. Aina, (2011) on his study of challenges and prospects of primary science teaching affirmed that there are unqualified science teachers in our schools. Attitude of many teachers to teaching are discouraging; they have been teaching for many years without upgrading their certificate by going for in-service training. This affects their output and it is a problem to the development of science education. Science teachers should use different strategies as there is no single universal approach for specific class. Many science teachers still hold to chalk and talk method which is not appropriate for science teaching in this age Aina, (2010) Lack of good strategies in the teaching of science is affecting student performance and at long run affects student enrolment Oladijo, (2011).

### 2.1.6 Differentials in Science and Arts Participation by Nigeria Students

Evidence of gender gap in the trend and pattern of enrolment in Nigerian universities was observed by different researchers (Ezeliora & Ezeokana, 2010; Imhabekhai,2013; Oke, 2009; Owolabi,2010; Salman, 2011; Yahaya,2014). The turnout of graduates in Nigerian universities, according to NUC's report on university annual review, showed that from 2007-2012, males who obtained masters degree were 44,337 (72.79%) while

females were 16,567 (27.20%). For graduates with doctoral degrees for the same period, males were 2,587 (64.01%) and females were 798 (23.57%). There was also low evidence of female enrolment in sciences and technology related courses. Olawole and Salman (2008) cited in Salman, Yahaya, & Adewara (2011) noted that participation of females in the study of sciences, technology and mathematics in the Nigerian institutions of higher learning has been discouraging. The females mostly subscribe for social sciences, arts and humanity courses and those that enroll into sciences are taken as gifted ones. This scenario is not only obtainable in Nigeria. At the higher education level in both industrialized and developing countries, women tend to cluster in areas of study which lead to traditional female careers of teaching, nursing and others (UNESCO, 2009). Gender parity in universities is a very vital and significant issue because the key to every nation's social, political and economic growth and development lies in the optimal participation of the citizenry in nation building.

Unfortunately, gender imbalance is noticeable in enrolment in different disciplines and programs, especially at the tertiary level (Nwajiuba, 2011). Citing National Gender Policy, 2006, Nwajiuba stated that "evidences abound that several negative aspects of gender relations, such as gender-based divisions of labour, disparities between males' and females' access to power and resources, gender biases in rights and entitlements remain pervasive in Nigeria". The report of situation analysis on education in Nigeria done in 2001 showed that compared with the primary and secondary levels, it is striking that there is much greater gender disparity in tertiary education especially in Nigerian universities. The male/female disparity is witnessed in most science courses, Vetenary medicine, English and technology-based courses with technical education favouring males and pure arts courses like English and Linguistics favouring females (Hodges, 2010). Several studies (Aguele &Agwagah, 2009; Njoku,2001; Nnaka,2010 &

Ukpai,2010) show that women in Nigeria are underrepresented in science and technology which is a serious bottleneck in an endeavour to attain technological progress in the country. With abundant mineral resources in the country which needs to be extracted and refined for economic development, adequate skilled manpower is needed (Nnaka, 2010). This is currently lacking. Increased participation of girls in science, technology and mathematics courses is seen by Nnaka as a way of bridging the manpower gap and fast tracking national development.

Gender imbalance in students' university enrolment has been attributed to many factors like traditional and cultural norms, attitudes and prejudices, religion, poverty and ignorance (Nnaka, 2010). Gender stereotyping rooted in cultural values and practices has led to some courses construed as being 'masculine' and 'feminine'. When any female is pursuing a 'male-labeled' profession and vice-versa, he/she is taken as being abnormal (Yahaya, 2014). Specific cultural gender socialization practices has stronger influences on the disparity existing in number of males and females offering science and technology related programs ( Ekpo, Orok, Ekukinam& Okon, 2010). Women constitute a pool of talent for science and technology courses (Inabawa, 2009) but cultural and educational biases and prejudice steer them towards arts and humanities whereas boys opt for science courses. The result of this disparity is that females remain under represented in professional careers like engineering and medicine which are important desired corps of female experts (Inabawa, 2009).

### 2.1.7 Gender Differentials in Science and Technology Participation

There has been rapid development in education since independence in Nigeria. More particularly, there has been rapid development in tertiary education with respect to science, technology and mathematics (STM) in the last two decades. This is due to the role of STM in the development of a nation. (Alli, 2011) observes that if anything is

important to any nation in solving its problems, it is science and technology education. Earlier, (Falana 2012) had observed, that we cannot hope to develop as a nation and be self-reliant with other people's science and technology. We must develop our own in order to be self-reliant. Hence the current emphasis in university admission is in favour of STM. It is common knowledge today that university enrolment in STM appears to favour the males more than the females.

This situation tends to agree with the findings of Aguele and Uhumuavbi (2009) that significant differences exist between male and female enrolment in STM in Nigerian universities. They however, did not find any definite trend or pattern in the enrolment: Coombs (cited in Aguele and Uhumuavbi, 2009) observed that gender differentials in enrolment and achievement in higher education is invariably rooted in inequality at the primary and secondary levels where the real sorting out of University bound students take place. According to Coombs, female participation and interest in STM diminishes as they move up in the educational ladder towards the university level due to a variety of factors that are primarily rooted in their religious and cultural beliefs surrounding the role of women in the society. The issue of low female participation in STM seems to be a global issue. Other studies appear to be supportive of this position. For example, Croxford (2010) in a study on "participation in science, Engineering and Technology" in Scotland following the introduction of a new programme titled "Science Strategy for Scotland" observed the following:

(i) After taking account of attainment and science qualifications, females were less likely than males to study mathematics, informatics and engineering.

(ii) One quarter of students with two or more sciences at higher grade were studying medicines and dentistry or subjects allied to medicine. The proportion for science-qualified females was 34%.

(iii) In the final years of compulsory education (S3-S4), all pupils studied at least one science and over half studied at least one technology subject. Gender and attainment are the main factors that influenced differences in choice of science and technology subjects.

The case appears to be the same in the United States of America, where Billings (2011) observed that despite efforts over the last 20 years to redress female underrepresentation, the percentage of women studying computing and related subjects continued to fall in between 2005 and 2009. Accordingly, this status quo was also maintained in the United Kingdom with females making up only 18% of computer science and 11% of software and engineering in 2010. Not only are enrolments low and declining, but proportionately more women than men drop out, fail courses or choose to major in another subject other than science (Selby, 2008). Furthermore, woman in United States Universities in 2008-2009 accounted for only 17% undergraduate science majors. (Billings, 2011). The deleterious trend was repeated in New Zealand with women accounting for a mere 20% of undergraduates in information technology and the sciences (Brook et al., 2010). The issue of low female participation and attainment in STM is not peculiar to Nigeria alone, but a global problem. It is coming more and more into lime light particularly with women accounting for more than half of the world's population.

A number of factors have been identified to influence gender differentials in S&T participation. These range from societal, religious, and psychological to attitudinal and interest levels of students. George (cited in Pathways Home, 2012) identified the following eight factors as being responsible for low participation of females in science and technology.

1. Attitudes and expectations of parents and teachers.
2. Instructional strategies, such as hands-on experiences, group projects, field trips, and interactions with role models, as opposed to traditional textbook methods.
3. Curriculum materials that perpetuate the stereotype of the white, male scientists and ignore the contributions of minorities and female scientists.
4. Involvement in out-school science activities.
5. Portrayal of scientists in the media as white males or as negative stereotypes.
6. Tracking or ability-grouped assignments.
7. Self-image and expectation that often change from high interest and low anxiety about science and mathematics in the early grades to avoidance in the intermediate class.

In a study on Gender Bias in mathematics, science and technology, Strauss (2012), found that the absence of equitable elementary and middle school science instruction that includes hands-on activities is a serious form of discrimination in the educational system. Similarly, (Croxford, 20112) observed that one of the reason why young people, particularly females, opt out of science and technology is due largely to their perception. In a similar vein, (Aguele, 2014) observed that the negative image of women towards STM has accounted largely for the low enrolment of females in these subjects particularly in the universities. According to (Chang, 2012), women in America still appear to have lower level of interest in the sciences and technology as research indicates that attitudinal factors, such as negative image and interest contribute to the discrepancy. National Science Foundation (2010) also reported that lack of interaction with current participants in STM fields tends to constitute barrier to increased interest. Cases of mathematics anxiety and instructors' lowered expectations have also been shown to hinder women from participating in STM (Seymour and Hewitt, 2011).

Research findings have indicated that gender differentials in higher education are invariably rooted in inequalities at the primary, and secondary levels where the real sorting out of university bound students takes place (Coombs, as cited in Aguele and Uhumuavbi, 2010a). These, inequalities include traditional and religious beliefs, remoteness, poverty, child labour, social roles required for the different sexes, argument about biological built up of women and birth order.

Some other factors that have been identified (Okeke, 2010) include lack of support from education policy makers, different socialization patterns for boys and girls at early stages of life, early marriages, and teachers' attitude to girls. It is a known fact in Africa that women used to be denied and deprived of many benefits (social and economic) which their male counterparts enjoyed. Such deprivation has also affected the status of girls and women in the society. The extent to which such deprivation has modified their mental capacity may never be fully explicated (Aguele, 2012).

Development essentially has to do with improvement in human well-being, elimination of hunger and poverty, and gainful and productive employment for all the citizen of a nation. According to Abbe and Momodu (2011) development means "bringing a nation to an advanced or highly organized state, that is utilizing all the human and material potentials of a nation to bring about growth or advancement". So national development therefore, would refer to the ability to harness all the available resources, human and material or economic, to bring out the potentials of a nation. It may also imply the ability to flow along with others in terms of effective management and utilization of current developments in science and technology. In the recent past, women have become a serious factor of recognition in nation building. Their important contributions to countries national economics and international trade stand out clearly and cannot be over emphasized. Women now constitute about one-third of all industrial sector of the

labour force in export processing activities and services sectors such as tourism and banking (Commonwealth, 2010).

Hence, we cannot continue to undermine their total and complete involvement in issues of national development in Nigeria. Again there are a number of international agreements/mandates that bear upon the issue of women involvement in national development which Nigeria is a signatory to. One of such agreements is the Beijing Platform for Action on women. The final clause of the Declaration according to Commonwealth (2010) is that "we hereby adopt and commit ourselves as government to implement the platform for Action, ensuring that a gender perspective is reflected in our policies and programmes". On the Commonwealth front, there have been various moves and activities on gender equality and development. For instance, the 1995 Commonwealth Plan of Action on Gender and Development is grounded in the Commonwealth fundamental values of democracy, rule of law and good governance, human rights, gender equality and the promotion of sustainable development. The plan presents a vision in which: The commonwealth works towards a world in which women and men have equal rights and opportunities at all stages of their lives to express their creativity in all fields of human endeavour and in which women are respected and valued as equal and able partners in establishing values of social justice. Within such a framework of values, women and men will work in collaboration and partnership to ensure people oriented development for all nations (Commonwealth, 2010). Such a plan recognizes the fact that women are very vital and indispensable in national development and we can therefore, not continue to undermine them. Despite considerable progress in some areas of women's lives since the United Nations named 22010 to 2015 as the Decade for women, gender in equality/inequity persists in almost all areas of life and all nations of the world.

According to King (2010), women often made the important and unsung contributions to national economies especially in support of export-led economic growth, yet more than 70 present of the 2.8 billion people living on less than US$2.00 per day are women. During the sixth meeting of Commonwealth Ministers responsible for Women Affairs held in New Delhi, India in April 2000, it was pointed out by Spence (2011) that Poverty for example continues to have a female face. Women constitute 70% of the world's 1.3 billion absolute poor. They have the most limited access to livelihood, resources or to new technologies-the key to employment in the 21st century. She added further that their huge contribution to economic growth of their countries is often not for in national budget and thus, largely ignored in economic development programmes.

### 2.1.8 Effects of Gender Differentials in Science and Technology on National Development

Science, Technology and Mathematics (STM) are today known to be very central to the development of any nation. Ukeje (2011) observes that the development of a nation is properly accessed by the level of the education of its citizens in STM. Uhlig (2010) also alluded to this view when he stated that: In the theory and policy of development it has been accepted from the beginning of the debate that one of the essential pre conditions for the development and transformation of a national economy is the factor of education in the broadest sense and science and technology in the particular sense. The implication of this is that to attain national development, it is not enough to educate the citizens in the broadest sense, but to give them sufficient education in STM. This is so because STM is considered as the vehicle for rapid development and economic transformation of a nation. Today, women constitute more than half of the world's population (Commonwealth, 2010). Hence, we cannot afford to ignore them if we must attain meaningful development in our nation. Their general education and in particular their

education in STM is very vital to any nation. The need to involve women equitably innational development needs no further emphasis. Hence, issues of governance and democracy, socio-economic development and peace couldn't be divorced from those of gender equalities (Mckinnon, as cited in King, 2011). In addition, it is becoming obvious that when women learn a nation stands to benefit. According to Abbe and Momodu (2011) women education positively correlates with several national and international goals and aspirations. Some of these according to them include economic productivity, social development, social equity and sustainable development. The low participation of women in education generally and STM in particular will therefor hinder the rapid actualization of these goals and aspirations.

## 2.2 Theoretical Frame Work

### 2.2.1 Modernization Theory

Modernization Theory has been defined as a theory (Reyes, 2001a) that uses a systematic process to move underdeveloped countries to a more sophisticated level of development. It is a US and European-centric normative model of development. The focus of Modernisation Theory is cultural change directed at institutional structures in non-industrialized countries. Modernisation Theory explains inequality within or between states by identifying different values, systems and ideas held by different nation states (Martinussen 1997, pp. 61-66, 167- 172). Modernisation Theory emerged in the late 1950s when it appeared as a North American political scientists' reaction to the incipient failure of many of the prescriptions of development economists (Rapley 2002, p. 15). While Modernisation Theory stresses the importance of political development in the progress and climactic improvement of a nations' economic standing, it also acknowledges social and cultural reforms. It should be added also that Modernisation Theory is completely different from development economics, which is

the first or basic model of development theory. Modernisation is appropriate for political development, but also can be used for any liberal theories of modernisation that appeared after 1945 targeting the nation-states of the Third World (Berger 2004, p. 87). Consequently, the focal point of Modernisation Theory is on political development with levels of coverage that consider history, sociology, political sciences in general, and area studies.

### 2.2.2 Globalization Theory

**Globalization Theory Defined**

Globalization is a theory of development (Reyes, 2001a) that uses a global mechanism of greater integration with particular emphasis on the sphere of economic transactions. It is a US- and Europe-centric positive model of development whose feature is the spread of capitalism around the globe. The focus of Globalization Theory is communications and international ties, with these ties directed at cultural and economic factors in communication systems. Globalisation Theory explains inequality by identifying cultural and economic factors in global connection. Reyes (2001, p. 2) claimed there are two major meanings of the word "Globalisation". One deals with the word as an event when a sense of interdependence occurs throughout different countries of the world in different aspects of communication, trade, and finance. The other meaning that has been applied to the concept of

Globalisation considers it as a theory of economic development with the supposition of widespread unification among different countries. This integration is believed to have an effective influence on the development of economies and on the improvement in social indicators.

### 2.2.3 Social Cognitive Theory

Social cognitive theory (Bandura, 1986) suggests that children may learn attitudes and behaviours, including gender schemas from media characters. According to this theory, children learn cultural patterns of behaviour through repeated observations of actual models, such as parents and teachers, and symbolic models, such as those depicted in the media. Studies documented children's ability to learn and model the behaviours of television characters, particularly those with whom they shared similar traits (Bandura, 2002). More recent studies also found that children learn more from same-sex character depicted in the programming (Marrilee, Jocelyn, Brooks, Maria, Marne and Sayani 2010). Implication of the theory to learning is that students not only emulate their teachers but also model influential figures in their community, teachers use of biography of contributions of a female scientist will serve as a role model worthy of emulation to female students.

## 2.3 Empirical Studies

There has not been any major research carried out in this area of 60:40 ratio admission policy implementation. However there are some related works. Yushau, Wushishi, and Shehu, (2008) carried out an investigation into an analysis of gender access to university, science, technology and mathematics education (STM) for the 2005/2006 to 2007/2008 sessions, admission of Usman Danfodio University Sokoto. Content Analysis Research Design Approach (CARDA) was adopted. Four research questions 1were addressed from which two hypotheses were tested using Analysis of variance statistics (ANOVA) with the aid of computer statistical package for the social sciences (SPSS). It was found that wide gender gap exists in terms of both access to university education and STM education. There is equally significant difference in these gender

gaps. The government policy on 60-:0 ratio for admission in favour of sciences is not being met.q

Joachim, Ene, and Victoria (2016) in their study examined the impact of the quota system and catchment area policies on students' admissions in North Central Nigeria. A research question and a null hypothesis guided the study. Descriptive survey design was adopted for the study. The population for the study was 14,347 staff in the federal and state universities in North Central Nigeria. A sample of 1,435 was drawn through stratified proportionate sampling technique. Data were collected using questionnaire and interviews. Mean scores and standard deviations were used to answer the research question, whereas t-test statistics were used to test the hypothesis at 0.05 level of significance, the findings of the results showed, among others, that the impact of the quota system and catchment area policies on students' admission was to a high extent.

Agu, and Omenyi, (2014) also conducted research on gender status in enrolment into different faculties in a south eastern university in Nigeria. Enrolment status by male and female students into arts and science based courses offered in this university from 2008 to 2011 was assessed. Four research questions guided the study. Results indicated that in spite of the profuse efforts made so far to bridge the gender gap in education access in Nigeria, many higher education courses are still being construed as either masculine or feminine. Evidence of this gender gap, it is hoped, will sensitize the government, educational institutions and the general public on the current gender situation in human capital empowerment for necessary interventions.

Akanwa, Kalu-Uche, (2010) examined the differences between enrolment and completion of students admitted into science, technology, engineering and technology based undergraduate courses in Michael Okpara University of Agriculture, Umudike.

The population consists of all students admitted into the university from 2004/2005 to 2005/2006 academic sessions upwards who started graduating from 2008/2009 to 2010/2011. All members of the population were used for the study. Three research questions were asked and three hypotheses tested to guide the study. Percentages were used to answer the research questions while t-test was used to test the hypotheses. Results showed significant differences between male and female students' enrolment, graduation and non-completion rates in STEM disciplines in Michael Okpara University of Agriculture, Umudike. It is recommended that greater attention be given to ameliorate the factors that militate against female participation in STEM.

Aderemi, Hassan, Siyanbola, and Taiwo, (2012) examined the trends in enrollment, graduation and staffing of science and technology education in Nigeria tertiary institutions: A gender participation perspective the study employed the use of structured questionnaire and personal interviews to obtain primary data from 2110 females in universities, polytechnics and colleges of education in the field of engineering and natural sciences in the six geopolitical zones of Nigeria using stratified simple random sampling. Secondary data were also used. Descriptive statistic was employed for data analysis. The result of the study provided information on enrollments and graduation figures, performance, motivational factors and career advancement of the females. The study compared the data obtained from Nigeria with that from United States, United Kingdom and other African countries to identify cultural differences and similarities.

Agboola, Adeoye, and Solanke, (2016) investigated gender access to university, science, technology and mathematics education (STM) for the 2012/2013 to 2014/2015 academic sessions, admission University of Lagos. Content Analysis Research Design Approach (CARDA) was used. Three research questions and two hypotheses were tested using ANOVA with the aid of computer statistical package for the social sciences

(SPSS). The findings of the study shows that wide gender gap exist in terms of both access to university education and Science, Technology and Mathematics Education. There is equally significant difference in these gender gaps.

**Lawrence and Uche, (2007)** Carried out a research on female participation in STM, for the 2005 to 2006 academic sessions. Ambrose Alli University Ekpoma, Edo State. Content Analysis Research Design Approach (CARDA) was used. Three research questions and three hypotheses were tested using ANOVA with the aid of computer statistical package for the social sciences (SPSS). The findings of the study shows that wide gender gap exist in terms of both access to university education and Science, Technology and Mathematics Education. There is equally significant difference in these gender gaps.

Abdulrahman, Adisa and Raji (2012) examined the differences between students admitted into science, technology, engineering and technology based undergraduate courses and arts courses in University of Ilorin. The population consists of all students admitted into the university from 2005/2006 to 2007/2008 academic. All members of the population were used for the study. Three research questions were asked and three hypotheses tested to guide the study. Percentages were used to answer the research questions while t-test was used to test the hypotheses. Results showed significant differences between science and arts students' enrolment. in University of Ilorin. It is recommended that greater attention be given to ameliorate the factors that militate against female participation in STEM.

Agu, Ngozi and Omenyi examine the gender status in enrolment into different faculties in a south eastern university in Nigeria. Enrolment status by male and female students into arts and science based courses offered in this university from 2008 to 2011 was

assessed. Four research questions guided the study. Results indicated that in spite of the profuse efforts made so far to bridge the gender gap in education access in Nigeria, many higher education courses are still being construed as either masculine or feminine. Evidence of this gender gap, it is hoped, will sensitize the government, educational institutions and the general public on the current gender situation in human capital empowerment for necessary interventions.

Muhammad, Kamar and Ibrahim carried out a study on the relationship between primary school pupils performance in Cultural and Creative Art (CCA) and in Basic Science and Technology (BST) in Sokoto state. Primary science is taught in the primary school as a core subject, as such it has been of interest to researchers and stake holders to raise the standard of children performance and achievement in science in primary school. Correlational research design was adopted in the conduct of this research. 360 children were sampled from 12 primary schools for the study through the four State Universal Basic Education Board (SUBEB) zones in Sokoto state. Two instruments were developed by the researcher in BST and CCA, which were validated by experts and found reliable at 0.86 and 0.78 respectively. Pearson **r** was employed in the analysis of data hypothesis was formulated and tested at .05 level of significance. Result showed that there is significant relationship between primary school pupils performance in BST and in CCA in Sokoto state. As a recommendation, relevant authorities such as inspectors, supervisors and other education regulatory agencies should monitor the trend in relationship and difference of performance of primary school pupils in BST, CCA and such other subjects taught at primary school. The researchers suggests that further research should be carried out on causation of relation between BST, CCA and such other subjects taught in the primary school.

Joachim, Ene and Victoria (2016): Carried out a study on the impact of quota sytem and catchment area policy on the university admission in North Central Nigeria. 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. Sequel to the enactment of these policies, government established several universities across the country to create equal opportunity for all candidates. In spite of the astronomical growth of the universities in Nigeria, both the federal and the state governments have not been able to contend with the surging demand for the university education, hence the adoption of the quota system and catchment area policies. Serious concerns were expressed by relevant stakeholders on their perceived impact of the quota system and the catchment area on admissions into the federal and state universities in North Central Nigeria. This study therefore examined the impact of the quota system and catchment area policies on students' admissions in North Central Nigeria. A research question and a null hypothesis guided the study. Descriptive survey design was adopted for the study. The population for the study was 14,347 staff in the federal and state universities in North Central Nigeria. A sample of 1,435 was drawn through stratified proportionate sampling technique. Data were collected using questionnaire and interviews. Mean scores and standard deviations were used to answer the research question, whereas *t*-test statistics were used to test the hypothesis at 0.05 level of significance. The findings of the results showed, among others, that the impact of the quota system and catchment area policies on students' admission was to a high extent.

## 2.4 Summary of Literature Review

Contemporary global issues created and nurtured by science and technology seemed to have provided the much needed reinforcement of the call for all to study science. Science for all cannot be achieved without integrating science process skills in the

teaching and learning of science. It is unfortunate that lack of time, competence level of teachers among other factors have led to the neglect of use of these skills in most nations. Even when teachers instil science process skills in students, female students are not always given equal chance to develop skills like communicating and manipulation of instrument. It has been suggested that teachers should inculcate these skills in both male and female students to bridge the long existed gender gap in science. Thus this study tends to investigate the level of implementation of 60- 40 ratio admission policy into science and arts related courses geared towards the encouragement of learning science and technology education. Related theories concerning gender and socialization, such as feminist theory, social cognitive theory and gender schemer theory were reviewed. Feminist theory is of the view that in other for men and women to be equal, women should be granted some special privilege and men should not be the central issue. Gender schemer and social cognitive theories linked children's development of gender role to a variety of socializing agents including parents, teachers, peer and the media. Empirically, works on gender and science achievement is mixed with magnitude of difference. Some reported strong gender differences, others decreasing gender differences and others still reported non-significant difference in achievement by gender. Most of the works reviewed were on gender inequality in admission placements into science related courses. Recent study in the area of this study continued to report that male candidates are offered admission more than female candidates into science and technology education. It is in light of this that the study tends to investigate the extent of implementation of 60:40 ration admission policy into science and artrs related courses in Kwara State tertiary institutions.

# CHAPTER THREE

## 3.0 RESEARCH METHODOLOGY

### 3.1 Research Design

The research design employed for this study is Content Analysis Research Design Approach (CARDA). This is a technique that enables researcher to study human behaviour in an indirect way, through an analysis of their communications. Text books, Essays, Newspapers, Novels, Records, Magazines, Articles, Cook books, Songs, Political speeches, Advertisements, Picture and in fact the contents of virtually any type of communication can be analysed (Jack and Norman, 2000). The research is non-experimental and therefore variables were not manipulated. This makes Content Analysis Research Design suitable for the study. This design enabled the researcher to analyse the admission placements lists of tertiary institutions in Kwara State.

### 3.2 Population of the study

The population of the study consisted of all the candidates offered admission in Kwara state tertiary institutions for the period of five academic sessions (2011/2012 to 2015/2016) which is Thirty-Six Thousand, Two Hundred and Eighty-Seven candidates (36287). The population of each institution per session is as shown in the Table 3.1

**Table 3.1: Admission Placement lists of Tertiary Institutions in Kwara State**

| Academic Sessions | Kwara State University Malete | Kwara State College of Education Ilorin | Kwara State College of Education (Technical) Lafiagi | Kwara State College of Education Oro | Grand Total |
|---|---|---|---|---|---|
| 2011/2012 | 545 | 781 | 3172 | 728 | 5226 |
| 2012/2013 | 865 | 1252 | 4126 | 826 | 7069 |
| 2013/2014 | 1189 | 1961 | 2938 | 985 | 37073 |
| 2014/2015 | 3154 | 1165 | 2199 | I872 | 8390 |
| 2015/2016 | 3996 | 800 | 2005 | 1728 | 8529 |
| Grand Total | 10049 | 5959 | 14440 | 5839 | 36287 |

## 3.3 Sample and Sampling Technique

The sample of the study is the total number of candidates offered admission for five academic sessions in all the tertiary institutions in Kwara state. This is thirty-six thousand, two hundred and eighty-seven candidates (36287) between 2011 and 2016 academic sessions.

The sampling technique used for the study is purposive sampling technique. Purposive technique is also known as judgemental, selective, homogeneous, is a type of non-probability sampling technique that aim to achieve a homogeneous sample; that is sample whose units (eg people, cases, etc) share the same or very similar characteristics or traits (eg a group of people that are similar in terms of age, gender, background,

occupation, etc). In this respect it is often chosen when the research question that is been address is specific to the characteristics of the particular group of interest.

### 3.4 Research Instrument

The researcher employed admission placements list for the five academic sessions of all the tertiary institutions in Kwara state as research instrument, where data for the analysis are contained. This included placements of admission into different courses related to science, Technology, Arts and humanities between 2011 and 2016.

### 3.5 Method of Data Collection

The researcher collected letter of introduction from the department to various tertiary institutions in Kwara State. On arrival at the tertiary institutions the researcher went to the Registrar's office to introduce himself and he was asked to apply formally. This was done and admission placement lists of all the tertiary institutions concerned were obtained directly by the researcher.

### 3.6 Method of Data Analysis

The researcher used simple percentage method to determine the overall placements based on science and Arts courses and the extent of gender access to science, Technology, mathematics education courses and Arts and humanities in Kwara state tertiary institutions. One way Analysis Of Variance (ANOVA) was used to test the hypotheses generated at 0.05 significant level. The computer Statistical Package for Social Sciences (SPSS) version 21.0 software was used to analyse the data.

# CHAPTER FOUR

## 4.0 RESULTS

**4.1 Research Question one:** What is the extent of implementation of 60 - 40 ratio admission policy into Science related courses and Arts related courses in Kwara State Tertiary Institutions between 2011 and 2016 Academic Sessions?

**Table 4.1: Percentage Distribution of Admission Placements for Science related courses against Arts related courses in Kwara State Tertiary Institutions.**

| Sessions | Sciences | Arts | Total | %Science | %Arts | Total |
|---|---|---|---|---|---|---|
| 2011/2012 | 1998 | 2447 | 4445 | 44.95 | 55.05 | 100 |
| 2012/2013 | 2465 | 3352 | 5817 | 42.38 | 57.62 | 100 |
| 2013/2014 | 2284 | 2828 | 5112 | 44.60 | 55.40 | 100 |
| 2014/2015 | 4109 | 3687 | 7796 | 52.71 | 47.29 | 100 |
| 2015/2016 | 4083 | 3646 | 7729 | 52.83 | 47.17 | 100 |
| Total | 14939 | 15960 | 30899 | 48.35 | 51.65 | 100 |

Source: Kwara State Tertiary Institutions Admission Units, (KWSTIAU, 2018)

Table 1 shows that the total percentage of admission for five sessions in Kwara State tertiary institutions is 48.35 % candidates admitted into Kwara state Tertiary institutions were in the area of Science related courses as against 51.65% admitted in area of Arts

related courses. This fall short of 60% Policy in favour of Science courses as against 40% in favour of Arts courses by the Federal Government of Nigeria through the National policy on Education.

**4.2 Research Question Two.** What is the difference between male access to science related courses and male access to art related courses in Kwara state tertiary institutions between 2011 and 2016 academic sessions.

**Table 4.2: Percentage Distribution of Admission Placements for male access to Science related courses against male access to Arts related courses in Kwara state Tertiary institutions.**

| Sessions | Male Sci. | Male Arts | Total | % Science | % Arts | Total |
|---|---|---|---|---|---|---|
| 2011/2012 | 945 | 834 | 1776 | 53.21 | 46.79 | 100 |
| 2012/2013 | 1189 | 1316 | 2505 | 47.47 | 52.53 | 100 |
| 2013/2014 | 1022 | 1158 | 2180 | 46.88 | 53.12 | 100 |
| 2014/2015 | 2340 | 1664 | 4004 | 58.44 | 41.56 | 100 |
| 2015/2016 | 2098 | 1654 | 3752 | 55.92 | 44.08 | 100 |
| Total | 7594 | 6626 | 14220 | 53.40 | 46.60 | 100 |

Source: Kwara state Tertiary Institutions, Admission Unites, (KWSTI, AU, 2018)

Table 4.2 indicated that the total percentage of admission for five sessions in Kwara State tertiary institutions is 53.40% of male students admitted into Kwara state tertiary institutions study science related courses as against 46.60% Arts related courses during the period of five academic sessions under study.

**4.3 Research Question Three.** Would there be any difference between female access to science related courses and female access to art related courses in Kwara State tertiary institutions between 2011 and 2016 academic sessions.

**Table 4.3: Percentage Distribution of Admission Placements for female access to Science related courses against female access to Arts related courses in Kwara state Tertiary institutions**.

| Sessions | Female Sci. | Female Arts | Total | % Female Science | % Female Arts | Total |
|---|---|---|---|---|---|---|
| 2011/2012 | 1332 | 1342 | 2674 | 49.81 | 50.19 | 100 |
| 2012/2013 | 1710 | 1702 | 3412 | 50..12 | 49.88 | 100 |
| 2013/2014 | 1845 | 1458 | 3303 | 55.86 | 44.14 | 100 |
| 2014/2015 | 2167 | 1911 | 4078 | 53.14 | 46.86 | 100 |
| 2015/2016 | 2263 | 1914 | 4177 | 54.18 | 45.82 | 100 |
| Total | 9317 | 8327 | 17644 | 52.81 | 47.19 | 100 |

Source: Kwara state Tertiary Institutions, Admission Unites, (KWSTIAU, 2018)

Table 4.3 shows that the total percentage of admission for five sessions in Kwara State tertiary institutions is 52.81% female gained access to science related courses as against 47.19% female access to art related courses in Kwara state tertiary institutions.

**4.4 Hypothesis One ($H0_1$)**There is no significant difference between students admitted to offer Science related courses and students admitted to offer Arts related courses in Kwara State tertiary institutions.

**Table 4.4 One-way Analysis of Variance on the differences between students admitted to offer Science related Courses and students admitted to offer Art related Courses in Kwara State tertiary institutions.**

| **Source of variation** | **Sum of squares** | **df** | **Mean square** | **F** | **Sig** |
|---|---|---|---|---|---|
| Between groups | 104244.100 | 1 | 104244.100 | 0.155 | 0.704 |
| Within groups | 5369172.800 | 8 | 671146.600 | | |
| Total | 5473416.900 | 9 | | | |

Table 4.4 shows that F (1,8) = 0.16 while P value = 0.704 at 0.05 significant level. Therefore, Ho was retained since P>0.05 which means that there was no significant difference between students admitted to offer Science related courses and students admitted to offer Arts related courses in Kwara State tertiary institutions, therefore, the null hypothesis is not rejected.

**4.5 Hypothesis Two ($H0_2$)**

There is no significant difference between Male access to Science related courses and Male access to Arts related courses in Kwara State tertiary institutions.

**Table 4.5: One- Way Analysis of Variance on Significant Difference between Male Access to Science Related Courses and Male Access to Arts Related Courses in Kwara State Tertiary Institution**s.

| Source of variation | Sum of squares | Df | Mean square | F | Sig |
|---|---|---|---|---|---|
| Between groups | 93702.400 | 1 | 93702.400 | .343 | .574 |
| Within groups | 2186879.600 | 8 | 273359.958 | | |
| Total | 2280582.000 | 9 | | | |

Table 4.5 shows that F (1,8) = 0.34 while P value = 0.574 at 0.05 significant level. Therefore, Ho was retained since P > 0.05 which means that there was no significance difference between male access to Science related Courses and Male access to Arts related Courses in Kwara State tertiary institutions for five academic sessions. Hence the null hypothesis is not rejected.

### 4.6 Hypothesis Three ($H0_3$)

There is no significant difference between Female access to Science and Female access to Arts in Kwara State tertiary institutions.

**Table 4.6: One-way Analysis of Variance on the difference between female access to Science related Courses and Female access to Art related Courses in Kwara State tertiary institutions**

| Source of variation | Sum of squares | df | Mean square | F | Sig |
|---|---|---|---|---|---|
| Between groups | 900000.000 | 1 | 900000.000 | 2.575 | .147 |
| Within groups | 2796226.400 | 8 | 349528.300 | | |
| Total | 3696226.400 | 9 | | | |

Table 4.6 reveals that F (1,8) = 2.6 value = 2.575 while P value = 0.147 at 0.05 significant level. Therefore, P > 0.05 level of significance level. Which means that there was no significant difference between Female access to Science related Courses and Female access to Art related Courses in Kwara State tertiary institutions. Hence the null hypothesis was not rejected.

## 4.7 Summary of Findings

The findings of the study for the period of five academic sessions are presented below.

1. There is a gap in the distribution of admission placements between science related courses on one hand and arts related courses on the other. The total percentage of 48.35% science and 51.65% arts. This is in favour of arts rather than science as directed by the National Policy on Education (NPC).
2. There is a gap between male access to science related courses and male access to arts related courses (average of 53.40% male science and 46.60% male arts) in Kwara state tertiary institutions.

3. There is a gender gap in admission placement in science related courses in Kwara state tertiary institutions (average of 58.36% male and 41.64% female) access to science related courses
4. The finding revealed that there was no significant difference between students offered Science related courses and students offered Arts related courses in Kwara State tertiary institutions.
5. The finding revealed that there was no significant difference between Male access to Science Courses and Male access to Art Courses in Kwara State tertiary institutions.
6. The finding revealed that there was no significant difference between Female access to Science Courses and Female access to Art Courses in Kwara State tertiary institutions.

### 4.8 Discussion of Result

The percentage distribution of admission placements for science related courses in Kwara State tertiary institutions indicated that 48.35% gained access to science related courses as against 51.65% arts related courses. This short fall of NPE guidelines quoted by JAMB registrar in his speech delivered at the workshop for all Head of Tertiary Institutions in Nigeria (Tunde, 2016). He stated that admission into tertiary institutions will be based on National Policy on Education (NPE). 60:40 ratio in favour of science. This policy has been proved otherwise by this study.

The percentage distribution between male access to science related courses and male access to arts related courses in Kwara State tertiary institutions shows that 53.40% males gained access to science related courses as against 46.60% male access to arts related courses.

The percentage distribution between male access to science related courses and female access to science related courses in Kwara State tertiary institutions shows that 58. 36% males gained access to science related courses as against 41.64 female access to science related courses. This indicated a considerable gender gap in terms of access to science related courses in Kwara State tertiary institutions.

This situation tends to disagree with the findings of Aguele and Uhumuavbi (2009) that significant differences exist between male and female enrolment in STM in Nigerian universities. They however, did not find any definite trend or pattern in the enrolment: Coombs (cited in Aguele and Uhumuavbi, 2009) observed that gender differentials in enrolment and achievement in higher education is invariably rooted in inequality at the primary and secondary levels where the real sorting out of University bound students take place. According to Coombs, female participation and interest in STM diminishes as they move up in the educational ladder towards the university level due to a variety of factors that are primarily rooted in their religious and cultural beliefs surrounding the role of women in the society. The issue of low female participation in STM seems to be a global issue. Other studies appear to be supportive of this position. For example, Croxford (2010) in a study on "participation in science, Engineering and Technology" in Scotland following the introduction of a new programme titled "Science Strategy for Scotland" observed the following:

(i) After taking account of attainment and science qualifications, females were less likely than males to study mathematics, informatics and engineering.

(ii) One quarter of students with two or more sciences at higher grade were studying medicines and dentistry or subjects allied to medicine. The proportion for science-qualified females was 34%.

(iii) In the final years of compulsory education (S3-S4), all pupils studied at least one science and over half studied at least one technology subject. Gender and attainment are the main factors that influenced differences in choice of science and technology subjects.

The case appears to be the same in the United States of America, where Billings (2011) observed that despite efforts over the last 20 years to redress female underrepresentation, the percentage of women studying computing and related subjects continued to fall in between 2005 and 2009. Accordingly, this status quo was also maintained in the United Kingdom with females making up only 18% of computer science and 11% of software and engineering in 2010. Not only are enrolments low and declining, but proportionately more women than men drop out, fail courses or choose to major in another subject other than science (Selby, 2008). Furthermore, woman in United States Universities in 2008-2009 accounted for only 17% undergraduate science majors. (Billings, 2011). The deleterious trend was repeated in New Zealand with women accounting for a mere 20% of undergraduates in information technology and the sciences (Brook et al., 2010). The issue of low female participation and attainment in STM is not peculiar to Nigeria alone, but a global problem. It is coming more and more into lime light particularly with women accounting for more than half of the world's population.

A number of factors have been identified to influence gender differentials in S&T participation. These range from societal, religious, and psychological to attitudinal and interest levels of students. George (cited in Pathways Home, 2012) identified the following eight factors as being responsible for low participation of females in science and technology.

1. Attitudes and expectations of parents and teachers.
2. Instructional strategies, such as hands-on experiences, group projects, field trips, and interactions with role models, as opposed to traditional textbook methods.
3. Curriculum materials that perpetuate the stereotype of the white, male scientists and ignore the contributions of minorities and female scientists.
4. Involvement in out-school science activities.
5. Portrayal of scientists in the media as white males or as negative stereotypes.
6. Tracking or ability-grouped assignments.
7. Self-image and expectation that often change from high interest and low anxiety about science and mathematics in the early grades to avoidance in the intermediate class

The percentage distribution of admission placements for male access to science related courses against female access to arts related courses in Kwara State tertiary institutions shows that an average of 50.62% males gained access to science related courses as against 49.38% female access to arts related courses.

The percentage distribution of admission placements for female access to science related courses against female access to arts related courses in Kwara State tertiary institutions shows that an average of 52.81% females gained access to science related courses as against 47.19% female access to arts related courses. This means that female science students are offered admission more than female arts students by 5.62% in Kwara State tertiary institutions.

Hypothesis One: The summary analysis on the significance difference between students offered Science related course and students offered Arts related courses in Kwara State tertiary institutions using one –way ANOVA statistics in SPSS. A p-value of 0.704 was reported. This reveals that there was no significance difference between students offered

science related courses and those offered arts related courses. Hence the null hypothesis was retained. The findings of this work differ from the work of Yushehu, Wushishi, and Shehu, (2008) which state that there is significant difference between science related discipline and arts related discipline. The difference might be as a result of all the tertiary institution in the state the researcher considered.

Hypothesis Two: The summary analysis on the significance differences between male access to science related courses and male access to arts related courses using one-way ANOVA statistics in SPSS. The p-value of 0.574 was reported. This means that there was no significance difference between male access to science related course and male access to arts related courses. Hence the null hypothesis was retained.

Hypothesis Three: The summary analysis on the significance differences between female access to science related courses and female access to arts related courses in Kwara State tertiary institution using one-way ANOVA statistics in SPSS. The P-value of 0.147 was reported. This shows that there was no significance difference between female access to science related courses and female access to arts related courses. Hence the null hypothesis was rejected.

# CHAPTER FIVE

## 5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

### 5.1 Summary

This study investigated the 60:40 ratio admission policy implementation for science and arts related courses in Kwara State tertiary institutions.

Chapter one of the study presented the problem of the study. In the background of the study, the researcher was prompted by low and unqualified number of science professional in Kwara State. The study has three objectives, one of which seeks to determine the extent of implementation of 60:40 ratio admission policy for science and arts related courses in Kwara State tertiary institutions. This is guided by three research questions and three research hypotheses. The study was delimited to only Kwara State owned tertiary institutions.

Chapter two of the study reviewed literature on; science and technology education, science and technology education development in Nigeria, teaching and learning process in science, importance and problems of science education in national development, gender differentials in science and technology participation, effect gender differentials in science and technology on national development. The review has pointed out that the admission policies in Nigeria has a great impact on science and technology participation.

Chapter three of the study presented the methodology employed in carrying out this study. The study employed Content Analysis Research Design Approach (CARDA). The population of thirty six thousand, two hundred and eighty seven (36287) candidates

was used. Admission placement list was used as research instrument, procedure for data collection and analysis was presented in this chapter.

Chapter four of the study presented the results and discussion of findings. Three research questions raised were answered using simple percentage while hypotheses were tested using ANOVA at 0.05 level of significance. From the result of findings, it was established that the 60:40 ratio admission policy for science and arts related courses is not implemented in Kwara State tertiary institutions.. The result further confirmed no significance difference between male access to science related courses and male access to arts related courses.

Finally, chapter five of this study presented the summary, conclusion and recommendations based on the findings of the study. The study concluded that the 60:40 ratio admission policy is not implemented in Kwara State tertiary institutions. The study recommended among others that admissions into science related courses in tertiary institutions in Kwara State should be highly improved by the management of the institutions.

## 5.2 Conclusion

The conclusion arrived at from the findings of this study is that there are gender gaps in terms of access to science education in Kwara state tertiary institutions. The Government guideline through National Policy on Education (NPE) on 60-40 ratio for admission in favor of science has not been met in Kwara state tertiary institutions and a lot of factors could be responsible. The gender gap in access to science education is quite significant in terms of their differences.

## 5.3 Recommendation

1. A review of admission policy is needed to stipulate a percentage of qualified female students to be admitted into science courses so that the nation can benefit from the contributions of women to the profession.
2. It is recommended that admission into science related courses in Kwara State tertiary institutions should be highly improved by the management of the institutions.
3. Secondary school science should be greatly improved in the state in order for the students to pass terminal examinations which would make them admit able into the tertiary institutions to study science related courses.

## 5.4 Contributions of the Study to existing Knowledge

This study has contributed to knowledge in the following ways.

1. The study has established that the 60:40 admission policy is not properly implemented in Kwara State tertiary institutions.

2. The choice of Kwara State tertiary institutions as a scope is a contribution to knowledge because such research have not been done in the state.

3. The methodology used for this research study serves as a contribution to the existing knowledge.

4. The study is published in a reputable journal.

## 5.5 Limitation of the Study

1. Some school managements are not willing to give out their data.

2. Distance

3. Appointment booking

## 5.6 Suggestion for Further Research

Based on the experience gathered during the course of this study, the following suggestions are made for further study.

1) Similar investigation be carried out into federal tertiary institutions in Kwara State.
2) Similar investigation be carried out in another state and in North Central.

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