CHAPTER ONE
INTRODUCTION

Background to the Study

A country’s level of development is determined largely by its level of scientific, technological and industrial advancement in addition to other development indices such as life expectancy, literacy levels, income levels, good governance, etc. (World Bank, 2008). Based on the aforementioned, countries of the world are categorized as either developed, emerging or developing. Nigeria, tagged a developing country, wants to become one of the world’s top 20 economies by 2020 (FRN, 2008). Consequently, concern over her technological and industrial development as Africa’s second largest economy has become rife in recent times. This concern formed the major plank of Nigeria’s discussion at the international conference on technical and vocational education (TVE) held at Abuja in 2007.

The Vision 20:2020 Initiative of the Federal Government is one of the ways by which the Federal Government tried to give expression to her socio-economic and technological aspirations, with the aim of transforming the country into a developed economy. Such medium to long term plans should take cognizance of the human resources required to transform the various sectors of the economy. Management scientists have posited that the most important resource of a nation or production unit, whether small or medium scale enterprise (SMEs) or multinational is the human resource otherwise known as Human Capital. Human capital is at the centre of economic strength and growth, as the development of any organization (including nations) is driven by skills and competencies of its human resources (Oguntoyinbo, 1998). The implication here is that the wealth of a nation rests largely on its human energies and talents.
Nigeria needs quality middle level manpower (technicians and technologists) to pull through her industrial and technological aspirations.

The realization that human resources among other indices is a critical factor in a nation’s overall development and effectiveness has made a great deal of attention to be directed towards the growth, direction and dimension of human capital development. Education remains the panacea through which effective human resource development can be achieved. In line with the above, Technology Education (TE) also known as Technical and Vocational Education (TVE) provided at the tertiary level in polytechnics and colleges of technology, is central to the training and production of competent and skilled technicians and technologists needed for industrial development.

One of the major reasons for the series of reforms in Nigerian higher education since 1959 was the need to prepare our graduates for the world of work. The birth of polytechnic education in Nigeria was sequel to the Ashby Commission’s Report of 1960 which noted a major defect in the Nigerian education system as being too strongly biased towards the traditional literary and academic subjects at the expense of technical oriented programmes that would produce technicians and technologists for industrial development (Yakubu, 2006).

The commission’s report gave birth to the first set of polytechnics – Yaba College of Technology in 1963; Institute of Management and Technology, Enugu 1964; Kaduna Polytechnic, Kaduna 1968 and Auchi Polytechnic, Auchi 1972. The idea of polytechnic education was to help youths acquire skills that will enable them become self reliant, employable and useful members of the society.
The National Policy on Education (NPE) (FRN, 2004) defined Technology Education (which Technical and Vocational Education at the tertiary level connotes) as that aspect of education that leads to the acquisition of practical and applied skills as well as basic scientific knowledge. It is aimed at producing trained man-power in applied sciences, technology and businesses through formal skills acquisition and capacity building for national development. Nigeria’s major objective in Technology Education as enunciated in the NPE is aimed at producing trained man-power in applied sciences as well as provides training for individuals who shall be self-reliant or work in industries to propel the nation’s growth. Olusakin (2005) agrees with the definition when she averred that Technology Education equip people to be able to apply scientific knowledge to find solutions to their environmental problems since it enables them to have an intelligent understanding of the increasing complexities of technology.

Industrialization and technological breakthrough are accomplished through the ardent pursuit of Technology Education backed by robust Research and Development (R&D). According to (Yakubu, 2002), Technology Education is an instrument for technological advancement and improvement as it equips its recipients with the needed skills to prepare them to become useful elements within the society (Olaitan, 1996). The purpose of Technology Education therefore, is to ensure that there is a skilled workforce and an engaged citizenry to keep industries thriving and economy buoyant with the establishment of SMEs (Brand, 2008). Technology and business skills acquired in polytechnics (such as technical, manipulative, innovative, creative, entrepreneurial and team building skills) are essential inputs required for achieving sustainable industrial development. Polytechnic education therefore, is considered germane to industrialization and graduates of the system could also create jobs through the acquired skills.
The Third National Development Plan period (1975-80) witnessed the establishment of the National Board for Technical Education (NBTE) in 1977, to coordinate and advise government on all aspects of technical education falling outside university education. It was established by Act No. 9 of 11th January 1977. In August 1985, the Federal Government Education Act No. 16 (National Minimum Standard and Establishment of Institution) empowered the board to institute a system of minimum standard for accreditation of National Diploma (ND) and Higher National Diploma (HND) programmes in polytechnics and similar institutions. Its aims among others includes:

1. The establishment and maintenance of minimum standard in polytechnic and other technical institutions in the country;
2. Accreditation of academic programmes for the purpose of awards of National Certificates and Diplomas and other similar awards and the recommendations for the establishment of private technology institutions in Nigeria.
3. To take charge of curricular issues in technology schools.

NBTE therefore, is the Federal Government Agency in control of Technology Education programmes and accreditation in Nigeria.

The society has been led to believe that Technology Education is for those who are unable to pursue the rigorous academic programmes given by universities. This however is an erroneous belief that has stalled the growth and development of Technology Education in Nigeria. Today, it has become most imperative that adequate skills acquisition training programmes hold the greatest guarantee for the development and economic survival of a nation (Onyene, Salisu, Johnson and Olusanya, 2007). In Pakistan for example, Technology Education is heavily
biased towards the more educated urban and relatively well-off (Amjad, 2006). The reverse is the case in Nigeria where Technology Education programmes are considered good for the less affluent. Indeed, as reported by Orner (2009), in a rapidly growing and changing business environment like China, Technology Education is seen as a pathway to enhancing their future employability and expanding their career options. Perhaps, the value and ethical orientation of these countries are different from Nigeria’s. They may have placed a premium on science and technology pursuit as a way of helping to grow their economies and accelerate their national development to higher levels.

Technology Education by design is expected to expose students to the practical aspects of their courses, thus making them functional and self-reliant on graduation. It then follows that whoever chooses to acquire Technology Education must of necessity be well grounded in technical, manipulative and innovative skills coupled with intellectual capabilities and training adequate for transforming the industrial sector (Okey, 2007). Nwagwu (2000) agrees as much when she noted that industrialization and technological breakthrough are solely accomplished through a systematic functional and vocational education. Kadri (2002) confirmed the significance of polytechnic education when he averred that “education, especially of the technical nature is indispensable to rapid and sustained development. It is inevitable that for a nation to move forward it must make constant efforts to develop and introduce new knowledge and skills into production activities as is done in polytechnics so as to achieve sustainable rapid growth.”

However, this broad mission of technological education is often lost when emphasis is placed on theoretical education to skills-based education. Perhaps one can claim that the recognition
of the importance of Technology Education has made Brazil, Russia, India and China (BRIC) to be recognized as emerging economies. But the quality of technicians and technologists from Nigeria’s polytechnics is being criticized as not meeting the needs of industries. This according to the Nigerian Association of Chambers of Commerce, Industries, Mines and Agriculture (NACCIMA) cited in Yakubu (2002) is the reason why many of them are unemployable.

At the National Summit on Higher Education in 2002, it was proposed that the vision of polytechnic education in Nigeria should be proactive, challenging and comprehensive, taking into account the national interest of the technological and industrial advancement as set within the framework of the NPE (Yakubu, 2002). However, the Nigerian Institute of Management (NIM) in their communiqué at the end of their annual conference in 2007 observed, that the Nigerian economy is severely challenged by a dearth of employable skilled hands as a result of skills acquisition deficiencies.

The prevailing socio-economic situation of the 80s dictated the needs of employers of labour in terms of manpower requirements. But then the ICT revolution of the 90s came and in its wake ushered in globalization. Among the ingredients of globalization are knowledge explosion and technological revolution. This, as noted by Onyene, et al (2007) called for a new orientation in Technology Education in order to produce competent people capable of applying knowledge, skills and resources under changing situations. To be successful as a technology graduate in this complex world and work place, students must acquire appropriate competencies and possess what is commonly referred to as 21st century skills and how to apply knowledge to solve problems (Brand, 2008). Some of the many skills identified in today’s world of work for Technology Education graduates are: intellectual skills, technical and manipulative skills,
innovative/creativity skills, entrepreneurial skills and interpersonal or team-building skills (Etuk and Eyo, 2007; Okey, 2007; Onyene et al, 2007; Brand, 2008 and Orner, 2009). The acquisition of these skills would equip Technology Education graduates with the ability to be self-employed or make them employable to meet societal manpower needs in varied industries.

It was observed in the 2000/2002 National Rolling Plan, (NPC 2002) that the lack of appropriate skills, competency and confidence levels required to execute the high varied jobs and tasks in a globalised world market is the reason there continues to exist in the country, a high unemployment rate side by side high vacancy rates in certain crucial areas of needs particularly those requiring scientific and technological skills. The implication here is that employers of labour are unable to select and match the right people with the right jobs. The World Bank cited in Ilusanya (2005) confirmed the above when it observed that

*Developing countries worldwide have greatly expanded their educational and curricular system. But much of the result of that expansion is seen in one of the most disturbing paradoxes of our time; namely while millions among the educated are unemployed, millions of jobs are waiting to be done as the people with the right educational training and skills cannot be found.*

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Very instructive about the lapses in skills acquisition programmes in Nigerian polytechnics, was the report of experts and professionals in the Oil and Gas sector, that a lot of vacancies are lying unfilled in the International Oil Companies (IOCs) which are multinationals and Nigerian Oil and Gas servicing companies as a result of the lack of necessary skills-based training and
specialized certification of Nigerians (Ahmed, 2008). The report revealed that 15,000 job vacancies and related openings exist at various levels in different capacities among several Oil and Gas as well as oil servicing companies operating in Nigeria. The alleged deficiency syndrome has made foreign craftsmen and women and technicians from faraway places like India, China, Philippines and Lebanon take over positions meant for Nigerians, and thereby earning huge salaries and wages in foreign currencies.

The youth restiveness in the Niger Delta was partly tied to their inability to get jobs in the multinationals and other oil prospecting companies perhaps as a result of the alleged skills deficiencies. Their unemployability gradually led to a steady rise in illegal oil bunkering, arms and ammunition proliferation, kidnapping and other antisocial activities that the country had to contend with (Awhinana, 2008).

The Federal Government’s attempt to correct the huge capital flight in the strategic Oil and Gas sector, led to the introduction of the ‘Local Content Initiative (LCI)’. According to Ahmed (2008), local content in relation to the oil industry is the quantum of value added or created in a country’s economy through a deliberate utilization of human and material resources and services in the exploration, development, transportation, marketing and sale of the country’s crude oil and gas resources without compromising quality, health, safety and environmental standards. The essence is to offer the opportunity to accelerate economic and social development of Nigeria through employment creation, but the alleged skills deficiency syndrome still threatens its workability. The Local Content Initiative (LCI) which has been passed into law in September 2010 can only thrive if technology-oriented schools that produce the technologists/technicians have adequate infrastructure and an enabling environment for
training and producing the desired manpower. The Nigeria Institute of Management in their communiqué also observed that a lot of vacancies still exist in industries needing skilled personnel even though there is high unemployment rate among polytechnic and university graduates.

The consequence of having a crop of dysfunctional Technology Education graduates in an economy is that, industrial development is stifled and this keeps the economy at a less optimal level and resource exploitation remains largely untapped. The World Bank Development indicator (2000) puts only seven percent (7%) of Nigeria’s population in the industrial sector and output growth rate at 2.4% while industries are 0.5%. This calls for concern.

According to Okunola (1986), Adeogun (1999) and Brand (2008), the extent to which educational programmes meet their purpose is reflective of the quantity and quality of the resources (inputs) in those educational programmes. Inputs or resources in education are the totality of what goes into an education system in order to achieve the purpose of education. According to the Education decree 16 of 1985, a major objective of polytechnic education is to produce the required skilled manpower (human resources) for the various sectors of the economy. This in itself makes the polytechnic an industry, requiring on a continuous basis, inputs in the form of men, money and materials, for the production of competent and skilled graduates ready for the world of work.

The system of achieving quality in any production effort is the provision of adequate inputs and the prevention of breakdown and decay in the factors of production. The inputs required for Technology Education for effective skill acquisition, include among others, physical and
material resources, qualified lecturers, robust and relevant curriculum content, funds, professional improvement programmes for lecturers, quality students and school-industry linkage.

With Technology Education, teaching is conceived as an act and a process that provides the stimulus on which the learner not only accumulates knowledge and technical skills but also develops desirable attitude and insight into the world of work. Theory and practicals are the anchor of learning here which in turn cause relatively permanent modification in behavioral potentials. Teaching and learning as a transaction in Technology Education is facilitated when the environment and the compliment materials (inputs) are available, adequate and effectively manipulated to provide the requisite experiences that are necessary for accomplishing predetermined educational goals. Oriaifo (2005) observed that at every level of education and its content are important for teaching and learning.

Physical and material resources like classroom blocks, well furnished laboratories, workshops, libraries, consumables like chemicals, stationeries, etc, backed by a robust and relevant curriculum content are greatly needed in Technology Education especially because of its nature as practical oriented. Qualified lecturers with the intellectual capabilities and professional background adequate for teaching accredited courses are also greatly needed in technology schools for students’ effective skills acquisition. The nature of Technology Education as ever changing requires that lecturers should undergo periodic professional improvement programmes in order to update on new technologies. Funds are needed for procurement of equipment and maintenance as well as for training and for R&D. The achievement of national goals (sustainable development) through Technology Education therefore requires a good mix
of all the factors of educational production. No wonder, Nweke (1985), Okunola (1985), Adigun (1997) and Yakubu (2000) observed that availability and effective utilization of resources in education are essential for the success of any education system. The National Board for Technical Education (NBTE), the controlling agency for polytechnic education in Nigeria, has set standards for programmes accreditation with respect to the inputs required for effective teaching and learning to take place in polytechnics. Okunola (1986) had observed that resources allocated to education in Nigerian are grossly inadequate. He is also of the view that many educational programmes have met with minimal success, because adequate provision was not made for resources. This situation, he argued, has a negative effect on the quality of educational products.

Yakubu (2002), on his part, reports that polytechnic education, which is supposed to be practical oriented has become very theoretical because of the inadequacy of the right caliber of lecturers. Technology Education lecturers have an instructional role that is different from others. The nature of their teaching is primarily focused on the problem-diagnosing and problem-solving approach that frequently utilizes one-on-one instruction. Some of them have skills that can be used in business and industry employment at salaries and benefits that are much greater than they would receive from teaching. The National Board for Technical Education (NBTE) in Adigun (1997) reported that majority of lecturers recruited by polytechnics throughout the country are non-qualified personnel… The above situations have an impact on the quality of educational products.
According to Drucker (1977), the purpose of every organization lies outside itself – in the society which is its external environment, and like every other organization, technology schools are established to produce quality graduates for employment in industries or for self employment and or as employer of labour. Employers of labour are the ones who assess the quality of educational products. The prognosis with the polytechnic technology oriented graduates is that they are not as skilled and competent as expected (NACCIMA in Yakubu 2002). The alleged poor quality and limited relevance of Nigeria’s technology graduates is a major challenge that has stalled Nigeria’s technological development. The quest for skills-oriented education to drive Nigeria’s industrial development is not new when we recall that Briggs, a onetime Commissioner for Education in Nigeria as reported by Ejiogu (1985), stated at the 1969 Curriculum Conference that “to make our independence meaningful, we must be able to, not only fly our own aeroplane, sail our own ships, drive our locomotive engine and ride our bicycle…we must learn to produce these things ourselves.”

Many years after the enunciation of a National Policy on Education with a section dedicated to Technology Education, Nigeria has not been able to produce our own aeroplane, our own ship or even our own bicycle. This calls for concern and a deeper look at the input factors required to produce competent and skilled graduates is thus necessary. The sophistication and complexities of work content and procedures call for a thorough human resource development strategy that meets international standards (Chukwuma, 2007). Today’s industries do not only require competent skilled workers, they also require multi-skills acquisition and capabilities. Polytechnics need to be well positioned in order to produce quality graduates that can help propel Nigeria’s technological and industrial development.
Statement of the Problem

There has been noticeable increase in the number of polytechnics and monotechnics in Nigeria but many of the graduates turned out from these institutions are said to be unemployable (Lukman, 2002). With about One hundred and one of such institutions, the country still lags behind in technological advancement. Graduates unemployability constitutes societal challenge which must be addressed. Programme accreditation is a huge requirement in the establishment of tertiary institutions. There are approved standards of availability and adequacy of inputs (lecturers, facilities, curriculum contents, student entry qualification etc) for the accreditation of programmes in polytechnics as established by NBTE. According to NBTE, 70-80% availability is considered adequate. The implication here is that any accredited programme in polytechnic has between 70-80% of inputs on ground to produce highly skilled technician. But are the inputs really available and adequate as specified by NBTE? If the inputs are available and adequate and are assured to be put to good use given that the various programmes have been accredited, why then are polytechnic graduates unable to meet industry competency levels of between 60-70% average performance in job aptitude test? This generated the concerns for this study, which is to critically and empirically ascertain whether the inputs factors (lecturers, infrastructural and material resources, curriculum content, lecturer’s professional development, funding, school-industry linkage and student quality) required in Technology Education are available and or adequate in meeting the goals of producing skilled and competent graduates of international standards. The study thus investigated polytechnic graduates’ skills acquisition for employability by determining the availability and/or adequacy of these input factors.
Purpose of the Study

The purpose of this study is to ascertain through a critical analysis and an empirical study whether input factors in the production of skilled and competent technologists are available and or adequate in technology oriented department of polytechnics. Specifically, the study sought:

1. To determine whether there are enough physical and material resources (classroom blocks, laboratories, workshops, equipment and consumables) to run the technology-oriented programmes of polytechnics;

2. To ascertain whether there are enough lecturers to teach in the various technology-oriented programmes of polytechnics;

3. To investigate whether lecturers of technology-oriented programmes have enough exposure to professional improvement;

4. To examine the adequacy of the curriculum content of the technology-oriented programmes of polytechnics in developing skills that meet the needs of industries;

5. To determine the adequacy of funds for the technology-oriented departments of polytechnics;

6. To ascertain whether the technology-oriented departments in polytechnics have enough linkage with related industries;

7. To ascertain whether students’ entry qualification is satisfactory for the technology-oriented programmes of polytechnics;

8. To identify which of the input factors have the most significant relationship with students’ skills acquisition;

9. To identify which of the employability skills is most acquired by students in technology-oriented programmes; and
10. To show whether a relationship exists between the students’ performance in the General Aptitude Technology Education Test (GATET) and their perceived acquired skills.

**Research Questions**

In carrying out this study, the following research questions were raised as guide.

1a. Are there enough physical and material resources (classroom blocks, laboratories, equipment, machines, tools, etc) for skills acquisition in the technology-oriented programmes in the polytechnics?

1b. Are there enough supplies of consumables (electricity, chemicals, water and stationaries) to the departments of the technology-oriented programmes of the polytechnics?

2. Do technology-related departments in polytechnics have enough lecturers?

3. Do lecturers of technology-related departments have adequate professional improvement exposure?

4. Is the curriculum content of the technology-related courses of the polytechnics adequate in developing the relevant technological skills in the students?

5. Is there adequate funding for the technology-related departments of the polytechnics?

6. Is there enough linkage between the technology-oriented departments of the polytechnics and their related industries?

7. Is the entry qualification of students into ND levels of technology-oriented programmes of the polytechnics adequate for effective skills acquisition?

8. Which of the input factors has the most impact on students’ skills acquisition?
9. Which of the relevant Technology Education skills is most acquired by the students in technology-related programmes of the polytechnics?

10. Does the students’ performance in the General Aptitude Technology Education Test (GATET) show that they have really acquired the relevant technological skills?

**Research Hypotheses**

The following operational hypotheses were postulated for testing in this study:

1. There is no significant relationship between available physical/material resources and students’ skills acquisition in technology-oriented programmes of the polytechnics.

2. There is no significant relationship between lecturer quantity and students’ skills acquisition.

3. Lecturers’ exposure to professional improvement will not have any significant influence on students’ skills acquisition in technology-oriented programmes of the polytechnics.

4. There is no significant relationship between adequacy of curriculum content and students’ skills acquisition.

5. Adequacy of funds in technology-related departments of the polytechnics will not significantly influence students’ skills acquisition.

6. School-industry linkage will not have any significantly influence on students’ skills acquisition.

7. Students’ entry qualification at the ND level will have no significant influence on students’ skills acquisition.

8. There is no significant relationship between students’ performance in the General Aptitude Technology Education Test (GATET) and their acquired skills.
Significance of the Study

The study is significant in articulating the importance of relevant skills acquisition in Technology Education as a way of enhancing graduates self-reliance and employability.

The result of this dispassionate empirical study would be useful to the government, educational planners, the National Board for Technical Education (NBTE), technology school administrators and industries in that it has provided practical suggestions on how best to improve service delivery in the Technology Education sub-sector as a springboard for achieving the aims of Technical and Vocational Education as enunciated in the National Policy on Education (NPE).

The results have also provided concrete data and information that will help to initiate policies in polytechnic education as a basis for effective implementation of the aims of Technology Education.

Finally the study has also been able to fill some gaps in literature of the dearth of studies with a focus on polytechnic graduates skills deficiencies. At the same time, the scope of the study could trigger other researchers to carry out similar studies in other zones of the country.

Scope of the Study

The study centered on polytechnics in the South-South geo-political zone of Nigeria. The zone was chosen because, graduates (including polytechnics) unemployability in that region despite the presence of local and international companies contributed in some ways to the youth
restiveness (Awhinana, 2008). It concentrated on accredited technology-oriented programmes in four of the nine polytechnics in the region – two Federal and two State owned.

The focus was on input factors and their influence on students’ skills acquisition. However, it was limited to such inputs as lecturer quantity, physical and material resources (classroom blocks, laboratories, workshops, equipment and consumables), curriculum content, students entry qualification, lecturers exposure to professional development, level of funding and school-industry linkage. Its delimitation to the above inputs was because of the time frame and because other educational inputs could form the basis of other empirical efforts.

**Operational Definition of Terms**

The following terms are hereby defined in order to facilitate a clear understanding of their use in the context of this study.

*Technology Education (TE)*: This is the education that leads to skills acquisition and competencies to produce graduates that can work in industries or setup Small and Medium scale Enterprises (SMEs).

*Technology Schools*: This refers to tertiary institutions like polytechnics, colleges of technology and monotechnics that give training and impart necessary skills that lead to the production of technicians, technologists and other skilled personnel.

*Input factors*: These are the totality of educational infrastructure and facilities that make for effective teaching and learning. In this study, they include: lecturers, students, curriculum
content, in-service training, classroom blocks, funds, laboratories, workshops, studios, ICT
gadgets, well-equipped libraries and consumables like chalk, chemicals, stationeries, fuel, etc.

**School-Industry Linkage:** School and industry working together to produce technologists that
meet industry requirements.

**Skills Acquisition:** Training received in Technology Education that emphasizes the possession
of six relevant skills (Technical, Manipulative, Innovative, Entrepreneurial, Interpersonal and
Intellectual) in polytechnic education.

**Technical Skills:** These are the practical skills or peculiar characteristics of a particular field of
study that borders on one’s ability to dismantle and assemble equipment and machines as well
as ability to identify parts and design components.

**Manipulative Skills:** These are the skills that border on one’s ability to handle or manage skills
in a chosen field of study through the skillful use of the hands such as ability to measure
liquids, volumes or draw accurately as well as other hands-on skills.

**Innovative/creative Skills:** These are skills that border on dynamism and initiative or readiness
and ability to initiate action in a particular field of study including being imaginative and
resourceful.

**Entrepreneurial Skills:** These are skills that have to do with readiness to initiate business and
self-drive such in a given field of study.
**Team Player/Interpersonal Skills:** These are skills that have to do with the ability of an individual to work willingly in cooperation with others to accomplish a given task.

**Intellectual Skills:** These are skills that have to do with the mental capacity for thinking and acquiring knowledge.

**Technological Development:** A broad-based industrial development with massive deployment of technologies in solving human problems in every facet of life – Automobile, Electrical Electronics, Textile, Food, Oil and Gas, Construction, Health, Machineries, Telecoms, etc.

**Sustainable Development:** This refers to the development that meets the needs of the present without compromising the needs of future generation.

**Competent Technologists:** Those that meet the skills-set, competence and confidence levels required to execute the high varied jobs and tasks in a globalized world market.

**Human Capital/Human Resources:** These two terms will be used interchangeably. As used in this study, it is the totality or aggregate of human beings (HODs and lecturers) working in their various departments.

**Technology Lecturer:** Is used here as a generic term to refer to those who teach in science and technology-oriented departments in polytechnics and colleges of technology.
**Capacity Building:** The process of equipping with understanding, skills and access to information, knowledge and training that enables an individual to perform effectively and efficiently.

**International Standards:** These are standards dictated by “Best Practices” in the context of due certification by International Standards Organization (ISO).

**Curriculum Adequacy:** As dictated by international experts provided by UNESCO Paris (2006). Major trusts are that curricula should be more learner-centered, competence-based including life skills, practical oriented, have clear guidelines of teaching-learning activities, have clear guidelines on learner experiences, and incorporate entrepreneurial education and Information and Communication Technologies (ICT).

**NBTE (2007b) minimum accreditation standard for facilities:** Having between 70 to 80% of resources.
CHAPTER TWO
LITERATURE REVIEW

Introduction

The review of literature in this study, focused on theoretical and empirical studies relating to concepts and variables used in this study. Specifically, the review was done under the following sub headings:

- The Concept of Technology and its Relationship with Science
- Technology Education
- The Concept of Competence, Skills Acquisition and Acquirable Skills
- Input Factors and Resources in Technology Education
- Lecturers Place in Technology Education in Relation to Students’ Skill Acquisition
- Infrastructural/Material Resources in Technology Education in Relation to Students’ Skill Acquisition
- Curriculum Content in Technology Education in Relation to Students’ Skill Acquisition
- In-Service Professional Development Need in Technology Education in Relation to Students’ Skill Acquisition
- Funding in Technology Education in Relation to Students’ Skill Acquisition
- School-industry Linkage in Technology Education in Relation to Students’ Skill Acquisition
- Students’ Quality and Entry Qualification in Technology Education in relation to Students’ Skills Acquisition
- Technology Education and National Development
- Conclusion
The Concept of Technology and its Relationship with Science

The concept of technology is derived from science and is defined in the Chambers 20th Century Dictionary as the practice of any or all the applied sciences that have practical value or industrial use. Technology is born from and in science. Busari (2004) notes that science is the mother of technology for while science is know-what, technology is know-how. In her opinion, technology uses science and science uses the products of technology to accumulate theory. Nwangwu (2000), Ivowi (2005), Amar (2007), Awanbor (2007), Okey (2007) and Brand (2008) have all observed that technology uses scientific knowledge and in this regard, it can be seen as applied science that has practical value or industrial use to the society. Oludotun (2005) on his part, sees technology as being concerned with finding solutions to the practical problems which confront humans in all spheres - health, transportation, agriculture, communication etc. The National Policy on Science and Technology (1986) sees science as the generation of knowledge about life, and technology as the use or application of knowledge to solve human problems. Scientists seek to explain why things happen; they generalize and make predictions while the technologists seek to use scientific knowledge to create useful articles or develop new techniques. In this way, technology empowers people to take control of their lives.

Olarinoye (2005) gave a clearer picture of the interrelationship between science and technology when he averred that in science, man endeavours to understand his physical environment and uses technology to control it. Oriaifo (2005) on his part notes that while science may be characterized as an adventure of man in accumulating systematic information and seeking rational answers to nature and the observable events and phenomena in nature, technology, he opines, is a way of doing things through the application of knowledge derived from analytical investigation of natural forces and materials. Esiobu (2005) supports the
relationship between science and technology when she averred that science and technology have long been recognized as the engine that drives economic development.

The impact of technology in our lives is enormous, but the impact is most felt in the industries. The industries produce most materials, objects and machines, hence, Olarinloye (2009) argued that the concept of technology involves man’s relationship with his physical environment as it involves his attempt to control and shape that environment making use of whatever resources are available in that environment. Indeed, our world has become dominated by science and technology for as observed by Njoku (2001) there is hardly any economic activity not propelled by science and technology. Both science and technology lead to development processes by providing devices and gadgets that are indispensable to the enhancement of stable quality of human life and progress. This perhaps explains why Fisher (1975) sees technology as the totality of the means employed by people to provide materials objects for human sustenance and comfort. The practice of technology is human centered and activity based – people bring about technology, use the products of technology and its main focus is societal sustenance and people’s comfort.

**Technology Education**

According to the National Policy on Education in (FRN, 2004), Technical and Vocational Education (TVE) at the tertiary level is considered Technology Education and it is provided at the polytechnics and colleges of technology. Technology Education constitutes a major backbone in the development of any nation. It is essential to capacity development in individuals to foster national development since it is the key to the production of skilled
manpower for technological advancement and economic growth. However, Technology Education which holds the ace for a country’s level of development have continued to suffer setback in Nigeria because of the erroneous belief that polytechnic education is for those who are not academically sound and so could not make it to the University. This contention is evidently born out of the shallow knowledge of what Technology Education is all about.

The National Policy on Education (FRN, 2004), in the sub-section on technical education defined technical education as that aspect of education that leads to the acquisition of practical and applied skills as well as basic scientific knowledge. TVE as used in the policy, is a comprehensive term referring to those aspects of the educational process involving in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitude, understanding and knowledge relating to occupations in various sectors of the economy and social life. Its goals include general and functional literacy in science and technology for useful living in society as well as specialized knowledge and skills for production and system maintenance. Ivowi (2005) opined that Technology Education is organized in such a way as to enable those who benefit from it to generate ideas and integrate them for national development through their activities.

In the views of Oriaifo (2005), Technology Education is the reality that is both a process and an end. It is a process in the sense of being a means to an end or an avenue through which persons are trained to acquire knowledge, skills, competences and attitude for civilized living. On the other hand, it is an end in terms of its products which include trained persons who are duly equipped and accomplished to meaningfully participate in and contribute to the “good” life. This is why he further argued that science and Technology Education have afforded
humans the opportunity to exploit their immediate and remote environment right up to the outer space for the benefit of the individual and the society at large. Okey (2007) on his part observed that Technology Education encompasses training in scientific process and attitudes as it entails doing things methodically. The aim of Technology Education, in his opinion, is to invigorate the creative and critical sensibilities of the learner for a productive and useful life to self and society. Indeed, Technology Education assists learners to develop manipulative skills and equip them to live productive and effective lives in this modern age of science and technology (Awanbor 2007; Oriaifo, 2005).

Technology Education has the attribute of a functional discipline as it offers invaluable knowledge in terms of theoretical and practical potentiality for the improvement of various facets of life. The aims of Technology Education as stipulated in the NPE are to provide “trained manpower in applied sciences, technology and businesses; provide technological knowledge and vocational skills necessary for agriculture, commercial and economic development; and give training and necessary skills to individuals who shall be self reliant economically”. In this regard Technology Education holds the ace for human progress and national development. It was thus stated in the National Policy on Science and Technology (as cited in Oriaifo, 2005) that “Science and Technology are to modern life what the hands are to the body. They are used to harness the forces of nature and to transform the raw resources with which nature endows man into goods and services for better quality of life.”

A well articulated Technology Education policy is the only panacea through which industrialization and technological breakthrough are accomplished. Industries require technicians and technologists (skilled labour) to deal with ongoing rapid and technological
changes which are critical to innovation and wealth creation. Technology Education holds the ace for achieving that.

Anya (2008) believes that the application of technology is one of the most effective weapons for the rapid reduction and eventual elimination of abject poverty in society. The developed economies are essentially structured for full utilization of Science and Technology as a pre-eminent governmental policy while the less developed ones like Nigeria dither and remain apathetic to its application. Osiyale (2000) enthuses that nation states tend to ascribe societal growth, progress and prosperity to education in general and Technology Education in particular. He therefore advocates ardent pursuit of Technology Education with the aim of building Science and Technology (S&T) capacity.

The expectation of mankind from the teaching and learning of science and technology are very high because of its utilitarian function of fostering economic, political, sociological and human resource development for a healthy, productive and progressive life. Outwardly, development is characterized by high rise buildings, highways, fast communication equipment, electricity, machines and labour saving devices. But the critical mass of those who make these things happen are themselves products of Technology Education (Esiobu 2005). Oludotun (2005) is of the view that Japan has achieved her level of economic development through the ardent pursuit of a vibrant Technology Education policy and is today a toast of the world in electrical and automotive gadget. Busari (2004) also asserts that Technology Educations attempt to change the world physically, economically and socially through the meaningful understanding and management of the environment, natural resources, land, sea and space.
Technology Education is somewhat related to entrepreneurial education in that it equips graduates of the system to be prepared to be on their own in the event that they are unable to secure white or blue collar jobs. With Technology Education or TVE at the tertiary level, skills are taught to the beneficiaries that will promote entrepreneurship awareness and an ability for the creation of an operating business outfit especially production and service provisions. Brand (2008) also considers Technology Education as enterprise education – an education in which the learners, lecturers and users of their products (employers) interact in an attempt to understand and explain nature and natural phenomena. Within the larger ambience of education, Technology Education focuses on teaching, learning and application of knowledge and skills.

By the very nature of Technology Education, teaching method is usually activity based and learner oriented. In order words, in Technology Education the learner is actively involved in the entire teaching/learning transaction. Hence Oriaifo (2005) noted that practice and experience are the mother of learning in Technology Education which in turn causes relatively permanent modification in the behavioural potentialities of learners. The mode of instruction within the programme, according to Singh (2007), involves a set of activities or events engaged in by the lecturers and students for the purpose of facilitating learning. Effective instruction therefore depends on the lecturer’s competence which will enable him to give effective purposeful instruction to the students. Usually, the relevant curriculum content to achieve the broad objectives of any programme in Technology Education is carefully selected. The nature of teaching is geared towards guided discovery and practical work and one-on-one is the usual practice.
Guided discovery methods according to Petty cited in Edem (2005) is teaching by asking which is also known as student-centered approach as opposed to teaching by telling which is lecturer centered. Guided discovery is active, involving, motivating and fosters intrinsic interest in the subject matter. He observes that guided discovery involves the students in higher-order-thinking i.e. evaluation, creative thinking, problem solving, analysis and synthesis. These are all skills needed for scientific and technological development. Any lecturer who is to teach in a technology oriented programme must be very good in these strategies which also involves adequate laboratory and field practice. He must, in the views of Oriaifo (2005), be adept in the use of his hands (manipulative skills), heart (positive emotion and moral sensibility) and head (sound intellect in the business of teaching).

Indeed, the lecturer in Technology Education must possess meaningful and relevant knowledge of the subject matter of the programme he teaches, in addition to having adequate laboratory and field skills. Beyond this, he must be proficient in scientific methods and should be able to thoroughly demonstrate scientific attitude. He must also be able to apply scientific knowledge to everyday life as it applies to his/her programme.

Evidently, Technology Education in its entirety is essential for a nation’s technological industrial development. UNESCO, reports Okey (2007), has for nearly four decades propelled African Nations towards adopting S&T as a recognized tool in national development. However, he observed that most sub-Saharan African countries are yet to commit the financial resources needed for such initiative. The government of Malaysia, an East Asia country, visited Nigeria in the 60’s and collected palm kernel for which Nigeria is massively blessed for agricultural development. Today, according to Oludotun (2005), Malaysia is the best palm oil
producer in the world and about fourteen industries produce and use palm oil in the country. Malaysia achieved that level of economic development through the application of technology.

Successful Science and Technology Education programmes have also made Japan the toast of the world in electrical and automotive gadgets. The present state of technological development in Nigeria calls for appropriate orientation towards Technology Education as a springboard for skills acquisition. Nigeria can truly become Africa’s giant if she evolves her Technology Education. But Adigun (1997) however noted that shortage of manpower, lack of adequate facilities and low funding are major problems of Technology Education.

The Concept of Competence, Skills Acquisition and Acquirable Skills
In a world where populations are rising and natural resources are depleting, harnessing the full potential of human resources is posing new challenges to nations, organizations and individuals as they continually seek ways to optimally allocate people with the right set of skills to achieve peak performance (Georgiou, 2004). In this matrix, incompetence is not in the mix. According to Nkang (2006), human resources, their know-how and innovations are the biggest asset of an organization today. For organizations to perform optimally, they need a strong infrastructure with competent workers to create value.

Competence refers to a worker’s ability to do a job well, based on some pre-conceived yardstick or parameters. It is the degree of success a worker achieves in meeting the achievement of some goals in production and service delivery (Awhinana, 2008). The New Oxford Advanced Learners Dictionary defined competence as being able to do something well
that stems from having necessary ability, knowledge and skills set. Therefore, competence is about the measure of astuteness a worker exhibits in job performance that stems from the relationship between knowledge and skills applied in a job and the output in job performance that result. From the above definitions, the competence of an individual has to do with his ability, knowledge and skills which translate to the efficiency and effectiveness of that individual. Each of these attributes will however apply in varying degrees depending on the type of task or activity to be undertaken.

Okey (2007) argued that knowledge driven competence can be tied to technology and innovation while skills set enhances the effectiveness of a person in terms of quality assurance (QA) and quality control (QC). Therefore, how well an individual achieves a comparison of what standard is expected and what is delivered is all that competence connotes. Competence in this regard measures how well a worker satisfies his/her employers since it entails how well previously established goals in production and service delivery have been met.

Competent technologists constitute a critical factor in a country’s match towards technological advancement. In essence, an accelerated approach for a country’s industrial advancement and transformation should be one that enhances the production of competent technologists with the relevant skills to become employable, self-reliant and/or employer of labour. But as reported by Ozoro (1976), NBTE cited in Badekale (1992) and Yakubu (2002) technical graduates from our polytechnics and colleges of technology have been found by employers to be largely incompetent unless they are retrained in industries. Indeed, in the views of Ajayi (1981), Ajeyalemi (2002) and Okey (2007) our trained engineers and technicians have failed to make anything work.
In a study on vocational skills and employment preferences of senior secondary students in Akwa Ibom, Awana (1999) found that students preferred computational occupations, engineering cum mechanical, medical and persuasive occupations. But the skills set needed in these preferred occupations were not emphasized. However, in a study on specific employability skills in technical education designed to measure students’ perception on how much of such skills they possess, Etuk (2006) identified eight skills which student’s were expected to have acquired. The eight skills comprised: adaptability, literacy, communication versatility, knowledge in all dimensions, life-long learning skills, team spirit, creativity and the fluency with information and communication technology (ICT). The skills variously called employability skills, daily-living skills, survival skills and life-coping skills (Taylor, 1998; Okebukola, 2003; Njoku, 2003 and Obanya, 2002; 2003) are the kinds of skills according to Etuk and Eyo (2007) which modern day technology schools are expected to equip their products with, especially as a result of globalization.

Uche and Kpee (2007) in a study on labour market needs and graduate acquired skills found that the knowledge and skills acquired by the graduates had no significant relationship to those required by their jobs. The sample for this study comprised 450 graduates from the faculties of Engineering and Management Science, University of Port Harcourt between 2000 and 2006. A self designed 30 items structured questionnaire titled ‘Graduate and Nigerian Labour Market Questionnaire (GANLMQ)’ was used to generate data for the study. The study concluded that many graduates are still unemployable in spite of varied job opportunities abounding largely because of the unrelatedness of the graduates’ careers and the skills acquired in schools to the demands of the labour market. In their estimation, students’ should be taught and prepared to
be multi skilled to improve their employability. But the proposed multi skills were not mentioned.

This study on Technology Education and skills acquisition in polytechnics has identified technical, manipulative and entrepreneurial skills as part of the employability skills in today’s world of work. Others are intellectual, creativity and team player skills. The intellectual skills are knowledge-based and they are sharpened in knowledge information which are the tools that essentially drive the other skills set in students. Physical competencies are embedded in the technical and manipulative skills of students and these are developed while in training. The technical skills learnt in technology schools have to do with the practical skills or the peculiar characteristics of a particular field of study such as ability to identify parts or components of equipment, machines or tools peculiar to a given field of study. It also has to do with the ability to dismantle and assemble equipment and machines using tools peculiar to a given field of study as well as the ability to design components, equipment, machines and tools.

Manipulative skills on the other hand have to do with students’ ability to handle or manage skills in a given field by the skillful use of the hands. In more specific terms, manipulative skills involve one’s ability to measure liquids, volumes, objects, motions, and or draw accurately. It also has to do with ability to interpret and translate such interpretation into actions as well as the ability to use hands-on activities in some processes to achieve desired results or standard in a given discipline. It is of essence that students acquire the technical and manipulative skills in particular areas of industry or applied art to become employable in today’s competitive world of work or to be adept as an employer of labour.
In the development and use of the technical and manipulative skills, the innovative and creative skills of students are awakened and sharpen. Innovative and creative skills can be considered the heart of Technology Education. Inquisitive and enquiring minds of students are seen in their creativity or innovativeness and their ability to adapt or generate ideas that can lead to positive results in products and service delivery. The concept of innovation and creativity has to do with the dynamism to be imaginative and resourceful in the management of a particular field of study. Basically, innovation borders on self-reliance in doing things. Science is inquiry and technology is the use of the result of scientific inquiry in producing things and in rendering specialized services. The creative skills of the technologist help to make him/her put the results of scientific inquiry into use in making products that are useful to man. Essentially, creative skills have to do with one’s ability to create and initiate ideas to help in effective utilization of knowledge and skills in one’s chosen field of study. It also has to do with the ability to adopt and depend on the utilization of local raw materials for basic needs in a chosen field of study as well as the ability to be independent and rely on one’s own power/resources in achieving desired goals.

Technology Education also equips students with entrepreneurial skills. This is under what Adeogun (1999) refers to as economic competencies. A UNESCO initiative cited in FRN (2000) to bolster technical and vocational education in Nigeria has in collaboration with NBTE integrated small-business management for engineering and other technical fields in the curriculum. The project which is aimed at supporting the Federal Ministry of Education in revitalizing the technical and vocational education sub sector also supports Technology Education staff training and development to facilitate skills development. In the curriculum of the UNESCO action plan, students are taught how to take risks and invest in private business.
where they are their own bosses instead of getting paid employment. They are also expected to be taught how to self-drive a thriving business and render services in their area of specialization. Besides, students in Technology Education are taught to identify opportunities, assess them for shortcomings and use findings to set up thriving businesses.

Team building skills necessary for being a team player are also imbibed in Technology Education. This falls under the purview of what Adeogun (1999) and UNESCO/ILO (2002) call social competencies. Societies are fluid and social interactions drive human activities and actions. Collaboration and cooperation are necessary as work ethics in carrying out any human activities. These skills are taught to students when group projects and assignments and practicals are given as part of their total education package to cope with the world of work.

In all, the acquisition of these skills equips students with the functional education that would enhance their ability for self employment or make them employable to meet societal manpower needs in special fields or industrial setups. Ajayi (1981) and Okey (2007) argued that skills set and competencies are the essential ingredients in self-employment stressing that one cannot get a job without the skills and competencies but one can easily have good training without the skills set and therefore no job. This, accounts for the unemployability of many graduates which have made unemployment and underemployment societal problems. There is therefore, a symbiotic relationship between skills acquisition and employability.

Selzer (1988) in Ayeni and Oladipo (2007) in a study on the employment status of Pittsburg State University female technology graduates, found that majority of the female graduates were gainfully employed in full-time positions and this implied that there was a relationship
between the skills they acquired and what their employers required. In a similar tracer study in Botswana by Emmanuelson, Franzen and Narman (1988) it was reported that about 77% of the Botswana Brigade leavers got jobs shortly after their training especially in the cities.

In a tracer study in Botswana by Emmanuelson, Franzen and Narman (1988) it was reported that about 77% of the Botswana Brigade leavers got jobs shortly after their training especially in the cities. Narman (1992) in another tracer study of some 1,000 trainees that had acquired skills from Moshi National Vocational Training Center in Tanzania confirmed that the absolute majority of the trainees who had acquired technical skills had been absorbed easily into the relevant jobs within the Tanzanian labour market. The implication here is that, both Botswana and Tanzania Technology Education system had been producing the right types of manpower with relevant technical/vocational skills to satisfy the need of these economies. Besides the above studies, the Graduate Placement Report Annual Summary for 1987 of the New Hampshire Vocational Technical College reported that 81% of the 998 seniors that graduated from the institute were employed (Ayeni and Oladipo, 2007). But, in their own study on training and employment of technical college graduates in Oyo state, they found that out of 900 graduates, 441 representing only 49% were employed. This could be an indication of some deficiency of some sort.

Madumere, Obikwelu and Olisaemeka (2007) in a study on impediments to managerial operations in two technological institutions in Lagos state reported that 82% of respondents in a survey agreed that Technology Education graduates hardly find employment, neither are they self reliant as they cannot translate theory to practice. Uche and Kpee (2007) put it more succinctly when they asserted that out of every 100 graduates churned out annually only 4-5
are employable. The situation has forced foreign investors to bring skilled hands from their countries and has thus worsened the unemployment situation in the country. UNESCO in Edem (2005) confirmed the above when it noted that even though Nigeria derives over 65% of her wealth from the oil industrial sector, only 2% of the population work in this sector. This in the views of Madumere et al gives a true picture of the inadequacy in the skilled labour force in the country with unemployment rate on the increase. Given the evident crisis situation, the graduate-labour market unrelatedness needs detailed examination and better understanding of input factors in Technology Education in order to provide appropriate measures to create a graduate-labour friendly society (Uche and Kpee, 2007).

In Australia, key organizations like the National Center for Vocation Education Research, the Australian National Training Authority and Commonwealth Department of Education, Science and Training, have addressed the highly problematic issue of employability skills and have placed the issue firmly on the vocational education training agenda (Taylor, 2005). In the United States of America, concern that American high school graduates are less prepared for the workplace has led to several legislative initiatives and white paper reports from educational agencies and others. For example in a 2006 joint survey of 431 human resource officials by the Conference Board Corporate Voices for Working Families, the Partnership for 21st Century Skills and the Society for Human Resource Management, it was revealed that many entrants to the workforce are not adequately prepared in the soft skills of which interpersonal or team building skills falls (e-School News, 2006). This study tried to ascertain whether students in technology-oriented programmes of polytechnics have acquired relevant skills that can make them employable.
As the private sector assumes more focal roles in national development and with the intent to enhance industrialization and self reliance in technology development, only persons who are equipped with relevant skills and are considered competent will find jobs. The slow rate of Nigeria’s industrial growth does not match her population growth rate. Technology Education as conceived in the NPE was envisaged to enhance industrialization and or self employment. Consequently, evolving relevant skills is the panacea against unemployment. Indeed, the World Wide Web has widened opportunities for employment. If the youths are proficient in the requisite skills, they can gain employment even outside their national borders. But jobs are now more than ever before, driven by skills set and competencies in a competitive labour market.

One of the reasons for the current emphasis on skills acquisition is to equip the youths with definite skills which could be utilized either for paid employment or self employment. But skills deficiencies reduce the chances of employability and make it impossible for graduates to confidently set up as employers of labour. Such a scenario dashes the hope of reducing unemployment and the ushering in of economic development. With today’s world characterized by deregulations and privatization, relevant skills acquisition would dictate who gets the jobs. The economy is tilting more towards free enterprise and there are no more jobs for life. Skills possession would enhance self employment if everything else fails. If students are trained to acquire all the relevant skills, the question of unemployability would not come in as they would be job creators for themselves and employers of labour through utilizing the skills they have acquired in school.
Given the above, accelerated overall development of the country presupposes the availability of skilled and competent manpower. In other words, economic development and technological growth, is dependent on the quantity and quality of occupational skills. By implication, Technology Education (which is skills-based) is mainly responsible for the product sector of the national economy and its major attribute is its relationship with the world of work. Consequently, there is the need to have a planned and sustained industrial training machinery and backup programmes to match up training with effective skills acquisition in order to bring to bear the desire of the federal government to become one of the 20 most developed economies by 2020.

Hallack (1990) is of the view that the availability, relevance and adequacy of facilities (especially in practice oriented institutions like technology schools) contribute to the academic achievement and to a large extent, competence level of graduates of any school system. Exposure to the practical use of equipment is brought to the fore during training when there are adequate facilities. It is for this reason Ehiamentalor (2001) viewed school equipment as the operational input which enables a lecturer to achieve some level of instructional efficiency and effectiveness. The need for quality assurance in educational products cannot be overemphasized. Issues of graduates’ competence and hence employability borders on quality assurance in education service delivery which is in turn, linked to the quality and quantity of inputs into the education production matrix. Schools without adequate resources have the tendency to hinder good teaching practice and as such a deterrent to learning with far reaching implications for students’ performance and competence level on graduation.

Malone (1997) stressed that, competence measures are bound to present difficulties especially in service industries where workers output are intangible, their input not clearly defined and
their jobs require a high degree of discretion. This however is not the case with production factories where output is measured in tangible terms in expertise and skills levels. Competence effects may show up in products design, procedures, systems design and strategy, but factors affecting competence level include human cognitive limits in terms of ability and multi-tasking, insufficient practice, task design and autonomy when work is to a large extent self managed (Davis, 2001).

**Input Factors and Resources in Technology Education**

According to Adeogun (2001) everything that goes into the teaching/learning process to help achieve school objectives is considered input resources in education. These resources are many and varied and they include human resources, (lecturers, students, non–teaching and administrative staff); infrastructural and instructional facilities, like classroom blocks, workshops, laboratories, well stocked libraries with up-to-date books, furniture and fixtures, syllabi/curricula, charts, funds, journals and consumables like chalk, whiteboard markers, chemicals, stationeries etc (Banjo and Taiwo, 1968; Ogodo, 1995; Oni, 1995; Madumere, 1999; Onyene, 2000; and Adeogun, 2000).

Meaningful training and necessary skills acquisition cannot take place in technology schools without adequate inputs. Schools are production units and education itself is an industry. It therefore has a factory model system which receives, on a continuous basis inputs in the form of men, money and materials for the production of needed and desired output. Therefore, as noted by Taiwo (2000), input factors make up for the factors of production while the finished products are the graduates of the system.
Inputs in education stimulate the curriculum content of a programme to assist its participants to realize the objectives of that programme. In different studies, Bosah (1997); Adeogun (1999); Adesina (2000); Obiegbulem (2005) and Etuk (2005) found that the successful accomplishment of educational goals is hinged on the availability and adequacy of educational resources. Fagbemi (1986) in assessing the possible causes of poor quality of education noted that the problem may depend on the quality of inputs into the system since output can be determined by the quality of inputs. Aghenta (1982) opined that education output depends on what goes into the education system and how what goes in is processed. Inputs in education also includes curriculum content, the training and retraining programmes lecturers undergo while in service, the entry qualifications of students as well as the school-industry linkage.

Studies conducted by Ivowi (1993), Durosaro (1985), Okunola (1985), Nwadiani (1995), Nwuzor (1989), Adeogun (2001), Ehiamentalor (2001) and Ayodele (2003) showed that lecturers, equipment and facilities are grossly inadequate in schools and this has greatly influenced school outcomes and by implication quality of graduates. Baiyelo (2009) on his own part, observed that notably poor funding, outdated content and defunct facilities have all combined to frustrate effective Science and Technology Education in Nigeria and this has greatly impeded the achievement of a common core scientific value upon which the legitimacy of a nation’s technological development is based (Ogunleye, 1999). In this study, curriculum content, lecturers’ exposure to professional improvement programmes, students’ entry qualification and school-industry linkage were studied as inputs in Technology Education.

Since the achievement, educational objectives is tied to availability and adequacy of inputs in education, there is therefore the need to assess the condition of input factors in institutions of
learning from time to time. It is also imperative that controlling authorities make them available in sufficient quantity and quality for the production of competent graduates who can meet both local and international standards. Input factors chosen for this study include:

- Lecturers
- Facilities
- Curriculum Content
- Funding
- Lecturers’ exposure to improvement programmes
- Students entry Qualification
- School-industry Linkage (interaction).

The Place of Lecturers in Technology Education in Relation to Students’ Skills Acquisition

The role of Technology Education in the overall development of a nation cannot be overemphasized because the knowledge and skills acquired in technology schools are essential inputs required for achieving sustainable development. But the achievement of national goals (sustainable development) through Technology Education requires technology lecturers with the intellectual capabilities and professional background and training adequate for teaching accredited programmes (courses).

Lecturers constitute a very important input of the education system. No education system and programmes would be successful without qualified lecturers. It is for this reason Ejiogu (1990) argued that the lecturer is a fundamental and indispensable tool (agent) in the development of
the potentials and abilities of society’s younger generation. In his views, the lecturer occupies a position of transcendental importance in the world as an embodiment of knowledge. Ashworth and Harvey (1994) identified the teaching staff as the school’s most important resource. Shulman (1987) also sees the lecturer as a major factor in student learning as the effectiveness of a school is judged by the quality and effective utilization of the teaching staff. On his part, Oderinde (1992) is of the view that the lecturer is the spark that fixes the whole development process, the key man in the drive to progress.

Stressing the importance of lecturers in education service delivery, Hallmark (1990); Ejiogu (2001) and Adeogun (2004) emphasized that the quality of education depends on the quality of the inputs of its lecturers. Indeed, studies carried out by Fuller (1987); Olotu (1990); Fuller and Clarke (1994); Oni (1995); Ogbodo (1995) and Park and Hannum (2001) on school factors that raise students’ achievement found that lecturer factor is predominant. In a study in Kenya, Lloyd, Mensch and Clarke (2000) and Hannum and Park (2001) found that teacher characteristics have an important impact on student’s attainment. It was specifically noted by these studies that approximately one-fourth of students test score variations is attributable to lecturer differences.

Technology Education involves the application of scientific and industrial methods in the production of goods and services. Therefore, lecturers in Technology Education must of necessity be well grounded in technical skills. They are expected to expose students to the practical aspects of their programmes thus making them functional on graduation and to a large extent, self-reliant. From the foregone, it is evident that technology students’ relevant skills
acquisition is dependent on lecturers who are themselves competent in the skills they intend to pass on to their students.

Given the above, if Technology Education is to achieve its purpose in any nation, it requires a large retinue of highly motivated, satisfied, intellectually and technically competent lecturers who will bring to bear the desired changes intended in the students. The role of lecturers in shaping the intellectual, technical, manipulative and creative skills in technology students cannot therefore be overemphasized. However, Anokye (1989); Oguntuye (1990); Yakubu (2000); Eweje (2001) and Okunola (2007) in different studies report that technical education has become very theoretical because of the inadequacy of the right caliber of lecturers. Ogunleye (1999) stated that the lecturer-students ratio of 1:30 is considered adequate for the dissemination of knowledge and skills in technology-oriented courses because the nature of their teaching is primarily problem solving that frequently utilizes one-on-one instruction. Shortage of lecturers has made the above lecturer-student ratio unachievable observed Yakubu (2000).

The opening up of labour market opportunities for Technology Education lecturers, according to Wright (1997), has always raised concern about retaining qualified lecturers in technology schools. Therefore, concerns about lecturer shortage are acute. Okunola (2007) clearly identified two notable challenges facing the lecturer situation in technology schools in Nigeria - the challenge of numbers and that of relevance. The challenge of numbers in his view has to do with insufficiency in the quantity of lecturers available for teaching various technology oriented courses in Technology Education institutions in Nigeria. That of relevance, on the other hand, has to do with the quality of the teaching staff.
Balogun (1991) was more succinct in his analysis of lecturer shortage in Nigerian technology schools. He categorized lecturer inadequacies into four, viz: overt shortage of lecturers, hidden shortages, suppressed shortages and modern shortages. He noted that actual vacancies to be filled is overt shortages; while positions filled by unqualified lecturers who teach outside their area of specialization are hidden shortages; suppressed shortage is seen as relating to lack of pedagogical training required to teaching effectively while modern shortage is used to describe lecturers who are qualified but are out of touch with current development in their fields. It is sad to note that in studies carried out by Aghenta (1992); Oni (1995); Adigun (1997) and Okunola (2007) all four types of shortages are inherent in technical and vocational schools. This study intends to ascertain the veracity of the lecturer shortage claim.

Adebambo (2007) observed that in the past, efforts to promote Technology Education have neglected the provision of trained lecturers. This made Awakuna (2006) affirm that the lecturer production problem has resulted in technology lecturer scarcity. The National Board for Technical Education (NBTE) cited in Adigun (1997) also noted that majority of lecturers recruited by polytechnics throughout the country are non qualified personnel who do not possess the necessary pedagogical training. Ajeyalemi, (2002) confirmed the above, when he noted that majority of those who teach science and technology programmes at the tertiary level are subject specialists and not professional lecturers and so teach science and technology courses as mere academic discipline as they fail to relate theory to practice or content to its social and technological application. To this group of lecturers, as observed by Adigun, teaching is a last resort and is usually regarded as a transit camp of some sort.
Aghenta (1992) argued that the idea of engaging the services of unqualified lecturers is having a toll on the transformation of school curriculum. This is because, much cannot be expected of lecturers if they have no knowledge and skills. Okebukola (2005b) thus argued that a lecturer who lacks the necessary pedagogical skills in teaching science and technology oriented courses cannot meaningfully contribute to the development of the scientific and technological manpower required for national development. We certainly need a new look at science and technology lecturers. Kalejaiye (2006) in a study however revealed that present day Technology Education lecturers are sound in theory but deficient in practice. Ashaye (2006) countered this with his own study which showed that Technology Education lecturers have practical knowledge but are impeded by lack of appropriate instructional resources.

Farrel and Oliveira (1993) and Yakubu (2000) reported that recruitment and retention of qualified lecturers tend to be most difficult in rural areas of developing nations, leading to a situation in which rural schools are paired with the least qualified lecturers and part-time teaching is the order of the day. Mbakwe (1986) and Gbadamosi (1998) also found out that better qualified lecturers sought deployment to schools located in urban towns especially those sited in state capitals. The result of the inadequacy of the right caliber of lecturers is that skills acquisition is distorted and the quality and competences of the technologists and technicians turned out from our polytechnics leave much to be desired (Lukman, 2002). This inadvertently seems to corroborate the assertion that polytechnic graduates are academically weak.

Qualified and competent lecturers are central to relevant skills acquisition and hence the production of competent technologists from polytechnics who would propel Nigeria’s industrial development. Darling-Hammond (1999) supports this view when he enthused that
the framework for understanding the labour force outcome of schooling has conceptualized lecturer quantity and quality as key inputs. Ejiogu (1990) upheld the above view when he averred that the strength and quality of academic and non-teaching staff has a lot to do with the quality of educational products. Ajeyalemi (2002) agreed as much when he opined that of all the factors affecting science and Technology Education in Nigeria, the lecturer factor is the most crucial.

In their studies, Darling-Hammond (2000) and Adegoke (2002) found a significant relationship between lecturer’s quality and students’ performance thus noting that lecturer’s quality is one of the indicators of standard of educational products. They observed that students learn more from lecturers with strong academic skills, from those more experienced and from those with high professional capacity. Fagbamiye (2003) also remarked that lecturer competence contributes to students’ achievement and their competence on graduation. Hanushek (1995) in highlighting the problem of poor efficiency of schools in developing countries argued that lecturer quality is the most important factor contributing to overall school quality. In this study, lecturer quantity will be assessed in relation to students’ skills acquisition.

The paucity of technical lecturers with the requisite experience (many of them prefer to stay in production work at salaries and benefits that are greater than they would receive from teaching) is the reason Ostroff (1997); Kadiri (2002); Ajeyalemi (2002) and Olusakin (2005) noted that staffing problem is probably the most difficult obstacle in the way of effective Technology Education. Solarin (1999) and Anokye (1999) confirmed same when they stated that technology schools have suffered a great deal from the personnel problem as they have not been able to attract and retain enough quality of the right caliber of lecturers.
Wright (1997) reported that technology lecturers choose white collar jobs where the pay is higher and working conditions generally more attractive than take to teaching. This perennial problem of lecturer shortage made the International Technology Education Association (ITEA)’s professional improvement plan to call for a study that addresses the Technology Education lecturer retention problem. Rosenholtz (1985) identified the central problem in being that good technology lecturers are difficult to recruit because the reward of teaching, to them, does not outweighs the frustration of teaching. Concerns for remuneration are paramount. Schlechty and Vance (1985); Perie and Baker (1997) and Ingersoll (2001) are of the same view that low salaries and truncated salary scales are among the reasons those with alternative career options like Technology Education lecturers give for refusing to come into teaching or for leaving the teaching profession. Farrel and Oliveira (1993) warned that in developing countries, qualified lecturers are likely to abandon teaching if what they earn in teaching differ greatly from what they could earn in an alternative career.

Pay package is particularly fingered in developing countries where the government had largely been unable to satisfy her citizen’s basic needs in food and shelter. Lending credence to pay as a dissatisfying issue in teaching, Ejiogu (1990) in a study reported that lecturers demand were distant from an altruistic self image…they show themselves as hedonistic and acquisitive creatures whose interest lies in obtaining the greatest economic rewards. This stance was resonated recently when polytechnic lecturers went on strike over the non implementation of an agreed enhanced and harmonized salary scale.

Okoro, (1998) lamented that in spite of the role lecturers play in the education system, there was abundant evidence to suggest that lecturers were neglected in terms of support and
welfare. In Nigeria, regrettably as in other developing countries, lecturers are not given the material reward and social prestige or the importance their job commands. They compare unfavorably with other professionals with similar qualifications and experience. Thus Ejiogu (1990) observed that “the Nigerian lecturer has his path strewn with thorns, broken bottles, mangled hopes and expectation, shattered dreams and broken promises.”

Poor working conditions and inadequate school resources have also been cited as another reason for lecturer attrition in the Technology Education sub-sector. In the United States for example, there is considerable research on how school resources, working conditions and the organizational attributes of the school environment are linked to lecturer satisfaction and retention (Rosenholtz 1989; Wright 1997 and Ingersoll 2001). Lecturers were said to be less satisfied and undesirous of staying in schools with poor resources and a less cohesive organizational climate. Ajeyalemi (2002) lamented the Nigerian technology lecturer situation when he stated that at the tertiary level, members of the teaching staff are frustrated due to poor working conditions and unconducive teaching/learning environment.

The deplorable working conditions of Technology Education lecturers have actually made the teaching profession unattractive to many qualified lecturers. Aghenta (1992) observed that many qualified technology lecturers with the technical know-how are leaving the profession for more prestigious and highly rewarding industry jobs. With the practical nature of their training as noted by Bian (2002), alternate career paths are opened to them. As a result, a good majority of them have greater flexibility to move to better jobs. Technology schools thus face barriers to recruiting and retaining qualified lecturers.
School location also has its own source of frustration for lecturers. Lecturers serving in rural communities in developing countries (like Nigeria) experience particular challenges (Sargent and Hannum, 2004). Recreation and opportunities for enrichment and personal advancement are often limited to those available in towns and cities. Such lecturers may feel isolated and refuse to take up employment in rural areas.

A high quality teaching staff is the cornerstone of a successful education system. Therefore, recruitment and retention of quality faculty is a major issue in Technology Education. Nigeria’s industrial growth is therefore greatly dependent on a crop of pedagogically well trained, highly motivated and committed professional lecturers who are dedicated to teaching. But the dearth of technology lecturers with the required training and experience to teach effectively in technology schools has become a perennial problem. Educational planners and policy makers cannot continue to ignore this trend which has assumed the dimension of a syndrome of continued downslide in the quantity and quality of education service delivery in the sector (Nwangwu, 2000). The reality is that the trend is showing no sign of abating but is rather on the increase with the result that Technology Education geared towards self reliance and industrial growth is stifled. The assumption here is that enough quality lecturers would help actualize the aims of the Technology Education as stated in the National Policy on Education (2004) and the National Policy on Science and Technology (FRN, 1986).

The solution to the lecturer shortage problem that is stifling education service delivery in the technical education sector lies in looking for ways of not only attracting the right caliber of lecturers but also of retaining them, especially as the Federal Government is advocating skills acquisition for industrial and entrepreneurial self reliance. Ex-president Bill Clinton of the
United States of America summed up the importance of the lecturers in society’s development when he challenged all Americans in his 1997 state of the union address “make sure there is a talented, dedicated and well prepared teacher in every classroom across the country…with the complexities of today’s technologically society, it is imperative that our children have well prepared teachers who know their subjects and who know how to teach effectively. We must be able to recruit and hire qualified teachers and keep them in the profession.” Nigeria as a developing country cannot evolve technologically and industrially to become one of the 20 most developed economies by 2020 without the technology lecturer with the capacity to master and manipulate the environment for the general good. Quality technology lecturers should be attracted and retained on the job.

Wages and incentives as contained in lecturers’ conditions of service play a major role as a factor in the attraction and retention of lecturers in Nigeria (Asika, 1984 and Binitie-Cassidy, 1998). This is also highlighted in the contingency approach to pay system in which the viability of a pay system is linked to continued stay on the job (Lupton and Growler, 1969). Mitchell (1986) highlighted a fairly small but agreed set of rewards (reinforces) that are used to motivate people. These rewards include monetary incentives (pay), security benefits (like retirement and pension scheme) and more personal rewards like recognition, increased autonomy and the choice to participate in decision making activities. In this regard, polytechnic condition of service may be a source of attraction and retention or a cause of attrition for lecturers especially given the fact that technology lecturers have job options in industries at salaries much greater than they could earn in teaching.
From the array of literature and studies reviewed, lecturers constitute indispensable tools in education service delivery. It is thus hypothesized that lecturer quantity and quality is significantly related to polytechnic students’ skills acquisition and their competence level on graduation.

**Infrastructural/Material Resources in Technology Education in Relation to Students’ Skill Acquisition**

Facilities in education are physical and material. Physical facilities are structures such as classroom blocks, laboratories, library building, office blocks, hostels etc. On the other hand, material resources are the teaching aids which accelerate the teaching/leaning process. They include useable and consumable materials like furniture, chalkboard, marker boards, biros, pencils, chemicals, charts, electronic devices like computers, television sets, VCD player, stationeries etc.

By its very nature, Technology Education requires a lot of infrastructural and material resources for its operations to be effective. Space utilization is generally more than that of conventional school. There is movement in laboratories, workshops and studios. Besides, a lot of equipment is required for the purpose of practicals or hands-on experience. Students learn best through the practical application of facts. To learn effectively, the presence of working facilities is required in large numbers. School facilities according to Ogodo (1995) is defined as space interpretation of the curriculum as the programme of schools are expressed as it were, through the school buildings and all the material resources that are put in place to aid effective teaching and learning in schools.
Ivowi (2005) identified facilities in Technology Education to include machines of different types and sizes, ICT materials, chemicals, other unspecified equipment and consumables like paper, markers, chalk etc. Onyene, (2000) considers facilities to fall under the purview of movable and immovable property. The movable properties in her view include fans, buses, cars, generating sets etc; and the immovable which are many and varied are sub-divided into permanent hardware and material software. The hardware are machines, tools, equipment and concrete structure; software are perishable and hardware bound. Madumere (1999) on her part posits that most perishable facilities are consumable while physical facilities are non-consumables. She categorized school facilities into three – consumables like chalk, biros, paper, maker, chemical, water, etc. Non-consumables include computers, laboratories’ equipment, blackboard markers, textbooks, machines, furniture, generating sets, tools, electrical sets and other appliances. Physical resources are the classroom blocks, laboratories, libraries, boreholes, etc.

Ehiamentalor (2001) sees school facilities as the operational inputs which enable a lecturer to achieve some level of instructional efficiency and effectiveness. Noting the importance of facilities in school outcomes, Okunola (1985), Hallack (1990), Hallmark (1997), Adeogun (2001) and Madumere (2007) asserted that availability, relevance and adequacy of facilities contribute to the academic achievement and hence competence level of graduates. Schools without facilities have the tendency to hinder good teaching and as such are a deterrent to learning with far reaching implications for students’ performance and competence level on graduation. Nwafuluaku (2003), Onyene and Fabiyi (2007) corroborated this assertion that availability and adequacy of modern state of the art facilities are essential and therefore imperative for quality assurance in education. In this regard, the importance of well equipped
laboratories, workshops, studios, libraries and the injection of ICTs, etc cannot be over emphasized. Arubayi (1987); Olotu (1990); Bloom (1997) and Adeogun (2004 in different studies found a positive relationship between laboratory facilities, textbooks, well equipped libraries and students’ achievement. In his own study, Owolabi (2005) found that availability of school buildings and other facilities contribute to academic performance as they enhance effective teaching-learning activities.

In a more recent study on the availability and adequacy of resources for the teaching and learning of vocational education in Lagos state by Adeogun and Oshifila (2007), it was discovered that 52% of respondents agreed that resources were inadequate while 48% responded otherwise. In another study on school plant and science student academic performance in selected schools in Ijebu Ode, Adegbesan (2007) discovered that only three (3) school plants out of fifteen (15) were adequate for effective teaching and learning. Available facilities were workshops, staff office and water. Others like classroom blocks, science laboratories, computer facilities, libraries, lighting and generating sets, laboratory equipment and materials were grossly inadequate. In all the studies above, emphasis has been on academic achievement or on teaching and learning. In this study, input factors and skills acquisition will be emphasized. Meaningful training and necessary skills acquisition cannot take place in technology schools without adequate facilities. Schools are production units and education itself is an industry. It therefore has a factory model system which receives on a continuous basis inputs in the form of men, money and materials for the production of needed and desired output. Therefore, as noted by Taiwo (2000), input factors make up for the factors of production while the finished products are the graduates of the system.
Ndukwe cited in Sofolahan (2005) noted the importance of relevant text in the education production matrix when he asserted that textbooks have helped lecturers to deliver the curriculum as they increase lecturer’s ability to impact knowledge. Fabunmi (2003) reports that most libraries in Nigerian schools do not have enough education materials and books which users can consult as the libraries are stocked with books and other reference materials that are outdated. A visit by this researcher to some of the libraries in polytechnics showed a sorry state of affairs. The libraries are at best empty and where there are books and journals, they are as old as the institutions themselves. We live in a changing world and with all the advancement in technology (that has made the Internet a source of information) one could conclude that any information can be gotten from the Internet. This however does not detract from the need to have a well equipped library. Without adequate library facilities, products from schools (including polytechnics) cannot claim to be adequately informed since they lack the reading culture required to explore the world of knowledge. Industrialization is dependent on a robust research and development strategies.

There is need for adequate library provisions in schools for any education system to work effectively. A library is a repository designed to perform specified function in academic information gathering for students, in books and non books materials. It is a media centre of books, journals and audio-visual aid materials. Intellectual and creative skills in students are sharpened when they explore books and the Internet for information in their chosen field of study. The need for adequate library facilities to accomplish the goals of Technology Education cannot therefore be over emphasized.
The absence of effective library network in our polytechnics is telling much on the standard of their products and is a major obstacle in skills acquisition and on our drive towards technological independence. Students have continued to depend on their lecturers without seeking for current information from other sources to satisfy their natural inquiring minds and widening of their experiences. These are essential attributes for the development of the intellectual and creative skills in Technology Education.

Libraries help students to form habits of independent study and helps with the provision of up-to-date resources to keep both lecturers and students abreast of recent and up-to-date development. Emphasis in our Technology Education should shift from “talk and chalk” to guiding the learner to explore the world of knowledge (Ajeyalemi, 2002). Being a media centre of books, journals and other audio materials, well equipped libraries will make benefactors (students and lecturers) to develop the culture of doing research and finding out. If polytechnics and specialized institutions like the Petroleum Training Institute are to produce quality technologists and thus achieve the goals of Technology Education as enunciated in the NPE, their libraries must be supported with a regular and huge budget to provide adequate reference materials – books, encyclopedia, science and technology journals, year reports etc.

Material resources like machines, tools, chemicals, equipment are also needed for effective skills acquisition which is the hallmark of Technology Education. Mill (1972) cited in Adeogun (1998) noted that skills acquisition involves the respective performance of an operation (involving material resources) through manual dexterity. The implications here is that, skills activities are accomplished through the interaction of a person with some materials objects like machines, appliances, equipment, etc. Badekale (1992) remarked that technical and
vocational training in Nigeria should not be classroom oriented alone as entrepreneurs are not created by years of unbroken schooling but are made through workshops and laboratories that are well equipped.

Bloom (1997) and Adeogun (2004) in different studies found a positive relationship between frequencies of use of laboratory facilities, textbooks, well equipped libraries and students achievement levels. However, it is one thing to have laboratories and workshops; it is another thing to have them well equipped. Optimum, effective and efficient use of laboratories and workshops is dependent on the availability of apparatus, equipment and materials to enhance the cognate learning experience of the students. Skills acquisition will be affected when there are no laboratory facilities in polytechnics.

The success of industrial operation depends on products of technology schools and the skills acquired both in theory and practice. However, Badekale (1992) in a study found that many technical schools operate stereotype and outdated pattern of training using in most cases ill-equipped workshops, laboratories and other training facilities. She further averred that where good facilities abound, they are sometimes under-utilized due to electricity failure and not running industrial hours. Interrupted electricity supply and lack of generating sets have made lots of materials that cost huge sums of money to lie in waste in many technical schools. Having to battle constantly with inadequate facilities certainly affects education service delivery especially in Science and Technology oriented programmes.

It is pertinent to note that the poor state of infrastructural and material resources is not peculiar to Nigeria polytechnics alone. In the last two decades, a number of studies have shown a sorry
state of affairs in American schools. Reports from the United States General Accounting Office (1995) and another from the U.S. Department of Education (NCE, 2000), show that there are students in urban and high poverty area who attend school in buildings that threatened their health, safety and learning opportunities.

Information and Communication Technology is an imperative in Technology Education. Olakulehin (2007) defined ICT as the range of technologies that are applied in the process of collecting, storing, editing, retrieving and transferring of information in various forms. Chen and Kee (2005) maintained that ICTs are the backbone of the knowledge economy which in recent years has been recognized as an effective tool for promoting economic growth and sustainable development. ICTs dominate educational activities in the developed world. But a deluge of challenges confront the application of ICTs in education in Nigeria. These challenges according to Olakulehin (2007) include limited ICT infrastructures (in terms of facilities and competent staff), poor Internet connectivity, the highly prohibitive cost associated with ICTs, lack of maintenance and technical support staff as well as poor electrical energy.

The relevance of ICTs in the educational process in Olakulehin’s view can be seen in two ways: ICTs for education and ICTs in education. ICTs for education refers to the development of Information and Communication Technology specifically for teaching/learning purposes, while ICTs in education involves the adoption of general components of Information and Communication Technologies in the teaching/learning process. ICTs help to accentuate students learning without limiting them to teaching/learning activities in the classroom. Internet helps to create autonomous and critical learners and this has brought a lot of ease to the teaching/learning process. UNESCO therefore, in Sofolahan (2005) emphasized better use
of information technology to boost the quality of teaching and learning since it shifts interpersonal relationships beyond the classroom.

According to Thomas & Ranga cited in Olakulehin (2007) the application of ICTs in Vocational and Technical Education (VTE) can be explored in three broad perspectives namely; pedagogy, training and continuing education. The pedagogical application of ICTs is in the area of effective learning with the aid of various components of ICTs. In their views, all areas of Science and Technology Education can be learnt with the help of computers and other information technologies serving the purpose of learning aids, which play complementary role rather than supplementary to the lecturer in teaching/learning situation. The pedagogic use of computers necessitates the development of skills and attitudes related to effective use of Information and Communication Technologies among lecturer as well as students. Okunola (2007) observed that the use of computers facilitate learning in one’s own home through the use of methods like modeling simulation, use of databases, guided discovery, closed word exploration, etc.

With respect to training, ICTs can be very useful tools for the development of skills as it provides effective training programmes which can be attributed to its capacity for simulation, model-building and interactive adaptation. Globalization has made the injection of ICTs into education a must if people are to lead productive and satisfying lives. Mohammed (2005) has observed that during the past several decades, a mismatch has been evident in Nigeria between the skills impacted by national educational system and those demanded by the workplace. This obvious mismatch is the result of the integration of new technologies in almost every sphere of professional activity which has not been reflected in schools’ training programmes. The
absence of the application of ICT in teaching made Olakulehin (2007) to comment that Nigeria and many other countries in sub-Saharan Africa fall below expectation regarding the use of ICTs in general and particularly in instructional learning activities. There is therefore the need for policy makers to narrow this gap by giving priority to ICT education policy issues and most especially in Technology Education.

Curzon (1990) maintains that when educational resources are well detailed and skillfully used, they multiply and widen the channel of communication between the lecturer and the learners while inefficiency in the use of resources according to Bajah (1995) affect student’s hands-on practice. Fagbemi (1986) and Aghenta (1982) in assessing the possible causes of the poor quality of education noted that the problem may depend on the quality of material inputs into the system and how what goes into the system is processed. Cohen cited in Sofolahan (2005) emphasized the need for quality assurance in educational products when he noted that adequate provision of facilities will contribute positively to the quality of education since facilities directly or indirectly support, facilitate, influence or encourage acquisition and transmission of knowledge, skills, expertise and competence. Pellicione and Giddings (2004) are of the view that the input and consequently output of workers is profoundly affected by the workers’ environment. Constantly having to battle with inadequate facilities certainly affects the way a lecturer works and the effectiveness of his or her work.

Material resources are critical ingredients in learning. They allow for sustainability, innovativeness and responsible standard when available for use in sufficient quantity. Adeogun (2001) observed that instructional resources increase lecturer’s effectiveness in the classroom because they complement and supplement lecturer’s efforts. Learners use them for self directed
learning. It is thus hypothesized that the availability and adequacy of material resources in Technology Education would be positively related to skills acquisition of Technology Education students and ultimately their competence level upon graduation.

In previous studies by Adegbesan (2005), Adeogun and Oshifila (2007) and Agbolade (2008), emphasis has been on educational resources and its relationship with students’ academic performance or teaching/learning. In this study, emphasis is on educational resources and students’ skills acquisition in technology-oriented programmes of polytechnics.

**Curriculum Content in Technology Education in Relation to Students’ Skill Acquisition**

The curriculum content for courses in education is as important as the lecturers who implement the curriculum. Like the lecturers, it is meant to be dynamic and evolving rather than static. A curriculum is like a roadmap that takes both the learner and the lecturer to their destination (Okey, 2007). It sets out the content of an education programme as it specifies the topic, performance objectives, specific content and activities to achieve the objectives (Edem, 2005). Oriaifo (2005) and Edem (2005) believe that the curriculum gives a clear guide of the extent to which a subject matter should be taught. It is from the curriculum, a blueprint which reorganizes or regroups the subject matter to manageable units is compiled to suit state and federal needs. According to Ivowi (2005), the philosophy and objectives of a course of study determine the core content of an envisaged course of study.
Usually, curriculum or syllabi are prepared by examination boards, councils, state or federal government giving due consideration to individual needs of the state or country as a whole. Izuagie (1982) is of the view that a wide range of universal experience, concepts, human resource needs and aspiration that include the economy come to play in drawing a programme’s curriculum content. Consequently, curriculum should be continually upgraded to meet international standards and labour market needs. Osiyale (2005) gives credence to the need to constantly upgrade Technology Education curriculum when he averred that education in science and technology aims to impact on learners, new knowledge, skills and attitude so its curriculum should be upgraded regularly.

In a rapidly changing world of technology only an effective workforce constituted of multi-skilled individuals in the appropriate vocational and technical skills are needed. But Ivowi (2005) however observed that with the changing labour market, there are still technology-oriented programmes that lack relevance to the labour market. He noted that gaps exist in curriculum instructional specification with regard to Technology Education at the tertiary level in Nigeria. Alade (2006) in a study on evaluation of Technology Education in colleges of education in South-Western Nigeria found that TVE curriculum were deficient and recommended for immediate review.

In another study, Adeogun and Oshifila (2007) found 70% of respondents agreeing that curriculum content of many programmes are inadequate. In recent times therefore, the ND and HND curriculum in technology-oriented programmes and their products have come under intense criticism by Technology Education and industry stakeholders in meeting the 21st century world of work (Ukoha, 2001). The greatest students’ expectation of technology
curriculum according to a study by Ukoha, is working in industry and going into private practice. But Brand (2007) opined that there are still outdated career and technical education programmes that lack academic rigor and relevance to the labour market.

The unique features of Technology Education curriculum are that the products are prepared for employment and the development of technical skills. Eze cited in Ukoha had observed that some Technology Education curricula do not include sustainable practical work, provide work experience in a haphazard way that students gain very little professional competence and lack positive work attitude and good work ethics.

In his write up on Technology Education, Okorie (1993) observed that some programmes are devoid of enough vocational and job skills, knowledge of principles and theories as well as the ability to solve practical problem. Ozoro (1972) and NBTE cited in Bedekale (1982) also noted that many Nigerian technologists are found by employers to be partially good in theory but are greatly lacking in skills utilization unless they are retrained in industries. This in the view of Amuka (1993) and Eze (1997) is because of inappropriate curriculum coupled with inadequate facilities for teaching and for practical work. According to the NBTE (1993) in their handbook on Standards for Accreditation of Diploma Programmes in polytechnics and similar institutions, it is expected that the curriculum of any good post secondary Technology Education institution should develop the whole person first by impacting knowledge and skills in a specialized field of technology.

The observed lapses in the curriculum content of many technology programmes, as observed by Amasa (1996) and Ogolanya (1996), have resulted in the training institutions graduating
technologists with poor quality and inadequate job skills who therefore cannot be readily employed in industries. Singh (2001) gave a vivid insight into what Technology Education should aim at when he averred that Technology Education should have a curriculum that is aimed at producing a better workforce (entrepreneurs) through seeking to foster in students the following:

- A greater understanding of how the workplace operates;
- The ability to demonstrate initiative and look for new opportunities in the work environment;
- A wider appreciation and understanding of the complexities in industry enterprise;
- The ability to apply enquiry reasoning, critical thinking, problem solving and analytical skills to different situations and,
- Creativity, self reliance, a capacity to respond to change and an ability to generate, recognize and seize opportunities.

Okey (2007) is of the view that the fulcrum on which Technology Education should be based is that of John Dewey and Ronald Dolls’ from which they proposed a comprehensive curriculum in which the learners learn within and outside the content of his focal course of study – a curriculum in which students have genuine situation of experience with the opportunity to test any idea by application in order to make their meaning clearer and to discover for themselves their validity. Edem (2001) averred that Technology Education curriculum should involve learning the underlying industrial principles and not merely learning how to fix stuff. Brand (2008), Okey (2007) and Ukoha (2007) are in agreement that the curriculum in Technology Education must combine the contents that are both formal and informal as long as the learners
are helped to gain knowledge and understanding, develop skills and other positive and related attitudes.

If training and education should reflect the definition of Technology Education as stated in the NPE (FRN, 2004) then, Technology Education should be accentuated in an appropriate curriculum. Osiyale (2005) is of the view that as in the Helzer project in Northern Nigeria in the 30s, Technology Education curriculum should be concerned with the contemporary notion of relating it to environment and to the possibility of relating it to current international trends. Brand (2008) believes that there is a lack of high quality interdisciplinary curriculum in technology schools in developing countries. The education content was found not linked qualitatively to the work environment and so organizations and industries have found many polytechnic and technical school graduates incompetent on their jobs and therefore unemployable. The non-employability of polytechnic graduates by industries could be an indication that they are not learning the full range of skills needed to be competitive in a global economy.

Instructional programmes in non technology schools are designed to focus on theory and conceptual knowledge and their curriculum and instruction tend not to show how knowledge is applied or used as in technology or vocational related programmes. Brand therefore advocates a cross disciplinary or integrated curricula which help learners make connections. When teaching does not make explicit connection between academic and applied knowledge, there is a disservice to students in technology-oriented programmes. Perhaps it was for this reason Ajeyalemi (2002) advised that attention should be given to practical work when he averred that teaching and instruction in science and technology programmes should focus on how to help
students make connections between disciplinary knowledge (content area) and application to real world situation and problem solving.

UNESCO and ILO in a recent study cited in Singh (2007) showed that many Technology Education programmes have barriers in their curriculum that erode the spirit of adventure in young people. The technologist is a searcher, an explorer and an adventurer. The barriers that erode seeming confidence, the spirit of adventure and the willingness to take initiative should be removed from our curriculum. To this end, UNESCO and ILO concluded that an effective curriculum should be ingenious, innovative and inspirational and should be tailored to industry needs, circumstances and opportunities. The UNESCO and ILO study recommended that in terms of need and aspiration of individuals, technical and vocational education should:

- Prepare the individual for lifelong learning by developing the necessary mental tools, technical and entrepreneurial skills and attitudes.
- Develop capacity for decision making and qualities necessary for active and intelligent participation, teamwork and leadership at work.

Technology is a systematic application of the fundamental scientific phenomena and principles in a device process or concepts that perform a function, useful to mankind. It draws heavily upon applied science and technical innovation. Today’s world has become dominated by science and technology. There is hardly any economic activity that is not propelled by science and technology. Therefore, to ensure the production of the critical labour force in different discipline in order to ensure socio-economic development, appropriate and comprehensive curriculum that is benched marked against best practices is imperative. This is even more so, because it has been predicted that in time to come, only persons with appropriate and
appreciable knowledge and skills in science and technology discipline would be required in the labour market (Njoku 2001). The implication of this is that economic survival, relevance and social mobility will depend considerably on the level and appropriateness of the knowledge and skills an individual has acquired.

Generally, the world is moving from a natural resource based economy to a knowledge based economy and national economic and social trends show frequent changes in the demands for different types of skills and knowledge. To this end, Oludotun (2005) noted that Technology Education curriculum need to easily adapt to the evolving scientific, technological and socio-economic changes. He advised that the curriculum should not only develop the scientific and technological knowledge relative to our natural resources, it must also integrate changes, ideas and opportunities that are constantly generated from Science and Technology in order to be creative and committed to universally shared values. One of such values in his and Okunola (2005), views is the massive deployment of ICTs into TVE.

The emergence of digital technology in the mid 20th century brought about development that could be used to improve organizations. ICTs have today become an integral and essential part of the workplace, making organizations respond better to present day challenges. It is for this reason Avgerou and Cornford (1998) affirmed that effective utilization of ICTs provide a competitive advantage for successful organizations, allowing them to out-perform their rivals, and raise the level and quality of products and services. Therefore, ICTs ought to be incorporated into Technology Education curriculum.
The key to transforming Nigeria’s strong comparative natural resource advantage into a competitive advantage is the creation of appropriate human resources with a mindset of self-reliance, creativity and high productivity ready to cope with the 21st century world of work. By its very nature, Technology Education is enterprise education and its curriculum should be geared towards learning targeted at developing in young people those skills, competences, understanding and attributes which equip them to be innovative, to identify creative initiatives and successfully manage personal businesses and work opportunities, including working for themselves.

The vision of Technology Education in today’s Nigeria (in her eagerness to be one of the most developed economies by 2020), should include updating curriculum content to focus on issues and values of sustainable development. This mix, in the view of Okey (2007) should also include the methodology for an effective learner-centered teaching/learning process where the presentation of new information to students is combined with interactive practical experience at school and in industries.

Indeed, a feature of successful Technology Education programme is involvement with industry. The industry provides students mentorship beyond the school, profiling career pathways and self employment opportunities. With industry involvement, students are encouraged to think about problems not just in abstract but how they might be solved in real life. Industry is therefore a resource for the development and delivery of Technology Education activities and programmes (Singh, 2007). In this regard, the involvement of industries as partners in drawing curriculum as well as in the learning process is a distinguishing feature of Technology Education.
Ensuring quality control and maintenance of national standards in the National Diploma (ND) and Higher National Diploma (HND) programmes are statutory functions of the National Board for Technical Education (NBTE) which also draws the curriculum of Technology Education programmes in Nigeria and pursue its ideals through its accreditation, monitoring and inspection exercises. In order to achieve the objectives of Technology Education as set within the framework of the National Policy on Science and Technology (FRN, 1986), ND and HND curricula in technology and science related programmes should have two major components: occupational studies and general studies (Ukoha, 2001). The occupational component, according to Ukoha and NBTE (2007), is intended to prepare the prospective technologists for proficiency in their areas of specialization like Mechanical Engineering, Civil Engineering, Survey and Geo-Informatics, Building Technology, Fisheries Technology etc. The general studies components should equip the trainees with a wide variety of skills such as social adaptation skills, basic intellectual skills of working as well as speaking and abstract reasoning needed for daily practice.

An integral part of the pedagogy in Technology Education is laboratory or workshop practical exercise intended to expose the students to real work experience. Eze (1997) in a study, however, reported that practical experience in the school is hardly comprehensive enough to enable students attain the level of occupational proficiency desired to work in industries. To this end, and as a supplement, students engage in twelve weeks industrial experience in two instances. The exercise called Student Industrial Work Experience (SIWES) is a form of internship for the students as they are meant to be exposed to actual work experiences, materials and machine which would not have been possible in a regular school setting (Ogwo, 1996). The SIWES provides prospective technologists the opportunity to apply theoretical
concept learnt at school into actual practice. A cursory look at the objectives of SIWES indicates that the products of polytechnic in technology oriented programmes would be expected to be occupationally competent and proficient in manipulative skills jobs so as to work in industries. With the SIWES, there is a link between school and industries in the training of technologist. However, as reported by NBTE (1998), Ozoro (1986) and Awhinana (2008) our technologists are still largely inadequately prepared for work in spite of SIWES to handle the many jobs in the industrial sector. Perhaps a revisit of the SIWES policy as a curricular issue is required.

In the developed economies, as reported by Imandojemu (2001), Technology Education programmes offer students the opportunities to see how theory is used and applied in very practical ways. Technology Education or Career and Technical Education (CTE) is based on project-based and problem-based learning which is a comprehensive approach to instruction that enables students to synthesize knowledge and to individually resolve problems in a curricular context.

The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2004) in a study across various parts of the world reported that most educational systems face problem with educational programming for the youth. The UNESCO document explains that many students lack interest in the prevailing content, under achieve and are unable to use their skills to engage in sustainable livelihood for themselves. For the UNESCO document, relevant curriculum content is the issue.
Increasingly therefore, Technology Education curriculum should be integrated, cross disciplinary and broad enough to reflect the complexities of the world of work. While previous studies focused on technical colleges and craft centers, this study focuses on the curriculum content of technology-oriented programmes in polytechnics that are geared towards enhancing industrialization. It is thus hypothesized that there is a significant relationship between appropriate curriculum content and relevant skills acquisition in Nigeria polytechnics.

**In-Service Professional Development Need in Technology Education in Relation to Students’ Skill Acquisition**

One obstacle to effective Technology Education is the low capacity of lecturers in the handling of practicals. Technologists are only as good as the lecturers who teach them. Technology Education involves the use of tools and equipment especially for practicals. The techniques and use of the equipment must be understood well enough by the lecturers before they can teach students. However, very few Technology Education lecturers’ programmes focus on helping prospective lecturers understand how knowledge is applied in real world settings (Brand, 2008). Consequently, most lecturers emerge from general education but not really prepared to teach or help students learn how to apply knowledge. Such ill-prepared lecturers would not know how to develop and execute quality curriculum. This calls for on-the-job professional development for most technology lecturers in order for them to be familiar with their job performance requirements (Garet, 2007).

Gay and Howard (2000) defined professional development as an on-going process of education and training that takes place in either external or work-based setting with the sole aim of
enhancing the productive capacity of professionals. Such training can be acquired by attending workshops, seminars, conferences, professional meetings, etc. Reading professional publications, watching or listening to documentaries related to one’s academic discipline, according to Ganser (2000), are also part of professional development. In-service training has therefore according to Awopegba (1999) become one of the most critical aspects of an employee’s effectiveness. It brings about efficient and effective staff utilization.

The need for training in education service delivery can be tied to the need to respond to crucial and structured changes in methodology or pedagogy, technological innovations and the performance demands of the dynamic education work environment. Training of lecturers especially in Technology Education would enable the lecturer to be acquainted with other ways of doing the same thing to achieve better results and bring about collective advantage to the school or department as the case may be. Onyene, Ikebude and Udume (2007) advised that organizations including schools should have built-in mechanisms for ensuring continuous staff retaining programmes as a way of regenerating school and social organizational norms and values.

Emphasizing the importance of Staff Training and Development (STD), Awopegba (1999) opines that while education provides the individual staff with the basic knowledge, skills and altitudes to qualify him or her for a given position, training improves his/her competence to effectively perform in that position. Johnson in (Ejiogu, 2000) further accentuated the importance and need for STD thus “organizations are in constant flux; ever-changing, willing and unwilling, the staff including the management has to be trained and retrained on a regular basis or else they would atrophy and shrivel up.” Indeed Case (1985) in his study on employee
job performance found that training is significantly related to improved job performance. Darling-Hammond, Smylie and Wenglinsky (2007) are of the view that high quality professional development accounts for the unique nature of individual needs, continuity and in-depth active learning opportunities.

The provision of professional development for lecturers and other staff is a key ingredient in the successful implementation of Technology Education curriculum. But it is often either overlooked in initial budgeting or understated with insufficient funds for the level of professional development necessary for sufficient benefits to occur. Much cannot be expected of lecturers if they have no working knowledge and skills in their areas of specialization (Gallaway, 1985). Oni (1995) and Aghenta (1992) criticized the idea of engaging such lecturers noting that the services of such lecturers would have its toll on the transformation of Technology Education curriculum. The above, underscores the need for professional improvement programmes for lecturers.

The ultimate realization of education goals in the views of Aderalegbe (1982) depends to a large extent on the quantity and quality of lecturers. Chapman (1994) on his part observed that poorly prepared lecturers find it difficult to face the challenge of classroom which manifests in the lack of skills to prepare and deliver content. Indeed, change in education occasioned by knowledge explosion and technological innovations require that lecturers keep pace with new developments with respect to their role expectations through professional development opportunities. It is thus imperative that available lecturers in technology schools constantly and periodically upgrade their knowledge in order to keep abreast with the latest trends in their
different areas of specialization. Professional development has great implications on lecturers’ job performance.

The need for training cannot be overemphasized. Capacity building for lecturers is essential to create and sustain high quality Technology Education. Ejiogu (2000) asserted that the success of any education programme depends on the professional competence of its lecturers as their competence contributes to pupils’ achievement levels. The training need of the lecturer goes beyond the desire to motivate them; it is to optimize their contributions to the overall goals of the National Policy on Science and Technology Education which is geared towards technological advancement. Adeniyi (1995) is of the view that professional development opportunities enable technology lecturers respond to their role expectations and role performance in the production of competent technologists who are technically competent and capable of career advancement into specialized departments. Armstrong (2001) postulates that training is a key element of improved organizational performance because it increases the level of individual competence by reconciling the gap between what should happen and what is happening and between targets or standards and actual work performance. Besides, lecturers gain competitive advantage from their ability to learn new knowledge and translate them into innovative actions (Nonaka, 1996).

Technology Education is conceived as a means of preparing individual for occupational fields and for effective participation in the world of work. To meet global change and technological innovations, lecturers in this sector of education need constant training to keep abreast of new trends and alternatives brought on by technological innovations. This would ultimately make them more effective and efficient in the performance of their jobs. The tremendous change in
the educational system all over the world, which is characterized by knowledge explosion and technological revolution, requires technology lecturers to keep pace with new trends and discoveries relevant to their areas of specialization. Staff training and development fulfills an important part of this process (Mullins, 2005). Through training, new knowledge, skills and attributes are acquired and these increase lecturers’ capacity and capabilities in performing their jobs creditably. Technology lecturers need professional development on several fronts. They are expected to develop and use integrated curriculum. They therefore need to learn new skills and become more adapt at translating how theoretical or conceptual knowledge is applied and used in various real work settings (Brand, 2008). A lot more could be done on professional development need for lecturers in Technology Education.

The lecturer also needs to learn how to use technical instruction to supplement, enhance and reinforce academic concepts and build in academic content where appropriate. The integration of these professional development matrixes would enable the technology lecturer cope with the challenges of the 21st Century technology evolution and therefore make him able to produce competent technologists. Professional development need, according to Singh (2007) is also needed to help technology lecturers understand the various models of curriculum integration such as building in the application of knowledge in academic classes and building more academic concepts in technical curriculum. Technology lecturers therefore need information on the development of interdisciplinary course. In the views of Brand (2008), there should be a special focus on developing such curriculum in engineering, ICT and other emerging technologies based on rigorous academics pegged to standards and the development of applied teaching and learning.
Another professional development need for the technology lecturer has to do with student assessment like using multiple and varied assessments and not just standardized tests only. Many technology-oriented lecturers are not familiar with performance or competency based assessment that are more commonly used in TVE (Brand, 2008). They need training to understand how these types of assessments can be aligned with and related to standardized academic assessments. They also need to understand the full range of skills on which students should be assessed in different programmes so they can develop integrated-and-competence-based curriculum and use a range of multiple assessments to measure their skills.

In the developed economies, Information and Communication Technology has modified lecturer’s role and has thus placed new demands of professional development on lecturers at all levels of education. Many training institutions in the developing economies like Nigeria, according to Okey (2007) either overlook training in their budget or make insufficient allocation for the level of professional development necessary for any significant benefits to occur. Some institutions just acquire equipment and forget about training and updating the staff on how to use such equipment. Those who acknowledge the need for training do so as an afterthought. Askar, Usluel and Muncu (2006) observed that the diffusion of ICT’s (skills) is insufficient through house training. Hyman (1996) noted that short term profit or expenditure minimization is a reason why organizations ignore training programmes. It could well be the same for polytechnics. But it could also be as a result of inadequate funds. Whatever the case, lecturers need to be thoroughly grounded in their jobs with professional development programmes through seminars and short courses to sustain the diffusion of knowledge and skills to students.
Training and professional development besides serving a positive enabling work condition, is a factor that impacts on a workers’ job performance. Professional growth and development are job related motivations that can lead to effectiveness on the job. From the classical economic point of view, in-house training through seminars, workshops and short courses is seen as an instrument in human capital development with the hope of increasing the productive capacity of workers including lecturers. Training is useful in developing skills and knowledge in lecturers to enhance their individual performance in the production of skilled and competent graduates.

Professional development refers to the gradual growth of a lecturer’s ability to do a job well which will make him more advanced and better equipped to teach and impact. In this regard, it is a process that provides lecturers with adequate learning experience to perform their current and future tasks effectively as well as improve their contributions towards the achievement of educational goals (Beardwell et al 2005). Since lecturers are central to the achievement of educational goals, training creates awareness of latest technology among them in relation to their programmes. Training (in relation to their programmes) updates their knowledge base and equip them to cope better with the demands of their jobs. This enriches the quality of their teaching and inadvertently improves the quality of their products in a highly competitive world of work.

Industries related to specific programmes in the Polytechnics can serve as professional development training ground for lecturers. Norms of continuous professional improvement (Rosenholtz, 1985) and support for internship programmes in industries (Ingersoll, 2001; and Rosenholtz 1985) have been linked to lecturers’ desire to stay on with teaching in technology
schools. Professional developments that support lecturer’s collaboration with industries are greatly needed in technical schools. Training and development can be individualized to a lecturer to constitute the need for growth, suitable placement and an increase in status that begets a sense of achievement and fulfillment. Therefore, ensuring that TVE lecturers have industry credentials can be an important requirement to ensure quality instructions in technology schools. This would help technology lecturers learn more about the academic content they can supplement, reinforce and apply in their classrooms. The linkage would also help them learn how academic knowledge and concepts can be applied in technical settings (Brand, 2008).

It is however important to point out that although the benefit of training and development programmes are obvious, it does not necessarily follow that it leads to improved performance if the organization concern does not have the culture in place benchmarked against result. Mullins (2002) is of the opinion that there has to be an appropriate training culture in place that is linked to output, performance or strategy and that is relevant to the needs of an organization. Such activities need careful planning with greater emphasis on employee (lecturer) development.

No educational system can rise above the quality of its teachers. This underscores the need for an effective training and development scheme for technology lecturers. The need for training and development for the lecturer is constant with Maslow’s (1952) higher order needs and with Hertzberg’s motivation factors. If adequate provision is not made for lecturers’ professional development, poor quality lecturers would be left to teach students. The product of such ill-prepared lecturers would in turn be ill-equipped to cope with the world of work no matter the
quality and sophistication of equipment and facilities made available for the students. A lot more could be done on professional development need for lecturers in Technology Education such as finding out whether they have enough training opportunities. It is thus hypothesized that there is a significant relationship between adequate professional development for lecturers and students’ skills acquisition in technology-oriented programmes in polytechnics.

**Funding in Technology Education in Relation to Students’ Skill Acquisition**

Education is the sole agent of societal development and it is a huge and expensive social service which needs continuous financing from government. Countries that believe in the efficacy of education as an instrument for national development devote a sizeable proportion of their Gross National Income (GNI) to Education. Investment in education is therefore synonymous with the overall national development desire of a nation. Adequate funding is necessary for the smooth running of education; hence the United Nations Educational Scientific and Cultural Organisation (UNESCO) recommended that 26% of a country’s annual budget be devoted to education (Fagbamiye, 2003). But financial challenges feature among the most extensive barriers to successful education service delivery in many developing nations.

In the views of Oguntoye (1987), no education system can rise above the size of funds allocated to it. In the developed countries in the West and in the new industrialized countries of Asia, economic growth has made funds available to finance education, but as observed by Ama (2007), Africa’s mounting threat of economic stagnation and decline has forced government to cut spending on most essential services including education. Consequently, in spite of the Federal Government’s recognition of education as an instrument for national development,
funding in education still falls short of UNESCO’s recommendation. Indeed, there has been
general under-funding of the educational sector by successive governments over the years.
Durosaro, (2000) noted that only a mere 7.6%-9.9% of Nigerian annual expenditure is devoted
to education. The Yar’Adua administration has increased the allocation to 13% in the 2008
budget but, it is still short of UNESCO’s recommendation towards raising the standard of our
education.

Fagbamiye (2003) is of the view that education expenditure in Nigeria is high even though it
actually falls short of the 26% of the annual budget of the country. He observed that the
allocation compares unfavourably with the expenditure profile of several African countries.
Diejomaoh (1985) had observed that even though Nigeria spent more on education it was less
effective than such countries like Ghana, Ivory Coast (Cote D’ivoire), Togo, Kenya and
Zambia which spent less. He noted that by 2001, Nigeria was actually spending less on
education compared with several African countries. Adequate funding is needed to run a
smooth education system especially the Technology Education sub-sector that is very capital
intensive.

By the very nature of Technology Education, which are practical oriented, investment in
infrastructural/material resources is often cost intensive and demands significant on-going
investment to establish, maintain and expand. Funds are needed not only to pay salaries but to
purchase equipment for laboratories, workshops and studios. Funds are also needed to carry
out staff professional development training programmes and for Research and Development
(R&D).
Adigun (1997) disclosed that technical equipment is scarce and expensive. Besides, the cost of installation and maintenance of equipment is enormous. This is the reason Okoro (1983) averred that government preferred the establishment of literary schools to technical schools. Ama (2007) confirmed that Technology Education is expensive to develop and sustain. Olaitan (1996) also observed that funding of Technology Education programmes has been difficult despite the fact that it is the form of education that holds the greatest guarantee for economic survival and development. Okunola (2007) is also of the view that the Federal Government of Nigeria is not funding the technical education sub-sector adequately. He noted for example that in 2003, only about 8.6% of the total allocation to education went to polytechnics where the bulk of Technology Education programmes are developed and executed.

According to Olusanya (2003), the principle underlying the funding of Technology Education is that there is a minimal level of funding below which a programme cannot be effective and should not be attempted. Funding need in Technology Education, succinctly put in his opinion includes:

- construction and maintenance of infrastructure
- acquisition of equipment and tools
- continuous research and development (R&D)
- payment of salaries for the varying categories of personnel
- staff development programmes and activities
- repairs, rehabilitation and refurbishing of equipment and tools.
- training and retraining of lecturers and technical assistants on improved facilities and equipment brought by change in technology.
• furnishing libraries and procuring consumables like chemicals, chalks, markers, stationeries, electricity, fuel etc.

Maintenance of infrastructural facilities and all the components of the laboratories is a big part of Technical and Vocational Education and it requires adequate funding. Ehiametalor (2001), believes that little attention is given to the maintenance of school facilities irrespective of the vagaries of weather and the unpredictable wear and tear due to handling, primarily as a result of financial constraints. He observed that, as important as the provision of school infrastructure is, of equal importance is their maintenance. It is not unusual that facilities are utilized without maintenance until they are no longer able to perform their functions because of the lack of funds. Funds are needed for maintenance so as to achieve the minimum standard for promoting any meaningful teaching and learning (Emetarom, 2003).

Professional development for staff is also a key ingredient in successful Technology Education. It is often either overlooked in initial budgeting or hampered by limited budgets. Ejiogu (1987) is of the opinion that the rapid expansion of education, compounded by the more recent global economic crisis and fiscal constraints due to the downward trend in every sector of the economy, has left higher institutions in Nigeria (including polytechnics) to experience deplorable states. The importance of proper timing and adequate maintenance of school plant/facilities cannot be overemphasized in view of the huge cost of procurement of new materials, but the availability of funds for that is a compelling issue. Aghenta (1982) observed that there is hardly enough funds for the provision and maintenance of infrastructural facilities in school. This view is also shared by Oguntoye and Alani (1998) who noted that educational expenditure has declined steadily with inflation accounting for the huge increase in educational expenditure which is not reflected in improved educational services. Finance thus constitutes a
major factor that limits the acquisition of facilities, construction of new buildings and the
effective maintenance of same.

Adeogun (2003) and Fagbamiye (2004) in different studies found that recurrent expenditure
and maintenance and repairs correlated positively with the quality of secondary education in
Lagos state. Callaway and Musone (1998) also discovered in their own study that personnel
emolument accounted for 65.9% of all expenditure in the country. This leaves 34.1% for other
crucial areas of needs including education. Technology Education which emphasizes skills
acquisition needs adequate funding not only to procure equipment but also for the maintenance
of same.

Okunola (1989) expressed the view that the Federal Government has not done much in meeting
UNESCO’s target in education budgets thus technology schools are riddled with ill-equipped
laboratories, workshops and libraries. This has greatly affected the quality and standard of
educational output as inadequate funding hampers the effective use of laboratories when there
are no equipment for students to use. Perhaps it was this realization that made Awanbor (2007)
to affirm that it is quite safe to say that poor funding is the greatest single obstacle to the
meaningful development of Technology Education in the African continent. Increasingly
however, there is pressure on the educational system to increase quality and the response to
this pressure, according to Oguntuye and Alani (1998) is to improve the amount of resources
going into education taking due cognizance of inflationary impact. This is imperative if there
will be noticeable change in the quality of education at all levels. If the Federal Government
truly wants Science and Technology Education to play its role as catalyst for
industrial/technological advancement, adequate funding must be provided to improve infrastructure and other educational necessities.

Ejiogu (1990) enthused that the rapidly worsening financial situation in our educational institutions has adverse effects on the provisions of established school programmes as well as inhibit any innovatory and experimental work. He therefore suggested that a very real appreciation of the potential effects of a siege economy on education development must be undertaken by analyzing the provision of alternative strategies, techniques and solutions because of the enormity of funds needed to adequately finance education especially of the technical nature. Ivowi (2005) on his part, is of the view that government can no longer shoulder the financing of education alone. The Federal government acknowledged as much when it stated in the National Policy on Education (NPE) (FRN, 1998) that “To supplement government funding, universities and other federal institutions (including polytechnics) are encouraged to explore other sources of funding such as endowments, consultancy services and commercial ventures.

The Federal Government has established other funds from which the burden of financing Technology Education can be eased and these are the Industrial Training Fund (ITF), the National Science and Technology Fund (NSTF), the Education Trust Fund (ETF) and the Petroleum Trust Fund (PTF). These agencies are used to effect direct government appropriation through the budgetary process. In spite of these measures and despite government’s remarkable increase in the proportion of overall budget devoted to education annually, Oguntoye and Alani (1998) observed that improvement in education services has not been seen because of inflation. It is thus hypothesized that there is a significant relationship
between adequate funding of Technology Education programmes and skills acquisition of technology-oriented students in Nigerian polytechnics.

**School-Industry Linkage in Technology Education in Relation to Students’ Skills Acquisition**

Technology Education (TE) deals with human usage and knowledge of tools and crafts and how it affects our ability to control and adapt to our environment – our ability to manipulate our world. Olarinloye (2009) noted that Technology Education facilitates the production of material objects for human sustenance and comfort. Essentially, this type of education should provide an individual an edge against unemployment because it is instrumental to the cultivation of talents and skills and so makes one more flexible in adapting to job opportunities or self-employment. It involves the teaching and learning of the knowledge and skills involved in production. It is also experimental education requiring heavy machines, sophisticated tools and equipment in large quantity for practicals, many of which schools do not have. This is perhaps why Anya (2008) stated that to transform our country technologically, it may be necessary to bring the higher education system into closer working and planning relationship with the technological institutions.

Schneider cited in Smollins (1999) asserts that the traditional classroom was insufficient for technical students to meet the demands of industries and businesses. He therefore called for school-industry linkage in what he called cooperative education between technical schools and industries. A good school-industry linkage as noted by Nwufor (2009) has some benefits to be derived by the students.
These include:

- Enhanced employability
- Vocational maturity
- Motivation to build a career in their area of strength
- Learning opportunities beyond the classroom wall
- Self-directed learning and
- Career clarity

School-industry linkage allows students to apply their classroom knowledge and develop new skills in a professional setting.

The concept of school-industry linkage can be defined as a structured method of combining classroom based education with practical work experience. The American Planning Journal of Cooperative Education (APJCE, 2009) sees cooperative education as work-integrated learning in which time spent in the work place forms an integrated part of an academic programme of study. Essentially, APJCE sees cooperative education as a partnership between education and work in which enhancement of students’ learning is a key outcome. In essence, cooperative education is a strategy of applied learning which is structured, developed and supervised by an educational institution in collaboration with an employer or industry grouping.

The most significant grassroots human resource development initiative that has a semblance with cooperative education in Nigeria is the Student Industrial Work Experience Scheme (SIWES) managed by the Industrial Training Fund (ITF). SIWES was established by the Education Decree 16 of 1985 with the aim of raising the training consciousness of skilled indigenous manpower to man and manage the various sectors of the national economy. The
main thrust of the SIWES, noted Nwufor (2009), is to enable students in the technology and business related programmes take time off school, usually three month to one year, to relate what they have studied in school with industrial and commercial practice. SIWES allows students to work in industries as part of their training, thus allowing for mentoring to occur naturally and developing employability.

SIWES is a kind of internship programme and it provides the opportunity for students to gain experience in their various fields of study. It also helps students to determine if they have an interest in a particular area of a broad field of study as well as enable them create a network of contacts (Crow, 1997). As an advantage to employers, SIWES provides the employer, free labour and ideally, according to Nwufor (2009), the prospect of interns returning to the place of internship after completing their education is great as they require little or no additional in-house training to fit in; although Okey (2007), observed that the lack of competence displayed by our polytechnics interns while on SIWES make many employers to reject them upon graduation.

Nwufor (2009) had observed that although SIWES has contributed to a good linkage between academic skills and the world of work, the scheme has a lot of drawbacks especially in monitoring of students involved in the programme to ensure that the actual benefit intended is reaped, especially the advantage of creating a stimulus, and strong linkage between school and the world of work. The duration of the exercise and inadequate funding are also some of the problems of the scheme.
School industry linkage is beneficial not only to students but to the faculty itself. Anya (2007) observed that most of the present staff of polytechnics and colleges of science and technology do not have the depth of industrial experience necessary for successful implementation of robust Technology Education. He therefore advocated for periodic exposure of staff to current industrial practice through a deliberate industry-academia interactions fostered by government. The school industry government linkage (tripartite cooperation) could also undertake a periodic review of Technology Education programmes’ curriculum to meet the skills need of the industrial sector. The import of school-industry linkage has not been extensively explored. This study therefore looked at school-industry linkage and its relationship with students’ skills acquisition in the technology-oriented programmes of polytechnics.

**Students’ Quality and Entry Qualification in Technology Education in relation to Students’ Skills Acquisition**

Teaching and learning are complimentary tasks. They are complex processes involving the teacher and the learner. In the context of learning, the quality of students is as important as the quality of teachers. Good quality students make it easier for the lecturer to achieve the objectives in each lesson. Such students are able to grasp lectures and can easily understand the objectives of the discipline as well as gain knowledge and skills quickly. They are also able to demonstrate initiative, resourcefulness, evoke questions for lecturers and bring out their creative and innovative abilities.

Okey (2007) is of the view that the quality of student that enters into a programme can also account for the quality of graduates of that particular programme. Ajeyalemi (2002) also
enthused that technical and vocational education at the tertiary level has not fared well because the students come in with very weak foundation. Already, polytechnic education has continued to suffer setback because of the erroneous belief that it is meant for those who are not academically sound and could not make it to the universities. This contention which is evidently borne out of the shallow knowledge of what Technology Education connotes is made worse by the quality of lecturers who teach science and technology related subjects at the secondary school. Technology Education is science based and the foundation for Science and Technology Education (STE) is built at both the primary and secondary education levels where emphasis is on sensitization and careful introduction, to stimulate learner’s interest in order to encourage him/her to make career in science and technology. Ajeyalemi (2005) argued that evidence available indicates that integrated science and introductory technology and all the other important foundation laying subjects for science and technology have not been effectively taught at the secondary school level due to teacher factor and inadequate facilities.

The British Council (1989) and Ajeyalemi (2002) had earlier reported that secondary school science classrooms are overcrowded, teachers are incompetent, and the basic infrastructure are grossly inadequate; leading to student poor performance in the West African Senior Secondary Certificate Examination (WASSCE). Also, the Federal Ministry of Education (FME 2000) reported that the failure rate on the National Technical Certificate Examination NTCE conducted in May 2002 was high. The failure rate as reported were, Engineering 48%, Construction trade 41%, Electrical trade 25%, Leather trade 100%, and Manufacturing/Chemical Processing of textiles 91%. This becomes a source of concern as these students are expected to also feed the Polytechnics. Also, in the light of current realities, where student prefer university to polytechnic education, this has some important implications
on the quality of students leaving secondary schools for polytechnics as those with some measure of academic competence go into universities which are considered better than polytechnics. This seems to corroborate Aina (1998) assertion that in Nigeria, polytechnic education is seen as meant for the unintelligent or what Ajeyalemi (2005) refers to as bottom of the barrel students.

The finding of the studies conducted by Castellano (2004), Stone and Aliaya (2003) showed that Technology Education students have higher Grade Point Average (GPA) when they come into a programme with good academic background. Skills deficiencies in polytechnic graduates in the views of Zakari (2008) can be linked to the lack of proper grounding in their area of academic pursuit due to poor academic background from the secondary school level. The poor quality of intake into the Science and Technology programmes combined to make the quality of graduates from technology-oriented programmes to be suspect (Ajeyalemi 2002). This study therefore looked at students’ entry qualification and its relationship with students’ skills acquisition in technology-oriented programmes of polytechnics.

**Technology Education and Sustainable National Development**

Education has remained the only panacea through which national development can be achieved but rapid technological growth and human advancement as well as sustainable development are all hinged on scientific breakthrough. Technology Education holds the ace. Yakubu (2002) holds that the level of development of any society depends on the level of Technology Education its citizens acquired and applied to society. Nwangwu (2000) on his part argues that
industrialization and technological breakthrough are solely accomplished through the ardent pursuit of a Technology Education.

Technology is derived from science, and science and technology has become a critical factor in the determination of the economic wellbeing of any nation. It is unarguably for this reason Ilemobade (1994) stated that technology makes the difference between development and under-development and between growth and development, and growth without development. Development may be seen as a process whereby an economy undergoes social and economic transformation leading to improved standard of living for all. But development is better felt in a society if it is sustained.

Development is said to be sustained when a people manage their socio-economic, political, cultural advances as well as the environment wisely, without prejudice to the needs and wants of future generation. Zakari (2008) believes that sustainable development is conceived within the context of growth, advancement, conservation and preservation of the gains of development for the benefit of the present and the future (posterity).

Odumosu (2005) puts it more succinctly when he averred that sustainable development depends on a well articulated functional Science and Technology Education that helps to create, a better informed citizenry. Consequently the role of Technology Education as a tool for national development should be conceived within the context of sustainable development. There is hardly any economic activity that is not propelled by Science and Technology (Njoku, 2001); hence Esiobu (2005) noted that Science and Technology have long been recognized as the engine that drives economic development.
The world is increasingly dependent on Science and Technology and problems tend to be termed in technical terms. It is now much clearer than before that sustainable development would elude any nation that toys with Technology Education. We cannot afford to do so. Therefore, investment in Technology Education with its consequent application to socio-economic development will certainly cause rapid transformation and advancement. This in a way would facilitate the attainment of the Millennium Development Goals (MDGs) and drive the goals of Nigeria’s the National Economic Empowerment Development Strategy (NEEDS) (Esiobu, 2005). The significance of Technology Education to national development cannot be over emphasized. Anya (2008) believes that increase in the industrial sector is essential for the economic development of any country. What is needed for any evolving nation is how inputs for the production of skilled manpower can be improved upon to make for rapid industrial and technological development.

The role of Science and Technology Education in the development of modern society is not in dispute since the influence of modern technological innovation are far reaching in every sphere of man’s life. Japan, Akande (2002) notes, is an existing example of the significance of Technology Education to national development. Arene (2005) observes that Japan came out of the ruins of the 2nd world war a poor nation, but America’s efforts at rebuilding Japan encouraged Technology Education backed by the Total Quality Management principle espoused by Juran and Demin. Japan has today become an industrial and technological giant of immense proportion and it is celebrated as a developed economy. As a country, she is globally reckoned with in scientific and technological development and is a member and player of the G8 (Group of eight most industrialized countries) alongside the United States of America, Britain, France, Germany, Canada, Italy and Australia. The Asian Tigers (Taiwan, Malaysia,
Indonesia, Singapore and South Korea) as they were dubbed in the 90s have all taken a cue and are today regarded as emerging economies alongside Brazil, Russia, India and China (BRIC). According to Ajibade (2001), the development of these fast growing and emerging economies is closely tied to the development of their educational sector especially the technical education and should serve as an inspiration to other aspiring nations like Nigeria.

Science and Technology has become and will continue to be a measure of any nation’s development and success. It has also become a measure of the respect a nations and its citizens’ command in the Committee of Nations (Ukah 2009). This is why Nwangwu (2000) argued that the degree and extent of growth brought to a nation is measured through Technology Education. Edem (2005) predicts that in time to come only persons with appropriate and appreciable knowledge and skills in science and technology discipline would be required in the labour market. The implication of the above prediction is that economic survival, relevance and technological development of any nation will depend considerably on the level and appropriateness of the knowledge and skills of its citizenry.

Countries in the western world place a lot of emphasis on Technology Education. As reported by Barlett, Burton and Rein (2001), a paper prepared by the Department of Education and Science in Britain attached great importance to design and technology as part of the preparation for living and working. Edem (2004) reports that in Germany the school system trains two-third of the young people in technical skills, electronics, new technologies, mechanics etc. The situation in the United States of America is not any different where mathematics, science, engineering and technology are considered central to their education for economic competitiveness and quality of life of the citizens. A White House report (1995)
tagged, “Science and National Interest” envisaged that among other things by the year 2000, American students would be the first in the world in mathematics, as well as science and technology achievements.

New Zealand’s example in emphasizing science and Technology Education deserves special mention. According to the Royal Society of New Zealand Education (2005), primary and secondary education in New Zealand is meant to develop a scientifically and technologically literate society able to utilize knowledge, skills and opportunities for social, environmental and economic betterment of the country. Besides, they have a variety of schemes and activities outside formal classroom learning through which science and Technology Education is encouraged for the purpose of national development. Among others are the Realized the Dream Scheme and the CREST award scheme. Realize the Dream according the Royal Society of New Zealand Education (RSNE), notes Odumosu (2005), brings together students who have carried out excellent scientific breakthrough throughout New Zealand; while the CREST (Creativity in Science and Technology) scheme encourages project in creativity and problem solving and opportunity to participate in Science and Technology programmes at both local and international levels.

Within the context of overall national development therefore, Technology Education helps to produce technically-oriented and other related manpower for the effective utilization, exploitation and conservation of a nation’s natural, economic and human resources. In this way, Technology Education assists in industrial and other developmental programmes of a country. It has been observed that the Nigerian economy is severely challenge by a dearth of employable hands and Nwangwu (2000) is of the opinion that a country with an ineffective
batch of technicians and technologist is as poor in manpower as a country which lacks the natural resources. Knowledge that is not put into practice becomes dormant and useless. Rodney (1973) had earlier argued that for a society to develop, it must possess the ability to tap its natural resources in order to cater for the material and socio-economic well being of its people. Tapping natural resources is tied to Technology Education.

Nigeria is blessed with abundant human and natural resources to meet the challenges of modern technological breakthrough. But, technological breakthrough according to Olarinoye (2005), Oriaifo (2005), Edem (2005), Amar (2007) and Awhinana, (2007) has eluded her since independence because of the absence of appropriate technology to tap her abundant natural resources. However, Ukah (2009) observed that the Nigerian economy has undergone rapid change in recent times with the floods of products of other nations’ technological exertions. The rapid and massive acquisition of automobiles, electronics appliances and the revolution of mobile phones acquisition in urban Nigeria are cases in point. Nigeria however, needs to develop and grow her own technology to become self reliant. To achieve that, emphasis has to be placed on science and Technology Education in the school system.

Within the context of sustainable national development, Nigeria’s driving force should be the awareness that the prevailing global trend indicates rather strongly that those countries that are unable to develop their science and technology and innovation system will sink further down into poverty and under development as humanity progresses in the present millennium (Ekpiwhre, 2008). The development that comes with the ardent pursuit of Science and Technology Education is sustainable development. Countries that dominate the world economically are all without doubt S&T leaders irrespective of their socio-political and
ideological leanings (Anya, 2008). Since Nigeria desires to be one of the top 20 economies by 2020, her focus should be on evolving Science and Technology Education at all levels but especially at the polytechnics in order to produce skilled technologists for industrial advancement.

Theoretical Framework

Theory, according to Sax (1968), is a set of principles, postulates and facts organized in such a way as to explain the interrelationships among variables. It helps scientists to attain greater objectivity in explaining relationships. Kerlinger (2000) defined theory as interrelated concepts, definitions and prepositions that present a systematic view of phenomena by specifying relations among variables with the purpose of explaining and predicting the phenomena. Theoretical framework therefore guides the researcher by giving him a clear view of the process and progress of the study and enables the work to move sequentially.

There exists in literature many theories that explain the phenomenon of education service delivery but the Systems Theory propounded by Bertalanffy (1968) is relevant to this study and therefore serves as the theoretical frame on which this study is hinged. The choice of the Systems Theory for this study is based on the premise that the system approach gives room for assessing the output of education in a given society by the inputs. The output in this regard will be the competence level/performance of the graduates who are the products of the system.

A system is a collection of interrelated independent parts which form a whole (Cole, 2004). According to Ejiogu (1990), the word system refers both to dependencies between parts,
components and processes that involve discernable regularities of relationships, and to a similar type of interdependency between such a complex and its surrounding environment. It is a conceptual structure composed of interrelated functions operating as an organic unit to attain a desired output effectively and efficiently. In his opinion, systems are viewed as organizations or aggregation of human interests, activities and commitments all of which function interrelatedly to achieve a goal.

To Onyene et al (2007), the Systems Theory is defined as a transdisciplinary/multiperspectual scientific domain that seeks to derive and formulate those principles that are isomorphic to all fields of scientific enquiry. In their opinion, the pursuit is based on several fundamental assumptions. First, all phenomenon can be viewed as a web of relationships among elements or a system. Second, all systems whether electrical, biological or social have common patterns, behaviours and properties that can be understood and used to develop greater insight into the behaviour of complex phenomena. Scott (1981), on his part, averred that all systems are characterized by an assemblage or combination of parts whose relations make them independent even though they also suggest the bases for the differences among them. To Katz and Kahn (1978), systems are basically concerned with problem of relationships of structures and of interdependence. They noted that systems begin by identifying and mapping repeated cycles of inputs, transformation, output and renewed inputs which comprise the organizational pattern.

Benedict (1995) opined that a system performs specific functions, through an interrelationship of parts; the functions are interrelated to each other in specific ways so that together, they perform adequately to achieve the purpose of the whole system. The Systems Theory has the
objective of explaining the complex systems that consist of a large number of mutually interacting and interrelated parts in terms of those interactions. Viewed from this frame of reference a system is composed of regularly interacting or interrelating groups of activities. A common tapestry that runs through all the definitions is the interrelationship of parts to make a whole. In this regard, the Systems Theory presents a holistic view of phenomena.

From the array of definitions above, it can be argued that the Systems Theory is based on the fact that all systems have different parts performing different functions, but interrelatedly to achieve desired results. It is the nature of the relationship among the parts rather than the nature of the parts itself which makes each system unique (Silver, 1983). It is this reason perhaps that made Peretomode (1999) state that instead of dealing separately with the various parts in an educational system, educational administrators should look at the system as a whole as the activity of any of the parts affects others. The Systems Theory aptly depicts the interaction and interdependence of the various inputs in the education system through an input – throughput and output process. This study is intended to assess the quantity and adequacy of inputs in Technology Education that must be available in order to acquire relevant skills needed in today’s workplace after their subjection to the conversion process. For polytechnics to produce competent and skilled graduates who will drive Nigeria’s industrial development, they need adequate supply of inputs that would be put to use to get the needed or desired output.

Systems however, may be closed or open but the type of system is usually determined on the basis of how the boundaries are defined. A closed system for example does not exchange matter with its environment, but are usually self supporting, autonomous, enclosed and sealed
off from the outside world. Usually, it is able to perform assigned functions without inputs from the outside. An open system on the other hand, relates with its environment for survival. It consumes and gives back to the environment with which it must have dealings.

Educational institutions can be considered to be open systems as they have common features with other open systems. Schools import energy (inputs like students, lecturers, facilities, etc) from the environment, transform them into some product form (graduates), export the products into the environment and re-energize the system again from sources in the environment; it is more like a vicious cycle that outlives its originators. Ejiogu (1990) upholds the view that schools are open systems when he argued that educational institutions like all other organizations are peopled and are involved in the inputs – throughput – output process. As open systems, schools interact with a number of other systems in the larger society such as the technical system, the social system and the economic system. From these systems, the school receives inputs such as pupils, money, materials and information. These inputs are then transformed or processed into output services (educated human beings) for the good of its members and the society in general.

Schools, by their operations are also regarded as social systems. Carr (1955) defined a social system as an assemblage or aggregation of individuals and institutional organizations located in an identifiable geographical locality and functioning in various degrees of interdependence as a permanent organized unit of the social order. In the views of Getzels, Lipham and Campbell (1968) the basic characteristics of a social system are the evident interdependence of the parts and their organizations into some sort of whole. Sugarman (1995) argued that the outputs are present in a school system itself. Indeed, like all systems, the educational system
has different components or parts which all work interdependently together to achieve the purpose of education. This view corresponds with that of Nwankwo (1982) who sees systems as a series of interrelated and interdependent parts such that the interaction of the parts affects the whole system. Brand (2008) viewed factors in education which include, lecturers, students and facilities as the major factors influencing the success of any educational system. The factors are all interdependent to achieve specific educational goals. The educational system takes its input from its environment but these must be available in sufficient quantity and quality to make meaningful impact on the quality of skills acquired by the output from the system.

The school system, like any other social system interacts daily with other members of the larger system. It thus requires feedback on aspects related to its outputs (those who have successfully completed required programmes). This study will evidently serve as one of such feedbacks to determine the efficiency of the educational system as it relates to the quality of Technology Education output. It is thus a link between the school and the world of work. Razik in a paper in the United Nations Educational, Scientific and Cultural Organization (UNESCO, 1984) had reiterated that if education as a system is to maintain itself, the quality of its output must be assured so the system has to provide for a continuous assessment of its output. The feedback will serve as basis for the systems’ adjustment.

The systems approach to management is considered appropriate for managing open systems and the school as an open social system is no exception. Ejiogu (1990) averred that the school as an organization is very unique and works towards a convergent production line following immeasurable goals. Given the nature of the school as an open social system, the systems
approach is most appropriate for its management. The approach is regarded as a strategy which utilizes, analyses, designs and manages to attain stated goals effectively and efficiently. It emphasizes a functional integration of parts, components and sub-systems into a workable whole. Coordination is an important element of the system approach. It serves to integrate organizational activities in relation to the environment of the supra system.

In a system approach, the parts are as important as the whole as they all depend on each other. Educational institutions require coordinated network of people, materials and events, all organized for optimal achievement of educational goals and objectives. The interactiveness and interdependence of all components of the school and the entire educational sector with the larger society which is its supra system is taken into consideration and emphasized by the system approach to educational management. With the system approach, educational institutions are perceived not in isolation but in relation to the total socio-cultural pattern of the larger society. The relationship between technology schools and the industrial sector of the larger society cannot be more apt. Technology schools are established by the society to serve it. It is therefore invariably accountable to the society for the performance of some specific functions.

The application of the systems management approach will therefore encourage a planning process which will not only be attuned to the socio-economic and political realities of the society but will also incorporate rational and logical analysis of situations based on comprehensive and up-to-date information from the environment. The interconnectivity and networking with other subsets of the society which the systems approach depicts, requires polytechnic administrators to demonstrate a willingness to work openly with all types of
interest groups such as other institutions of higher learning within and outside the country; industries and multinationals that employ the graduates; the society within which their products operate and the developed nations from whom various technologies can be adopted and adapted for a sustainable society. This will enable them to confront vital issues affecting their schools’ growth so as to formulate realistic effective policies that would stand the test of time and encourage sustainable development.

The (1981) edition of Encyclopedia Britannica sees the system approach as a procedure which lists all the facts that might affect a given situation and then select from the complete list those that appear critical. This precisely is in line with the researcher’s approach whilst looking at the reason for the sub-optimal quality of Technology Education graduates which has affected their employability and hence Nigeria’s industrial growth. Issues bordering on skills acquisition require a holistic look at input factors and choosing from them those that appear critical. In this case, the critical factors chosen are those that affect knowledge and skills acquisitions such as lecturer quantity and quality, student entry point requirements, curriculum content, infrastructural and other facilities, lecturers’ continuous professional development, school-industry linkage as well as funding. These components work interrelatedly to bring about effective knowledge and skills acquisition that result in having competent skilled graduates that are ready for the world of work.

In carrying out this study, the researcher found it necessary to develop a conceptual model to explain relationship among the variables. The model is a simplified mental picture of the real
world. It has some of the characteristics of the real world and this has helped the study to imagine the variables in an apparent interaction. Below is the conceptual model:

![Figure 1: Integrated School System Flowchart. Source: Field work (2009).]

The model, as can be seen, suggests that the variables affecting the production of skills and competent technologists can be found in individual and school factors. The individual factor is represented by the entry qualification of students (student quality) while the school factors are depicted by lecturers quantity and quality, facilities, curriculum content, funds, training and development, school/industry linkage and consumables. The factors are presented in a kind of
perspective which provides a basis for the understanding of the interrelationships among the inputs in Technology Education. The benefit of this model is that it leads to statement of hypotheses.

Hypothesis 1 through 7 are depicted in a theoretical model

![Diagram](image)

**Figure 2:** Skilled Manpower Value Creation Chain.

**Source:** Field work (2009).

**Appraisal of Reviewed Literature, Previous Studies and Conclusion**

In this chapter various opinions, suggestions, proposals, reviews of empirically related studies by different experts in related topics were reviewed. The concept of technology as shown in different literature reviews is said to derive from science. While science is know-what, technology is seen as applied science because it is know-how and has practical value and industrial use. The interrelationship between science and technology was viewed against the
backdrop of the fact that in science, man tries to understand nature and then use technology to control it for his own benefit. Both therefore, lead to development that brings about improved quality of life. Technology Education from the array of reviewed literature is said to hold the ace for the development of any nation in that it is the key to the production of skilled manpower needed for development and economic growth. Its aim essentially is to enhance the creative, manipulative and critical sensibilities of learners for a productive useful life. Ardent pursuit of Technology Education with the aim of building Science and Technology (S&T) was therefore canvassed.

It is evident from the review of literature that availability and adequacy of inputs are required for the realization of educational objectives. The need for rapid industrialization which technology connotes demands that measures are adopted to ensure maximal mobilization of human and material resources in polytechnic education in order to ensure maximization of their output. To achieve the lofty idea of becoming one of the 20 most developed economies by 2020, it was revealed from reviewed studies that input factors in Technology Education be made available in adequate quantity and quality since polytechnics produce the technicians and technologists needed to propel industrialization. It is obvious from the literature review that accreditation of programmes is somewhat done under false precepts as there seem to be a gap between what is specified in NBTE accreditation standards and what previous studies revealed.

The concept of skill set, acquisition and level of competencies of graduates were all well articulated in various reviews so also were the conditions for attaining the achievement of goals of Technology Education well spelt out in clear and unequivocal terms in both the NPE as it relates to Technology Education and the NBTE standards for the accreditation of
programmes in polytechnics. Identified skills set sometimes called employability or survival skills included intellectual, technical, manipulative, creativity, entrepreneurial and team building skills.

Acquiring the employability skills was seen to be dependent on the availability and adequacy of different inputs into the education production matrix. Inputs were said to be the totality of all the things that go into education service delivery for the attainment of its goals. These inputs include men, money and materials. Several research findings conclude that different input factors have influence on students’ knowledge acquisition without recourse to showing the potency of each of these inputs on students’ achievement levels.

Physical and material resources was found from the various reviews to be critical and crucial for relevant skill acquisition in Technology Education especially because of its practical nature as science based that requires frequent use and manipulation of machines, equipment and tools. NBTE lecturer-student recommended ratio is 1:35 but indication from the literature review shows that the ratio has been consistently overshot. The dearth of Technology lecturers was said to be because lecturers in Technology Education have job options in industries at salaries greater than they would ever receive from teaching. Lecturer related concerns should not be handled with levity. Research evidence also showed that lecturers professional improvement exposure is among the factors that enhances lecturer professional competence and hence students’ skills acquisition. However, studies showed that provision for training is hardly budgeted for in departmental annual estimates. Even when this is done, inadequate funds make the lecturer’s professional exposure to new trends unattainable or unachievable and lecturers hold the key to development.
Curriculum content and adequate funding were also seen from research findings to have a great impact on students’ skills acquisition. Several studies revealed that the curriculum content of many Technology Education programmes is obsolete and outdated to match current trends in industries. Total curriculum review was advocated that would lead to an integrated one. The near absence of school-industry linkage was exhaustively decried and school industry interaction was proposed as a panacea for graduate employability. In all of the review there were studies which either support or negate expressed views and opinions. In essence service delivery in Technology Education requires adequacy of inputs to see through. Therefore the system theory which seeks to explain the interactions between variables in education production matrix is appropriate for this study.

In the final analysis, the review of literature in this study has examined the different views of researchers, their findings and conclusions and found that input factors are essential to enhance students’ capacity building to overcome perceived graduate incompetence and unemployability. This is particularly so because in Nigeria, there has been the tendency especially in industrial circles, to view polytechnic graduates as less competent than their comparable equals from other climes. Availability and adequacy of inputs are required for the realization of educational objectives as evidenced from literature and previous empirical studies. Consequently, the extent to which polytechnics have qualified lecturers in sufficient quantity, have adequate and functional facilities for training as required for accreditation, backed by a robust curriculum content and adequate funding in addition to having quality students at entry point will determine the extent to which they are able to produce skilled and competent graduates of internationally acceptable standards.
CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

This chapter presents the framework and a detailed breakdown of how the study was carried out. The focus here is the research design, population of the study, the sample size and sampling techniques, research instrument, validity and reliability of the instruments, procedure for data gathering as well as the method of data analysis.

Research Design

Descriptive survey was adopted for this study. Descriptive research design aims to show conditions as they exist without being influenced by the investigation. It describes systematically, the facts, qualities and characteristics of a given population as factually and as accurately as possible to answer questions arising from a study. This study was an attempt to assess the availability and adequacy of inputs in Technology Education in relation to skills acquisition in polytechnics. The descriptive research design is therefore appropriate for it. In using the descriptive research design, both qualitative and quantitative methods of data collection such as checklist, questionnaire and test were used for a vivid description of the situation of the variables as they existed. The study is also correlational as it established the relationship that exists between the independent and the dependent variables.
Population of the Study

The target population for this study included all the nine federal and state government owned polytechnics in South-South Nigeria, all heads of departments, of various programmes in the polytechnic all full time regular classroom lecturers, as well as HND final year students. In all, due to the nature of the study which focus only on accredited programmes, the total lecturer population was 332 while the final year students’ population was 899. Lecturers and heads of departments were involved in the study because they were considered to have had adequate experience of the polytechnic education system and as such could provide the researcher with the most reliable information on relevant issues bothering on Nigerian polytechnics. The final year students were chosen for the study in conformity with the scope of the study to focus on polytechnics’ graduating students.

Variables of the Study

The dependent variable in the study is skills acquisition which was conceptualized to include intellectual, technical, manipulative, creative, entrepreneurial, and team building skills. Skills acquisition as dependent variable is related to the characteristics predicted in the hypotheses postulated for this study. The independent variables are input factors which were understudied, such as lecturer quantity, available physical/material resources, current polytechnic curriculum content, level of in-service training for lecturers, level of funding for technology-related departments, school/industry linkage and students’ quality.
Samples and Sampling Techniques

The sample for this study was made up of 20 heads of departments, 200 lecturers and 200 final year students who were about writing their second semester examination. An admixture of stratified and purposive sampling techniques was used to select four out of the nine (one was used for pilot study) polytechnics in the south-south geo-political zone. The nine polytechnics were stratified according to ownership – Federal and State (there were no privately owned polytechnics) as shown below:

Table 1: Polytechnics in South-South Nigeria

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<tr>
<td>Auchi Polytechnic</td>
<td>12</td>
<td>Akwa Ibom (Ikot-Osuruo)</td>
<td>1</td>
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<tr>
<td>PTI (Effurun)</td>
<td>7</td>
<td>Delta (Ogwashi-Uku)</td>
<td>Nil</td>
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<tr>
<td></td>
<td></td>
<td>Delta (Otefe-Oghara)</td>
<td>1</td>
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<td>Delta (Ozoro)</td>
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<td></td>
<td>Rivers (Bori)</td>
<td>6</td>
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<tr>
<td></td>
<td></td>
<td>Rivers (Arts &amp; Science)</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Edo State Institute of Management and Technology (Usen)</td>
<td>Nil</td>
</tr>
</tbody>
</table>

From the two groups, the two federal and two states owned polytechnics were purposely selected based on the number of accredited technology-oriented programmes they have. The four sampled institutions i.e. 2 Federal polytechnics and 2 State polytechnics are:

- Auchi Polytechnic, Auchi (Federal)
- Petroleum Training Institute, Effurun (Federal)
• Delta State Polytechnic, Ozoro (State) and
• Rivers State Polytechnic, Bori (State).

According to the NBTE (2007a) technology-oriented programmes of polytechnics are stratified under seven groups using the nature of the programme as the basis for the grouping. The seven groups or strata are:

• Art and design Technology
• Health and related technology
• Engineering Technology
• Science, Computing and related technology
• Environmental Design studies
• Agricultural technology
• Hospitality and related technology.

From the NBTE stratification, four programme areas were purposely selected based on the number of available programmes in the chosen polytechnics. These four programme areas had a total of thirty-one (31) programmes in the four selected polytechnics. From these programmes, twenty accredited technology-oriented programmes were selected to serve the purpose of the study. Accreditation was the basis for selecting the twenty (20) technology-oriented programmes chosen for the study. The simple random sampling techniques were thereafter used to select 200 lecturers from the total population of 332 lecturers on the basis of 10 lecturers from each of the 20 departments selected for this study. This represents 60% of the total population. Similarly, 200 final year HND students in the proportion of 10 students per department were also selected from a total population of 899 final year students. This represents 22.2% of the total population. The 20 heads of the selected departments were also
included in the study. The sample was restricted to the number stated above because not all the technology-oriented programmes in the polytechnic have been accredited at the HND level. The twenty selected were those with accredited programmes. The number of lecturers was restricted to ten per department because there were some departments that did not have more than 10 lecturers. That became the basis for selecting ten from each department. For the students, we were restricted to ten from each department in line with the purpose of the study which focused on only the final year students.

The sampled programmes in the subgroups are as depicted below:

I. **Engineering and Related Technology**
   - Electrical/Electronics Technology
   - Mechanical Engineering Technology
   - Civil Engineering Technology
   - Computer Engineering Technology
   - Petroleum Engineering Technology
   - Petroleum and Gas Processing Technology
   - Welding and Fabrication Engineering Technology
   - Industrial Safety and Environmental Engineering

II. **Science, Computing and Related Technology**
   - Computer Science
   - Science Laboratory Technology
   - Polymer Technology
   - Chemistry
   - Statistics
IV. Environmental Design and Related Technology

- Quantity Survey
- Building Technology
- Surveying and Geo-informatics
- Architectural Technology

V. Agricultural and Related Technology

- Agricultural Engineering Technology
- Agricultural Technology
- Fisheries Technology

Research Instruments

Four research instruments were developed for use in this study. The Schools’ Resources Profile Checklist (SRPC); the Technology Education Lecturers’ Questionnaire (TETQ); the Technology Education Students’ Acquired Skills Questionnaire (TESASQ) and the General Aptitude Technology Education Test (GATET). These are described below:

1. The School Resource Profile Checklist (SRPC) – Form I for Heads of Department

This was a structured checklist whose intent was to provide factual data from respondents on the current state of human (lecturers and students), physical and material as well as financial resources in technology-oriented departments of polytechnics in the South-South geopolitical zone. It has two parts. The first part (section A) sought information on important attributes and demographic characteristics of respondents such as name of school, department, gender, highest academic qualification, area of specialization, professional qualification, years of
teaching experience and registration with the Lecturers Registration Council of Nigeria (TRCN).

The second part (section B) is a structured and standard checklist on available lecturers/lecturer required; available physical resources/physical resources required; available equipment/required equipment; available consumable resources/consumable resources required; amount of funds required and funds received as well as sources of funds. The guide used to draw up this checklist was the guidelines for establishing new programmes in polytechnics and similar tertiary institutions in Nigeria (NBTE, 1993); and Standards for the accreditation of Diploma Programmes in polytechnics and similar post-secondary Technical Institutions (NBTE, 2007).

2. **The Technology Education Lecturers’ Questionnaire (TETQ) – Form II for Lecturers**

This is a two-part, self administered, Likert-type questionnaire. The first part (section A) focused on the relevant attribute and demographic characteristics of the respondents such as name of school, department, gender, academic qualifications, area of specialization, years of teaching experience and registration with the Lecturers Registration Council of Nigeria (TRCN). The second part (section B) consists of itemized statements that sought perceptual data from respondents focusing on material resources in Technology Education, current curriculum content, professional development for lecturers, school industry linkage and students quality. The structured statements were designed to measure the perceptual view of Technology Education lecturers on the adequacy of inputs in technology-oriented departments in polytechnics in relation to skills acquisition.
3. The Technology Education Students’ Acquired Skills Questionnaire (TESASQ) – Form III for Students

This was a twenty-item, Likert-type structured questionnaire that sought to know the level of the acquisition of the various relevant skills (intellectual, technical, manipulative, innovative, team player or interpersonal and entrepreneurial skills) in technology-oriented programmes of polytechnics. It is like the lecturers questionnaire, a two-part instrument. The first part (section A) sought background information on respondents such as name of institution, state where school is located, faculty/school, course of study (area of specialization), gender, age and programme.

The second part, (section B) sought information from the respondents on their opinions and feelings about the skills they have acquired most.

4. The General Aptitude Technology Education Test (GATET) – Form IV for Students

This was a fifty question objective aptitude and psychometric competency test that are tailored to specific technology-oriented programme of study/job description. The numeric data in percentage derived from this test is the measure of polytechnics graduates’ competency levels. By GMAT worldwide standard, 60-70% score is considered adequate competence level (GMAT, 2008).

Validity of the Research Instruments

Each of the instruments used in this study were validated through consultation with my supervisors and other experts in the field of educational administration and Technology Education. Their modifications and suggestions in terms of clarity, relevance and
appropriateness of instructions to the respondents were incorporated into the final drafts of the instruments. Besides, the instruments were tested on two Heads of Department, two Lecturers and two Students at the Lagos state polytechnic in order to ensure the instruments elicited the desired responses. The exercise served its purpose as it helped to remove any ambiguity. In this way, both the face and content validity of the instrument (SRPC, TETQ, TESASQ and GATET) were ensured.

**Reliability of the Research Instruments**

In this study, the test re-test method was adopted to determine the instruments reliability. And so, a pilot study was carried out by the researcher before the main study to determine the instruments’ consistency in measuring in different circumstances, what they were meant to measure. This pilot study was administered on 20 Lecturers and 20 students from a polytechnic different from those chosen for the study. Two weeks later, a repeat of the exercise was undertaken to obtain a second set of data. The essence is to remove any ambiguities from the questionnaire and to check the reliability of the various variables in the instrument. The administered questionnaires when retrieved were grouped into two groups of odd and even numbers. The scores of the two groups were correlated using the Pearson Product Moment Correlation Coefficient Method in order to show the level of correlation between the two sets of data generated. The level of correlation shows the level of reliability of an instrument. A high coefficient shows a high reliability status of an instrument. Table 2 below shows the reliability coefficient of ‘r’: 0.62, 0.74 and 0.68 for TETQ, TESASQ and GATET respectively.
Table 2: Summary of the Reliability of the Instruments

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Variables</th>
<th>Reliability Co-efficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>(TETQ)</td>
<td>Infrastructural and Material resources</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lecturer Quantity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional Improvement Opportunity</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>Curriculum Content</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Funding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student Entry Qualification</td>
<td></td>
</tr>
<tr>
<td></td>
<td>School-Industry Linkage</td>
<td></td>
</tr>
<tr>
<td>(TESASQ)</td>
<td>Intellectual Skills</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technical Skills</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manipulative Skills</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>Creativity Skills</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Entrepreneurial Skills</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Team-player/Interpersonal Skills</td>
<td></td>
</tr>
<tr>
<td>(GATET)</td>
<td>Skills (as above in different occupational areas)</td>
<td>0.68</td>
</tr>
</tbody>
</table>

However, the data that were obtained from the school profile checklist (SPC) are considered reliable because they were obtained based on a validated scale used by the National Board for Technical Education for accreditation of polytechnics and similar institutions in Nigeria. Besides, there was a physical assessment by the researcher of the available resources as a way of verifying what is on ground. Such data cannot be changed and are thus considered reliable.

**Instrument Administration Procedure**

To achieve the purpose of this study, a team of two research assistants were engaged and trained to help with the data collection.

All the four instruments (SRPC, TETQ, TESASQ and GATET) were personally administered with the help of the trained assistants. The subjects with respect to forms I, II & III were given
two weeks to respond. However, it took several visits to get the questionnaires and checklists retrieved. The written tests GATET was conducted in the different departments of the different institutions on different days but were usually retrieved within a day. The administration of the tests was carried out by some lecturers and the researcher with the help of the research assistants. In all, it took about five months to retrieve all the instruments. Personal administration of the instruments and the fact of knowing some top officials in each of the schools as well as repeated visits to the institutions helped to solve the problem of low response.

**Data Scoring**

**Table 3: Scoring of the data in TETQ and TESASQ**

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>Strongly Disagree</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>Disagree</td>
<td>2</td>
</tr>
<tr>
<td>A</td>
<td>Agree</td>
<td>3</td>
</tr>
<tr>
<td>SA</td>
<td>Strongly Agree</td>
<td>4</td>
</tr>
</tbody>
</table>

GATET and SRPC were scored using percentages.

**Data Analysis**

Descriptive and inferential statistics were used for data analysis. Descriptive statistics such as simple percentage, mean and standard deviation were used to collate demographic information about the respondents. Research questions were answered using percentage on the basis of adequacy of the various input factors. The Pearson Product Moment Correlation Coefficient
was used to analyze all the hypotheses using the Statistical Package for Social Science (SPSS). The $H_0$s were tested at $\alpha = 0.05$ level of significance.

Items in section A of the three questionnaires SPRC (Form I), TETQ (Form II) and TESASQ (Form III) were on the demographic characteristics of respondents and these were analyzed using simple percentage.

Items in section B of SPRC (Form I) and TETQ (Form II) were used to answer research questions 1-7 and the simple percentage was used to determine adequacy based on some index. The parameters for measuring adequacy for the various input factors in the selected polytechnics are as follows:

(a) **Assessment of Physical and Material Resources Adequacy**

Adequacy of physical and material resources such as classrooms, workshops, studios, laboratories as well as workshop equipment/materials, studio equipment/materials and laboratory equipment/materials were assessed based on the number that were available in the twenty selected departments compared with what is required according to NBTE (2007a) specifications.

(b) **Assessment of Lecturer Availability and Adequacy**

Lecturer adequacy was based on the NBTE standard for programme accreditation (NBTE, 2007a). Lecturer-student ratio of 1:35 is the standard. Lecturer-student ratio was determined for each of the four programme areas:

- Agricultural and related technology programmes
- Engineering and related technology programmes
- Environmental Design and related technology programmes
- Science, Computing and related technology programmes.

The lecturer-student ratio was calculated by dividing the sum total of all the students in the departments in each of the programme areas by the total number of lecturers in the departments.

(c) Assessment of Lecturer Professional Development/Training Adequacy

Lecturer professional development/training adequacy was determined from Article 5(2) of UNESCO convention on Technical and Vocational Education (1989) which specifies regular lecturer training to update through special courses, practical training periods in industries and any other organized form of activity involving contact with the world of work. The indexes for measuring adequacy were:

- 0-2 trainings in five years – Not Adequate
- 3-4 trainings in five years – Adequate
- 5 and above in five years – Very Adequate.

(d) Assessment of Curriculum Content Adequacy

Curriculum content adequacy or inadequacy was determined from UNESCO (2006b) which specified composition of seven components. The index for measuring adequacy of the curriculum content of the technology-oriented programmes of the polytechnics were:

- Composition of 1-3 components – Not Adequate
- Composition of 4-5 components – Adequate
- Composition of 6 and above components – Very Adequate.
(e) Assessment of Funding Adequacy

Funding was measured using annual departmental budget estimates. The index for funding adequacy was:

- If funds received meets budget estimates – Adequate
- If funds received is below budget estimates – Inadequate

(f) Assessment of School-Industry Linkage Adequacy

The measure for adequacy of school-industry linkage was based on Article 3(4) and Article 5(2) of the UNESCO convention on Technical and Vocational Education (1989) which specifies exchange programmes and practical training programmes in enterprises and any other organized form of activity with the world of work in what it calls cooperative programme of Technology Education. The index for adequacy was:

- 0-2 in contacts in five years between departments and industry – Not adequate
- 3-4 contacts in five years between departments and industry – Adequate
- 5 and above contacts in five years between departments and industry – Very adequate.

(g) Assessment of Students’ Entry Qualification Adequacy

Lecturers experience with students over the years formed the basis for measuring the adequacy or inadequacy of this variable.

Research question 8 was answered using inferential statistics – Pearson Moment Product Correlation Coefficient. Research question 9 was answered using the descriptive statistics – Mean and Research question 10 was answered using the General Aptitude Technology Education Test (GATET) based on GMAT (2008) and it was analyzed using mean and standard deviation.
CHAPTER FOUR
DATA ANALYSIS AND PRESENTATION OF RESULTS

Introduction
The entire data generated for this study were statistically analyzed to answer the research questions raised and hypotheses postulated in the study.

The first part contains the demographic characteristics of the students and lecturers involved in the study; the second part contains the answers to the research questions; while the third part contains the results of the statistical analysis of the hypotheses posited in the study.

Table 4: Demographic Characteristics of Students

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>125</td>
<td>62.5</td>
</tr>
<tr>
<td>Female</td>
<td>75</td>
<td>37.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 - 24 years</td>
<td>74</td>
<td>37</td>
</tr>
<tr>
<td>25 – 29 years</td>
<td>97</td>
<td>48.5</td>
</tr>
<tr>
<td>Above 29 years</td>
<td>29</td>
<td>14.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4 shows the distribution of students by gender and age. From the table, less than sixty-three percent (62.5%) of the students were males; while less than thirty-eight percent (37.5%) of them were females. About thirty-seven percent (37%) were between the ages of 20 and 24 years; less than forty-nine percent (48.5%) of them were between 25 and 29 years; while less than fifteen percent (14.5%) were above 29 years.
Table 5: Demographic Characteristics of Lecturers

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>152</td>
<td>76</td>
</tr>
<tr>
<td>Female</td>
<td>48</td>
<td>24</td>
</tr>
<tr>
<td>TOTAL</td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Academic Qualification</th>
<th>Frequency (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>HND/First Degree</td>
<td>62</td>
<td>31</td>
</tr>
<tr>
<td>Master Degree</td>
<td>112</td>
<td>56</td>
</tr>
<tr>
<td>PhD</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>TOTAL</td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Further Training</th>
<th>Frequency (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have participated</td>
<td>93</td>
<td>46.5</td>
</tr>
<tr>
<td>Have not participated</td>
<td>107</td>
<td>53.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Registration with TRCN</th>
<th>Frequency (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered</td>
<td>42</td>
<td>21</td>
</tr>
<tr>
<td>Not Registered</td>
<td>158</td>
<td>79</td>
</tr>
<tr>
<td>TOTAL</td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teaching Experience</th>
<th>Frequency (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 10 years</td>
<td>69</td>
<td>34.5</td>
</tr>
<tr>
<td>11 – 20 years</td>
<td>108</td>
<td>54</td>
</tr>
<tr>
<td>Above 20 years</td>
<td>23</td>
<td>11.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 5 shows the distribution of lecturers by gender; academic qualification; further training; registration with the Lecturers’ Registration Council of Nigeria (TRCN); and work experience. According to table two above, about seventy-six percent (76%) of the lecturers were males; while about twenty-four percent (24%) of them were females. About thirty-one percent (31%) of the lecturers had Higher National Diploma (HND) or first degree; fifty-six percent (56%) of them had master degree, while thirteen percent (13%) had PhDs. Also, less than forty-seven
percent (46.5%) of the lecturers had participated in further professional training in their area of specialization, while less than fifty-four percent (53.5%) had no such exposure. Besides, twenty-one percent (21%) of the lecturers had registered with the TRCN but seventy-nine percent (79%) of them were yet to register. Less than thirty-five percent (34.5%) of the lecturers had been lecturing for almost 10 years; fifty-four percent (54%) of them had spent between 11 and 20 years lecturing, while less than twelve percent (11.5%) had been lecturing for more than 20 years.

**Research Question 1A:** Are there enough physical and material resources (classroom blocks, laboratories, equipment, machines, tools, etc) for skills acquisition in the technology-oriented programmes in the polytechnics?

**Table 6: Availability and Adequacy of Physical and Material Resources for Technological Related Programmes in the Polytechnics**

<table>
<thead>
<tr>
<th>Physical/Material Resources</th>
<th>No. Available</th>
<th>No. Required</th>
<th>% of No. Available to No. Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classrooms</td>
<td>27</td>
<td>48</td>
<td>56.3</td>
</tr>
<tr>
<td>Workshops</td>
<td>15</td>
<td>32</td>
<td>46.9</td>
</tr>
<tr>
<td>Studios</td>
<td>11</td>
<td>27</td>
<td>40.7</td>
</tr>
<tr>
<td>Laboratories</td>
<td>16</td>
<td>33</td>
<td>48.5</td>
</tr>
<tr>
<td>Workshops’ equipment/materials</td>
<td>3,528</td>
<td>7,655</td>
<td>46.1</td>
</tr>
<tr>
<td>Studios’ equipment/materials</td>
<td>2,431</td>
<td>5,264</td>
<td>46.2</td>
</tr>
<tr>
<td>Laboratory equipment/materials</td>
<td>2,183</td>
<td>4,844</td>
<td>45.1</td>
</tr>
</tbody>
</table>
Table 6 presents the quantity of physical and material resources available in the polytechnics as against the quantity required, as well as the percentages of the available resources to their required numbers. As shown in the table, both physical and material resources were inadequate in the polytechnics as at the time of this study. This is because the percentages – Classrooms less than fifty-seven percent (56.3%); Workshops less than forty-seven percent (46.9%); Studios less than forty-one percent (40.7%); Laboratory less than forty-nine percent (48.5%); Workshop materials/consumables less than forty-seven percent (46.1%); Studio materials/consumables less than forty-seven percent (46.2%) and Laboratory materials/consumables less than forty-six percent (45.1%) - at which they were available in the polytechnics as at the time of the study were all below the 70 - 80% availability that is recommended by NBTE (2007B) for physical and material resources in the polytechnics. The implication of this discovery is that students in the technology-oriented departments of the polytechnics involved in the study may not be as practical oriented as would be expected due to the inadequacy of relevant physical and material resources.
Research Question 1B: Are there enough supplies of consumables (electricity, chemicals, water and stationeries) to the departments of the technology-oriented programmes of the polytechnics?

Table 7: Adequacy of Consumable Materials Supplied to the Departments of Technology-oriented Programmes of the Polytechnics

<table>
<thead>
<tr>
<th>Supply of Consumables</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>As Required</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Less than Required</td>
<td>17</td>
<td>85</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Number of respondents (N) = 20

Table 7 presents the responses of the HODs on the adequacy or inadequacy of the consumable materials supplied to their departments. From the table, 3, representing fifteen percent (15%) of the 20 HODs involved in the study indicated that their departments do receive adequate supply of consumables required by them, the remaining 17 representing eighty-five percent (85%) HODs noted that the supply of consumables to their departments is always less than required by the departments. This discovery shows that most of technology-oriented departments of the polytechnics do not receive adequate supply of consumables. The implication of this result is that practical lessons may not be as frequent as desired due to inadequate supply of consumables such as chemicals, water, electricity, stationeries; etc. Therefore, there is the need to make due provisions for supply of consumables to meet the demands of the various programmes.
**Research Question 2:** Do technology-related departments in polytechnics have enough lecturers?

**Table 8: Lecturer-Students’ Ratios in the Technology-oriented Departments of the Sampled Polytechnics**

<table>
<thead>
<tr>
<th>Programme</th>
<th>Depts.</th>
<th>Lecturers</th>
<th>Students</th>
<th>Lecturer/Students Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural/Related Tech.</td>
<td>3</td>
<td>33</td>
<td>298</td>
<td>1:9</td>
</tr>
<tr>
<td>Engineering/Related Tech.</td>
<td>8</td>
<td>159</td>
<td>2,271</td>
<td>1:14</td>
</tr>
<tr>
<td>Environmental Design &amp; Related Tech.</td>
<td>4</td>
<td>69</td>
<td>1,253</td>
<td>1:18</td>
</tr>
<tr>
<td>Science, Computing &amp; Related Tech.</td>
<td>5</td>
<td>71</td>
<td>997</td>
<td>1:14</td>
</tr>
</tbody>
</table>

Table 8 presents the lecturer-students’ ratio in the technology-oriented departments of the sampled polytechnics. From the table, it could be discerned that the lecturer-students’ ratios for the departments stand at 1:9 for the Agricultural/related technology departments; 1:14 for the Engineering/related technology departments; 1:18; for the Environmental design/related technology departments, and 1:14; for the Science, computing and related technology departments. This result shows that in terms of personnel, the polytechnics have adequate lecturers to handle accredited programmes. This is because all the class sizes are below the 1:35 lecturer-student ratio recommended by NBTE (2007b). The implication of the low lecturer-student ratio is that there may not have been enough students or patronage for technology-oriented programmes.
Research Question 3: Do lecturers of technology-related departments have adequate professional improvement exposure?

Table 9: Showing the Number of Professional Improvement Programmes Undergone by Lecturers for the Past Five Years.

<table>
<thead>
<tr>
<th>Training Level</th>
<th>Assessment</th>
<th>No of Lecturers (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>Low</td>
<td>133</td>
<td>66.5</td>
</tr>
<tr>
<td>3-4</td>
<td>Adequate</td>
<td>49</td>
<td>24.5</td>
</tr>
<tr>
<td>5 and above</td>
<td>Very Adequate</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

Number of respondents (N) = 200

Table 9 presents the responses of lecturers in the technology-oriented departments of the sampled polytechnics on the number of professional improvement programmes they have undergone. In the table, it is shown that out of the 200 lecturers involved in the study, 133 representing less than sixty-seven percent (66.5%) have not had more than two professional training in the past five years; A total of 49 representing less than twenty-five percent (24.5%) of them had undergone between three to four professional trainings in the past five years; while 18 representing nine percent (9%) of them had undergone five or more professional trainings in the past five years. This result clarifies that professional improvement opportunities are not adequately provided for lecturers in the technology-oriented programmes of the polytechnics covered in this study. The result also shows that the number of professional improvement programmes undergone by lecturers in the technology-oriented programmes of the polytechnics is grossly inadequate as majority of the lecturers on the average have not
undergone one professional improvement programme per year as recommended in the Article 3(4) and 5(2) of UNESCO (1989) at the Convention on Technical and Vocational Education, and adopted by the general conference at its 25th session on lecturers’ professional development and training. Only the combined total of 67 lecturers which represents less than thirty-four percent 33.5% (one-third) of the lecturers sampled for the study have had adequate training. The implication of this result is that most of these lecturers may not have been updating themselves in their areas of specialization.

**Research Question 4:** Is the curriculum content of the respective technology-oriented courses of the polytechnics adequate in developing relevant technological skills in the students?

**Table 10:** Lecturers’ Assessment of the Adequacy of the Curriculum Contents of the Technology-oriented Courses in the Polytechnics in Line with the UNESCO’s Seven Qualities of Sound Curriculum Content

<table>
<thead>
<tr>
<th>Prescribed Curriculum Contents</th>
<th>Assessment</th>
<th>Number of Lecturers (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>Low</td>
<td>119</td>
<td>58.5</td>
</tr>
<tr>
<td>4-5</td>
<td>Adequate</td>
<td>69</td>
<td>35.5</td>
</tr>
<tr>
<td>6 and above</td>
<td>Very Adequate</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>200</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Number of respondents (N) = 200**

Table 10 presents the lecturers’ assessment of the adequacy of the curriculum contents of the respective technology-oriented courses of the polytechnics in line with the UNESCO’s (2006B) seven qualities of sound curriculum content. According to Table 10, 12 of the respondents representing six percent (6%) of the 200 lecturers that participated in the study
opined that the curriculum contents were very adequate in line with the UNESCO’s specifications; the remaining 69 representing less than thirty-six percent (35.5%) assessed the curriculum contents as adequate, but the remaining 119 representing less than fifty-nine percent (58.5%) lecturers in their own assessment noted that the curriculum contents were inadequate. Based on the above assessment of the lecturers, it could be inferred that the curriculum contents of the courses offered in the technology-oriented programmes of the polytechnics are no longer adequate to meet up with the challenges of today’s global technological demands. Technology Education is dynamic and ever changing. Consequently, there is the need to upgrade the curricula to international standard to make the beneficiaries (students) able to compete and remain relevant in the present day global labour market. Gladly, the UNESCO-NIGERIA project for revitalization of technical and vocational education phase II is already doing so.

**Research Question 5:** Is there adequate funding for the technology-related departments of the polytechnics?

**Table 11a: HODs’ Responses on the Adequacy of Funds Provided to Technology-oriented Departments**

<table>
<thead>
<tr>
<th>Level of Funding</th>
<th>Assessment</th>
<th>Number of HODs (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets Budget</td>
<td>Adequate</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Below Budget</td>
<td>Not Adequate</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>20</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Number of respondents (N) = 20**

Table 11a presents the responses of the heads of departments of the technology-oriented programmes on the adequacy of funds made available to their departments. The table shows
that 5 respondents representing twenty-five percent (25%) of the 20 HODs sampled indicated that they were always provided with funds that meet their departments’ annual budget estimates while the remaining 15 representing about seventy-five percent (75%) of the HODs affirmed that funds released to them were always less than their departments’ annual budgets. This shows that most of the technology-oriented departments of the polytechnics are inadequately funded. The implication of this result is that the departments may not be able to carry out many of their financial obligations such as procurement and maintenance of facilities that would enhance effective teaching and learning as well as carry out practical activities that would enable graduates of the system meet the demands of industries.

Table 11b: H.O.Ds Responses on Sources of Funds Received by Departments

<table>
<thead>
<tr>
<th>Sources of Funds</th>
<th>Number of H.O.Ds (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subvention from Government only</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>Government Subvention/Endowments</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Government Subvention/Contribution from Industry</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Government Subvention/Sales of Patent Rights Products</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Total                                           20        100

Number of respondents (N) = 20

Table 11b shows the responses of the heads of department of the selected departments on the sources of funds received by their departments yearly. The table shows that 15 respondents
representing seventy-five percent (75%) of the 20 H.O.Ds involved in the study indicated that government is the only source of their funding. But 5 representing twenty-five percent (25%) of them affirmed that both government and industries are the sources of their funds. The implication is that polytechnics should endeavor to have viable and financial rewarding relationships with related industries and industries on their part should be encouraged by government to see contributions to relevant and related training institutions as part of their corporate social responsibilities. Indeed they should be made by government to see contributions to training institutions as contributions to their continued existence as corporate entities as is done in the developed economies. It is interesting to note that the 5 H.O.Ds who indicated contributions from industries as a source of funding were all from the Petroleum Training Institute PTI Effurun.

**Research Question 6:** Is there enough linkage between the technology-oriented departments of the polytechnics and their related industries?

**Table 12a: H.O.D Responses on Departments and Related Industries Relationship**

<table>
<thead>
<tr>
<th>Relationship with Industries</th>
<th>Responses</th>
<th>No. of H.O.Ds (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partnership with Industries</td>
<td>Yes</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>SIWES only Relationship with Industries</td>
<td>Yes</td>
<td>16</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Exchange Programmes with Allied Industries</td>
<td>Yes</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>16</td>
<td>80</td>
</tr>
</tbody>
</table>

**Number of respondents (N) = 20**
Table 12a shows the heads of departments’ responses as it is relates to their departments’ relationship with allied industries. 5 respondents representing twenty-five percent (25%) of the 20 H.O.Ds involved in the study indicated that they have relationship with related industries while 15 remaining representing seventy-five percent (75%) affirmed that they have no relationship with allied industries. A total of 16 respondents representing eighty percent (80%) of the H.O.Ds attested to SIWES being the only relationship their departments have with allied industries while the remaining 4 representing twenty percent (20%) noted that there relationships go beyond SIWES. A total of 4 respondents representing twenty percent (20%) also agreed to having had exchange programmes with allied industries and 16 representing eighty percent (80%) confirmed no such relationships with allied industries. The implication here is that school-industry relations are grossly inadequate and so industries should endeavor to align with training institutions.

Table 12b: HODs’ Responses on the Number of Mutually Benefitting Refresher Programmes their Departments have had with Related Industries for the past Five Years

<table>
<thead>
<tr>
<th>No. of Training Programmes</th>
<th>Assessment</th>
<th>No. of HODs (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>Low</td>
<td>17</td>
<td>85</td>
</tr>
<tr>
<td>3-4</td>
<td>Adequate</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>5 and above</td>
<td>Very Adequate</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>20</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Number of respondents (N) = 20

Table 12b presents the responses of the head of departments that participated in the study on the number of exchange/training programmes their departments have had with related industries in the past five years. In the table, 17 representing about eighty-five percent (85%)
of the 20 HODs indicated that their departments have not had more than 2 exchange/training programmes with related industries in the past five years; but the remaining 3 representing about fifteen percent (15%) of the HODs affirmed that their departments have had between 3 - 4 exchange/training programmes with related industries in the past five years. With only fifteen percent (15%) of respondents asserting that school-industry linkage is adequate, on the basis of having between 3 - 4 exchange programmes in 5 years, the implication is that the technology-oriented departments are not receiving appropriate external motivation and encouragement from related industries in the world of work. Therefore, current dynamics in global industrial labour requirements may not be making much impact in the production of technologies in polytechnics in the South-South and this is contrary to what Article 5(2) of UNESCO (1989) stipulates.

**Research Question 7:** Are the entry qualifications of students at the ND levels of technology-oriented programmes of the polytechnics adequate for effective skills acquisition?

**Table 13: Lecturers’ Assessment of the Adequacy of Students’ Entry Qualification at ND Levels of the Technology-oriented Programmes**

<table>
<thead>
<tr>
<th>Lecturers’ Perception of SEQ at ND level</th>
<th>Assessment</th>
<th>Number of Lecturers (N)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>Adequate</td>
<td>79</td>
<td>39.5</td>
</tr>
<tr>
<td>Poor</td>
<td>Not Adequate</td>
<td>121</td>
<td>60.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

Number of respondents (N) = 200

Table 13 presents the lecturers’ assessment of the adequacy of students’ entry requirement at the ND levels of the respective technology-oriented programmes of the polytechnics.
According to the table, 79 respondents representing less than forty percent (39.5%) of the lecturers opined that students’ entry qualification at the ND levels of the respective technology-oriented programmes of the polytechnics is adequate; while 121 representing less than sixty-one percent (60.5%) of them indicated that the students’ entry qualification is inadequate based on their experience with students over the years. The implication of this result is that majority of the lecturers want the entry qualification of students at the ND levels of the polytechnics in technology-oriented programmes upgraded to the same level of universities in order to attract quality students.

**Research Question 8:** Which of the input factors has the most impact on students’ skills acquisition?

**Table 14: The Potency Level of the Input Factors in Determining the Skills Acquisition of Students in the Polytechnics**

<table>
<thead>
<tr>
<th>Input Factors</th>
<th>Total Weighted Responses</th>
<th>Mean</th>
<th>SD</th>
<th>r-value</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecturer Quantity</td>
<td>6269</td>
<td>31.3</td>
<td>4.0270</td>
<td>0.195</td>
<td>4th</td>
</tr>
<tr>
<td>Physical/Material Resources</td>
<td>8588</td>
<td>42.9</td>
<td>5.9787</td>
<td>0.887</td>
<td>1st</td>
</tr>
<tr>
<td>Training/Re-training Lecturers</td>
<td>3777</td>
<td>18.9</td>
<td>2.3105</td>
<td>0.140</td>
<td>6th</td>
</tr>
<tr>
<td>Curriculum Content Adequacy</td>
<td>7576</td>
<td>37.9</td>
<td>4.5706</td>
<td>0.354</td>
<td>2nd</td>
</tr>
<tr>
<td>School-Industrial Linkage</td>
<td>3438</td>
<td>17.2</td>
<td>2.3389</td>
<td>-0.077</td>
<td>7th</td>
</tr>
<tr>
<td>Students’ Entry Qualification</td>
<td>3826</td>
<td>19.1</td>
<td>1.9318</td>
<td>0.149</td>
<td>5th</td>
</tr>
<tr>
<td>Funding</td>
<td>3788</td>
<td>18.9</td>
<td>2.9952</td>
<td>0.316</td>
<td>3rd</td>
</tr>
</tbody>
</table>
Table 14 presents the potency level of the respective input factors in determining students’ skills acquisition in the polytechnics. According to the table, the input factor that has the highest potency in determining the students’ skills acquisition in polytechnics is physical/material resources with the highest co-efficient of correlation \( r \)-value of 0.887; curriculum content adequacy was second (2nd) with \( r \)-value of 0.354; funding was third (3rd) with \( r \)-value of 0.316; lecturer quantity, fourth (4th) with \( r \)-value of 0.195; students’ entry qualification was fifth (5th) with \( r \)-value of 0.149; training/retraining of lecturers was sixth (6th) with \( r \)-value of 0.140; and school-industry linkage came last (7th) with a negative \( r \)-value of -0.077. This result implies that skills’ acquisition of students in polytechnics, especially in technology-oriented programmes will be enhanced immensely if the challenges associated with physical/material resources, funding adequacy, curriculum content, lecturer quantity, lecturers training and re-training as well as students’ entry qualification at ND levels are properly addressed. The implication of the negative \( r \)-value of school-industry linkage is that there is a near absence of it in the sampled institutions. Since the importance of this variable was emphasized, from the array of literature reviewed, perhaps, improved school-industry linkage can be advocated in polytechnics in order to make students employable in the world of work.
**Research Question 9:** Which of the relevant Technology Education skills is most acquired among the students in technology-related programmes of the polytechnics?

Table 15: *The Most Acquired Skill among the Students of the Technology-oriented Programmes of the Polytechnics*

<table>
<thead>
<tr>
<th>Acquired Skill</th>
<th>(N)</th>
<th>Total Weighted Responses</th>
<th>Mean</th>
<th>SD</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual</td>
<td>200</td>
<td>1555</td>
<td>7.78</td>
<td>2.2042</td>
<td>3rd</td>
</tr>
<tr>
<td>Technical</td>
<td>200</td>
<td>1565</td>
<td>7.83</td>
<td>1.7026</td>
<td>2nd</td>
</tr>
<tr>
<td>Manipulative</td>
<td>200</td>
<td>1402</td>
<td>7.01</td>
<td>2.3766</td>
<td>4th</td>
</tr>
<tr>
<td>Innovative/Creative</td>
<td>200</td>
<td>577</td>
<td>2.89</td>
<td>0.9033</td>
<td>6th</td>
</tr>
<tr>
<td>Entrepreneurial</td>
<td>200</td>
<td>1905</td>
<td>9.53</td>
<td>1.6132</td>
<td>1st</td>
</tr>
<tr>
<td>Team player</td>
<td>200</td>
<td>986</td>
<td>4.93</td>
<td>1.2897</td>
<td>5th</td>
</tr>
</tbody>
</table>

Number of respondents (N) = 200

Table 15 presents the degree to which the respective skills are acquired by students of the technology-oriented programmes of the polytechnics. According to the table, the skill that is mostly acquired among the students is the entrepreneurial skill with the highest mean value of 9.53; technical skill is second (2nd) with a mean value of 7.83; intellectual skill is third (3rd) with a mean value of 7.78; manipulative skill is fourth (4th) with a mean value of 7.01; team player skill is fifth (5th) with a mean value of 4.93; while innovative/creative skill is sixth (6th) with a mean value of 2.89.
**Research Question 10:** Does the students’ performance in the General Aptitude Technology Education Test (GATET) show that they have really acquired the relevant technological skills?

**Table 16: The Performance of the Sampled Students in the General Aptitude Technology Education Test (GATET)**

<table>
<thead>
<tr>
<th>Department</th>
<th>(N)</th>
<th>Number of Students</th>
<th>Students’ Total Score</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agric/Related Technology</td>
<td>3</td>
<td>30</td>
<td>1,435</td>
<td>47.8</td>
<td>3.3795</td>
</tr>
<tr>
<td>Engineering/Related Technology</td>
<td>8</td>
<td>80</td>
<td>4,546</td>
<td>56.8</td>
<td>3.6575</td>
</tr>
<tr>
<td>Environmental Design/Related Tech</td>
<td>4</td>
<td>40</td>
<td>2,102</td>
<td>52.6</td>
<td>3.7292</td>
</tr>
<tr>
<td>Science, Computing &amp; Related Tech.</td>
<td>5</td>
<td>50</td>
<td>2,730</td>
<td>54.6</td>
<td>3.2888</td>
</tr>
</tbody>
</table>

**Number of respondents (N) = 20**

Table 16 presents the performance of the sampled students of the technology-oriented programmes in the General Aptitude Technology Education Test (GATET) administered on them. According to the table, the mean scores of the students in the test across the departments are 47.8 for agric/related technology students; 56.8 for engineering/related technology students; 52.6 for environmental design/related technology students; and 54.6 for science, computing and related technology students. The implication of the above average performance of the students in GATET across the technology-oriented programmes is that the quality and level of skills acquired by these students is not commensurate with the standard required by the
industries which is 60-70% average (GMAT, 2008) considering the present day trend in global technological advancement.

**Results of Hypotheses Tested**

*Hypothesis 1:* There is no significant relationship between available physical/material resources and students’ skills acquisition in technology-oriented programmes of the polytechnics.

**Table 17: Available Physical/Material Resources and Students’ Skills Acquisition in Polytechnics**

<table>
<thead>
<tr>
<th>Variables (N)</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>P-value</th>
<th>r-cal.</th>
<th>r-crit.</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students’ Skill in Polytechnics</td>
<td>200</td>
<td>50.9</td>
<td>6.8537</td>
<td>198</td>
<td>0.05</td>
<td>0.87</td>
<td>0.1346</td>
</tr>
<tr>
<td>Physical and material resources available for programmes</td>
<td>200</td>
<td>42.9</td>
<td>5.9787</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Number of respondents (N) = 200, α = 0.05 level of significance*

Table 17 shows that the calculated r-value of 0.887 is greater than the critical r-value of 0.1346, given 198 degrees of freedom at 0.05 level of significance. This result supports the rejection of null hypothesis 1 and the acceptance of its alternative that there is a significant relationship between physical/material resources and students’ skills acquisition. The
implication of this is that physical and material resources is a significant determinant of students’ skills acquisition and an improvement in the physical/material resources available in the technology-oriented programmes would further enhance the students’ skills acquisition in the polytechnics.

**Hypothesis 2:** There is no significant relationship between lecturer quantity and students’ skills acquisition in technology-oriented programmes of the polytechnics.

**Table 18: Quantity of Lecturers and Students’ Skills Acquisition in Polytechnics**

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>P-value</th>
<th>r-cal.</th>
<th>r-crit.</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students’ Skill Acquisition in Polytechnics</td>
<td>200</td>
<td>50.9</td>
<td>6.8537</td>
<td>198</td>
<td>0.05</td>
<td>0.195</td>
<td>0.1346</td>
<td>Significant</td>
</tr>
<tr>
<td>Lecturer quantity</td>
<td>200</td>
<td>31.3</td>
<td>4.0270</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of respondents (N) = 200, α = 0.05 level of significance

Table 18 shows that the calculated r-value of 0.195 is greater than the critical r-value of 0.1346, given 198 degrees of freedom at 0.05 levels of significance. This result certifies the rejection of null hypothesis 2 and the acceptance of its alternative that there is significant relationship between lecturer quantity and students’ skills acquisition. This implies that the number of lecturers available for the technology-oriented programmes is a significant factor in determining students’ skills acquisition in the polytechnics.
**Hypothesis 3:** Lecturers’ exposure to professional improvement will not have any significant influence on students’ skills acquisition in technology-oriented programmes of the polytechnics.

**Table 19: Lecturers’ Exposure to Professional Improvement and Students’ Skills Acquisition in Polytechnics**

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>P-value</th>
<th>r-cal.</th>
<th>r-crit.</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students’ Skill Acquisition in Polytechnics</td>
<td>200</td>
<td>50.9</td>
<td>6.8537</td>
<td>198</td>
<td>0.05</td>
<td>0.140</td>
<td>0.1346</td>
<td>Significant</td>
</tr>
<tr>
<td>Training and re-training of lecturers</td>
<td>200</td>
<td>18.9</td>
<td>2.3105</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Number of respondents (N) = 200, α = 0.05 level of significance**

Table 19 shows that the calculated \(r\)-value of 0.140 is greater than the critical \(r\)-value of 0.1346, given 198 degrees of freedom at 0.05 level of significance. This result confirms the rejection of null hypothesis 3 and the acceptance of its alternative that a significant relationship exists between lecturers’ exposure to professional improvement and students’ skills acquisition. The implication of this result is that lecturers’ exposure to professional improvement would enhance students’ skills acquisition in the technology-oriented programmes of the polytechnics. Consequently more professional improvement programmes should be made available through seminars, short courses, workshops etc. as a matter of policy to Technology Education lecturers.
**Hypothesis 4:** There is no significant relationship between the adequacy of curriculum content and students’ skills acquisition in technology-oriented programmes of the polytechnics.

**Table 20: Curriculum Content Adequacy and Students’ Skills Acquisition in Polytechnics**

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df (n-2)</th>
<th>P-value (α)</th>
<th>r-cal.</th>
<th>r-crit.</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students’ Skill Acquisition in Polytechnics</td>
<td>200</td>
<td>50.9</td>
<td>6.8537</td>
<td>198</td>
<td>0.05</td>
<td>0.354</td>
<td>0.1346</td>
<td>Significant</td>
</tr>
<tr>
<td>Curriculum content adequacy</td>
<td>200</td>
<td>37.9</td>
<td>4.5706</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Number of respondents (N) = 200, α = 0.05 level of significance**

Table 20 shows that the calculated **r-value** of 0.354 is greater than the critical **r-value** of 0.1346, given 198 degrees of freedom at 0.05 level of significance. This result endorses the rejection of null hypothesis 4 and the acceptance of its alternative that there is a significant relationship between curriculum content adequacy and students’ skills acquisition. This result implies that curriculum content adequacy has significant influence on polytechnic students’ skills acquisition. Consequently, the curriculum content of technology-oriented programmes of polytechnics should be reviewed to make it adequate for graduates of the system, to fit into the 21st century world of work.
Hypothesis 5: Adequacy of funds in technology-related departments of the polytechnics will not significantly influence students’ skills acquisition.

Table 21: Funding of Polytechnics and Students’ Skills Acquisition

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>P-value</th>
<th>r-cal.</th>
<th>r-crit.</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students’ Skill Acquisition in Polytechnics</td>
<td>200</td>
<td>50.9</td>
<td>6.8537</td>
<td>198</td>
<td>0.05</td>
<td>0.316</td>
<td>0.1346</td>
<td>Significant</td>
</tr>
<tr>
<td>Funding of Polytechnics</td>
<td>200</td>
<td>18.9</td>
<td>2.9952</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of respondents (N) = 200, α = 0.05 level of significance

Table 21 shows that the calculated r-value of 0.316 is greater than the critical r-value of 0.1346, given 198 degrees of freedom at 0.05 level of significance. This result certifies the rejection of null hypothesis 5 and the acceptance of its alternative that a significant relationship exists between funding and students’ skills acquisition. This result implies that the level of funding accorded the polytechnics and hence the departments, has significant influence on the students’ skills acquisition. Therefore an increase in the funding of the technology-oriented programmes of the polytechnics would further boost the students’ skills acquisition.
Hypothesis 6: School-industrial linkage will not have any significant relationship with students’ skills acquisition in technology-oriented programmes of the polytechnics.

Table 22: School-Industry Linkage and Students’ Skills Acquisition

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>P-value</th>
<th>r-cal.</th>
<th>r-crit.</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students’ Skill Acquisition in Polytechnics</td>
<td>200</td>
<td>50.9</td>
<td>6.857</td>
<td>198</td>
<td>0.05</td>
<td>-0.059</td>
<td>0.1346</td>
<td>Not Significant</td>
</tr>
<tr>
<td>School – Industrial Linkage</td>
<td>200</td>
<td>17.2</td>
<td>2.336</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of respondents (N) = 200, α = 0.05 level of significance

Table 22 shows that the calculated r-value of -0.059 is less than the critical r-value of 0.1346, given 198 degrees of freedom at 0.05 level of significance. This result certifies the acceptance of null hypothesis 6, that there is no significant relationship between school-industrial linkage and students’ skills acquisition. This result implies that school-industrial linkage in form of exchange or refresher programmes for lecturers to enhance polytechnic students’ skills acquisition is grossly inadequate in the polytechnics sampled for this study.
**Hypothesis 7**: Students’ entry qualification at the ND level will have no significant influence on students’ skills acquisition.

**Table 23: Entry Qualification at ND Levels and Students’ Skills Acquisition in Polytechnics**

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>P-value</th>
<th>r-cal.</th>
<th>r-crit.</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students’ Skill Acquisition in Polytechnics</td>
<td>200</td>
<td>50.9</td>
<td>6.8537</td>
<td>198</td>
<td>0.05</td>
<td>0.149</td>
<td>0.1346</td>
<td>Significant</td>
</tr>
<tr>
<td>Students’ entry qualification at the ND levels</td>
<td>200</td>
<td>19.1</td>
<td>1.9318</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of respondents (N) = 200, α = 0.05 level of significance

Table 23 shows that the calculated **r-value** of 0.149 is greater than the critical **r-value** of 0.1346, given 198 degrees of freedom at 0.05 level of significance. This result supports the rejection of null hypothesis 7 and the acceptance of its alternative that there is significant relationship between students’ entry qualification at the ND levels and their skills’ acquisition. This result implies that students’ entry qualification at the ND levels is a significant determinant of their knowledge and skills acquisition.
**Hypothesis 8:** There is no significant relationship between students’ performance in the General Aptitude Technology Education Test (GATET) and their acquired skills.

**Table 24: Students’ Perceptual Acquired Skills and their Performance in General Aptitude Technology Education Test (GATET)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Df</th>
<th>P-value</th>
<th>r-cal.</th>
<th>r-crit.</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students’ Performance in</td>
<td>200</td>
<td>54.1</td>
<td>6.2808</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMAT</td>
<td>198</td>
<td></td>
<td></td>
<td>0.05</td>
<td>-0.077</td>
<td></td>
<td>0.1346</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Students’ Acquired Skills</td>
<td>200</td>
<td>50.9</td>
<td>6.8537</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Number of respondents (N) = 200, α = 0.05 level of significance**

Table 24 shows that the calculated r-value of -0.077 is less than the critical r-value of 0.1346, given 198 degrees of freedom at 0.05 level of significance. This result upholds the acceptance of null hypothesis 8, that there is no significant relationship between the students’ acquired skills and their performance in the General Aptitude Technology Education Test (GATET) that was administered on them. The implication of this result is that most of the graduating students of the technology-oriented programmes of the polytechnics in the south-south geopolitical zone do not really have the skills they professed to have acquired taking cognizance of the demands of the contemporary technological world.
Summary of Findings

As presented in the analysis above, research questions raised and hypotheses postulated for this study have been answered and tested using different but relevant statistical tools. The following are the summary of findings in this study:

- There are not enough physical and material resources in the polytechnics sampled. In addition, physical and material resources were found to have a significant relationship with students’ skills acquisition in polytechnics. The calculated **r-value** of 0.887 is greater than the critical **r-value** of 0.1346 given 198 degree of freedom at 0.05 level of significance.

- There are adequate numbers of lecturers in the sampled departments, and lecturer quantity was found to have a significant relationship with students’ skills acquisition. The calculated **r-value** of 0.195 is greater than the critical **r-value** of 0.1346 given 198 degree of freedom at 0.05 level of significance.

- Professional improvement opportunities are not adequately provided for lecturers in technology-oriented departments of the sampled polytechnics, while professional improvement opportunities was found to have a significant relationship with students’ skills acquisition. The calculated **r-value** of 0.140 is greater than the critical **r-value** of 0.1346 given 198 degree of freedom at 0.05 level of significance.

- The curriculum content of the various courses offered in the technology-oriented programmes as at the time of this study are adjudged to be inadequate to meet the challenges of today’s global industrial demands, while curriculum content was found to have a significant relationship with students’ skills acquisition. The calculated **r-value** of 0.354 is greater than the critical **r-value** of 0.1346 given 198 degree of freedom at 0.05 level of significance.
• There is not enough funding for technology-oriented programmes in the polytechnics, while funding was found to be significantly related to students’ skills acquisition. The calculated \( r\)-value of 0.316 is greater than the critical \( r\)-value of 0.1346 given 198 degree of freedom at 0.05 level of significance.

• School-industry linkage does not exist in most technology-oriented departments of the sampled polytechnics, while school-industry linkage was found not to have a significant relationship with students’ skills acquisition. The calculated \( r\)-value of 0.059 is lower than the critical \( r\)-value of 0.1346 given 198 degree of freedom at 0.05 level of significance.

• The entry qualifications of students at the ND levels of the technology-oriented departments are assessed as inadequate and students’ entry qualification at ND levels was found to have a significant relationship with students’ skills acquisition. The calculated \( r\)-value of 0.149 is greater than the critical \( r\)-value of 0.1346 given 198 degree of freedom at 0.05 level of significance.

• Students’ performance in the General Aptitude Technology Education Test (GATET) in the various technology-oriented programmes does not show that they acquired the relevant technology skills and the students’ acquired skills is found not to have any significant relationship with their performance in the GATET. The calculated \( r\)-value of -0.077 is lesser than the critical \( r\)-value of 0.1346 given 198 degree of freedom at 0.05 level of significance.
CHAPTER FIVE
DISCUSSION, IMPLICATIONS, CONCLUSION AND RECOMMENDATIONS

Introduction

In this chapter, detailed discussion of the findings based on the research questions and hypotheses which guided the study is undertaken. It also contains the implications of the study for policy and practice as well as conclusion and recommendations.

The results of the study are discussed under the following sub headings:

- Availability of infrastructural and material resources and students’ skills acquisition.
- Lecturer quantity and students’ skills acquisition.
- Lecturer’s Exposure to Professional Improvement Programmes and Students’ Skills Acquisition
- Curriculum content and students’ skills acquisition.
- Funding and students’ skills acquisition.
- School-industry Linkage and students’ skills acquisition.
- Students’ entry qualification and students’ skills acquisition.
- Relationship between Students’ Acquired Skills and Students’ Performance in the General Aptitude Technology Education Test GATET.
Availability of Infrastructural and Material Resources and Students’ Skills Acquisition

The result of the study showed that significant relationship exists between physical/material resources and students’ skills acquisition in the technology-oriented programmes of the polytechnics in the south-south zone of Nigeria. The r-value of 0.887 which is greater than the critical r-value of 0.1346 given 198 degree of freedom at 0.05 level of significance was obtained as indices of relationship between physical and material resources and students’ skills acquisition. This implies that physical and material resources are an important inducer of students’ acquisition of skills. The theoretical model for this study which is the Systems Theory showed that physical and material resources are important input in education production process. The findings here are in agreement with the results of studies by Adeogun (2001) and Madumere (2002) that availability and adequacy of physical and material resources are essential for the attainment of education goals. The finding is also in congruence with the views of Hallmark (1997); Alani (2001); Owolabi (2005) and Madumere (2007) who highlighted facilities such as school buildings, classroom accommodation, libraries, laboratories apparatus, furniture and instructional materials as major factors influencing academic achievement and skills acquisition in the school system as they enhance effective teaching/learning activities.

Answer to research question 1 shows that there are not enough physical and material resources in the technology oriented departments of the sampled polytechnics and, physical and material resources was found to have a significant relationship with students’ skills acquisition. NBTE’s physical and material resource adequacy specification for programmes accreditation in polytechnics is 70-80%. But available classrooms in the samples polytechnic as shown in Table 6 was less than fifty-seven percent (56.3%); number of workshops was less than forty
seven percent (46.9%); studios was less than forty one percent (40.7%); laboratory was less than forty nine percent (48.5%) and workshop materials/consumables was less than forty six percent (45.1%).

Technology Education students need to be well trained to become skilled and competent with adequate resources in order to work effectively in industries. Technology Education is hands-on and physical and material resources are needed for practicals. When there are not enough materials to carry through a curriculum in Technology Education teaching will become generally didactic and theoretical through the lecture method and learning will be mainly through the memorization of the massive information provided by lecturers (Ajeyalemi, 2002). The inadequacy of physical and material resources in the twenty sampled departments confirmed the views of Ajeyalemi (2009) and Offorma (2009) that a lot of the ingredients needed to attain the goals of Technology Education such as important infrastructure, equipment, laboratory materials and other teaching resources are lacking in many of our technology schools.

Indeed, the result of this study as shown in Table 13 shows that infrastructure and facilities accounted for the most critical factor in skills acquisition in Technology Education. This perhaps is because of the nature of Technology Education where practical and hands-on experiences are essential attributes (requiring equipment, machines, tools and materials). Government intention in Technology Education is for students to learn by doing rather than rote memorization of theories and concept, which is typical of lecture method. This means that facilities must be available in adequate quantity and are to be used effectively to enhance students’ skills acquisition.
The school’s physical and material resources not only influence students’ achievement and skills acquisition levels, it also influences the work and effectiveness of a lecturer. Hanushek (1995) had noted that quality outcome from schools are seen when learners perform beyond expectations. Adequacy of physical and material resources cannot be taken for granted in Technology Education as they could be detrimental to skills acquisition. Technology Education is expected to expose learners through hands-on experience and interactive methods. It is what the learners do, they understand and so they must be guided through practical experience to facilitate transfer of knowledge. When there are not enough physical and material resources to carry through a curriculum in Technology Education, teaching would generally become theoretical through the lecture method and learning would be mainly through memorization of the information provided by lecturers. This does not augur well for practical-based education, which Technology Education connotes.

In recent years however, there seem to be some level of consciousness on the part of government that the quality of education can be traced to the quality of facilities available to that school system. To this end, government, both federal and state, have made efforts to allocate certain amount of money for renovation and for equipping educational institutions, but a lot more still needs to be done.
Lecturer Quantity and Students’ Skills Acquisition

A statistical significant relationship was found between lecturer quantity and students’ skills acquisition in the technology-oriented programmes of the polytechnics in the South-South zone of Nigeria. The $r$-value of 0.195 which is greater than the critical $r$-value of 0.1346 given 198 degree of freedom at 0.05 level of significance was obtained as indices of relationships between lecturer quantity and technology students’ skills acquisition. This implies that lecturer quantity is a significant determinant of students’ skills acquisition.

Answer to research question 2 as answered in summary in Table 8 shows that there are enough lecturers to handle accredited programmes in the technology departments of polytechnics in South-South Nigeria. This negates the highly held view that there is a dearth of Technology Education lecturers in training institutions in the country (Yakubu, 2002). The International Technology Education Association (ITEA) had observed that lecturer shortage in Technology Education is pervasive and called for a plan of action to address the problem (Wright, 1997). The National Board for Technical Education (NBTE, 1993b) recommended lecturer-student ratio in technology-oriented programmes is 1:35 but the study showed an average lecturer-student ratio of 1:14. The implication of having this ratio is that there is not enough students’ patronage perhaps because the programmes are science based and very many science students prefer going to the university. Given the nature of Technology Education as science and practical based, having adequate lecturers to handle courses in accredited programmes is necessary to see students through the acquisition of the multi skills in the different programmes. Students’ knowledge and skills acquisition suffer set back when there are not enough lecturers to handle accredited programmes.
The paucity of students might also not be unconnected with the way the society views Technology Education as the education meant for the unintelligent. Indeed many science students opt for university degrees. Perhaps government should through advertisements and jingles begin to advocate the course of technical education as the panacea for individual and national self-reliance in a world where unemployment and under-employment have assumed alarming proportion.

However, from the analysis in Table 4, on the distribution of lecturers by years of teaching experience, less than twelve percent (11.5%) of lecturers had spent above twenty years in their institutions. Less than fifty-five percent (54.7%) had spent between 11-20 years while those who had spent between 1-5years were less than thirty-five percent (34.5%). The two Federal Polytechnics in this study, Auchi Polytechnic, Auchi and the Petroleum Training Institute (PTI), Effurun were both established in 1972. Therefore, it is expected that there should be a higher concentration of staff with over 15 years teaching experience. The implication here is that, there might be high attrition or turnover rate of lecturers in the technology-oriented departments of polytechnics in the south-south geo-political zone. The reason for that might not be unrelated to the fact that technology-oriented lecturers have job options in industries where salaries are better than they would get from teaching.

Farrel and Oliviere (1993) confirmed the above in their study which showed that qualified lecturers in Technology Education were likely to abandon teaching if what they earn in teaching differs too greatly from what they could earn in an alternative career. With economic development, teaching alternatives (for the Technology Education lecturer) are likely to attract more Technology Education lecturers from teaching to industries. Most industries are in urban
areas and all the polytechnics except PTI are either in semi-urban areas or rural areas like Ozoro and Bori. Naturally, most lecturers would prefer to work in urban areas because of the availability of social amenities. This expressed view is in agreement with the opinion of Badejo and Odugbemi (1988) that successive Nigerian governments have neglected the Nigerian rural/semi-urban areas and there is therefore constant rural-urban drift.

Lecturer’s Exposure to Professional Improvement Programmes and Students’ Skills Acquisition

A statistical significant relationship was found between lecturer’s exposure to professional programmes and student’s skills acquisition. The *r*-value of 0.140 which is greater than the critical *r*-value of 0.1346 given 198 degree of freedom at 0.05 level of significance was obtained as the indices of relationship between lecturers’ professional development and students’ skills acquisition. The implication of this finding is that lecturer professional improvement would enhance students’ skills acquisition.

The findings is are agreement with Onyene’s (2001) views that at all levels of education, educational institutions would be in jeopardy if lecturers are haphazardly employed and are not exposed to continuous professional improvement programmes. Several other studies also seem to suggest that staff development programmes could just as easily ameliorate the problems of lecturers’ ineffectiveness that ultimately affects students’ skills acquisition and achievement (Ukah, 1997; Balogun, 1998 and Olakulehin, 2005). This view is shared by Ejiogu (1990) who advocates the need for continuous staff improvement where none existed previously. He
averred that the success of school programmes depends in no small measure on lecturers’ goodwill and professional competence.

Article 5 (2) of UNESCO convention of 1989 which stipulates regular lecturer update through special courses, seminars, practical training period in industries etc. But analysis of data with respect to research question 3 (Table 12) shows that professional improvement programme for lecturers were grossly inadequate in the sampled departments. Out of the 200 lecturer sampled in this study only 67 representing 33.5% affirmed to having adequate training. The remaining 113 of them affirmed to not having adequate professional improvement, representing 66.5% of the sample with contrary view. Therefore, professional development funds should be made available by individual training institutions to develop the skills lecturers need in an integrated curriculum that runs across discipline which is now being advocated. Change in curriculum content and instructional methods has created the need for in-service training opportunities for lecturers especially in technology-oriented programmes where there is constant systemic change due to technological innovations.

Change is a constant phenomenon and change in education occasioned by knowledge explosion and technology revolution requires that lecturers keep pace with respect to their various role expectations through continuous professional development to enhance their job performance. Besides, information and communication technology (ICT) which is now an integral part of teaching in the developed world requires the lecturer to be computer literate. To this end, lecturers need to go for refresher courses in order to be able to use the Internet and the interactive board to enhance their teaching. Since analysis of the HODs’ checklist and lecturers’ response gave indications that not much of retraining is going on in polytechnics in
the South-South, government should not score political points by establishing schools and not do the right thing in staff training and development. Besides, they should provide support programmes for lecturers to upgrade and update so they can achieve the highly qualified status under NBTE categorization. In the light of the above therefore and within the context of Technology Education serving as a catalyst for sustainable development of a country, there is need for government to take the issue of staff training more seriously since no education system can rise above the quality of its lecturers.

**Curriculum Content and Students’ Skills Acquisition**

A statistical significant relationship was discovered between current curriculum content and students’ skills acquisition. The $r$-value of 0.354 which is greater than the critical $r$-value of 0.1346 given 198 degree of freedom at 0.05 level of significance was obtained as the indices of the relationship between curriculum content and students’ skills acquisition. The implication here is that curriculum content is an important determinant of students’ skills acquisition.

However, lecturers’ response to research question 4 (Table 10) shows that the curriculum content of technology-oriented programmes are obsolete to meet the needs of today’s industrial work environment. While 81 lecturers representing 41.5% of the 200 respondents affirmed that curriculum content was adequate in their courses in line with UNESCO’s specification, a total of 119 (58.5%) of them stated that curriculum content was inadequate to meet international standards. This finding corroborates the views of Baiyelo (2009) and Offorma (2009) that outdated curriculum content is frustrating the production of competent graduates and this in
their opinion has provided proof for the remarks of the World Bank cited in (Ilusanya 2005) that:

"developing countries worldwide have greatly expanded their education and curriculum system but much of that expansion is misdirected because, while millions of jobs are waiting to be done millions of people among the educated are unemployed because people with the right education, training and skills cannot be found." P. 161.

Curriculum content adequacy was based on UNESCO’s (2006) seven qualities of sound curriculum content. Relevant and appropriate curriculum content should therefore have a minimum of four components if polytechnic graduates are to become skilled and competent to meet industries requirement for employment.

Defunct curriculum negates rapid industrialization which Nigeria seeks. Appropriate curriculum therefore, is necessary for the development of appropriate knowledge and skills to cope with the demands of today’s work environment. Okey (2007) had observed that many business enterprises fail because many such business operators lack entrepreneurial skills which are also lacking in school programmes. School programmes should therefore equip learners with the skills that will make them self reliant or prepare them to enter jobs and progress in them. Because Technology Education is functional, it is important that its programmes should inculcate in learners life coping or employability skills with which they can survive after graduation. The mean average performance of less than fifty-five percent (54.1%) by final year students in the General Aptitude Technology Education Test (GATET) does not show that they have acquired the relevant and appropriate skills that industries
require. This should be a wakeup call for a review of our polytechnic curriculum to meet international standards as specified by UNESCO.

Given the complaints of employers of labour and because of the average performance of final year HND students in the General Aptitude Technology Education Test (GATET) there is urgent need to re-examine the curriculum content in technology-oriented programmes of polytechnics to make them more relevant to societal needs. In other words, polytechnic curriculum must be revised to ensure that the right and sellable skills are inculcated in the learners. This way, they would be functional members of society. Technology Education is dynamic and ever changing. Gladly, the UNESCO-NIGERIA project for revitalization of Technology Education phase II is currently reviewing polytechnic curriculum.

**Funding and Students’ Skills Acquisition**

The result of the test of relationship between adequate funding for Technology Education and students’ skills acquisition in polytechnics reveals that adequate funding is significantly related to students’ skills acquisition. The $r$-value of 0.316 which is greater than the critical $r$-value of 0.1346 given 198 degree of freedom at 0.05 level of significance was obtained as indices of the relationship between adequate funding and technology students’ skills acquisition. The implication of this is that the level of funding of programmes of Technology Education has an impact on students’ skills acquisition.

The nature of Technology Education requires adequate funds to procure equipment and materials for practicals and inadequacy of funds will therefore hamper even the maintenance of
available resources. HODs responses to research question 5 as shown in Table 11 on the adequacy of funds given to their departments annually showed 15 respondents representing seventy – five (75%) of the twenty respondents affirming that funds given are usually below budget estimates while only 5 representing twenty – five percent (25%) affirmed that funds are adequately provided for their departments. Technology Education by nature is capital intensive. It requires heavy machines, tools and equipment for practicals and hands-on-experience. Besides, adequate funds are also needed for the buildings that will house the machines and equipment just as funds are required for research grants and training. The finding in this regard, is in congruence with Baiyelo 2009 study where he found that a relationship existed between adequate funding and students’ achievement in polytechnics. It can therefore be concluded that poor funding is a major problem in science and Technology Education and this has the implication of impeding the nation’s technological development. Indeed, successful Technology Education in developing country like Nigeria, should be premised on adequate funding to help focus on areas requiring attention such as procurement of equipment, recruitment of top flight manpower, lecturers professional exposure and research grants.

Ivowi (2009) had lamented the poor funding of education when he averred that there is low funding of education generally and that of science and technology in particular. If Anya’s (2009) observation that Nigeria’s total expenditure on education is 0.6% of GDP is anything to go by then, there is need for government to change its attitude towards educational funding, especially Technology Education, if Nigeria is to realize the vision 20 – 2020 initiative.
School-Industry Linkage and Students’ Skills Acquisition

The test of relationship between school-industry linkage and students’ skill acquisition, showed no significant relationship. The \textit{r-value} of 0.059 which is lower than the critical \textit{r-value} of 0.1346 given 198 degree of freedom at 0.05 level of significance was obtained as the indices of the relationship between school-industry linkage and students’ skills acquisition. The result of this study is at variance with Schneiderh cited in Smollins (1999) and Nwufor (2009)’s views that classroom instruction alone is not sufficient to equip today’s student with the knowledge and skills required to ensure a successful career. In their opinion practical industrial experience is imperative as the traditional classroom was insufficient for technical students to meet the demands of industry and business. However, the analysis of data in respect to research question 6 (Table 12) shows that there is not enough school-industry linkage. Out of twenty HODs who responded to this research question, only 3 representing 15% confirmed that their departments have adequate linkage with related industries. The remaining 17 (85%) affirmed to not having school-industry linkage apart from SIWES.

The school-industry linkage being advocated here is not synonymous with the Students’ Industrial Work Experience Scheme (SIWES); rather, it is one that involves both the lecturer and students in exchange programmes with related industries essentially to update on current industrial practices. Therefore, that the result of this study showed no significant relationship could be because in most of the training institutions, there is a total disconnect with related industries except when students are on SIWES. Since Technology Education is functional, school-industry linkage could rub off positively on students’ skills acquisition when it is not practiced.
In the developed economies, industries related to specific fields take chairs in related departments of technology schools, sponsor research and development projects and offer apprenticeship to students for a number of years in what Nwufor calls experiential learning or work-place education. Nigeria’s industrial development as Africa’s largest economy would require a close working relationship/linkage between industries and training institutions.

**Students’ Entry Qualification and Skills Acquisition**

With respect to the test of relationship between entry qualification and students’ skills acquisition the result of this study showed that students’ entry qualification has a significant relationship with students’ skills acquisition. The r-value of 0.149 which is greater than the critical r-value of 0.1346 given 198 degree of freedom at 0.05 level of significance was obtained as the indices of the relationship between students’ entry qualification and students’ skills acquisition. The implication here is that students’ quality at the point of entry (entry qualification at the ND level) is a significant determinant of their knowledge and skills acquisition potentials.

This finding is in agreement with Fagbamiye (1980) and Nwagwu (2000) in their studies which found that candidates with higher entry scores not only performed better, but their quality in terms of class of degree at the university is also superior. The findings also agree with the expressed views of Ajeyalemi (2002) and Okey (2007) that the quality of students that enter into a programme also accounts for the quality of graduates of that particular programme. They noted that technical and vocational education at the tertiary level have not fared well because the students come in with very weak foundation.
However, the analysis of data with respect to research question 7 (Table 13) on the adequacy of students’ entry qualification at the ND level into technology-oriented programmes of polytechnics show that only 79 out of 200 respondents representing 39.9% agreed that the entry qualification is adequate while 121 of them representing 60.5% disagreed with the entry qualification being adequate. The implication here is that the entry qualification into technology-oriented programmes should be upgraded to attract quality students who have the intellectual capacity to acquire knowledge and skills required in industries.

Polytechnic education has continued to suffer set back because of the erroneous belief that it is meant for those who are not academically sound and could not make it to the university. Perhaps this erroneous belief can be changed if technology-oriented programmes of polytechnics are given the same status as science programmes in universities and their students are awarded degrees instead of HND certificates.

**Relationship between Students Acquired Skills and Students Performance in the General Aptitude Technology Education Test (GATET)**

The result of this study showed that there is no significant relationship between the students acquired skills and their performance in the Technology Education General Methods Aptitude Test (GATET) administered on them. The r-value of -0.077 which is lesser than the critical r-value of 0.1346 given 198 degree of freedom at 0.05 level of significance was obtained as indices of the relationship between Students’ Acquired Skills and their performance in GMAT. The implication here is that most of the graduating students of technology-oriented
programmes on whom the tests were administered do not really have the skills they professed to have acquired.

Analysis of data on students’ performance in GATET in response to research question 10 (Table 16) shows that the students’ performance was below GMAT (2008) acceptable competency level for employment which is 60-70% on the average. The mean average score in the Agricultural and related technology programmes was 47.8%; for Engineering and related technology programmes, it was 56.8%; for Environmental Design and related technology programmes, it was 52.6% and for Science, Computing and related technology programmes, it was 54.6%.

Aptitude tests are carried out by most organizations to ascertain applicants’ intellectual competence in relation to specific job roles and on the basis of the results of such tests results, (60-70% and above), they are considered to be competent or incompetent. By the result of this study, intellectual skills which border on students’ mental capacity for thinking, acquiring and transferring knowledge is found not to be the most acquired skills by the students. The response of the students to research question 9 negates expectation. Perhaps it is because of the deficiency in the intellectual skills that technology-oriented graduates of polytechnics are considered incompetent. The standardized tests given by employers of labour are usually intellectual based test and not practical based as such. There must be a better way to test technology graduates before their employment. Perhaps, if the aptitude tests are varied to include practical tests, the prognosis might be different from the notion that is presently held about polytechnic graduates competence levels.
Implications of the Study for Policy and Practice

The path to the future is one we will all tread and therefore need to light with a brilliance that will enable others to follow. The youths are the embodiment of our hopes and dream for a better tomorrow. Therefore, issues concerning youths and therefore Nigeria’s tomorrow and industrial development should not be handled with levity. It is the responsibility of government through its agencies and all asundry to make effective policies that would impact youths education on whose shoulders hinge the wheel of Nigeria’s technological/industrial advancement and hence the progress and prosperity of the nation. This study has thrown up an amalgam of findings that are necessary for systemic change in polytechnic education policy especially in the technology-oriented programmes.

- One implication of this study for policy is that the research effort, spelt out some of the major constraints militating against the effective implementation of the National Policy on Technology Education such as inadequate physical and material resources, obsolete curriculum content and inadequate funds. Invariably therefore, information from this dispassionate empirical study can be used to initiate policies in polytechnic education as a basis for improving the implementation strategies for the achievement of the aims of TVE as enunciated in the National Policy on Education. Effective implementation would translate to increased industrialization and therefore progress and prosperity for Nigeria. Besides, the suggestions thrown up from this study could also help policy initiators formulate realistic and effective policies in Science and Technology Education that would encourage sustainable industrial development for Nigeria.

- Basic requirement for admission into all programmes in Nigerian polytechnics is four credits at the O. levels in subjects related to the intended course of study. But this
admission requirement may have inadvertently led many brilliant students away from desiring to attend polytechnics. Given the above, and in order to attract quality students into TVE programmes especially in technology-oriented programmes, government could change the entry qualification policy into polytechnics in favour of an upward review to five credits.

- Findings from this study showed an average lecturer-student ratio of 1:14 whereas NBTE maximum lecturer-student ratio is 1:35 (NBTE, 2007). The implication here is that there are not enough students in the technology-oriented programmes in the polytechnics in the South-South zone. It could well be the same in other zones. Given the above, government could as a policy, review the current senior secondary curriculum that does not allow students to choose either general education or technical education. There should be a broad based curriculum that allows for a fusion of general education with technical and vocational education at the senior school secondary level. The new system if effected as a policy would enable students at the senior secondary school level, to also acquire technical and vocational skills in addition to general education (as done in Australia). This would have the effect of preparing them for the world of work and/or some to pursue careers in Technology Education at the tertiary level. Invariably, if this new system is implemented as a policy, it will lead to increased student patronage of technology-oriented programmes in polytechnics.

- Another implication of this study for policy has to do with professional improvement programme for lecturers in the Technology Education sub sector. Findings from this study showed that professional development programme in all the polytechnics chosen
for this study is near zero. Most of the lecturers were unanimous in their responses that training was grossly inadequate. Training to upgrade is an imperative for Technology Education lecturers in order to be abreast of new developments in the sector. In this regard, it should be made a policy that lecturers in the Technology Education sub sector should undergo at least a professional development programme every year. It is only when it is made a policy that it would be strictly adhered to by the polytechnics’ management.

- Findings from this study, (Reference Table 2) also show that only (21%) of lecturers in the technology-oriented programmes have been registered with the Teachers’ Registration Council of Nigeria (TRCN). Therefore all lecturers in the technology-oriented programmes who have not been given training in teaching pedagogy and are therefore not professional lecturers could as a policy be made to undergo training in the methods and techniques of teaching to enhance dissemination of and consolidation of knowledge as recommended by the Teachers’ Registration Council of Nigeria (TRCN) that all lecturers should be professional teachers, licensed to teach.

- Finally, extensive review of literature in this study has shown that the survival of industries depends on the production of skilled and competent graduates from the polytechnics. Consequently, government could initiate a policy that would make industries to see partnering with technology schools and financing Technology Education as an investment in their future survival as corporate entities by contributing a certain percentage of their income into an Industrial/Technological Development Fund (ITDF). From this special escrow fund, in addition to the PTDF and the ETF,
government can help finance Technology Education and propel and indeed sustain Nigeria’s industrial development.

- Besides, the suggestions thrown up from this study could help policy initiators formulate realistic and effective policies in science and technology that would encourage sustainable industrial development for Nigeria.

- Implicitly, the result of the study has provided empirical evidence to support the fact that infrastructural and material resources are inadequate to effect good teaching practices in the basically practically oriented programmes of Technology Education. The implication of this for practice therefore, is that efforts should be made by government and other stakeholders in this subsector to make funds available for the procurement of necessary facilities for an effective teaching-learning process. This is more so, since, the study identified – availability and adequacy of material resources as the input factor with the greatest impact or highest potency on students’ skills acquisition in the technology-oriented programmes of the chosen polytechnics.

- The study also provided empirical support to show that curriculum content in the identified programmes is inadequate to meet current international standard as stipulated by UNESCO, to produce graduates that would meet the 21st century industry practice level. The implication of this finding for practice is that, there is the need to review and upgrade the current curriculum content of the various programmes to meet the global trends in industries. Indeed, a review of literature and the results from
lecturers’ questionnaires (form II) showed that the current curriculum is defunct and therefore requires total overhaul to meet international standard.

- Further implications of this study’s findings for practice, is that employers of labour could devise competency tests that are practical-based and not just intellectual test especially as polytechnic education itself is mostly hands-on. Competency-based tests should therefore be more practical than theoretical.

**Summary of the Study**

This study was carried out to assess the adequacy of input factors in technology-oriented programmes of polytechnics with reference to students’ skills acquisition. A total of eight hypotheses were postulated and tested and four hundred and twenty subjects were drawn as sample from four polytechnics in South-South Nigeria. The selection of the polytechnics was based on ownership (Federal and State government owned) and the technology-oriented programmes were selected on the basis of their accreditation by NBTE.

The data analysis was done using the Product Moment Correlation Coefficient. This was done not only to establish whether a relationship exists between the different input factors and student skills acquisition, but also to show which of the input factors is most potent in influencing students’ skill acquisition in the technology-oriented programmes of the selected polytechnics. The result of the study showed that physical and material resources have a significant relationship with students’ skills acquisition. Facilities, which was also found to be inadequately provided in the polytechnics was also found to have the greatest impact on the
dependent variable. This result confirmed several input in the literature which showed infrastructural and material resources, as a strong determinant of school outcomes and therefore should be provided in adequate quantity for effective students’ skills acquisition. Lecturer quantity, lecturer exposure to professional improvement programmes, curriculum content, funds and students’ entry qualification were also found to have significant relationships with students’ skills acquisition in the polytechnic.

However, in disagreement with expected outcome, school/industry linkage was found not to have a significant relationship with students’ skills acquisition. This is a negation of literature review and some previous studies. But the near absence of school industry linkage could be responsible for the findings with respect to this variable.

As a result of the findings of this study, suggestions were made on ways to make polytechnics produce competent and skilled graduates who can help propel Nigeria’s industrialization especially as Nigeria desires to be one of the 20 most developed economies by the year 2020.

**Contributions to Knowledge**

- The study identified the important and required relevant skills in Technology Education as a way of showing where emphasis should be laid to make graduates employable i.e. Technical skills, Manipulative skills, Innovative skills and Entrepreneurial skills.

- The study developed a conceptual model (the Integrated School Systems Flowchart) to explain the relationship between input factors and skills acquisition leading to the production of competent technologists in polytechnics.
The study identified four input factors as critical success factors in the production of skilled and competent technologists - facilities, funding, curriculum content and lecturer quantity.

The theoretical model created for this study - Skilled Manpower Value Creation Chain is also a contribution to knowledge in this study.

The study contributed to existing literature in Technology Education especially with respect to relevant skills in Technology Education.

**Suggestions for further Studies**

It is a well established fact that no research is absolutely new and none puts paid to further intellectual investigations. More questions are usually raised during the course of a study than originally intended. This study has been able to sensitize further investigative paradigm for Technology Education. Given the above, the following empirical studies are hereby proposed:

- A replication of the same study in other zones for the purpose of comparative analysis.
- Attempt at looking at process variables such as students’ interest, ability or aptitude, study time, lecture hours, socio-economic background, home support, etc in relation to students’ skills acquisition in polytechnics.
- Replication of the same study in universities of technology in specific accredited programmes.
- Replicating of the same study in faculties of science in universities and colleges of education (technical).
Conclusion

This study was conducted at a time when talks of Nigeria becoming one of the world’s top twenty economies by 2020 gained local and international attention through its Vision 20:2020 Initiative. The study could not have come at a better time. With the initiative, there is the need to shift paradigm and revitalize the Technology Education sub-sector as the basis for industrialization especially with the local content bill passed into law in September, 2010.

Nigeria has made considerable strides to return to the part of industrialization since 1999, when she returned to the part of Democratization, but the need to consolidate the success achieved so far is hampered by the shortage of employable skilled hands. The Nigeria Institute of Management in a communiqué at the end of its annual conference in 2007 had observed that the Nigerian economy is severely challenged by a dearth of employable skilled hands needed for industrial development. Yakubu (2008) the executive director of the National Board for Technical Education (NBTE) also expressed concern at the rate at which many artisans and technicians as well as technologists are unable to meet up with the challenges of new technologies in industries due to inadequate skills acquisition. This trend evidently posed a daunting challenge to Nigeria’s industrial development. However, the prevailing global trend which shows that countries that are unable to develop their science and Technology Education as well as innovations in industrial system will remain underdeveloped, has become the main driving force needed to confront the lack of skills and competencies of Nigeria’s technicians and technologists.

This study was motivated by this researcher’s belief that, the talk of incompetence by employers of labour could be stemmed or reversed if we look at the process that produce
technologists through an input factor availability and or adequacy assessment. The study therefore attempted to reappraise the triggers of Nigeria’s industrial development (with respect to Technology Education) in a bid to chart a way forward in the production of skilled technicians and technologists.

One of the five main national objectives of Nigeria as stated in the second National Development Plan and endorsed as the necessary foundation for the National Policy on Education, was the building of a united strong and self-reliant nation. A national aim and objective to which the above philosophy is linked is the acquisition of appropriate skills, abilities and competencies both mental and physical as required for individuals to live in and contribute to the development of his society (FRN, 1989). It could be said that it was to facilitate the realization of this national aim of education that Technology Education was incorporated as a subsector in the N.P.E. The NPE as it relates to Technology Education is a statement of the aims of government on the course of activities that are intended to affect present and future decisions in the technological development of Nigeria.

The effective implementation of that aspect of the NPE should be vigorously pursued if Nigeria is to become an industrial giant of world reckoning. The aims of Technology Education as enunciated in the NPE (FRN, 1998) and in the NSTP (2006) should be the underlying principles which our polytechnic education with respect to technology-oriented programmes must strive to meet. Among these aims is the need to produce the middle level manpower necessary for accelerated industrial development. The skilled and competent manpower from the polytechnics utilize their skills to interact with persons, materials and the environment to install structures, goods and services that impact on society and cause growth.
and development. This study investigated the availability or adequacy of inputs in polytechnics in the production of graduates of international standards. Four of the input factors (facilities, curriculum content, funds and lecturers) threw up as the most critical in students’ skills acquisition. Therefore, for Nigeria to be recognized globally in the area of technology, sufficient number of lecturers, adequate infrastructural and material resources, robust and international curriculum, backed by adequate funding, are imperative in our technology schools. This would make polytechnic graduates fit into today’s world of work as well as meet global competitiveness. But since the findings from this study showed that three of the four most critical factors in Technology Education (facilities, curriculum content and funds) are inadequate, efforts must be put in place in the training institutions to provide these inputs in order to improve the productive capacity of graduates from the system to enable them compete globally.

Defunct facilities, obsolete curriculum content, poor funding and inadequate professional exposure for lecturers have all combined to frustrate Technology Education development in Nigeria as found in this study. Therefore, the achievement of a common core scientific value upon which the industrial development of Nigeria is hinged, is hampered. Enough attention must be paid to the acquisition of skills and aptitude in Nigeria’s education system. Until there is a paradigm shift in this regard, and technology schools are empowered (by the provision of adequate inputs) to produce competent technicians and technologists to fill vacancies in industries and multinationals, industrialization would remain stunted. Besides, the Local Content Initiative that has been passed into law in September, 2010 would not achieve its purpose. It is thus incumbent on the 21st century policy initiators and planners in the
Technology Education sub sector to make relevant inputs in Technology Education available and adequate in training institutions.

In general, the study achieved its purpose which was to find out the reasons for Technology Education graduates unemployability through an investigation of the availability and or adequacy of the inputs required in the production of skilled and competent technologists. However, it used a fairly small sample and so, generalization or definite conclusions can only be tentative.

**Recommendations**

Based on the findings from this study, the following recommendations are made in order to make Nigerian Technology Education system produce skilled and competent technologists that would propel her industrial development. These recommendations are herein stated according to the variables in the study.

**Infrastructural and Material Resources**

- Standard laboratories/workshop/studios with modern equipment, machines and tools should be provided in all technology-oriented departments;
- Consumables like electricity, water, chemicals, markers, stationeries, chalk etc, should be made available in sufficient quantity;
- Available resources should be put to good use and constantly and regularly maintained by good handling and repairs;
- Good and well equipped departmental libraries are hereby advocated and these should be constantly upgraded with recent and relevant books and journals;
• There should be well-equipped computer laboratories in all technology-oriented departments as e-learning centers for students to use at a fee; and

• The use of new and modern teaching software – the interactive Board is also hereby recommended for technology-oriented departments of polytechnics;

**Lecturer Quantity**

The result of this study showed that there are enough lecturers in the technology-oriented departments of polytechnics in the South-South. This should be sustained, and to grow the Technology Education sector in Nigeria, the following are recommended;

• scholarship should be granted to lecturers from the industrial training fund to pursue PhD programmes since only 13% of lecturers’ respondents were PhD holders.

• Scholarships should also be given to HND holders willing to pursue careers in teaching to the PhD level;

• Given that only 21% of the sampled lecturers were registered with the Teachers Registration Council of Nigeria (TRCN), all lecturers of polytechnics should be encouraged to undergo training in teaching and thereafter register with the TRCN.

**Curriculum Content**

It has been established from the findings in this study that gaps exist in curricular and instructional specification in Technology Education in Nigerian polytechnics. Against the backdrop of the above, the following suggestions are made:

• Existing curriculum should be reviewed to meet international standard as specified by UNESCO to make it relevant to the needs of the contemporary realities (world of work) especially within the context of a globalised world.
The curriculum that should be put in place should be such that would ensure that graduates can compete internationally through programmes that list indices for promoting the level of technical competency in addition to academic competence. Such a curriculum should emphasize innovativeness;

- ICT should be integrated into Technology Education curricula in order to advance knowledge and skills acquisition.
- In order to ensure that Technology Education translates to industrial development for Nigeria, 60% practical work or hands-on experience for polytechnic undergraduates is hereby recommended.

**Lecturers Professional Development**

The result of this study showed that exposure to professional development for lecturers in Technology Education is inadequate. But professional development is needed by lecturers to enhance their job performance. Consequently, the following recommendations are hereby proffered.

- Professional development for capacity building should be made available for lecturers in technology schools as specified in Article 5 (2) of UNESCO’s convention, 1989. This is essential to create and sustain the high quality Technology Education programmes that can make lecturers achieve the highly qualified status under NBTE categorization.
- Lecturers should be exposed to programme for capacity building that lists the skills required for each technology programme.
- A professional development fund should be created and made available to individual polytechnics especially technology-oriented departments.
Funding

Inadequate funding as shown from the array of literature review is one of the major bane of Technology Education and findings in this study showed that there is a significant relationship between adequate funding and polytechnic students’ skill acquisition. However, funds are inadequate in the sampled departments. To cushion the effect of poor funding from government which has now been further weakened by other socially important issues competing for attention, the following are recommended.

- Separate votes or budgets should be made for Technology Education development so that such funds can be transparently accounted for.

- The total amount of funding going into the Technology Education subsector should be increased if there will be noticeable change in service delivery. Private sector participation in funding is hereby advocated. Indeed public/private funding partnership is greatly required if Technology Education is to serve its purpose in Nigeria.

- Multilateral and bilateral aid agencies like USAID, IMF and UNESCO should be requested to scale up their financial support for Technology Education in Nigeria.

- The Federal Government Education Trust Fund (ETF) should as a matter of priority invest more generously in Technology Education programmes. Also, a special Technology Education Trust Fund (TETF) can be initiated to supplement government subvention to enhance Technology Education development. Huge resources can accrue from this to cushion the effects of inadequate funds.

- Industries should be made to spend an appreciable amount of money on Research and Development (R&D) in the training institutions by buying chairs as done by Ford Foundation, Carnegie and Bill Gates of Microsoft in the United States of America. In this regard, since the focus of this study was the South-South, the multinationals -
Exxon Mobil, Chevron, Texaco, NNPC and other oil servicing companies could do so in the polytechnics in the zone.

- A greater proportion of funds meant for polytechnics should be allocated and devoted to the science and technology programmes as against the social sciences.
- The polytechnics should also, shore up their financial base by investing in income generating activities such as consultancy services and other commercial ventures like those existing at the University of Lagos to augment their subventions. Huge funds could also accrue from such enterprises.

**Student Entry Qualification**

The findings from this study with respect to the entry qualification into technology-oriented programmes in polytechnics gave indication for an upgrade in entry qualification in order to attract quality students. To enhance and upgrade in entry qualification, a framework to ensure the aim of making science and technology learning interesting and challenging to adolescents in secondary school through the provision of adequate practical equipment is hereby proposed.

- It is also hereby recommended that technology-oriented programmes should be degree awarding. This will encourage many science students to patronize technology-oriented programmes in polytechnics.

**Development of Technology Education in Nigeria**

In order for Nigeria to be recognized and applauded globally in the area of technological development, the following are hereby proposed:

- There should also be massive deployment of lecturers for training in the developed or emerging economies of the world. This could further enhance the transfer of technologies from such countries.
The 70/30% admission ratio in favour of science and technology programmes originally planned for polytechnics (FRN, 1998) should be adhered to and implemented in Nigeria polytechnics.

Companies that are willing to assist training institutions in what is called co-operative education or school-industry linkage should be given tax incentives as a way of encouraging them to support development of Technology Education.

An assessment system that includes multiple measures and has academic, applied and contextual knowledge, critical thinking skills, workforce readiness and social engagement skill is hereby proposed.

Exhibition of research products by staff and students of technology schools should be encouraged and applauded with awards as is done in New Zealand. This would serve to boost the morale of staff, students and others.

Wealthy individuals and corporate organizations should be encouraged by government to sponsor Research and Development (R&D) programmes and take the patent rights of such products if the results prove positive.

Finally, industries should be encouraged to monitor Technology Education programmes on a constant basis in collaboration with the NBTE in order to ensure currency and relevance of curriculum content.
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