

**A COMPARATIVE ANALYSIS OF THE NEED AND AVAILABILITY OF  
SCIENCE TEACHERS IN SENIOR SECONDARY SCHOOLS  
IN DELTA AND IMO STATES**

**BY**

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**A COMPARATIVE ANALYSIS OF THE NEED AND AVAILABILITY OF  
SCIENCE TEACHERS IN THE SENIOR SECONDARY SCHOOLS  
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**DEPARTMENT OF EDUCATIONAL ADMINISTRATION AND POLICY STUDIES  
DELTA STATE UNIVERSITY, ABRAKA**

**MARCH, 2015**

## **DECLARATION**

I declare that this is an original research work carried out by me in the Department of Educational Administration and Policy Studies.

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## CERTIFICATION

We certify that this work was carried out by Ogbuka, Laurette Amauche Rose in the Department of Educational Administration and Policy Studies.

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Date

## DEDICATION

Dedicated to:

My children,

Ugonwa, Anuli, Chigozie,

Uchechukwu, Chijioke, Obinna,

for their unflinching and childlike support,

and

My late husband, Engr. G. O. L. Ogbuka;

whose love would have sustained me,

whose character would have inspired me,

with whom I would have shared gratefully,

the feelings, values, perceptions, ideas,

and the actions that have given rise to this work.

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## ABSTRACT

The purpose of this study was to comparatively analyze the need and availability of science teachers in the senior secondary schools in Delta and Imo States between the 2006/2007 and 2010/2011 academic years. The study determined the distribution of science teachers in the urban, suburban and rural locations, in senatorial districts, in specific science subject areas and identified the constraints to the need and availability of science teachers. Ten research questions were raised and answered. The design was ex-post- facto, with a population consisting of 681 senior secondary schools and their principals. Multistage stratified random sampling was used to select 68 (ten percent of the population) and their principals. Four hundred and twenty-seven science teachers were used. Primary data was gathered with two checklists. The data was analyzed using percentages, ratios, tables, component bar charts and line graphs. The study revealed a low availability of science teachers, with a high retention and a low attrition. Shortages and surpluses were found within and between the urban, suburban, rural locations and specific science areas. More female science teachers were available and the constraints on the need and availability of science teachers were identified. It was recommended among others that considerations should to be given to an equitable distribution of science teachers in senior secondary schools by subject specializations, using class size indicators based on the number of science teachers per school, per class and the science teacher's workload. Subjects with Science teacher shortages should be given priorities in postings, while teacher surpluses should by all means be discouraged. Science teachers could teach in more than one school at close proximity while state governments should improve science teacher's welfare package as a desirable incentives that could offset the shortage of science teachers in some science subjects, districts and locations.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **Background to the Study**

The importance of science and technology as the most predictable significant tool for sustainable technological development has been fully acknowledged in Nigeria as substantive governments at all levels continue to assert their determination to achieve meaningful technological development at the shortest possible time, so as to be self reliant in manufacturing and harnessing our raw materials. The recognition of the invaluable role of science and technology by government as instrument per excellence for effecting national development is therefore not misplaced because development is associated with scientific and technological progress (Todaro and Smith 2003). It is scientific discoveries that lead to technological inventions and are the foundations of knowledge, the kind of knowledge that must precede development. Science and technology is contracting the world into a global village, and has made the provision of science education a responsibility that the government can no longer treat with levity. Hence, science and technology has become the life-blood for national existence, the antidote to poverty, ignorance, superstition and disease.

The National Science Education Standard as detailed in the National Policy on Education (2004.2) is premised on the conviction that all students deserve and must have the opportunity to become scientifically literate and it

spells out the vision of science education that will make scientific literacy for all a reality, as it reiterates:

- Science education shall emphasize the teaching and learning of scientific processes and principles. This will lead to the study of fundamental and applied research in the sciences at all levels of education.
- The goals of science education shall be:-
  - To cultivate inquiry, knowledge and rational mind for the conduct of good life and democracy.
  - To produce scientists for national development.
  - To provide service studies in technology and the cause of technological development.
  - To provide knowledge and understanding of the complexity of the physical world, the forms and conduct of life.
  - Special provision and incentives shall be made for the study of sciences at each level of national education system. For this purpose, the functions of all agencies involved in the promotion of the study of these sciences shall be adequately supported by government.
  - Government shall popularize the study of the sciences and production of an adequate number of scientists to inspire and support national development.

Furthermore, the Constitution of the Federal Republic of Nigeria (1999) highlights, that the government shall promote science and technology by introducing the child to the understanding of nature. The Nigerian society shares a general belief with science educators that our students at whatever level of education ought to be literate in science and technology.

At the senior secondary school level for instance, the purpose is to prepare students to exit secondary school with necessary skills to find

employment and to prepare them to continue with careers in the sciences in higher institutions. The federal government has a policy of admission into tertiary education deliberately tilted in favour of science and technology, 60% science, and 40% other disciplines. Further, there are universities for science and technology, polytechnics, colleges of technologies, colleges of education technical, secondary technical schools, and like in Imo state senior secondary science schools. Besides, there is a Federal Government Policy establishing a third unity technical school in every state. Primary science is taught even at the lowest level of the educational system. It must be emphasized that the government must have put up these structures in place to aid the learning of science, for the production of qualified science teachers, to ensure that science teachers are always supplied on demand and to enable the nation to achieve the established goal that all students should be scientifically literate.

As expanded by Klausner

(2012.HP/Scholar.google.com/Scholar=Klaysner+Klai);

All of us have a stake as individuals, as a society in scientific literacy. An understanding of science makes it possible for everyone to share in the richness and excitement of comprehending the national world. Scientific literacy enables people to use scientific principles and processes in making personal decisions, and to participate in discussions of scientific issues that affect the society. A good grounding in science strengthens many of the skills that people use every day, like solving problems creatively, thinking critically, working cooperatively in terms of using technology effectively and valuing long-life learning.

The Phelps-Stroke Commission Reports (1924) had abhorred and criticized the irrelevant and poorly conceived curriculum that the western education missions were offering Africans, revealing that it was bereft of scientific content and was ill-suited to the needs, opportunities, and aspirations of the African people. The report also indicted the missions for concentrating on classical education, mainly literature and history, with colonial flavor, noting that such education could not be expected to be functional in Africa because the context was different. In some countries such as China, Japan, and even India, the science curriculum bases on their value systems (Brown, 2009). This consideration must be contributing to the very fast development of their technologies.

The UNESCO Conference of Ministers of Education and those responsible for Economic Planning in the African Member States, as reported by Fyle (1987, EDUCAFRICA pg.99), met in Harare. Perhaps as a way of incorporating the Phelps-Stroke and other commission's reports, amongst other suggestions to government and training institutions advised on:

- creating an awareness of the importance of science and technology for national development, and ensuring proper individual and attitudes towards science and technology, through the use of mass media, and teaching in formal and non-formal education;
- organizing inter-disciplinary courses of study designed to train supervisory personnel capable of solving the practical problems of the community;

- researching, creating, and introducing the technology needed to solve the problems of development, especially in rural setting;
- establishing curricular and curriculum guidelines, methodologies and materials for science and technology education at all levels of education;
- training especially supervisors and trainees of teachers, organizations of writing talents for the production of texts and educational materials in science and technology education;
- taking effective measures to ensure a greatly expanded output of personnel trained in science and technology from the higher education institutions so as to ensure an adequate supply of such personnel for teaching research and industry;
- establishing joint research development projects involving staff and students in community development with industry, agriculture and other areas of economic development; and
- organizing training programs, the research designs, manufacture and distribution of science teaching equipment and materials for national use at low cost, using local resources as far as possible.

In an attempt to adhere to the Harare suggestions, and as part of a cooperative curriculum programme in education amongst scientists, mathematicians, school teachers and educators from Africa, to develop an indigenous science and a technological based education in the mid-seventies, the United Kingdom and the USA Educational Service Incorporation (ASPA), later renamed Science Education Program for Africa (SAPA), sought to bring

new ideas on the teaching of science at the basic level of education. The SAPA's approach was used in the former Bendel State to develop the "Science is Discovery" materials for primary schools in the early eighties. This attempt failed to promote science teaching, as it remained clogged with a deluge of problems, such as lack of fund, lack of maintenance and renovation of equipment and buildings, lack of continuing teacher preparation, provision, supervision and retention. This eventually led to the erosion of the SAPA minded science teachers, and the inability to develop a sound science based education. A sound science based education, as opined by Kosamani (2005.151),

is expected to train the people's ability to make incisive observations, to design ways of solving problems, choosing instruments to investigate the problems, ability to carry out investigations, ability to conceptualize and evaluate ourselves in our environment, based on experiences gained from experience.

This relates to the view of Dewey (1900 in WIDERDON/. Com.2005) when he talked about experience leading to further experience. A science-based education trains people to be able to adapt to the modern age of science and technological development, and as well raise a generation of people who can think scientifically for themselves, people who are able to respect the views of others. Teachers are expected to encourage parents and children to explore the world through simple, everyday science experiments, including measuring and cooking, planting and gardening, watching the weather, or reading science literature. Doing these everyday activities, families can spend

meaningful times together and children can develop positive attitudes towards science (Katz 1996, Kokoski and Downing-Leftler, 1995; Strong, Silver and Robinson, 1995, in Klausner, 2011).

Science students in many senior secondary schools in this State, from personal observation as a teacher, exhibit very poor attitudes towards the learning of science. This has a consequent negative effect on the production and supply of qualified science teachers. Science subjects should be taught in well-equipped and updated laboratories with technical knowledge that can only be impacted by qualified science teachers. A Sub-Committee set up by the Ministry of Education Asaba (2007), to study the situation of infrastructure in the schools in Delta State revealed that the existing laboratories were inadequate and insufficient for the senior secondary schools. The senior secondary schools in Delta state needed 1,393 laboratories in the selected science subject areas. 636 laboratories were found available. Out of this, 238 were dysfunctional while 747 were yet to be provided. In line with this finding, a study on the Evaluation of Science Teaching in Secondary Schools in Delta State, Ajaju (2009), also indicated that practical lessons were not conducted due to lack of properly equipped laboratories, and that the students were not assessed in all the domains of knowledge. This is an insinuation that the students were not properly assessed in the cognitive and psychomotor domains, which are most essential in the acquisition of scientific and technological principles and skills. The study concluded that poor state of



laboratories, and poorly trained teachers are among the causes of ineffective teaching of science subjects.

In a related study on Poor Laboratory Management and its influence on Science Education in Owerri Municipal Council (Nnebuchi and Obisogu, 2010), concluded that the students' learning of science was hindered by shortage of laboratories, lack of facilities and equipments, lack of experienced and efficient laboratory assistants' and poor learning environment. Uwadiae (2009) in Edukugho (2009.41), as Head of the National Office of WAEC, decrying the poor state of laboratories reported that major research findings in their archive confirm that the learning of science is hindered by the poor state of laboratories. One of such studies was on the Problems of Teaching and Examining Science Subjects in Nigeria (Majason 1989). Scientists are made in the laboratories. This is where science is discovered. When students are not adequately exposed to such explorative rudiments in learning science, they lose interest and remain under-achievers, as they become less scientific, less curious, having little or no ideas of what they are studying, just as teachers who are not adequately fortified and motivated to teach, loose scientific focus and may leave for more fulfilling and rewarding alternative employments. This could be a major cause of the shortage of science teachers.

Under-achievement in science prevents the recipients from pursuing a science course or a science based professional course at the tertiary education level. Professions such as engineering, medicine, pure and applied

sciences, and agriculture become out of reach to the underachiever. We must produce these professions in large numbers if we must advance scientifically and technologically. Decrying a continuously perceived low performance in the sciences, Ochnogor and Umudhe (2007) traced underachievement in science to the colonial era, while Edukugho (2010) noted that failure is as a result of poor preparation, as most senior secondary science school teachers have not learned to apply the right ethics in teaching science. Uwadiae (2009) in Edukugho (2010.41) complained that no learning takes place in science classrooms as no effective teaching occurs because of the professional inadequacy of science teachers. They are found incompetent, unqualified, non-challant (Obisogu and Nnebuchi., 2010), poorly trained, (Ajaju 2009), and professionally inadequate (Majason 1989), lacking in quantity (Ochonogor and Umudhe, 2007).The destiny of this nation could be said to be shaped in the classroom, and the science teacher is a very important instrument in molding this destiny.

The teaching of science in the senior secondary schools in Delta State has been found to suffer from non-coverage of the science scheme of work, possibly due to the nature of the science curriculum content and science text books ( Ochonogor and Umudhe (2007), insufficient allocation of periods, persistent use of the lecture method, and teacher domination of teacher-student interaction during lessons (Ajaju, 2009). In Imo State Obisogu and Nnebuchi (2010) claimed that science teachers did not adhere to the scheme of work, and taught only theories. These findings are in line with research

claims that the science taught in schools is very abstract (Ochonogor and Umudhe 2007), “very pure, content laden, teacher centered and examination oriented” (Kosamani, 2005.152). It is important to note that the science curriculum for the senior secondary school is planned to achieve some perceived goals necessary to acquire a specific level of science education. When such ends are not achieved, it results in a truncated scientific belief, graduation of half-baked science teachers, and an obsolete technological development.

The Joint Admissions and Matriculation Board (JAMB) has continued to comment on the low percentage of application for science and science related courses, and a lower percentage that meets the requirement for admission. Contemporary education thought blame this trend on very low staffing of science classrooms with qualified science teachers. In Delta and Imo, low level of staffing is noticed, most particularly in the sciences. For instance in Delta, the 361 senior secondary schools have staff strength of 5,503, with a student population of 104,220. Biology for instance is a compulsory science subject with just 431 teachers. That is a Teacher Student Ratio of 1:242. In Nigeria, shortage of science teachers has been reported. Ivowi (1982) in Adeyemi (2011.315) examined the performance of Nigerian students in physics, chemistry and biology in WASC and found that the high failure rate was due to acute shortage of science teachers. For meaningful science learning, and for the goals of the curriculum to be achieved, science classrooms must be properly staffed. If candidates do not apply, or qualify to

read the sciences, scarcity of science teachers will continue to trail the senior secondary schools. This calls for a quick and necessary intervention.

The decline in science students' enrolment appears to have a global trend. Research results report of low enrolment in many nations. White, (2006) reported of a chronic shortage of teachers in mathematics and physical sciences in the UK. Guriano, Stantibanez and Daley, (2006), examined the problem of teacher shortages in American schools and remarked that one of the most serious challenges facing American education is the dearth of science and mathematics teachers in secondary schools, and that majority of the new science teachers lacked sufficient training in the subject matter they taught. Other studies by Despora, (2002) in Greece; Rangahau, (2003) in New Zealand; Dibben and Shepard, (2001) Canada; Kwansah, (2002), Ghana; Ingersol,(2001), South Africa; and Tanzania and Lesotho (Lewin and Staut, 2003) also reported of overt shortages of science teachers.

It is expected that science teachers must be skillfully developed because they constitute an important aspect in students learning. Adesina (1981) described teachers as the key input of a highly-skilled labour force. Umeasiegbu (1991) argued that the level of performance in any school is intimately related to the quality of the teachers. Aghenta (2000) opined that they are the key factor in formal education, while Adeyemi (2011) stated that teachers are the hub of the education system (in Adeyemi, 2011.304). Science teachers therefore require vigorous, continuous training and retraining, because the quality and level of their training indisputably impact on

the student's academic success. Teacher education ought to be able to provide the scientific skills and the professional training needed to develop these skills in learners for the labour market.

The rate at which the development of scientific skills is neglected in this country is found alarming by Adesulu, (2011) as he reported that in 1979, Malaysia came to Nigeria and picked our palm fruits. Today Malaysia is the world's greatest producer of palm oil, with some other twenty different products from palm oil, including petrol fuel. Nigeria is blessed with abundant local raw materials which has played a major role in the industrial development of the nation. To properly harness and use these materials without having to import experts from abroad needs the expertise of skilled graduates (Osarenren-Osagie and Irabor, 2013).

The problem of lack of proper development of scientific skills is common in tertiary institutions, as the resultant uncondusive environment created by inadequate availability of school resource, outdated and overused facilities explains the growing incidence of low quality graduates, and low enrolment in science disciplines. Students who cannot tolerate the excruciating effect either change to other disciplines or drop out of school. This is a major contribution to science teacher shortage. In line with this thought, Ogunsele (2010) reported of an engineer who complained that the same practical tools he used in the University of Ibadan in the 2005 to 2009 academic sessions were the same ones his mother used in the same department sixty years before.

From the foregoing, the typology portrays a product of our educational system, that are unable to adapt to the constant exposure of the workforce to new discoveries, and new scientific research in methods of production and services that are salient demands of modernization. The report of the Nigerian Institute for Social and Economic Research (NISER, 2001) comes to life here, as it painted a grim picture of the average Nigerian science graduate who the report claimed lacked basic scientific and technological skill. In confirmation of this deplorable situation, the former Minister of Education, Prof. Ruquyyatu Rufa'i, R. in an Educational Seminar/Workshop in Calabar lamented that fifty percent of the nation's science teachers at the secondary school level lack requisite scientific, mathematical manipulative skills, and the capacity to impart scientific knowledge (Oluwole, 2010). This is possibly the reason some industries and oil firms, Shell Petroleum for instance, recruit Nigerian science graduates and subjects them to a one to two year rigorous retraining before the successful ones are deployed.

Furthermore, the subject of which retains more teachers between the urban, suburban and rural schools have been a debate. Large schools retain higher number of teachers for the mere fact that they have better economies of scale, program quality and caliber of staff (Omoifo, 2012 ). School managers and educational policy makers argue that rural and suburban schools are too costly. The public also believe that rural schools are inefficient because they produce poor result, and the students receive the kind of

education that is inferior to that of urban schools. It is therefore disturbing in a growing nation like ours whose society is predominantly rural

To adequately create a balance between the consequent neglect suffered; when the quality of science teachers are in doubt, due to lack of constant training, exposure and interaction with professional experts through seminars, symposia, workshops and conferences that will help to improve their competences, when they are not adequately equipped to teach, when they are not made available, and when students are not disposed to learn often translates into frustrations, disappointments and finger pointing. It is imperative therefore to address this issue of the need and availability of science teachers in the public senior secondary schools, as a milestone that this nation must pursue, if its high aspirations for economic development must be achieved.

### **Statement of the Problem**

The world looks different after the learning of science hence; science is widely acclaimed as the fundamental principle and the powerhouse for scientific and technological development, and seems to be the only force that divides the `world into developed, developing and underdeveloped nations. Indications are; that this so much desired development appears to be still eluding this nation, as research findings have shown that science teachers are almost always in short supply in public senior secondary schools.

The employment of science teachers is a function of their need but their level of availability is complicated by subject specializations because of the

practical skills and competences that must be imparted. Shortage of science teachers at the senior secondary school level of education limits its access to, and prevents progression to the tertiary level, a formal requirement for most senior secondary school teaching positions. Teachers are trained, recruited and deployed for the derived need, and so they have vital obligations to contribute positively to the qualitative education of learners. The basic principle that drives the availability of teachers is that individuals will remain teachers if teaching represents the most attractive amongst activities available to them. The incidence of shortage of science teachers appear to have reached a crises level as stakeholders like the NUT and parents continue to agitate for an improved management of schools with an increased availability of science teachers. When teachers are in short supply the cohesion and effectiveness of school community suffer from the apparent disruption of educational programmes and professional relationships intended to improve learning. The problem of this study therefore is to comparatively analyze the need and availability of science teachers in the senior secondary schools in Delta and Imo States?

### **Research Questions**

In the analysis of this problem, specifically the following research questions were raised:

1. What is the Need for Science Teachers in the Public Senior Secondary schools in the urban, suburban and rural areas, from 2006/07 to 2010/11 academic years, in Delta and Imo states of Nigeria?



2. What is the Availability of male and female science teachers in the public senior secondary schools in the urban, suburban and rural areas from 2006/07 to 2010/11 academic years in Delta and Imo states of Nigeria?
3. What is the rate of Availability of science teachers in public senior secondary schools in the urban, suburban and rural areas, from 2006/07 to 2010/11 academic years in Delta and Imo states of Nigeria?
4. What is the Need and Availability of science teachers in the public senior secondary schools in the Senatorial Districts, from 2006/07 to 2010/11 academic years in Delta and Imo states of Nigeria?
5. What is the Availability of science teachers in the public senior secondary schools from the 2006/07 to 2010/11 academic years in Delta and Imo states of Nigeria?
6. What are the constraints on the Need and Availability of science teachers in the public senior secondary schools in Delta and Imo states?
7. Did Location influence the Need and Availability of science teachers in the public senior secondary schools in selected subject areas from 2006/07 to 2010/11 academic years in Delta and Imo states of Nigeria?
8. What are the class sizes and teacher pupil ratios in the public senior secondary schools in the urban, suburban and rural areas, from 2006/07 to 2010/11 academic years in Delta and Imo states of Nigeria?
9. What are the sources of the science teachers in the public senior secondary schools, from 2006/07 to 2010/11 academic years in Delta and Imo state of Nigeria?
10. What is the Need and Availability of science teachers in public senior secondary schools, in the urban, suburban and rural areas, from 2006/07 to 10/11 academic years in Delta and Imo states of Nigeria?

## **Purpose of the Study**

The purpose of this study was to comparatively analyze the need and availability of science teachers in the public senior secondary schools in Delta and Imo states, from 2006/07 to 2010/11, and to determine their distribution in the urban, sub-urban and rural locations.

Specifically, the study aimed to:

- Identify the need for science teachers in the public senior secondary schools in Delta and Imo states, within the 2006/07 to 2010/11 academic years.
- Determine the availability in the urban, rural and suburban localities.
- Compare the need and availability in Senatorial districts
- Determine the availability in Delta and Imo states.
- Examine and identify the constraints to the need and availability of science teachers.
- Determine whether location influences the need and availability of science teachers in specific science subject areas.
- Determine the current science class sizes and teacher ratios.
- Ascertain the source of the availability of science teachers in Delta and Imo states..

### **Significance of the Study**

The success of any educational science based curriculum depends largely on the adequacy of the need and availability of its science teachers. The fact that this nation is plagued with science teacher shortage at the senior secondary level of education has generally reflected not only in the inability of

learners to acquire skills relative to science and technological advancement, but also in the non-achievement of the set national objective for science education. The senior secondary school is labor intensive, and this calls for a critical examination of the state of the existing approach for teacher development, their adequacy and effective management. The beneficiaries of this study includes teachers, science supervisors, curriculum developers, publishers, science centers, science educators, school administrators, educational planners, school board members, legislators, government at all levels, parents/guardians, students, scholars and researchers.

The study will draw the attention of the state ministries of education in Delta and Imo, and their relevant agencies to the pattern of distribution of science teachers between urban, sub-urban and rural schools, and hopefully identify areas that need science resource and manpower. The determination of current science teaching manpower position in the schools through this study will provide a base line for:

- Immediate or short range needs for science teachers.
- Planning, forecasting and projecting future requirements for science teachers.
- Establishing a framework for making subsequent periodic inventories of science teacher through the provision of a dependable data base.
- Comparison of science teacher staffing position within the six Senatorial Districts in Delta and Imo States.

Delta and Imo states are of comparative alternatives, as they belong to the group of states that produce the highest number of candidates for the Federal Common Entrance ,WAEC, NECO and JAMB Examinations, the states “with the highest literacy rates, the highest standard of living and the highest proportion of citizens with post secondary education in Nigeria” (Achebe, 2012.76) The study will therefore not only provide a useful guide as the analyses are verified and presented together but also will identify the emerging trends, the differences and similarities as regards the need and availability of science teachers in the two states. To this extent, it will no doubt provide useful information that will guide policy initiators and makers, relevant authorities and stakeholders to regulate the production of science teachers in the states, and to provide the right quantity and quality of science teachers as a measure to ensure their adequate need and availability.

### **Delimitation and Scope of the Study**

The study was designed to comparatively analyze the need and availability of science teachers in public senior secondary schools in Delta and Imo states of Nigeria between the 2006/2007 and 2010/2011 academic years. The study was specifically concerned with the actual number of science teachers available as well as the actual number that were needed for the effective running of the public senior secondary schools taking into consideration the number of students available, the national benchmark, the distribution of the science teachers across the urban, suburban and rural areas, across the senatorial districts, across the selected science subject areas and

across gender. Therefore, the study was restricted to sixty eight (68) – thirty six (36) from Delta state and thirty one (31) from Imo public senior secondary schools.

### **Limitations of the Study**

The study was limited in scope to the principals of the selected schools and the science teachers that were available for the 2010/2011 academic year in the public senior secondary schools in Delta and Imo states, therefore, the result of the study cannot be generalized to the whole states bin Nigeria,

### **Basic Assumption for the Study**

It is assumed that the relative school records such as class attendance register, time tables, WAEC and NECO registration broadsheets, nominal roll of science teachers in the specific science subject areas, and other relevant records from the state Ministries of Education were valid and reliable.

### **Definition of Terms**

The following terms were operationally defined for the study:

**Availability of Science Teachers:** The willingness and desire of capably trained and qualified individuals, to provide their services as teachers at an offered incentive such as salary and work conditions.

**Need for Science Teachers:** The number of appointed science teachers, and those needed to fill in vacant positions for an effective teaching of science subjects in the senior secondary schools.

**Retention of Science Teachers:** This has to do with the number of science teachers supplied by an employer such as the Ministry of Education, who stay on the job at a particular point in time.

**Rural Schools:** Schools sited in areas far and outside urban towns or cities. They generally lack social infrastructure and other facilities.

**Science Subjects:** These represent the following science subjects selected for the study; Physics, Chemistry, Biology, Mathematics, Further-Mathematics, Agric-science and Home-Economics.

**Science Teachers:** All teachers with NCE or university degrees in the sciences and are teaching science subjects in the selected senior secondary schools.

**Sub-Urban Schools:** Schools sited not too far from the cities with considerable network of roads and transport facilities.

**Urban Schools:** Schools sited in areas with dense population, availability of basic amenities such as good road networks, pipe-borne water, electricity network and generally the Local government headquarters.

## CHAPTER TWO

### REVIEW OF RELATED LITERATURE

The purpose of this chapter is to study the, concepts, ideas and issues, as well as to critically analyze and summarize the review of related literary works, researches and studies on the need and availability of science teachers under the following sub-headings:

- Conceptual Framework. The law of Demand and Supply and its Relevance in Educational Planning
- Need and Availability in Educational Planning
- Need for Science Teachers.
- Availability of Science Teachers.
- Key Issues in the Need and Availability of science Teachers
- .Factors that Determine the Need for Teachers:
  - School Enrolment
  - Participation Rate of Students
  - Teachers' Salary
  - Curriculum Content
  - Projection of Teacher Demand
  - Size of Senior Secondary School Population
- Factors that Determine Availability of teachers (Supply)
  - Preparation and Development of Teachers
  - Recruitment and Selection of Teachers
  - Turnover and Attrition of Teachers

- Teacher Shortage and Surplus
- Size of Senior school Teaching Force
- Factors that Influence Availability of Teachers (Retention)
  - Deployment of Teachers
  - Deployment in Urban, Suburban and Rural Localities
  - Deployment of Teachers in Science and Arts Subjects
  - Deployment of Male and Female Teachers
  - Utilization of Teachers
  - Condition of Service of Teachers
  - Class Sizes, Ratios, Teaching Hours and Periods
  - Quality, Qualification and Mix of Teachers
  - Management and Supervision of Teachers
- . Constraints on the Need and Availability of Science Teachers
  - Government Policies
  - Labour Market Characteristics
  - Societal Attitudes
  - Institutional Practices
- . Appraisal of the Reviewed Literature

**Conceptual Framework: The Law of Demand and Supply and its Relevance in Educational Planning**



The Economic law of Demand and Supply formed the conceptual framework for this study. Several early fourteenth century scholars like Ibn Taymiyyah understood the power of demand and supply as he explained that as the desire for goods increases while its availability decreases, its price rises, whereas if the availability of the good increases and the desire for it decreases, the price comes down. John Locke (1691) included an early and clear description of demand and supply and their relationship as he described demand as a “rent”. He claimed in his book, *Some Consideration on the Consequences’ of the Lowering of Interest and the Raising of the Value of Money*, that “the number of any commodity rises and falls by the proportion of the number of buyers and sellers.” James Denham-Steuat (1767) coined the phrase “demand and supply”, in his *Inquiry into the Principles of Political Economy*. Adam Smith (1776) used this phrase in his book, *The Wealth of Nations*, assuring that the supply price was fixed, but that the value would decrease as its scarcity increased.

The law of demand and supply owe its roots actually to the early theories of Alfred Marshall (1890), which recognized the role of consumers in determining prices, rather than taking the classical theorists approach of focusing exclusively on the cost for the producer as a determinant. Apart from bringing together the classical supply theory with the more recent developments concentrating on the utility of commodity to the consumer, Marshall further developed and popularized the demand and supply model in his *Principles of Economics*. The demand and supply model is used to

understand the determination of the price of quantity of goods sold in the market. It works by looking at two different groups, buyers and sellers and asking how they interact, by yielding information used in planning the volume and structure of production and the selling prices. Demand and supply simply refers to the product available in the market, or which can be delivered to it (Karl Max and F. Engels, 1848).

The aggregate demand and supply are analyzed in three different conditions;

**Supply less than demand:** such situation is known as surplus. The price of goods in such situation is low owing to less demand and more supply. The more the supply the lower the cost.

**Demand less than supply:** This condition is deficit of supply. There is more demand and less supply which leads to a rise in the price level. The lesser the supply the more the demand and the higher the price.

**Equilibrium:** This is an ideal stage in any transaction. The price is not very low and also not very high. It is precise. This is a desirable situation in any market as it ensures a great level of adequacy, balance and stability. Figure 1 further illustrates these points;

### **Figure 1: Maintaining a Balanced Demand and Supply in Economics**

**Source:** <http://www.buzzle.com/articles/demand-and-supply-analysis.htm/print>

In the above diagrams, the intersection of the two curves decides the price of commodities. Movement by any of the curves raises or decreases the price of the commodity. For instance, if the demand curve shifts in an upward direction, then prices are bound to rise, and if it moves in downward direction, prices tend to fall. On the other hand if the supply curve indicates a fall, prices

are bound to rise drastically. It basically works like a balance, where one fall leads to an opposing rise.

Education adopts the tools and methods of the economic law of demand and supply in its investigation and analyses as it seeks to explain how the provision of educational programmes and training as a reliable tool for the development of human resource, and how investment in education can be pursued within the context of diverse institutional constraints to maximize the advantages or minimize the disadvantages from educational investment activities. As a matter of fact, the need for teachers is determined as the price of goods. For instance the wages like salaries of teachers is dependent on how much the recruiting agency can afford to pay. The economic principles of demand and supply are applied to education because educational activities are economic activities that are rendered for the good of the public. Educational activity is a social service that holds the key to national development. It is hardly surprising then that Agabi (2002:74) should warn that:

Such analyses must however be interpreted with a great deal of caution in the light of the fact that not all educational activities and impacts can be given quantitative and numerical expression.

Rust (2002), and Agabi (2002) were categorical when they stated in their individual works that educational activities are different from other economic activities because education manifests some unique features that make it distinct from other economic goods or services, such as, multiplicity of objectives, difficulty in estimating the cost of education, difficulty in defining

output, difficulty in relating input with specific output, difficulty in quantifying benefits, motive of acquiring education hard to discern, education is not transferable, education has long gestation period, education has an uncertain life span, education has high wastage rate.

Government policies sometimes do not acknowledge the law of demand and supply. Rust (2002), points to the fact that, when government mandates a higher price for labour, for instance the minimum wage' employers decrease the quantity of labour they demand and search for substitutes thereby creating an inelasticity of demand. Rust further concluded that the law of demand and supply is an important idea in the social sciences but a deceptively simple principle with a wide range of applications that helps to understand market for goods like tomatoes, and services like plumbing, but not education.

### **Need and Availability in Education**

Need for teachers is a derived demand. Teachers like other factors of production are trained, recruited and deployed for what they can contribute to education. Teachers are expected by obligation to contribute positively to the qualitative education of learners. Applying the law of demand to the need for teachers, the higher the wage rate that teachers are willing to take in exchange for their services, the lower will be the need for them and the lower the wage rate they are willing to take the more the need for them. Teacher availability is determined in much the same way as the price of goods as it responds to the change in wages. All things being equal, teachers will remain on their jobs if teaching represents the most attractive amongst job activities

available to them. Teacher availability in the senior secondary schools includes all the teachers in teaching positions, those suitably qualified but not employed, the gross annual addition of output of colleges of education and universities that take to teaching, those turning to teaching as their second or subsequent job, returnees like married women, and the annual wastage resulting from death, retirement, resignation, transfers to other employments and abscondment.

### **Need and Availability of Science Teachers**

Science teachers do not differ greatly from other teachers.. The difference perhaps is that their role is universal, especially in a developing nation as Nigeria, where the teaching of science becomes the most vital, for national development. Education in the sciences requires not only facts and information but also involves changing people's attitudes and lives. In fact to Akpotu (2007.27), "Science teachers are effect agents of change. Their main role is to find scientific solutions to human and societal problems".. They are always in high demand and tend to leave the teaching job when more attractive jobs become available in government, politics or private enterprises (Nwadiani, 1995; Aghenta, 2001; in Adeyemi, 2011.304). Their training focus heavily on the content of their respective disciplines since their field is considered amongst the most difficult subjects offered. Some of them specialize in one field like just biology, but some specialize in double majors, perhaps as a measure to ameliorate their shortage. In all, whether they are properly trained or not, they face special challenges in presenting their

subjects to the students. It is therefore imperative as enunciated by Klausner (2011.[www.Google.com/#Salient=psy=etc](http://www.Google.com/#Salient=psy=etc)) that:

Achieving scientific literacy will take time because the standards call for a dramatic change throughout the school system. They emphasize new ways of teaching and learning about science, that reflect how science itself is done, emphasizing enquiry as a way of achieving knowledge and understanding about the world. They also invoke changes in what the students are taught, in how their performance is assessed, in how teachers are educated. They keep pace and relationship between schools and the rest of the community including nations, scientists, *technocrats* and engineers.

To this extent, science teaching should groom science teachers in its skill-based methods and principles, so that they can sow the fruits of their science training. Osarenren-Osaghae and Irabor (2012) conclude that the growth and development of skill-based courses in any nation of the world to a large extent depends on the quality and adequacy of these professional areas.

### **Key Issues in the Need and Availability of Teachers**

Science teachers are made available in senior secondary schools by the Ministry of Education according to the need. Within the school system, certain school and non-school factors exert pressure on them. Some of them stay and are retained, while some leave. The relevance of these key issues model (Figure 2) in guiding the analysis is that it helps to clarify the relationship between the need, the availability of science teachers and their constraints. In doing this, the quantity of science teachers available is expressed as a percentage of the need. Similarly the number of teachers retained and those who left the system are expressed as percentages of those

available. The resultant percentage of the relationship between these indicates very clearly the effectiveness or elasticity of the need and availability. The system would be effective if the level is hundred percent and less effective depending on the rate of deviation from the equilibrium. The model indicated also the extent to which need and availability of science teachers is constrained by government policies, societal attitudes, and the curriculum, as well as the teachers and the student's attitudes.

**Availability  
Need**

**Retention  
Supply  
Demand**

Deployment of Teachers  
Population in School age/Enrollment

Teacher Preparation Preparation

Utilization of Teachers  
Participation  
Rate

ClassSize/Ratios /Teacher Work load  
Recruitment/Selection

Structure of the Curriculum

Turnover/Attrition  
Salary Salary

Teacher Quality/ Qualification. Etc.

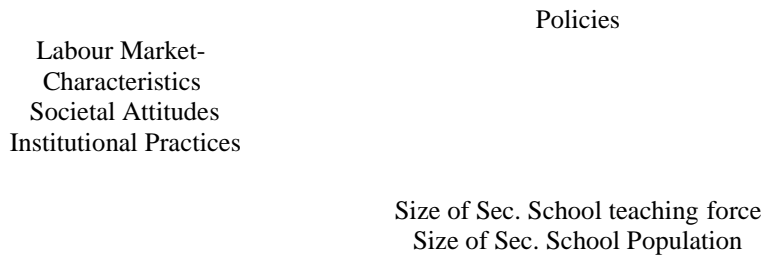
Condition of Service.

Shortage/Surplus  
Teacher Projection

Management/Supervision of teachers

Constraints;





## **Figure 2: Key Issues in the Need Availability of Teachers**

**Source: Adapted from Aidan Mulkeen, David W. Chapman, John Dejaeghere, Elizabeth Len, & Karen Brynor (2005.5).**

### **Factors that determine the Need for Teachers**

#### **School Enrolment**

The Nigerian education system is based on the Social Demand Approach (SDA). Educational planners use this approach to predict the future demand for education by parents and students. SDA emphasizes consumption of education as it is regarded as a public service and a right of everyone and as such, must be provided for every citizen. In Delta and Imo States for instance, tuition is free in public primary and secondary schools. This is to provide access to all students of that schooling age to go to school. This has also been responsible for the massive uncoordinated expansion in enrolment without a corresponding expansion in the provision of teachers,

infrastructure and equipments. The result is that facilities though undersupplied, are overstretched and over utilized.

Enrolment refers to the number of students that are enlisted in an institution at a given period. To assess a country's coverage of enrolment at a particular level of education, enrolment ratios are the most commonly used indicators. An enrolment ratio is the ratio of the number of students enrolled in a given age group in an institution at a given period. Enrolment ratio can be calculated once the school-age population and the enrolments for various periods are provided using this formula:

$$\text{Enrolment Ratio} = \frac{\text{Number of students enrolled}}{P} \times 100$$

Where: = School-age population  
Number of students enrolled

Enrolment ratios are used to estimate the total educational cost and to plan for the necessary funding. Sometimes they provide insight into the level of educational attainment in a particular country over a period of time. Such insights guide educational planners and administrators when they are contemplating new policies. Ovwigho (2004:297) stated,

In a state where the enrolment ratios for the various levels of education are persistently low, the *Government* may introduce programmes that could stimulate greater demand for education in the state. Such measures may include the intensification of public enlightenment on the benefits of education, reducing the cost of education for students and parents through subsidies, scholarships and loan schemes or improving the conditions of living in the schools for students and teachers.

This is true of what happened in Imo state, as the government recently embarked on a massive reform of the education sector. The governor introduced such measures as free tuition, free text books, free uniforms and some financial allowance for feeding and transport for primary and secondary school children, subsidies, bursaries, loan schemes and scholarships at the tertiary level. He also raised the minimum wage for civil servants from the federal government proposed seventeen thousand, five hundred naira (N17, 500.00) to twenty thousand naira (N20, 000.00). This was a measure to curb the perceived low enrolment, and high dropout rate of 21.68 percent (Ugwuegbu, 2010) especially amongst the male students at the junior secondary school level, to encourage progression to the senior secondary and tertiary levels, but most especially as a palliative to ameliorate the negative impact of the oil subsidy removal implemented by the federal government in April 2012 on the parents.

The nature of the student population enables the planner to forecast the possible implications of such enrolments for other levels of education in subsequent years. It has a direct bearing on the teaching workforce as it impacts on the number of teachers and the types of knowledge and skills teachers need to do their job efficiently (Michelle McGowan 2000).

### **Participation Rate of Students in Education**

The estimated population of secondary school age group that corresponds to the relevant grade level is the basis for the structure of the

education system. For instance, the estimate for school age population for year 2000-2005 is based on the structure of the education system in 1996.

Participation in education refers to the extent to which a school-age population is able to pursue its studies as far as it can to the expected level. The most commonly used indicators to measure the ratio of participation are:

- Gross or Overall Enrolment Ratio
- Net or Level Enrolment Ratio
- Age-specific Enrolment Ratio
- Adjusted Enrolment Ratio

**Gross Enrolment Ratio (GER)** - indicates the ratio of all students of all ages enrolled in a specific level of education expressed as a percentage of the eligible official school-age population corresponding to the same level of education in a given year. It is calculated by dividing the number of students enrolled in a given level of education irrespective of age by the population of the age-group which officially corresponds to the given level of education thus:

$$GER_h^t = \frac{E_{h,a}^t}{P_{h,a}^t}$$

Where:

$GER_h^t$  = Gross Enrolment Ratio at level of education school- year.

$E_h^t$  = Enrolment at the level of education in the school-year.

$P_{h,a}^t$  = Population in age-group corresponding officially to the level of education  $h$  in school-year  $t$ .

A high GER generally indicates a high degree of participation. GER could be deceptive as it has little value as a measure. It includes students of all ages; that particular school-age, over-age and under- age. It does not distinguish the

level at which they are enrolled, nor indicate the length of the various educational stages (NESD, UNESCO 2006, Akinwumiju 1995).

**Net Enrolment Ratio (NER)** – enrolment of students of the same age-group who officially belong to a given level of education, expressed as a percentage of its corresponding population. It is calculated by dividing the number of students enrolled who are of the official age-group for a given level of education by the population for the same age-group. The formula is:

$$NER_h^t = \frac{E_{h,a}^t}{P_{h,a}^t}$$

Where:

$NER_h^t$  = Net Enrolment Ratio at level of education  $h$  in school-year  $t$ .

$E_{h,a}^t$  = Enrolment of the population of age-group  $a$  at level of  $h$  in school year  $t$

$P_{h,a}^t$  = Population in age-group  $a$  corresponding officially to the level of education  $h$  in school-year  $t$ .

A high NER shows a high degree of participation of the official school-age population and increasing ratios reflect improving participation at the specified level of education. NER when compared with GER highlights the incidents of sunder-aged and over-aged enrolment (NESD, UNESCO 2006, Akinwumiju, 1995).

**Age-specific Enrolment Ratio (ASER)** - relates to the enrollment of a given age-group in a given year to the population of that age in that year, irrespective of the level of education. It is calculated by dividing the number of students of a specific age enrolled in educational institutions at all levels of education by the population of the same age. The formula is:

$$ASER_a^t = \frac{E_a^t}{P_a^t}$$

Where:

$ASER_a^t$  = Age Specific Enrolment of the population of age in school year  $t$ .

$E_a^t$  = Enrolment of the population of age in school-year.

$P_a^t$  = Population of age in school-year .

When ASER is high, it shows a high degree of educational participation of the population of the particular age, and a low one below 100% provides a measure of the proportion of the population of the particular age who are not enrolled (NESD, UNESCO 2006, Akinwumiju, 1995).

**Adjusted Enrolment Ratio (AER)** – Tabulations showing gross enrolment ratios for countries with different educational structures often employ this term. It means that the enrolment ratio for a given level of education has been adjusted for each country to the prescribed duration of that level. This measure particularly represents a major improvement for measuring changes in educational coverage over time and for international comparisons (Akinwumiju, 1995).

In an attempt to create access to schooling, the growth in the number of participating school age children out spaces the growth in the number of teachers. This limits the number of qualified teachers. In such situations as observed, school administrators use less qualified teachers, assign teachers trained in one subject area to teach in a shortage area, or make extensive use of substitute teachers or student teachers. This is true of some secondary schools I have worked in. Shortage of science teachers has led to the use of non-qualified teachers to teach subjects like biology, mathematics and integrated science. Consequently, teachers who lack the knowledge and skills

necessary to produce the desired learning objective teach students. This can destroy the interest of students to study science related courses.

### **Teacher's Salary**

The teacher's salary forms the biggest proportion of education's spending in developing nations (NESD, UNESCO, 2002), and in some cases, also accounts for the largest part of the public service pay bills. Government therefore faces a dilemma. On one hand, raising salaries may be a powerful way to attract more and better-qualified teachers. Low pay may result in poorly qualified and disoriented teachers, reducing the quality and impact of the education system. On the other hand, a large number of teachers means that even modest changes to teacher's level of compensation has financial consequences for the government (Macdonald 2001).

Teacher organizations like the Nigerian Union of Teachers (NUT), continues to assert that salaries are low, declining in real terms, relative to remunerations in other professions. When teachers' salaries are eroding, teachers are pushed to seek second jobs or private tutoring. One common consequence of this is teacher absenteeism, as teachers try to supplement their income with second and third jobs. When teacher's standard of living degenerates to a level that basic needs are not met, teachers do not give priority to their teaching responsibilities, and so instructional quality suffers. A further difficulty arises when the payment system is inefficient or unreliable as was the case in Delta State before payment of teacher's salaries was moved from Union Bank to Access Bank. Late payment of salary imposes hardships

on teachers. In such situations, teacher's misbehaviors like lateness to class, irregular attendance to school, lack of lesson preparations, becomes hard to discipline.

Increasing the reliability of salary payment seems to offer a cost effective way of enhancing teachers work conditions, as it is now in Delta State where teacher's salaries are paid directly into their bank accounts. The presence of a differentiated salary structure as operational in ILMs is perhaps as important as the starting salary level in the motivation of teachers. When teachers receive monthly salaries less than half the cost of a basic survival food basket, it is a logical conclusion that teacher motivation, attendance, creativity and other factors that enhance teacher supply and retention are constrained.

An excerpt from the United Nations (UN 1998) standard rule preamble cited in Craig (2004.5) posits that when salaries are competitive, graduates of teacher training programs are more likely to enter the teaching profession than the private sector. It is very common feature in this nation that science teachers leave their teaching positions to join oil, gas, contracting firms and banks where the pay package is more meaningful. Teacher's salary as in internal labour markets is generally structured to reflect length of tenure as well as teaching experience with new entrants commencing on a base salary. Most science teachers detest this as they would prefer to work in situations where their skills and merits are recognized, commended and rewarded. This is a major contribution to the high turnover of science teachers.

## **Curriculum Content**



The curriculum comprises all arrangements for student's education, and includes three elements; general orientation and philosophical underpinnings of the curriculum, strategic component consisting of, content and methods, application, language of instruction and textbooks (Nielson 2003). The indicator of the curriculum relevance is the extent to which it prepares students for integration into the environment, and into the labour force. In a study on a Critical Appraisal of the Implementation of the Nigerian Senior Secondary School Curricular carried out by three Nigerian academics Ofoha, Uchegbu and Anyikwa, a doctoral student Nkemdrim (2010), Oyekanmi (2010.37) reported that:

The study revealed a predominantly theoretical and less practical approach by teachers in the classrooms, confirming fears that technical and scientific subjects are being poorly taught in especially public schools across the country. Affirming the appropriateness in terms of goals and content, the mode of implementation was found to be weak, and when compared with some international standard, the curricular have some missing links too.

In the rapidly changing globalizing world of today, one of the vital characteristic of a relevant curriculum should be its flexibility, openness and adaptability to both local needs and to future trends. Effective curriculums are therefore those organized to emphasize the acquisition of basic skills, to ensure academic success by defining learning objectives that are matched to specific teaching strategies, available materials, and an integrated subject sequence of topics across grade levels.

An organized curriculum is reflected in a written schedule of work that all teachers in a school use to adapt the curriculum to the needs of the students and also to produce local teaching and learning materials. For instance, the current senior secondary school curriculum as can be observed lacks local content (Kosemani, 2005), too mechanical, too broad and irrelevant to the ideal needs of the learners (Edukugho, 2009). This could be the reason many students claim that they have difficulties reading, learning and passing science subjects. What is needed is a curriculum that incorporates a child centered approach to teaching, learning related to the learner's everyday life experiences, and the use of local materials that the students are familiar with. This will avail the learners' access to resources, provide them opportunities and experiences that will enhance their knowledge and at same time prepare them for the labour market.

### **Projection of Teacher Need**

The purpose of teacher projection is to know in advance the number of teachers required to sustain a given number of students, the needs of each employing agency such as, the local government, zone, state, or nation, for deployment and plan for them. Projection of teacher demand is based on teacher- pupil ratios. The number of teachers required is obtained using this formula:

$$\text{Teachers required (T)} = \frac{P}{R}$$

Where:

The number of full time teachers required  
Total number of students  
Number of students per class

The supply of teacher should be geared towards anticipated demand, since it could lead to an investment in frustration in terms of scarce financial resource and of teachers who could be trained but cannot be subsequently employed in teaching.

Teacher projection is expected to provide useful information to advise relevant institutions as to how many qualified teachers in different disciplines need to be produced for a planned period. The teacher education department in collaboration with the universities is responsible to plan in advance in-service courses for unqualified teachers for their enhancement. The university is saddled with the responsibility of producing enough graduate teachers, in identified subject areas to satisfy demand during future years, To implement special projects, the Ministry of Education often needs to know the estimated enrolment and the stock of teachers for a specific projected period to plan their activities in order to ensure adequate supply of teachers to satisfy the needs of the system. Teacher requirement should be estimated by a number of future years, and teacher shortages described in regions, levels, and subject areas.

Educational planners concern themselves with the establishment of certain targets for school enrolment, teacher supply, and other educational facilities over periods of 5, 10, or 20 years. It does so in the light of the economic and manpower resource available to supply the facilities, the political decisions as to desirable rate of growth, and the probable course of future demand for education. Using the data of present teacher stock, the number

of present teachers who will remain in jobs in the future may be projected, then estimates are made of the proportion of those who will leave temporarily or permanently, through death, retirement, replacements, secondments, study leave, in-service training, transfers to other levels of education and other subsystems. Other estimates include new entrants from teacher trainings, returning qualified teachers from approved absence, entrants from other occupations, transfers from other levels or types of education, recruitment from abroad and continuing teachers. Having projected the number of teachers required to sustain a given number of students, the present teacher stock is determined, so is the output needed from the existing teacher training institutions, and the labour market to meet this demand.

It is necessary to ensure adequate supply of teachers to satisfy the need of the system, and to eliminate shortage. Teacher projection is meant to identify additional teachers required to eliminate shortages, to reveal the impact of turnover on overall projection, to provide guideline for equitable distribution of teachers amongst disciplines, and between rural sub-urban and urban school.

### **Size of the Senior Secondary School Population**

The level of enrolment in a school governs the demand for teachers. When enrolment is small, teachers are underutilized resulting in wastage. For instance, one of the rural schools in this study had an enrolment of less than 30, with a minimum of five teachers (TPR 1:6). If the standard measure; TPR 1:40, governing the supply of teachers is used, more teachers may not be sent

to the schools and the purpose of learning may not be achieved, and if teachers are posted, it may constitute a huge waste. Small schools consume an unproportional amount of recurrent expenditure on teacher's salaries. The Ministry of Education in charge of such schools may decide on a school rationalization program aimed at making the system more economically viable. In such an exercise, schools that are close to each other could be merged with a few uneconomic ones closed down where the students can be accommodated in nearby schools. Such restructuring could be aimed at rationalizing the school system with most schools having more cost effective class sizes. Such a system would require less teachers resulting in a reduction on salary bills. The end goal would be to utilize the money so saved to provide quality inputs to the schools. Schools with small class sizes, low enrolment, generally have low TPR while those with larger class sizes have large TPR. The TPR therefore undermines the equitable distribution of teachers, and this wide variation in enrolment from school to school within and across localities poses a challenge in determining teacher demand.

### **Factors that Determine the Availability of Teachers (Supply)**

#### **Preparation and Development of Teachers**

Training and development programs in education are designed to train and increase the knowledge, skills, experiences and attitudes of teachers to meet the present and future job requirements. Gidada (1995, in Osarenren-Osaghae and Irabor, 2012:17) that the major problem of education in Nigeria is that the teachers that are being trained are not sufficiently prepared to meet

the complex demands of the teaching profession. Staff development provides the means for the staff to meet the needs of the student's academic, social, personal, intellectual, and career objectives, most especially in skill-based subjects.

Opataye, Johnson Ayodele (2012) investigated the awareness and preparation of secondary school science teachers for the challenges of Vision 20: 2020 in South West, Nigeria. Using a survey research design, four research questions were used. A 50-item structured questionnaire with reliability index of 0.82 was used for data collection. Nine hundred science teachers were randomly selected from three South Western states in Nigeria. Descriptive statistics (mean and Chi-square), t-test and multiple regression analysis were used to analyse the data. The results showed that science teachers have low awareness of Vision 20:2020 educational goals with Ogun state teachers having the least. A significant difference in awareness was noticed between public and private and also between rural and urban science teachers. No significant difference was observed in the level of preparation between rural and urban but there exist significant difference between public and private science teachers. Science teachers' computer illiteracy, inadequate infrastructures, unfavourable school environment, weak coordination and lack of standardization have significant contributions to the level of preparation. It was therefore, recommended that both federal and state governments should boost the level of awareness of vision 2020 goals and improve on science teachers' quality and development with adequate

provisions of infrastructures and facilities for use in secondary schools” laboratories.

The National Planning Commission (NPC) in their situation assessment and analysis report noted that teacher quality has not been enhanced by the standard of the preparation given to teacher trainees. The report (NPC/UNESCO 2001.157) concluded that, “if anything, under the existing model and practice of teacher education, training institutions spew out teachers that are deficient in content and methodology” One major outfit criticized is the outreach and sandwich programs. A study by Okebukola (2010) in Olusegun (2010.37) revealed that 60% of the poor quality teachers in Nigeria are trained in sandwich and part time programs, reiterating that “the motley assortment of outreach and sandwich centers for teacher education has been found to have very weak pedagogical bases and frameworks”.

A UNESCO executive president (Awosiyan, 2010), in Olusegun, (2010.37) identified poor quality of teachers as a major force steering education in the wrong direction. He alleges that degree programs in the faculties of education, are underserved with teaching subject courses, and overloaded with education courses. Consequently, graduate teachers are ill prepared for teaching subjects up to a level of competence matching the need of the senior secondary school certificate syllabus. He suggested that 80% of

the course load be assigned to courses in the teaching subject. This calls for a curriculum overhaul and improvement in the process of admission into teacher preparation programs.

Teacher preparation programs should concern itself with the training of the most promising and willing and passionate teachers, and academically successful students. (Alvarado et. al. 2001), observed that academically stronger students were not entering teacher training programs, and caution that the teacher trainees in mathematics and the sciences tended to have the lowest qualifications. They may not have passed well in the sciences in their entry certificate. The craze appears to be to get a university degree and not necessarily to train as a teacher. This is true, as it is commonly observed that prospective students who do not meet the admission requirements and are rejected in other disciplines end up in education. Preparation of teachers can be effective only if policy makers and planners tailor practices and institutions to the characteristics of those who are available, have the ability, and are willing to teach. If low quality students gain admission, then low quality graduates should be the outcome. As a way of minimizing wastage in schools, teachers should be trained, and hired to serve the organization. To this end, the requirement for teachers depends on the quality and quantity of teachers to be employed, and the mentoring system put in place to ensure school effectiveness.

One of the major ways of providing for a continued opportunity for teachers to learn is in-service training. This concept derives from a



supposition that a teacher is deficient, and needs a current orientation to improve the teaching methods, ideas and skills. It could be training undertaken during a break in professional service or in conjunction with it as distinct from initial training. Science teachers require continuous and vigorous training to remain focused.

The National Policy on Education (2004) upholds that in-service training shall be developed as an integral part of continuing teacher education aid meant to take care of all inadequacies.. To this effect, Aloa (2003) noted that this has led to the encouragement of various methods of training for the acquisition of professional certificates with teacher training institutions and agencies empowered to organize workshops, seminars, conferences and lectures as a way of promoting teacher education and encouraging professionalization in teaching.

Teacher education is increasingly under pressure to improve performance in order to adapt itself to the need of the future. Teachers therefore require constant training, exposure and interaction with professional experts through seminars, symposia, workshops and conferences to make them more efficient, competent and up to date (Adeyemi, 2011).

In a related development, Egbejumi-David (2014), lamenting on the perennial low performance in the sciences that has remained a pattern for the past twenty five years concluded that to redress the situation, there is an urgent need to revamp the curriculum, redesign training programs for teachers, introduce performance related pay for teachers, improve on

infrastructures and decrease class sizes. He also called on both federal and local governments to enforce minimum standards in schools and on parents to play active role, because education is too important to be left at the hands of the government alone

### **Recruitment and Selection of Teachers**

Recruitment is a process of searching for a pool of qualified persons with the needed skills, attracting and encouraging them to apply for jobs in an organization. Selection is the process of actually evaluating the applicant's suitability to the existing position. Selection could be done through observation, oral or written interviews. Recruitment and selection of teachers into schools at all levels is the priority and responsibility of school owners, school boards, teaching service commissions and private school proprietors. Most employers focus on the qualification and the experience of candidates being qualified for vacant positions.

Until the early seventies in Nigeria, the missionary bodies, private proprietors and the government recruited their own personnel. With the government take-over of schools after the Nigerian civil war, school boards, teaching service commissions, and the ministry of education, became the chief recruiting agencies for the public schools, while private proprietors recruited for their own schools. With the publication of the Phelps-Stokes reports (1920-1921), the memorandums (1925), the education ordinances (1926), and the successive commissions (1943-1944) of the early and middle nineteenth century (Itejere, 2005), the government suddenly realized that the

pace of educational expansion was desperately slow relative to need. The government then embarked on a crash expansionist program aimed at improving the situation. Apart from lowering entry standards, crash expansionist programs increase the probability of recruiting reluctant and unwilling teachers. Because the emphasis tilted towards the arts, such a policy has led to shortages in the supply of science teachers in the midst of surplus trained graduate teachers.

From a political perspective, policy makers will see the need to recruit in order to provide jobs for their voters without regards to the needs of the education system. Secondly, it may not be possible to recruit personnel even if the need is there if necessary fund is not available, and even if fund is available, such recruitment creates an oversupply that becomes an unfruitful drain of scarce resource. For instance, the mass recruitment of nearly seventy thousand teachers in the early nineties, created a vicious circle, such as, high upsurge in the demand for education, more expansion, improper management of facilities and low funding. Teacher recruitment requires proper planning, to avoid a mismatch between supply and demand. Ad-hoc recruitment decisions taken for reasons unconnected to education, leads to the recruitment of persons not required by the system and creates a situation of ineffective demand, where teachers are recruited to fill vacant positions, but not in the required subject areas. A typical example is a recent recruitment by the State Universal Basic Education Board (SUBEB) where the three teachers sent to a school, were graduates of commerce and economics, whereas the school

asked for teachers in integrated science, mathematics and agricultural science.

Unplanned recruitment results in an excess of teachers in some areas, with deficiencies in others within the same zone, district or locality. Sometimes, recruitment and selection exercise drag on with poor execution, leaving schools in perennial shortages, especially of science teachers.

### **Turnover and Attrition of Teachers**

Teachers may decide to leave the teaching profession, either temporarily or for good. Turnover indicates the rate at which teachers move in and out of the employment of the teaching industry, attrition is the rate at which they leave for good. Teachers leave because of retirement, family responsibilities and health reasons. Other reasons are to take other jobs, for the females, pregnancy and child rearing, family moves and transfers, or some other personal reasons. Different studies also indicate different types of Turnover. Pigors & Myers (1981) cited in Akpotu (2002.38), identified; Accessions and Separations. Accessions include:

- The hiring of new employees and relieving of former employees.
- Those called back to work after layoffs, internal transfers, former employees from military service, other employees without pay that were not counted as separations, sabbaticals and leave of absence.

Separations are terminations of employment usually sub-divided into:

- Voluntary Exits; absence without authorization for a period of seven consecutive days or sometimes less.

- Layoffs for lack of work, reorganizations, or reduction of employments.
- Disciplinary layoffs or discharge due to dissatisfaction with an employee's conduct or performance
- Permanent or partial disability.

Turnover could also be voluntary or involuntary. Accordingly, Heinemann, Schwab, and Dyer (1981), Eherenberg & Smith (1985) as also cited in Akpotu (2002.38) submitted that voluntary quits are employee initiated, while involuntary ones are employer initiated and consists of layoffs, dismissals, terminations, compulsory retrenchments, all forms of labour exits imposed on the worker by the employer.

Teacher turnover could also result from economic factors as teachers make rational decisions about their careers and seek better job opportunities. Teacher turnover is generally highest in geographical localities where living conditions are extremely poor, harsh, expensive, or where teachers do not feel comfortable with local ethnicity, customs and language. Ingersol (2001a) also found that large schools had higher turnover than smaller schools, wealthier schools and rural schools tended to experience less turnover than poorer and urban schools, private schools have annual higher turnover rate (18.9%), than public schools (12.4%), as they are generally smaller than public schools. Highest turnover and attrition rates are reported for teachers in their first years of teaching, and after many years of teaching when they were near retirement. According to Johnson and Birkeland (2003), in Haunshell et al. (2004.193) teachers who left within three years cited low pay and lack of

prestige as factors in their decision to leave. Teachers from minority areas are found to have lower attrition. High turnover of teachers can negatively affect the cohesiveness and effectiveness of school communities by disrupting educational programs and professional relationships intended to improve student's learning (Ingersol, 2002), while a healthy turnover can promote innovation, stability and ensure that the teachers supplied are retained.

Attrition may be due to a perception of teaching as a path to further education or an exit strategy. A Tanzanian student for instance, asserted that "it is the only profession which will allow me to advance to the higher levels of education" (Tonse, 2002, in Ingersol, (2002.64). Attrition does not just mean numerical loss, but represents the loss of experienced teachers from the education system especially when those who are leaving are the more successful and qualified. Their exit leaves a less capable pool of teachers in the classrooms. This may demoralize teachers as schools end up operating for a period with reduced staff.

Attrition leads to a high level of expenditure in the running of schools. The exit of teachers and their movement to better schools are costly phenomena, both for students who lose the value of being taught by experienced teachers, and for the schools and agencies which must recruit and train their replacements. Often, experienced qualified teachers who leave are replaced with poorer quality and relatively inexperienced teachers. This demoralizes the learners as they adjust to new teachers and at same time

battle with the lack of permanent teacher-pupil culture as the fresh ones are less mature.

### **Teacher Shortage and Surplus**

Shortages occur in the labour market, when demand is greater than supply. This can result from an increase in demand or a decrease in supply or both simultaneously. There is teacher shortage when more teachers are in demand than the number supplied, and surplus when supply is greater than demand. Shortage of teachers disrupts the teaching and learning process, as the effort of a limited teaching force becomes highly ineffective and cannot ensure full attainment of educational goals and development. This is because the prosperity of the teaching industry depends upon the effort and the adequacy of the teaching force employed by it.

Most developing countries are plagued with teacher shortages. Researches in Nigeria lend support to this. In a national survey of the supply and demand for teachers in secondary schools by the Nigerian Educational Research Council a long time ago (NERC, 1977), it was reported that it will take more than twelve years to meet the shortfall in teacher supply, and we are still grappling with the problem especially in science related subjects. In Delta State, for instance, the Sub-Committee on Standards of Education reported a low level of staffing in the senior secondary schools especially in the sciences as indicated in Table 1.

### **Table 1: Science Teachers in the Public Senior Secondary Schools in**

### Delta State by Science Subject Distribution

Subjects	Delta North	Delta Central	Delta South	Total
<b>Mathematics</b>	185	213	115	513
<b>F/ Maths</b>	4	7	2	13
<b>Physics</b>	87	106	77	270
<b>Chemistry</b>	136	174	86	396
<b>Biology</b>	174	157	94	425
<b>Ag/Science</b>	137	152	112	401
<b>H/Econs.</b>	68	71	51	190
<b>Total</b>	<b>791</b>	<b>880</b>	<b>537</b>	<b>2, 208</b>

**Source: Statistics Division, Ministry of Education Asaba, (2012)**

Out of the five thousand five hundred and three (5,503) teachers in the senior secondary schools, two thousand two hundred and eight (2,208) are science teachers in the selected science subject areas, distributed across the 361 senior secondary schools, an average of 5 science teachers per school. This is too low to cover all the science subjects taught in the schools and lends support to some research results like Ajaju (2009), who reported that science teachers in secondary schools in Delta State do not give nor mark assignments regularly, with science instructions not adequately supervised. This could result from inadequate supply of science teachers or overpopulation of students in the classrooms.

A teacher surplus is one that provides an adequate supply of highly qualified candidates in all the fields, and in all regions, districts and localities. Teacher shortage or surplus is a common cause of educational wastage. Preston (2005), listed such reasons for teacher shortage as; increasing



student enrollment, rising teacher turnover, and accelerated rate of retirement caused by an ageing teacher work force. Others are structural changes, greater alternative career opportunities for post secondary graduates, overcrowded classrooms, insufficient facilities and other material conditions, and the nature of the teacher labour market, as affected by supply and demand, by public policies, and by free market forces. Public school teachers work in a regulated market place as in ILMs, where a number of policy variables regulate teacher qualification, entrance requirement, remunerations and available incentives to address teacher shortage and surplus. These have implications, as teachers carry the burden of excessive workloads in their attempts to cover for ongoing vacancies. This contributes to the reduction in the attractiveness of teaching as a profession to current and potential graduates.

### **Size of the Senior Secondary School Teaching Force**

The teaching force consists of two large groups, those internal to the stock composed of employed teachers continuing from year to year, promoted experienced teachers, those on transfer from other schools. For the purpose of educational planning, the stock of educated persons is usefully measured as the number of persons per 10,000 population. The teaching stock is always affected by the movement of the teaching personnel. The second group, external to the stock is made up of entering teachers in any teaching year. The stock of teachers is calculated by keeping track of the flow of teachers. There is always inflow and outflow of teachers every year. The

annual loss is calculated on a net basis, usually expressed as apparent teacher wastage rate, (Akinwumiju 1995.176):

$$\text{Apparent Teacher Wastage Rate } (W^t) = \frac{1^t - (S^{t+1} - N^{t+1})}{S^t} \times 100$$

Where:

$S^t$  = stock of teachers in year .

$S^{t+1}$  = stock of teachers in year .

$N^{t+1}$  = newly trained teachers entering service in year

$W^t$  = apparent wastage rate applying to teachers in year

The flow considers a reserve pool of qualified teachers, recent graduates from higher institutions, teachers on transfer from private schools and industries. The number of funded teaching positions determines the size of the teaching force. This is why science subjects are hard pressed. Sometimes, in the midst of surplus teachers in a school, shortage is the bane in the sciences.

The profile of the stock of teachers includes their qualifications, subject specializations, grade levels to be taught, gender, and age. This information makes it possible to determine how well the supply of teachers yields a teaching force that corresponds to the demand for teachers with desired characteristics for various subject matters and grade levels. To determine the demand for teachers, it is important to know the number of the present stock that will remain in their jobs in the future, the number that will leave permanently or temporarily through death, retirement, study leave, transfers, replacements, dismissals or other causes. Teaching force is distributed among public schools that vary by type, grade level, and location. A major concern should be that teachers are maladjusted among schools in terms of qualification, experience, age, gender, ethnicity and other dimensions of the

teaching force. Taking stock of teachers should be a measure to arrest such situations. Among conditions that determine a capable teaching force, researchers outlined the following:

- Teachers' mastery of the material they are supposed to teach.
- The amount of teaching experience they have.
- The length of time they have been in the school.
- The extent to which the teaching force is full time in the school

(Fuller 1996, in Earling et al. 2005.13)

In a stable teaching force, teachers know their subject matters, have experience and are stable in their full time assignments. A highly skilled and professional teaching force ensures a low turnover and attrition.

### **Retention of Teachers**

The teachers trained and employed to teach have a vital obligation in the society. They are trained to contribute positively to the qualitative education of the students. To achieve this objective, teachers must be retained on a continual basis. Retention of teachers is calculated as follows:

$$\text{Retention of Teacher} = \frac{(S^{t+1} - N^{t+1})}{S^t} \times 100$$

Where:

$S^t$  = stock of teachers in year .

$S^{t+1}$  = stock of teachers in year .

$N^{t+1}$  = newly trained teachers entering service in year

The number of teachers retained is usually subtracted from the anticipated demand to derive the supply. This retention formula however aims at the aggregate balance of the supply and demand for teachers. It does not

consider the distribution of teachers by subject specialization, a detriment to the supply of science teachers in senior secondary schools. This procedure also fails to analyze the distribution of teachers by geographical localities and to make distinctions between the sexes (Akinwumiju, 1995).

## **Factors that Influence the Availability of Teachers - (Retention)**

### **Deployment of Teachers**

In practice, two main systems of deployment exist. There is deployment by market system, and deployment by central authority (Lewin 2002). In the market system, each school can advertise and recruit its own teachers. This is what obtains in private schools. Such systems have the advantage of ease of administration and automatic response to teacher shortages. However, market systems allow new teachers to apply for advertised jobs and to exacerbate shortages in unfavorable locations. Market systems will only act to reduce imbalance if there are incentives for trained teachers to apply for jobs where there is need. Centralized deployment system is used in public schools where it is fairly common for teachers to require deployment to anywhere in a state. Deployment by a single central authority is generally free from local pressures and can only be transparent and fair. As observed by Hedges (2002), in Mulkeen et al. (2005.5) centralized deployment is weak. The system is dependent on the quality of information coming from the school, and without adequate data, it easily subjects itself to red-carpetism and unresponsiveness. Besides, there are sometimes difficulties in implementing deployment decisions in many countries as a significant number of teachers fail to take up

their postings, and face penalty. In Lewin's (2002) opinion, this posting system often allows experienced teachers to transfer, thus resulting in greater number of inexperienced teachers especially in areas with weak infrastructures and teaching resource as is prevalent in our own environment.

Decentralized deployment, operates in Delta and Imo States, with the setting up of zonal education offices to remain in touch with the needs of the schools and to respond quickly and flexibly to these needs. School administration at the local government level is sometimes full of risks, as those with weak administrative capacity are easily susceptible to undue influence by individuals in positions of power.

Teacher specialization further complicates deployment at the senior secondary school level. Teachers are typically specialists in one or two subject areas, with frequent shortages in the sciences. The existence of the private education sector also diminishes the capacity of the state system to deploy teachers. Private school positions in the urban areas especially, even at lower pays than government schools often become more attractive than rural postings. The private sector has other impacts as well, as some public secondary school teachers actually teach part-time in such schools with full-time positions in public schools.

Cost sharing initiative also creates an uneven deployment of teachers. Schools in more affluent areas that charge fees are often in a position to lure additional teachers or to offer higher salaries to the existing ones. For teachers, this means the possibility of reduced workload or more pay. The

system can create a private market for teachers within the public system. Often poor schools find their teachers transferring to such schools. Such arbitrary teacher deployment practices, poor salaries and conditions of service are amongst the root causes of low teacher retention.

The thinking that perhaps personal history and family connections will entice new teachers to teach within their localities after their graduation, and the presumption that those with family roots in rural areas may be more willing to return to and remain in their rural setting was crowned with bottlenecks. When teacher's salary is inadequate, working close to one's family may provide some level of financial support and subsidy. In Uganda for instance, services such as retirement pensions, unemployment benefits, housing and other social services are often provided by the extended family. Lewin (2002) reported that some countries lowered entry qualifications for new students from rural areas as an enticement, but it was discovered that these teachers did not want to return to their roots, and may have entered teaching in the first place as an attempt to leave their roots, and move to urban areas.

Most experts and scholars commenting on pre-service and induction programs for newly deployed teachers, share the view that it is impossible for a pre-service or induction program to produce a fully qualified teacher. These programs as suggested should involve a restrictive choice of what is most desirable and feasible for future teachers to learn before they will become practicing teachers. Stakeholders are to let beginning teachers start their jobs without all the capabilities they need, trusting that these capabilities will be

acquired during the early course of their careers as classroom teachers. Induction after deployment provides opportunities for newly deployed teachers to adapt and to learn about their roles. Such programs need restructuring. The few that I participated in, in the Warri zonal area were always hurried, lecture centered and brief, with the participants not really gaining any new experience nor knowledge.

### **Deployment of Teachers in Urban, Sub-Urban and Rural areas**

An area is termed urban, sub-urban or rural based on the population, and availability of modern facilities, infrastructure, communication networks, roads, transport and social amenities. The rural areas are stagnant traditional agrarian societies. They tend to be characterized by abject poverty, unemployment, underemployment, ignorance, decease and superstition. The rural-urban migration of the active population in search of jobs leaves the rural areas with the aged who cannot meet their own food needs. They lack accessibility, educational infrastructure and facilities, and teaching manpower. The students lack basic school needs, exhibit poor and unencouraging attitudes towards learning, often due to poor academic environment, lack of motivation and drive. This is possibly the reason most teachers do not accept postings to rural areas.

The urban areas are beehives of activities, as lots of people abandon rural life in favour of urban life where the standard of living is higher with better amenities that make life a bit more comfortable. A higher population also leads to increase in school enrollment and overcrowded classrooms marked with

over-utilization of resources and facilities. The semi-urban towns enjoy some signs of modern life interjected with rurality. Its nearness to the city often attracts the spillovers from the city into these towns, as they are less stressful and cheaper.

In many African countries, the distribution of teachers is uneven with surpluses in certain areas, co-existing with shortages in others (Lewin 2002). The pattern is that fewer untrained under qualified teachers are in the least attractive rural and poorer sub-urban locations, while the best teachers tend to congregate in urban locations. Qualified teachers are often reluctant to stay in rural areas. Akyeampong and Lewin (2002) found in Ghana that over 80% of teachers said they preferred to teach in urban schools. Even in our midst, teachers posted to rural schools accept the postings with mixed feelings, while others refuse outright to accept such postings, preferring to work in towns and cities. Rural deployments are therefore unpopular for a variety of reasons; such as, the fear of disease, unhygienic home accommodations, inadequate school resource, lack of leisure and medicals, problems with the local languages especially where the language of instruction is not the one the teacher is fluent. This can lead to isolation of the teacher professionally and socially within the community (Brodie, Lelliot and Davies 2002) in Lewin (2002.37). Teachers in rural locations often complain that they spend several hours daily writing detailed lesson plans and notes for each class and subject, as some of them teach up to three subjects in more than three different classes. They often feel isolated and excluded from opportunities for participation in consultations and



professional developments. They find it difficult to secure their entitlements, for instance, salaries are delayed, and circulars arrive late from the zonal and state education offices. They often complain of the forfeiture of benefits and opportunities for professional development sometimes due to transportation irregularities and administrative procedures.

The unpopularity of rural posting has two self-enforcing effects. In some cases, the ministry transfer teachers to unpopular places as punishments for improper behavior, such as; stealing, immorality and examination malpractice. In Delta State for instance, teachers and principals who were involved in examination malpractice during the 2006/2007 junior and senior secondary certificate examinations were redeployed to rural and riverine locations. This action can also create a high concentration of misbehaving teachers in schools far away from inspection. Where there is shortage of teachers in rural areas, the teachers who are on ground have greater workloads, further increasing the disincentive to accept rural posting. This is one of the probable bottlenecks to getting qualified teachers adequately in the rural areas. This is why the rural areas have a higher proportion of untrained and uncertified teachers with its untold effect on the quality of learning.

Various state governments in an attempt to encourage teachers to accept postings to rural areas had promised rural allowance for those teachers willing to accept postings to rural areas. In Delta State for instance, the government during the most recent posting of teachers, as a way of keeping them in their rural locations proposed to pay 75% of their basic salaries, in

addition to transport and housing allowance. This is encouraging, although yet to be implemented.

### **Deployment of Teachers in Science and Arts Subjects**

Science graduates enjoy a high rate of employment as the labour market for science skills and the wage premium continue to be strong. This perhaps is among the reasons for the severe staff shortage in the sciences, as schools continue to experience critical shortfalls. Most of the expatriate personnel in our secondary schools in the late sixties were science teachers, as the early missionary's education lacked scientific content. This resulted to the overproduction of graduate teachers in the humanities, and underproduction in the sciences. Besides, the free labour mobility in the Nigerian economy makes it possible for those who read courses meant for teaching to find jobs in the top echelons of the civil service, police force, armed forces, banks and oil companies, where there exists better payments, better conditions of service and a higher status.

Science and innovation are the bedrock of a nation's future. The young, need to be helped to consider the wide range of career opportunities that science courses can lead to, and encouraged to study science to a standard that will enable the future needs of the country to be met. A situation where the cycle of science teachers who are not exposed to practicals, also teach the students in the same way continues to hunt the teaching of science subjects. With the crunch in fund allocation and the increasing enrolment, the teaching of the sciences using conventional equipments and laboratories is ineffective.

This calls for innovative ways where micro science kits can replace expensive equipments, while laboratories are replaced with multipurpose classrooms (Nigerian Education Sector Diagnosis NESD, Mozilla Forex, 2010). There is need to consult on measures to be developed in the future to modernize science education, promote science careers, and increase public engagement with science. Reemergence of JETS clubs and moral engagements in activities that entice students using formats like symposiums, debates, and quiz competitions can raise awareness and student's interests, and encourage prospective students to study the sciences because they constitute the future science teachers. ,

As a way of encouraging and sustaining the deployment of more science teachers, educational planners like Enormah (2005), supporting other contributors suggested that deployment of teachers should be based on a science-humanities ratio of 60:40 in line with the current national policy provision for a 60 to 40 ratio of admission in favour of the sciences. This could be a useful measure where there is an adequate supply of science teachers.

### **Deployment of Male and Female Teachers**

Women formed a greater proportion of teachers. Steven Leonard et al. (2001) in Cassandra et al. (2006.176) agreed that the teaching profession is increasingly becoming a female profession and wondered why teaching should be less attractive to males. This could be because teaching for men is socially defined as a stepping stone, prior to their real career in one of the male dominated, skilled, blue-collar job occupations or white-collar professions. The

male see teaching as a lower status “easy in easy out” occupation. To Boe and Clifford (1992) in Cassandra et al. (2006.176), teaching is socially defined since the inception of the 19<sup>th</sup> century as a temporary line of work suitable for women prior to their real career of child rearing. Cassandra et al. (2006) in continuation, affirmed that women bear a greater share of child rearing responsibility than men and so find teaching to be more compatible with this constraint, thus narrowing their choice set.

Women form a greater proportion of new teachers. In a longitudinal study of more than 11,000 college graduates in Texas, Cassandra et al. (2006) reported that women were more likely to enter into teaching, to have taught in a school, to have become certified to teach, to have applied for a teaching position, or to be considering teaching.

Rural postings may also create particular problems for female teachers. Single females may feel unsafe or believe that they have better marriage prospects in urban areas. Married female teachers may be reluctant to accept rural postings if it involves a move from their husbands, children and family. Women when married become an appendage to their husbands and are bound in most cases to follow them as better employment opportunities opened up for these husbands, and this can result to low retention of females. In a recent mass deployment and transfer of teachers by the PPEB in Delta State, pregnant women, some women on maternity leave with less than six weeks old babies were posted to the rural and remote areas. Such postings contribute to the high turnover of teachers as most of them worked themselves back to

urban schools. Some other researchers claim that society ascribes certain value traits to men and women, with women traits as being supportive, gentle, kind, co-operative, and dependable. The labour market supply and demand framework discussed in the conceptual framework, suggested that individuals with higher opportunity costs in the form of attractive alternatives to teaching are less likely to enter teaching. Males have historically a wider choice of job, and this imbalance seems to persist.

### **Utilization of Teachers**

Utilization refers to the degree to which an item is effectively used. When for instance, there is so much pressure in the use of laboratory equipments and facilities, there are breakdowns. Such pressures could be because of too many students using very few existing science facilities, lack of maintenance of the facilities, and use of unqualified staff. Utilization embraces the use of human resource, space, time, and facilities.

The contribution of human resource is determined by the caliber of personnel recruited into the organization. Shermon (2009) calls on government and other recruiting agencies to go for a “scientific” human resource planning because the market has fundamentally changed, as it has become the world of the knowledge worker. He concludes in Shermon (2009.2) that:

Human resource planning can no longer confine itself to the traditional sources of hiring and retaining, as the skills of yesterday are no longer being sought after by the new generation. The human resource of today sees their role as changing from that of a doer to that of a thinker, and in most situations “thinker-doer”. Organizations like the school systems appear to continue to nurture

and retain a set of human resource that has become more redundant than ever before.

To ensure organizational efficiency and effectiveness, teachers trained and engaged in services are to utilize available resource productively. It is also important to point out that the school personnel especially science teachers and lab attendants need to have adequate knowledge of the functions of such facilities and equipments and alternative uses to which they can be put. For instance, the equipments for the 6.3.3.4 program of the early nineties were left to rot because teachers were not trained on how to use about 95% of them.

Teachers are often used inefficiently, with few class hours per week, particularly in rural areas. Teachers may need to be prepared to teach more than one subject, or possibly as many as three subjects at various grade levels in the secondary schools. This is done at the primary school level. Mulkeen et. al. (2005), considered a system of rotation of teachers through several nearby schools and alteration of timetables, so that teacher's time is put to effective use with students taught all subjects required in the curriculum. This practice is ongoing for instance among teachers who have teaching positions in public schools but teach part time in private schools. Inefficient utilization of staff revolves around relatively small sized schools, the number of subjects in the curriculum, and the willingness and ability of teachers to teach two or more subjects (Lewin and Stuart 2002). It also happens that some teachers may have too many periods, while others have fewer periods. Departments especially the

sciences suffer shortage with teachers overburdened with too many teaching periods, while others have surplus therefore underutilized.

One of the objectives of teaching science is to ensure that students acquire the skills of science. Such skills are supposedly acquired in specialized laboratories with adequate floor space, good light, clean air, proper ventilation, a quiet, comfortable, safe environment with the proper noise level as proffered by Lamester (1997), Lackley (1999), Colton (2000) and Schneider (2002), in Chukwuma (2008.2). The acquisition of these skills depends on how effectively the children are exposed to laboratory experiments. Early introduction at a very tender age to scientific toys and experimental objects is effective. Such exposures kill the enigma and phobia of science. ( Uzondu, (2009) in Adesulu, 2009.41). In a related write up, Adenipekun (2009), reports of some research breakthroughs by some senior secondary school science teachers. The first, Osuji of Madonna Senior Secondary Science High School Ihitte, Imo state, with two projects; “Bearing Demonstration Set” used in practical demonstration of probability and a ‘Trigonometrically Set”, for demonstrating trigonometry, and Ahura Senior Science Secondary School, Makurdi, with his project “Multi-purpose Solar Energy Devise” for water distillation and solar energy. The research objective is to help the children to understand and to remove the fear of science from their minds. These science teachers won the Science Teachers Association of Nigeria’s (STAN) awards, as proof of STAN’s determination to ensure an effective teaching of science. STAN organizes workshops, lectures, seminars, conferences for science teachers. Despite the

efforts of STAN and other concerned agencies, Edukugho in the same report blamed corruption, manipulation, favoritism and bribery as the major hindrances to achieving set objectives.

Materials for teaching science are grossly inadequate in senior secondary schools. Most of these schools are yet to be provided with trained competent science teachers, they lack laboratories, lab assistants, science equipments, well stocked science libraries and infrastructures, consequently students are not encouraged to use such facilities. Teachers appear not to be aware of potential laboratory dangers; some of them do not have the defense and counter attack readiness. This makes it imperative to have properly trained laboratory assistants. In a preliminary study (Asonibare, 1984.15) in some secondary schools in Ilorin on science teaching, science teachers reported that; Lab assistants were either not trained or not well trained, teachers complained of their general carefree attitude to work. They dress extravagantly to duty, knowing fully well the nature of their duties. Some refuse to clean or clear up, claiming that they were not employed as cleaners or messengers. The issue of a large number of students in a class, for instance, which becomes critical when a teacher wants to show a class of 40-100 how to use a microscope that is, if it is available in the school. The teachers bitterly complained about lack of equipment, that they have in some situations subjected themselves to borrowing from a nearby college of education.

One of the negative consequences of the uncontrolled growth of student population is that laboratories are overstretched. In the past, it used to be one



student per equipment, but today sometimes, 60-100 students continue to struggle for a few and scarce equipment. This leads to the production of half-baked scientists, with the knowledge, skills and values of science still eluding the learners and the developing society. A technologically oriented and aspiring society ought to realize that the laboratory is an indispensable aspect of science teaching. This is where expert scientists who can 'see, think and do' are produced. For an improved performance in the teaching and learning of science, teachers ought to be adequately encouraged to teach by providing them with proper laboratories and science teaching materials to ensure their optimal utilization.

### **Condition of Service of Teachers**

As vital, crucial and strategic as the teaching profession is to national development, the Nigerian senior secondary school teacher just like in most developing countries is very poorly remunerated, operates under very un-conducive work environments, suffers from low self esteem, enjoys poor public image, and commands little or no respect and influence in the society. The traditional respect accorded him in those days (like the village head master) by the pupils, parents and communities have all eroded. All these contribute to low morale and lack of motivation. Motivation is the most important single force for staff retention. It reduces tension, stress, worries, anxieties and frustrations. A well-set motivation program that rewards teachers for work done enhances teacher's classroom performance. Motivation factors operate within the school system and if they are in use, teacher retention is enhanced.

An improved working condition leads to high retention of teachers. For instance, in-service policies and programs, class size, level of autonomy granted to teachers and the amount of administrative support teachers receive appear to play a dominant role on their decision to quit or remain in teaching (Smith & Ingersol 2004). According to Kelly (2004) in Ingersol and Smith (2004.123) undesirable working conditions specifically the behavioral climates of the schools relates to lower retention. Podgursky et al. (2004) in Ingersol and Smith (2004.123) maintained that teacher's salary is positively associated with retention, while earnings are negatively associated with attrition.

Writers abhor the condition of service in the teaching service in Nigeria. As Nwadiani (2003) concluded, virtually all necessary facilities and resources except students are in acute short supply. This is unhealthy as it exposes teachers to a level of stress that could force them to deviate from their normal functioning. Teachers feel their work becoming increasingly stressful and their status falling. Lack of teaching and learning materials, inadequate equipments, poor teaching and learning accommodation, large class sizes, and the governments nonchalant reactions to the teacher's plight adds to low retention.

### **Class Sizes, Teacher-Pupil-Ratios Teaching Hours and Periods**

Class sizes, ratios, teaching hours and periods are indicators used to measure the effects of economic investments in education. Knowledge from these measures enables the planner to analyze the possible implications of reducing or increasing the sizes of the classes in a school. They include:

- Teacher Pupil Ratio/Average number of students per teacher

- Average number of students per class/Hours taught by the teacher
- Average number of teachers per school
- Average number of teachers per class

**The Teacher Pupil Ratio (TPR)** is the average number of full time study students per full time working teacher. This is obtained by dividing the total number of students enrolled in a school by the total number of teachers and is represented as follows:

$$\text{Teachers required (T)} = \frac{P}{R}$$

Where:

- = Number of full time equivalent teachers required
- = Total projected number of pupils
- = Teacher pupil ratio/Average number of pupils per class

TPR provides an overall view of the staff need of a school to enable the planner to decide whether to employ new staff or not.

**Average Number of Students per Class (ANSC)** refers to the total number of students in the same teaching group at a given time. It is calculated ordinarily by dividing the total student enrolment with the number of classes in the school. Sometimes if the average number of hours per week received per class is known, it is divided by the average number of hours per week taught by teachers to get the average audience; that is, the number of students one teacher meets in a period. Using the standard weekly period for a teacher, the full-time equivalent for a teacher is derived by dividing the total weekly period for all the teachers in the school with the standard weekly period. The

standard weekly period varies from between 24 to 27 periods per week. In Delta and Imo states, it is 24 periods per week.

The average number of students per class is then calculated using this formula:

Teachers required ( =

Where:

- Number of full-time equivalent teachers required
- Total projected number of students
- Average audience per class
- Average number of weekly hours per full-time teacher
- Number of hours received by students

Average student per class describes the capacity utilization of the classroom by the teacher. It may not be a very realistic measure especially in situations where the citing of schools has political undertones.

**Average Number of Teachers per School (ANTS)** is determined by dividing the total number of teachers in a local government area, state or nation by the total number of schools in these areas, using the following formula;

$$\text{Average Number of Teachers per School} = \frac{NT}{NS}$$

Where:

- $NT$  = Number of teachers
- $NS$  = Number of Schools

This ratio gives at a glance the average number of teachers as required during the period under consideration. For planning purposes, care should be taken about some related factors. The number of teachers varies from one institution to another, for instance, schools in urban areas tend to attract more teachers, and some schools are more comprehensive in terms of what they offer.

**Average Number of Teachers per Class (ANTC)** is obtained by dividing the total number of teachers in a school with the total number of classrooms, as illustrated by this formula:

$$\text{Average number of teachers per class} = \frac{NT}{NC}$$

Where:

$$\begin{array}{l} NT \\ NC \end{array} = \begin{array}{l} \text{Total number of teachers} \\ \text{Total number of classrooms} \end{array}$$

This ratio provides information on the adequacy of classrooms and facilities that can enable the planner to introduce a system of education that is ideal for specific situations. For instance, Ovwigho (2004) reported that the number of teachers per class were so high in Imo state in the 1985/1986 academic session, and suggested that in such a situation, the authority may consider the possibility of increasing the number of schools or classrooms. In Delta State in the late nineties for instance, morning and afternoon schools were introduced to deal with a similar situation. In all, as Ovwigho (2004.306) expounded:

Computation of averages/*ratios* for an educational system furnishes the planner and administrator with a lot of information with which to analyze the educational system and make appropriate decisions. It is however pertinent to note that in doing so most of the data collected have to be considered together. Moreover, it is highly recommended that the planner and administrator should carefully consider the prevailing circumstances under which his plans are made and implemented.

One of the key causes of teacher shortage is the overall shortfall in relation to the maintenance of the prescribed ratios. Ratios of 40:1 (Bagauda, 1980; WAEC, 1999), 25:1 (International Council of Education and Technology ICET), 50:1, and 20:1, 15:1, higher, or lower are common characteristics of

schools in different parts of the world. Researches in Delta and Imo States indicate that these ratios have overshoot the norms as teachers are compelled to teach between 60-200 students at a time. The ratios however vary between senatorial districts, between urban, sub-urban and rural locations.

Class sizes affect the process of teaching and learning. Research studies conclude that teacher-student interaction is enhanced in smaller class sizes (Achilles, 1999). Large class sizes increase teachers workload, creates crowded classrooms, high level of indiscipline and inhibits teachers routine teaching practices, including difficulty in assessing class work and assignments (Egumu, 2009). Abudullah, (2000, in Egumu, 2009 .27) identifies large class size as a factor that militates against the effective implementation of the science curriculum. From a personal observation, some science teachers teach up to 30 to 50 periods a week in the sciences. This is why some complain that they cannot regularly give individual attention, nor give and mark assignments. However knowledge of class sizes and ratios enable planners to analyze the possible implications of increasing or reducing class sizes and ratios.

### **Quality, Qualification and Mix of Teachers**

Qualified teachers are those that meet various licensure and certification requirements. Quality teachers are those who positively influence students learning. It is important to improve the quality of teachers by ensuring that all new teachers participate in quality induction and mentoring programs and by providing professional development that supports and sustain their growth.

Teachers are expected to participate not only in teaching, but also in the production of technological innovations. The Baguada Seminar (1998) recommended that teachers should be trained and exposed to the latest developments in their professional field of competence. The quality of teachers in a school affects its efficiency. Effective teachers are less likely to leave teaching than ineffective teachers (Salinbanez 2006, in Alvarado 2006.14) Teachers with a higher measured ability are suggested to have a higher probability of leaving, with their availability rate varying by their level of education and qualifications (Russel, Pedgiovsky, 2004 in Alvarado 2006.17). More qualified teachers were found to have a higher rate of leaving, and science teachers were less retained. This is because they are easily absorbed in the labour market. When age and experience are taken into consideration, older and more experienced teachers tended to stay on the job. Female teachers, it was further revealed stayed longer in their teachings jobs, and were found more committed, Alvarado (2006).

Emergencies also lead to low retention of the teaching force through death, natural disasters such as earthquakes and floods, forced migration, disruption of school program, strikes, nonpayment of salaries, armed and tribal conflicts, like in Warri in the late nineties. These impose additional burden on the educational system including the provision of special in-service training for teachers and the development of re-employment policies for returnee teachers, as was the case after the Nigerian Civil war.

### **Management and Supervision of Teachers**

The aim of staff personnel administration is to ensure a proper day to day management and supervision of staff, to make sure that the school attracts, retains and develops the kind of personnel required to effectively achieve the desired goals of the school. Management is human resource control to attain educational goals.

Supervision is a service activity that exists to help teachers do their jobs. The aim of supervision is to oversee the activities of teachers and other educational workers in the school and to ensure that they conform to existing rules and regulations. Supervision involves a constant and continuous monitoring of the performance of the school staff, noting their merits and demerits, and using befitting and amicable techniques to ameliorate their flaws, while at same time encouraging their merits, thereby increasing the school standard and achieving set goals. Supervision can be instructional when it is learner centered but personnel oriented when the purpose is to sensitize, mobilize, motivate and retain staff. It is the duty of the supervisor to train and counsel especially newly deployed teachers, to assist them to integrate the theoretical training acquired in school with the practical requirements of the job. This is most important in the teaching of science subjects. Inadequate supervision and inspection in school has made many science teachers that are academically deficient and indolent not to be discovered and may be replaced. Classroom observation of teachers, by their peers and supervisors, forms part of a development-oriented culture that schools seek to instill, and part of the teacher's on the-job training and



sharing. The school attaches teachers to heads of subjects as subject supervisors, to assist them in the release of their inherent potentials and to achieve desired changes in learners.

The Inspectorate arm of the Ministry of Education occasionally visits schools for critical supervision and evaluation of the school as a place of learning. This helps to have a proper analysis of the quality of learning and the stability of the staff. It is therefore the duty of a school manager to efficiently run the school. This calls for the ability to attract, develop, motivate, utilize and retain staff.

## **Constraints on the Need and Availability of Teachers**

### **Government Policies**

The purpose of policy efforts is to meet the need for teachers. They focus on availability issues such as teacher preparation, entry requirements, salaries and conditions of service. When policies are implemented on ad-hoc basis, or when policy makers rely on studies that provide contradictory data about teacher need and availability, conflicting results becomes the outcome and these sometimes hamper the policy maker's attempts to develop sound strategies and standards (Cooper et al, 2003 in UNESCO, 2006) Policy summersault seems to be the bane in the education sector, for instance, reform after reform, and change of curriculum takes place within very short intervals, the 6.6.4, 6.3.3.4, 9.3.4, and recently a new curriculum for senior secondary schools. This often translates into a culture of lack of proper implementation of the respective policies.

Policies needed include those that can initiate steps in developing teachers as professionals. These focus on helping teachers to develop basic instructional competence, providing opportunities to develop reflective skills, and make decisions to change the classroom learning environments followed by increasing autonomy and accountability (Feldman, 2008 in Sterhem et.al 2008.31). Educators sometimes wonder whether teachers actually need lengthy periods of training, whether their tasks can be performed by less trained and paid personnel, and whether the cost of employing them should also be taken into account. In all these, the teaching profession has to remain an attractive choice in order to recruit teachers and retain them. The low wages and poor working conditions are strategic areas in need of improvement. Teachers need possibilities with good working conditions and a competitive salary that makes it possible to perform well in their chosen careers. Teaching policies should therefore include possibilities for an upgrading closely associated with the teacher's day to day activities as it is done in other professions.

Furthermore, policy analysis does not consider the distribution of teachers by subject areas, a factor particularly significant in senior secondary schools. Government should show commitment at policy level aimed at promoting the teaching of science subjects. The observation is that the policy statement in this area is very general. It has to be more specific, for instance, recruiting science teachers on a 60:40 percentage ratio in line with the policy on admission into tertiary institutions. The aim should be to have an aggregate

balance of supply and demand for teachers, and remain consistent with market imbalances in special fields of learning. Science teaching otherwise remains handicapped.

Policies fail to analyze the distribution of teachers by localities, such as, urban, sub-urban and rural (Shannon 1979 in Akinwumiji 1995.81) Teachers in rural areas may need specialized training and induction, so policy guidelines should provide adequate training and support before appointing such teachers (Craig et al., 1988, in UNESCO, 2004.110).

Policies also do not make distinctions about sexes (OECD, 2005). This is very important in situations where a policy target is to increase female enrollment like in our country Nigeria, necessitating a greater supply of female teachers. Policies do not allocate teachers by number, discipline and mix, nor do they account for shifts in demand from the primary level of education to the secondary, especially for special fields of learning like the sciences. This is a major cause of shortage of science teachers in senior secondary schools.

There is a policy that compel teacher trainees to sign bonds in some nations, and when they derail in payment, their guarantors are held responsible, with the defaulting teachers blacklisted, banned from further employments, and forced to pay back the loans (Kwansah, 2002). Such, if enforced could help to curb the incidence of high turnover of science teachers.

Government, (Goliber, 2000 in OECD 2005.27) should align research policies with financial resources, and be strategic and prudent in the use of existing financial and human resource, to help ensure that highly qualified and

certified teachers teach learners. When policy efforts do not aim at matching school system's need with teacher availability, and when such policies are just on paper with implementations not followed up, the whole system becomes constrained.

### **Labour Market Characteristics/Conditions**

The labour market is a social institution that coordinates transactions with greater or lesser success and efficiency (Scott, 1994 in Osterman et.al.2006.198). The conceptual background for this study derives from the economic law of demand and supply. Educational activities are economic activities as they are rendered for the good of the public. In the economics of education, elasticity have been used to the extent to which an increase in income is associated with a change in educational expenditure, for instance, the Udorji Award. Education as a social service seeks to explain how the provision of its programmes and training as a reliable tool for the development of human resource, and how investment in education can be pursued within the context of diverse constraint to ensure that the set goals are realized.

Education as it produces its service is concerned with the cost. The special character inherent in education, such as, difficulty in defining its product, in identifying its transaction, its character as a public service amongst others creates problems in defining its cost (Agabi, 2005). An absolute balance in the need and availability of teachers may be difficult to attain as any number of factors, for instance, changes in the economy, personal circumstances, local needs, government policies can rapidly cause the scales

to move in any direction. It is therefore all about how political social and economic forces act together to determine what happens to a people at work and this is a huge constraint.

### **Societal Attitudes**

The social-cultural conditions, values, norms and habits prevalent in a society provide motivation or lack of it to join and to continue attending school until completion. Besides, the job opportunities for various types and levels of education serve as a great incentive for success in school. Educational aspiration levels in some societies remain traditionally low for certain professions, for girls, and for rural children. It is the observation that teaching is not high in public perception as other professions like law, medicine, engineering, architecture. In many parts of the developing nations, the labouring class seems to enjoy greater security than the teacher. Shortages in availability are attributed to discouragements and frustrations resulting from low salaries in relation to those offered in alternative professions, low prestige and low social status in the society (Adeyemi, 2011)

Status is important to attract and retain teachers as well as the amount of support provided by the local community, and the society. Low status links with low salaries, poor work conditions, fewer opportunities for advancement, and fewer rewards. An OECD (2004) study committee found that some stakeholders believe that teaching holds a low status within the broader community. As societies have become wealthier, with educational qualifications increasing, and employment outlook and opportunities

expanding, teaching's appeal as a path to upward social mobility and job security does seem to have diminished. Widespread concern about the many difficulties faced by many schools, fuelled by the frequent strikes and negative media reports have also helped to damage teaching's appeal. These are huge constraint as they make it difficult for the different recruiting authorities to recruit the caliber of teachers needed to move the education industry forward.

### **Institutional Practices**

Institutional practices broadly determine all the rules that govern a discipline's behavior. Teaching as an institution is an important issue that is always current in educational debates. Is teaching a profession or an occupation? Ambiguity and arguments trail this decision. According to Prof. Imogene (1975), an occupation is the work people do for remuneration, and a profession is an organized group performing a highly specialized function on a service rather than on a material bases. This involves a network of formal relationship that creates its own sub-cultural adjustments regarded as a precondition for career success. All professions are thereby occupations, but not all occupations are professions.

Professionalism begins with instructional competence, commitment, and extends into a number of related issues dealing with the degree of decision-making, autonomy and accountability. The Nigerian Manpower Board (1964), in a study of the Nigerian Professional Manpower, listed disciplines like architecture, town planning, accountancy, medicine, engineering, economics,

statistics, mathematics, auditing, and excluded teaching. Teaching is normally ranked above manual labour and unskilled jobs but below most managerial professions and management jobs. This is one of the reasons university graduate teachers leave teaching for other jobs, and why teaching in Nigeria is regarded more of an occupation. It is also of importance to note, that teaching may not have been the primary aspiration of those who became teachers, as their decision to take up teaching could have been a question of restricted alternatives. If lack of opportunity to get into other professions is driving people into teaching, then one cannot expect that kind of commitment that is basic for the development of professionalism. If those who assume teaching responsibilities are there on temporary basis, or to support themselves while in transit to choice professions, then this is a major constraint to teacher supply and retention, which calls for quick and serious intervention.

The realization of the importance of professionalizing teaching has compelled the federal government to set in motion the machinery, Teachers Registration Council (TRC) to recognize teaching legally and publicly as a profession. This body is to accredit, certify, register, regulate and develop teachers. Okafor (2011) reports, that many teachers do not patronize the council, as the council blankets itself from reaching out to its target audience. Teachers remain skeptical, because they want the council to publicize the number of teachers in their data bank, the council's efforts to encourage registration, and how robust the funding. This is a huge constraint, as there

has been no regulatory examination taken, and many teachers that paid the regulatory fee have neither received their receipts nor their certificates.

### **Appraisal of the Reviewed Literature**

It is clear from relevant issues appraised, that the need and availability policies have direct impact on the decisions of teachers or prospective teachers to remain or to enter into teaching. The determinants of teacher need are demography, influence of public policies on class size targets, teaching load norms, budgetary constraints, and the labour market characteristics for teachers. Each of these determinant factors has a significant effect on the nature, size of the teacher's labour market at any given place and in any given year.

The reviewed literature identified factors that relate to teacher turnover and attrition for instance, opportunity costs that outweigh the rewards gained from teaching, policies that focus on rewards offered by teaching, factors that determine why teachers may leave teaching, for instance, retirement, leave of absence, change of environment, ill health and death. Others include policies that promote recruitment by focusing on mechanisms to adjust the attractiveness of teaching relative to other occupations.

There were variations of opinions on the teaching, learning and practicing of science, on enrolment, and on science student's performance. Comments on science teachers, science classrooms, laboratories, and science curriculum content, are that science classrooms should be active places for relevant discovery and interesting science teachings. Brown (2009),



a renowned expert in mathematics and science shares the view that in countries like China and Japan, children are further advanced in mathematics and science, although the curriculum content is narrower, and does not emphasize problem solving. This is an indication that the size of the curriculum may have some effect on how much science the students can learn.

The review also emphasized that the science teacher should be one that knows his subjects, the science curriculum, instructional approaches, with practical knowledge of running a laboratory, and lab safety. He should know the students, and how they learn. The curriculum content should draw on student's experiences and ideas, anticipating and identifying student's errors, addressing student's misconceptions, and assessing their understanding.

There is a continued decline in science student's enrolment with its consequence on the continued training of future science teachers. Indications from the review also point to a downward trend in science student's performance in tests, internal and external science examinations. Developed countries, have facilities, and fund, so a downward trend in performance should not be expected, but in the developing countries the problem as identified is as a result of lack of adequate provision and management of fund, to provide and maintain facilities, to train, recruit, reward and retain a quality teaching staff, and to provide a relevant and adequate curriculum.

The focus of these earlier studies have been on the shortfalls of the teaching of science subjects, teacher retention practices, science curriculum

content, and declining science student enrolment. However, there appears to be no consensus in the reports of scholars as to the need and availability of science teachers. Shortages and surpluses were identified based on some locations and subject areas, whereas in some studies they were found within and between locations. The review also showed a deficiency in the availability of science teachers in senior secondary schools. This study the researcher believes would reveal the present need and availability of science teachers, whether there are shortages or surpluses, so that the immediate beneficiaries of education in Delta and Imo states are informed of the situation and of its resultant effect on the achievement of the goals of science education.

## CHAPTER THREE

### RESEARCH METHOD AND PROCEDURE

This chapter describes the research method and procedure of the study under the following subheadings:

- Research Design.
- Population of Study.
- Sample and Sampling Techniques.
- Data Collection.
- Research Instrument
- Validity
- Reliability
- Method of Data Analysis.

#### **Research Design**

This study adopted the ex-post facto design. The choice of this analytic design was informed by the fact that it was an after the fact study (Gay 1996). The data were retrieved from appropriate school records, and from the relevant Ministries of Education in the states of study and did not involve any manipulation of variables. It was descriptive in the sense that it was a form of planned collection of data from a large population for the purpose of comparatively analyzing the relationship between variables.. .

#### **Population of Study**

The population of this study consisted of the six hundred and seventy five public senior secondary schools in Delta and Imo states of Nigeria. As at the 2010/2011 academic year, the states had six hundred and seventy five (675) public senior secondary schools, thirty four (34) in Delta and thirty one (31) in Imo. These formed the target population for the study.

### **Sample and Sampling Techniques**

The study employed the multi-stage sampling technique. Multi-stage sampling is a simple sampling procedure where the sampling is carried out in stages using smaller sampling unit at each stage. First, schools were listed into senatorial districts and randomly selected from each of these collection districts. Second, the schools in the senatorial districts were then divided into local government blocks. Third, schools were listed into selected blocks and sixty eight (68) of these schools (10 % of the parent population, Roscow, 1977), were randomly selected. Tables 2 and 3 show details of the number of schools sampled.

### **Table 2: Sampled Schools in Zonal Districts and Local Government Areas**

S/N	State	Zonal Districts	Local Government Areas	Population of Schools	(10%) Sample of Schools.
01	Delta	Delta North	Aniocha North	17	2
02			Aniocha South	17	2
03			Ika North East	20	2
04			Ika South	18	2
05			Ndokwa East	15	1
06			Ndokwa West	18	2
07			Oshimili North	9	1
08			Oshimili South	12	1
09			Ukwani	11	1
10			Delta Central	Ethiope east	21
11		Ethiope West		11	1
12		Okpe		9	1
13		Sapele		21	2
14		Udu		5	1
15		Ughelli North		34	3
16		Ughelli South		15	1
17		Uvwie		15	2
18		Delta South	Bomadi	8	1
19			Burutu	13	1
20			Isoko North	16	2
21			Isoko South	18	2
22			Patani	6	1
23			Warri North	6	1
24			Warri South	20	2
25		Warri South West	4	1	
26	Okigwe	Ehime Mbano	20	2	
27		Ihite-Uboma	11	1	
28		Isiala-Mbano	18	2	
29		Obowu	9	1	
30		Okigwe Municipal	12	1	
31		Onuimo	5	1	
32		Orlu	Ideato North	9	1
33	Ideato South		9	1	
34	Isu		6	1	
35	Nkwere		6	1	
36	Nwangele		6	1	
37	Njaba		6	1	
38	Orlu Munucipal		19	2	
39	Orsu		7	1	
40	Oru East		8	1	

41			Oru West	8	1
42		<b>Owerri</b>	Aboh-Mbaise	12	1
43			Ahiazu-Mbaise	13	1
44			Ezinihite	15	1
45			Ikeduru	18	2
46			Mbaitolu	20	2
47			Ngor Okpalla	13	1
48			Oguta	10	1
49			Ohaji-Egbema	11	1
50			Owerri Municipal	9	1
51			Owerri North	18	2
52			Owerri West	15	1
<b>Total</b>				<b>675</b>	<b>68</b>

**Source:** *Statistics Division, Ministry of Education, Asaba, and Owerri (2012)*

**Table 3: Science Teachers in Selected Subject Areas in Senatorial Districts.**

Senatorial Districts	State	Science Teachers in Selected Subject Areas							
		Maths.	F/Math.	Physics	Chem.	Biol.	A/Sc.	H/E.	Total
Delta N.	Delta	19	1	8	14	18	14	8	<b>84</b>
Delta C.		18	1	9	15	13	13	6	<b>74</b>
Delta S.		17	2	11	13	15	16	9	<b>82</b>
<b>Total</b>		54	4	28	42	46	43	23	<b>240</b>
Okigwe	Imo	10	2	4	4	7	5	4	<b>37</b>
Orlu		10	3	3	4	6	7	4	<b>36</b>
Owerri		33	8	10	13	20	18	12	<b>114</b>
<b>Total</b>		53	13	17	21	33	29	20	<b>187</b>
<b>Grand Total</b>		<b>107</b>	<b>17</b>	<b>47</b>	<b>63</b>	<b>79</b>	<b>73</b>	<b>43</b>	<b>427</b>

**Source:** *Fieldwork 2012*

### Research Instruments

Two instruments were used to collect data for this study:

- Principals Checklist on the Need and Availability of Science Teachers (PCNAST)

- The Senior Secondary School Science Teachers Checklist (SSSSTC)

The PCNAST was adapted from the Science Teachers' Association of Nigeria (STAN) Conference Questionnaire (1986, reviewed 2006). Section (1) of the checklist sought demographic information such as name of school, location, type, size and level of study (Items 1-5). Personal information on the principals like age, qualifications, years of experience, marital status, length of stay in the school were collected from responses to Items 6 to 12. Section (2) (Items 13 to 17) collected information on the science subjects taught in the schools, and the reasons for the ones not taught, information on the supply and retention of science teachers, their numbers in selected science subject areas, the number of science teachers that left the schools within the study period, their length of stay in the schools, and their reasons for leaving.

The SSSSTC was also adopted from the STAN Conference Questionnaire. Section (1) was designed to assess background information on school location, size and type (Items 1 to 4), personal information on the science teachers such as, qualification, age, sex, marital status, length of stay in school, experience, class taught, number of periods per week, mode of deployment and the name of the institution of preparation or training (Items 5 to 13). Section (2) contained five clusters of items of constraints to the demand for, supply and retention of science teachers. The first cluster sought information on the constraints on the demand for, and supply of science teachers from the Government (Item (1, a-m)). The second, third, fourth and fifth clusters considered constraints on the retention of science teachers from

the Students (2, a-g), from Teachers (3, a-h), from the Society (4, a-g) and from Curriculum and Examinations (5, a-d).

### **Validity of the Research Instrument**

The Principals' Checklist on the Demand for, Supply and Retention of Science Teachers (PCNAST) and the Senior Secondary School Science Teachers Checklist (SSSSTC) were adapted from the original instrument which have been widely and successfully used by STAN (1986, reviewed 2006) in the gathering of data on the supply and retention of teachers. This notwithstanding, the content and face validity of the instruments were modified and established by the project supervisors and other experts in the Department of Educational Administration and Policy studies. Their comments, modifications and professional suggestions guided the formation of the final research instrument. For instance, one of the supervisors suggested to the researcher to modify item 16 (SSSSTC) so that the table would provide the required information on the science teachers that resigned, and their reasons for resigning within the period of study. Another supervisor advised that science teachers with doctorate degrees (Ph.D.) should be included in the categorization of science teachers as some Principals and teachers in the senior secondary schools these days hold such degrees.

### **Reliability of the Research Instrument**

The reliability of an instrument indicates how consistently it gives the same or nearly the same result on subsequent applications. This study did not



involve the manipulative examination of past records and therefore excluded the need to administer the checklists a second time to determine the reliability.

### **Method of Data Collection**

The research instrument was distributed personally by the researcher and two colleagues who were properly briefed on the importance of administering the checklist to the principals and science teachers for the proper and correct information to be gathered. This was also to ensure optimal retrieval of the instrument. Data was collected through on the spot administration of the two checklists. The school records used were:

- **The Log book;** which showed the period that a science teacher worked in the school.
- **The Time Table;** showed the teaching work load and the periods allocated to the science subjects on daily basis.
- **The Class Attendance Register;** for the students enrolment in the particular science subjects and classrooms.
- **Records of Relevant School Statistics;** from the Statistics Divisions of the Ministries of Education in Delta and Imo States.

### **Method of Data Analysis**

The data collected to answer research questions 1, 2, 3, 4, 5, 7, and 10 of the PCNAST and section (2) of the SSSSTC were analyzed using simple percentages, averages and ratios. Tables and bar charts were used to illustrate the level of the need and availability of science teachers in the urban, suburban and rural areas, in Senatorial Districts and across the years of study

in Delta and Imo states. From the responses to the questions in section (2) of the SSSSTC, research question 6, on the constraints on the need and availability of science teachers was investigated. The responses were rank ordered. The aggregate rankings are indicated in Tables 17, 18, 19, 20, and 21. Research question eight on class sizes and teacher pupil ratio was analyzed using their relative indicators as follows:

**Average Number of Students per Class (ANSC):**

$$\text{Teachers required ( } T =$$

Where:

- Number of full-time equivalent teachers required
- Total projected number of students
- Average audience per class
- Average number of weekly hours per full-time teacher
- Number of hours received by students

**Average Number of Teachers per School (ANTS):**

$$\text{Average Number of Teachers per School} = \frac{NT}{NS}$$

Where:

- Number of teachers
- Number of Schools

**Average Number of Teachers per Class (ANTC):**

$$\text{Average number of teachers per class} = \frac{NT}{NC}$$

Where:

- = Total number of teachers
- = Total number of classrooms

**Average number of pupils per teacher/Teacher Pupil Ratio (TPR):**

$$\text{Teachers required ( } T = \frac{P}{R}$$

Where:

- = Number of full time equivalent teachers required
- = Total projected number of pupils

= Teacher pupil ratio/Average number of pupils per class

The sources of the science teachers refer to institutions where they are trained and developed. This is part of the teacher's quality, profile and package. Research question nine was investigated using the responses to item 13, on the SSSSTC. Altogether, 413 science teachers out of the 419 used for the study answered this question. The result is presented in Table 28, page 166.

## CHAPTER FOUR

### PRESENTATION OF RESULTS AND DISCUSSION

This chapter is primarily concerned with the presentation, analysis of the data collected as well as the interpretation and discussion of the results.

**Research Question One: What is the need for science teachers in the public senior secondary schools in the urban, suburban and rural areas, from 2006/07 to 2010/11 academic years in Delta and Imo States?**

To verify the need and availability of science teachers in the senior secondary schools in Delta and Imo states, data on the number of science teachers supplied were collated to determine the teacher availability while the corresponding student enrolment was used to calculate the need, using the government benchmark of 40 students per teacher. The results are presented in Tables 4, 5, 6, 7, 8 and Figures 3, and 4.

**Table 4: Need for Science Teachers in Urban, Sub-urban and Rural Locations in Delta and Imo States from 2006/07 to 2010/2011 Academic Years**

Location	Academic Years											
	2006/2007		2007/2008		2008/2009		2009/2010		2010/2011		Total	
	E	N	E	N	E	N	E	N	E	N	E	N
Urban	8,687	217	8,076	202	7,793	195	7,761	194	9,008	226	46,317	1,158
S/Urb.	9,302	233	9,630	241	9,128	228	9,443	236	9,242	231	41,975	1,049
Rural	9,731	243	3 369	84	3,426	86	3,031	76	3,113	78	16,946	424
<b>Total</b>	<b>27,720</b>	<b>693</b>	<b>21,075</b>	<b>527</b>	<b>18,234</b>	<b>509</b>	<b>20,022</b>	<b>506</b>	<b>21,363</b>	<b>535</b>	<b>105,238</b>	<b>2,631</b>

**Key: E- Enrolment, N- Need**

**Source: Fieldwork 2012**

The data in Table 4 shows the total enrolment data and the total need for science teachers in the public senior secondary school in the urban, suburban and rural areas from 2006/07 to 2010/11 academic years. The table revealed that the total enrolment was 105,238 and the total need was 2,631. The total enrolment in Delta was 63,450 and in Imo, 41,788; the total need in Delta was 1,586 whereas Imo had 1,045.

**Table 5: Need for Science Teachers in the Urban, Sub-urban and Rural Areas of Delta and Imo States**

Location	Need for Science Teachers					
	Delta		Imo		Total	
	Enrolment	Need	Enrolment	Need	Enrolment	Need
Urban	25,643	641	20,674	517	46,317	1,158
Suburban	31,688	792	10,287	257	41,975	1,049
Rural	6,119	153	10,827	271	16,946	424
<b>Total</b>	<b>63,450</b>	<b>1,586</b>	<b>41,788</b>	<b>1,045</b>	<b>105,238</b>	<b>2,631</b>

**Source: Fieldwork 2012**

Table 5 shows the need, calculated by dividing the enrolment with the national approved teacher-pupil-ratio (TPR) benchmark of forty pupils per teacher, in the urban, suburban and rural areas. The total enrolment in the urban was 46,317, Delta urban 25,613 and Imo urban 20,674. In the suburban the enrolment was 41,975, Delta urban had 31,688 and Imo urban 10,287, and in the rural area the

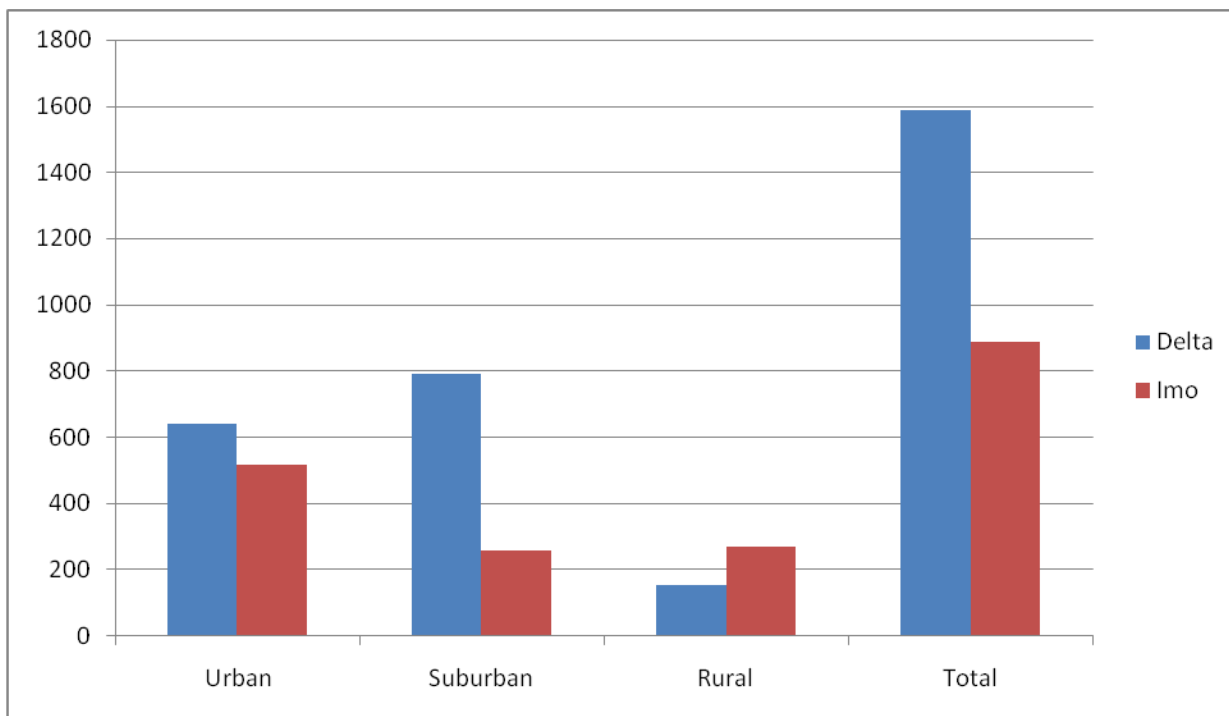
enrolment was 16,946, Delta had 6,119 whereas Imo had 10,827 in their rural areas. The total need for science teachers for the urban was 1,586; 641 in Delta and 517 in Imo. In the suburban, it was 1,049; 792 in Delta and 257 in Imo, whereas in the rural area the total need was 424; 153 in Delta and 271 in Imo. Table 6 shows the Need in the urban, suburban and rural areas.

**Table 6: Summary of the Need for Science Teachers in the Urban, Suburban and Rural Locations of Delta and Imo.**

Location	Summary of the Need for Science Teachers		
	Delta	Imo	Total
	Need	Need	Need
Urban	641	517	1,158
Suburban	792	257	1,049
Rural	153	271	422
<b>Total</b>	<b>1,586</b>	<b>1,045</b>	<b>2,631</b>

**Source: Fieldwork 2012**

Table 6 showed the summary of the need for science teachers in Delta and Imo States. Figure 3 further illustrates the result.



**Figure 3: Summary of the Need for Science Teachers in the Urban, Suburban and Rural Areas of Delta and Imo States**

Table 7 shows the science students enrolment and the need for science teachers from 2006/07 to 2010/11 academic years.

**Table 7: Need for Science Teachers from 2006/2007 to 2010/2011 Academic Years in Delta and Imo States**

Academic Years	Need for Science Teachers		
	Delta	Imo	Total

	<b>Enrolment</b>	<b>Need</b>	<b>Enrolment</b>	<b>Need</b>	<b>Enrolment</b>	<b>Need</b>
<b>2006/2007</b>	12,225	305	9,412	234	21,637	539
<b>2007/2008</b>	12,403	309	8,672	218	21,075	527
<b>2008/2009</b>	12,713	330	7,421	185	20,134	515
<b>2009/2010</b>	13,120	315	7,996	199	20,123	514
<b>2010/2011</b>	13,082	327	8,287	209	21,369	536
<b>Total</b>	<b>63,450</b>	<b>1,586</b>	<b>41,788</b>	<b>1,045</b>	<b>105,238</b>	<b>2,631</b>

**Source: Fieldwork 2012.**

The result in Table 7 indicated the total science student enrolment and science teacher need from the 2006/07 to the 2010/11 academic years. In 2006/07, the total enrolment was 21,637; 12,225 in Delta and 9,412 in Imo, and the need was 539; 305 in Delta and 234 in Imo. In 2007/08, the enrolment was 21,075; 12,403 in Delta and 8,672 in Imo, and the need was 527; 309 in Delta whereas Imo had 218. In 2008/09, enrolment was 20134; 12,713 in Delta and 7,421 in Imo, and the need was 515; 330 in Delta and 185 in Imo. In 2009/10, enrolment was 20,123; 13,120 in Delta and 7,996 in Imo, and the need was 514; 327 in Delta and 199 in Imo. In 2010/11, the enrolment was 21,369; 13082 in Delta and 8287 in Imo, and the need was 536; 327 in Delta with Imo 209. Table 8 shows the summary of the need between 2006/07 to 2010/11 academic years.

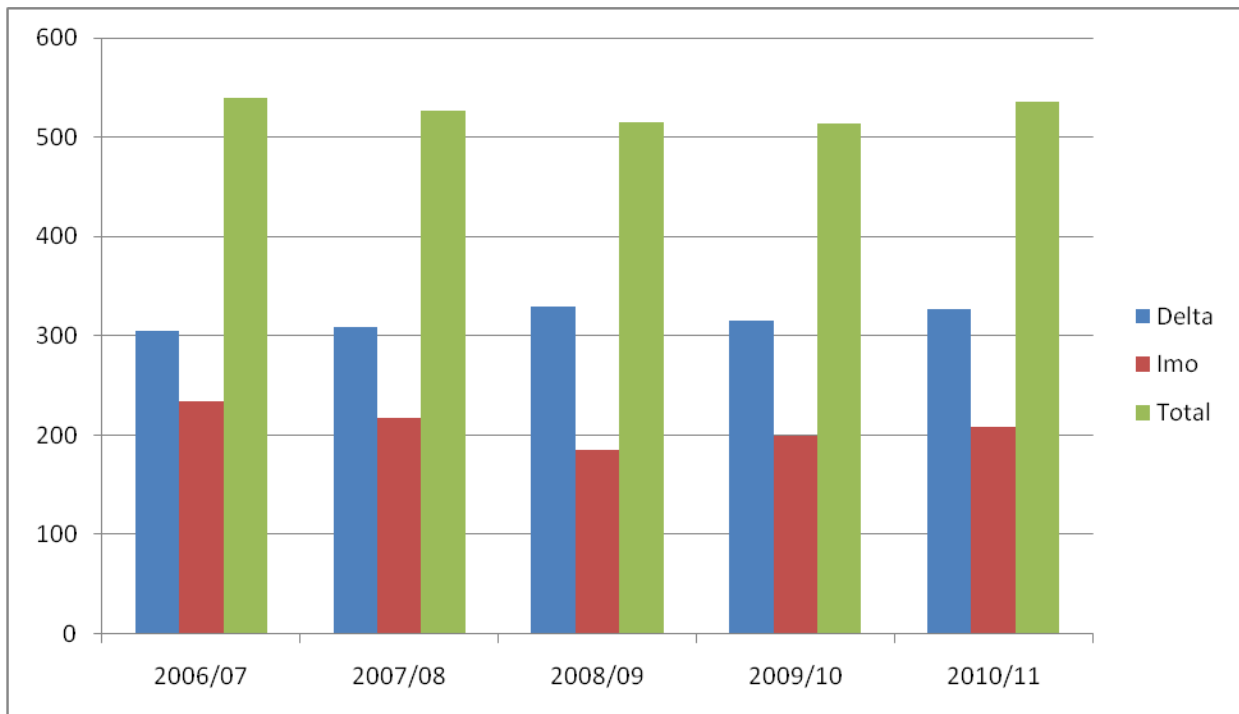
**Table 8: Summary of the Need for Science Teachers from 2006/07 to 2010/11 Academic Years in Delta and Imo**



Academic Years	Summary of the Need for Science Teachers		
	Delta	Imo	Total
	Need	Need	Need
2006-2007	305	234	539
2007-2008	309	218	527
2008-2009	330	185	515
2009-2010	315	199	514
2010-1011	327	209	536
<b>Total</b>	<b>1,586</b>	<b>1,045</b>	<b>2,631</b>

**Source: Fieldwork 2012**

The analysis of the need for science teachers as presented in Table 8 showed that the need for science teachers for the period of study was 2,631. The highest need for 330 science teachers in Delta was in 2006/09, whereas in Imo the highest was in 2006/07. The lowest was 305 in 2006/07 in Delta, while in Imo it was 185 in 2008/09 academic year.. Figure 4 further shows the result.



**Figure 4: Summary of the Need for Science Teachers from 2006/07 to 2010/11 Academic Years in Delta and Imo States**

The analysis of the need for science teachers as presented in Tables 4, 5, 6, 7 and Figures 3 and 4 showed a total need of 2,631, 1585 in Delta and 1,045 in Imo. The urban area had total need for need for 1,586; 641 in Delta and 517 in Imo. The suburban had 1,049; 792 in Delta and 257 in Imo, whereas the rural had 424; 153 in Delta, with Imo 271.. Considering the years of study, the highest need 330 was in Delta in 2008/09 330 and the lowest 185 was in Imo in the same year.

**Research Question Two: What is the availability of male and female science teachers in the public senior secondary schools in the urban, suburban and rural areas, from 2006/07 to 2010/11 academic years in Delta and Imo states of Nigeria?**

Data on the number of science teachers available and their gender were collated from question 15 and 16 of the principals checklist, and question 8 of the science teachers checklist in the urban, suburban and rural areas between the 2006/2007 to 2010/2011 sessions. The data were analyzed using percentages bar charts, and line graphs. Table 9 shows the result.

**Table 9: Availability of Male and Female Science Teachers in the Urban, Suburban and Rural Locations, from 2006/2007 to 2010/2011 Academic Years.**

Availability of Male and Female Science Teachers																
State	Urban				Suburban				Rural				Total			
	Availability				Availability				Availability				Availability			
	Supply		Retention		Supply		Retention		Supply		Retention		Supply		Retention	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Delta	38	70	38	69	26	48	26	48	18	33	17	33	79	150		
Imo	28	53	28	53	19	35	19	35	13	25	13	25	61	114		
Total	66	123	66	122	45	83	45	83	31	58	30	58	142	264		
Delta	42	69	42	69	26	49	26	49	18	33	18	32	80	151		
Imo	23	52	23	51	20	37	19	37	14	25	13	24	61	114		
Total	65	121	65	120	46	86	45	86	32	58	31	56	141	265		
Delta	39	72	39	71	26	48	25	46	18	33	18	33	82	153		
Imo	29	54	29	54	19	36	19	37	14	25	14	25	62	116		
Total	68	126	68	125	45	84	44	84	32	58	32	58	144	269		
Delta	39	72	39	72	26	46	26	47	18	32	17	32	82	153		
Imo	29	55	29	55	19	37	19	35	14	24	13	24	63	117		
Total	68	127	68	126	45	83	45	82	32	56	30	56	145	268		
Delta	41	77	41	77	26	48	26	48	18	32	18	32	85	159		
Imo	31	58	31	57	20	37	19	37	14	25	13	25	64	119		
Total	72	135	72	134	46	85	45	85	32	57	31	57	149	278		
	339	632	336	626	226	442	225	420	155	288	154	286	721	1,341		

**Key: M- Male, F- Female**  
**Source: Fieldwork 2012**

A summary of Table 9 revealed that out of the 2,062 science teachers available, 721 (35%) were male, while 1,341(65%) were female,. 2,037 science teachers were retained, 715(34%) male and 1,323(66%) female.

Table 10 shows availability in urban, suburban and rural areas in Delta and Imo States.

**Table 10: Availability of Male and Female Science Teachers in the Urban, Suburban and Rural Areas of Delta and Imo States**

Location	Availability of Male and Female Science Teachers									
	Sate	Supply			Retention			Attrition		
		Male	Female		Male	Female		Male	Female	
Urban	Delta	553	193	360	548	191	357	5	4	1
	Imo	418	146	272	414	145	269	4	3	1
	Total	971	339	632	962	336	626	9	7	2
S/urban	Delta	369	129	240	3 65	127	238	3	2	1
	Imo	279	98	181	2 75	96	179	5	2	3
	Total	648	227	421	6 40	215	419	8	5	3
Rural	Delta	252	88	164	2 48	87	161	3	2	1
	Imo	191	67	124	1 87	65	120	5	2	3
	Total	443	155	288	435	154	286	8	4	4
Total		2,062	721	1,341	2,037	715	1,322	25	16	9

**Source Fieldwork 2012**

Table 10 revealed that in the urban, 971 (47%) science teachers were supplied; 553 (26.7%) in Delta and 418 (20.3%) in Imo. Out of this number, 632 (30.7%) were female; 360 (17.5%) in Delta and 272 (13.2%) in Imo, 339 (16.4%) males were supplied; 193 (9.4%) in Delta and 146 (7.1%) in Imo. The suburban had a total supply of 648 (31.2%) science teachers; 369 (17.9%) in Delta and 279 (13.5%) in Imo, 227 (11%) males; 129 (6.3%) in Delta and 98 (4.8%) in Imo and 421(20.4) females; 240 (11.6%) in Delta and 181(8.8%) in

Imo. In the rural area, there were a total of 443 (21.5%) science teachers; 248 (12%) in Delta and 191(9.3%) in Imo, the females were 288(14%); 164 (7.7%) in Delta and 179(8.7%) in Imo.

In the urban, 962(46.6%) science teachers were retained; 548 (26.6%) in Delta and 414(20.1%) in Imo. Of this, 336(16.3%) were male; 191(9.3%) in Delta and 145 (7%) in Imo, 626 (30.5%) were females; 357(17.3%) in Delta and 269 (13.1%) in Imo. The suburban had 640 (31%) science teachers, 365 (17.7%) in Delta; 127(6.2%) male and 238 (11.5%) female, and in Imo 275 (13.3%); 96(4.6%) male and 179 (8.7%) female. In the rural area, 435 (21.1%) science teachers were retained; 298 (14.5%) in Delta and 187(9.1%) in Imo, 153 (7.4%) were male; 87(4.2%) in Delta and 65 (3.2%) in Imo, whereas 286 (13.9%) were female; 181(8.8%) in Delta and 170 (8.2%) in Imo.

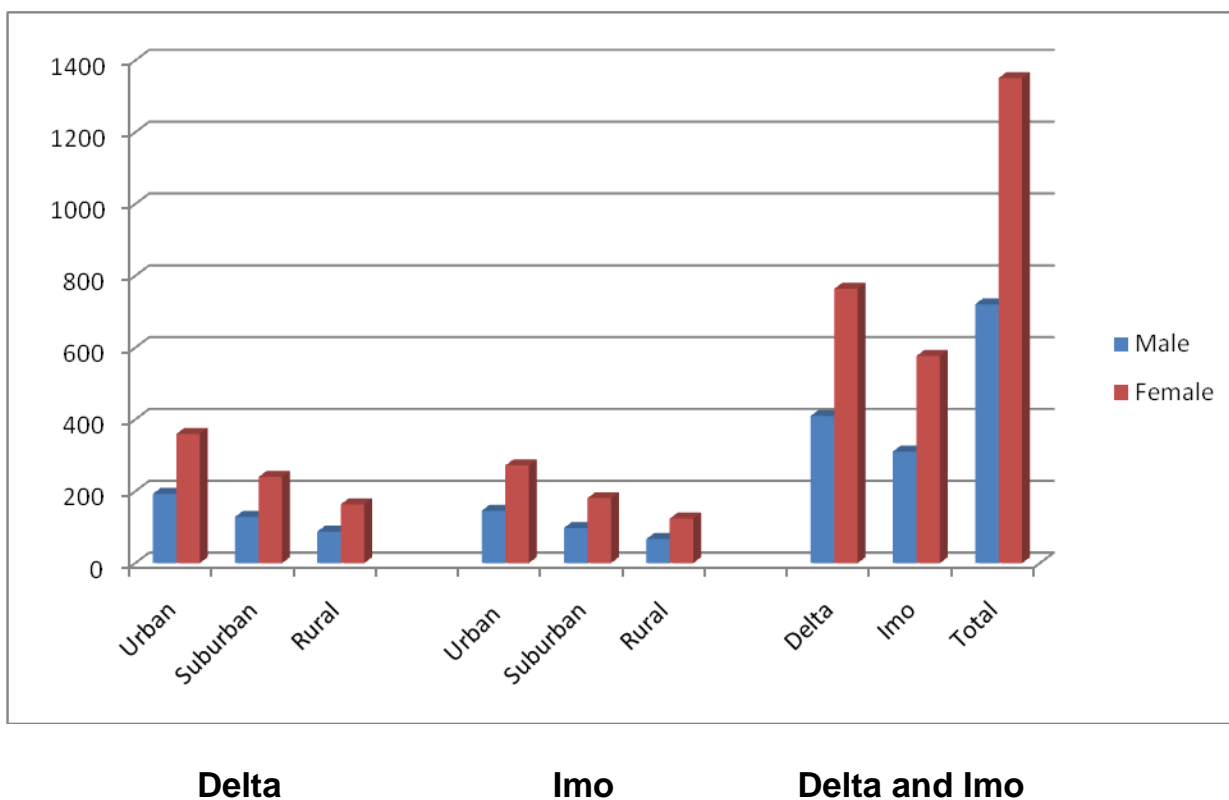
Furthermore on attrition, 9 (.45%) teachers left; 5 (.25) in Delta and 4 (.20%) in Imo, 7 (.35%) were male; 4(.20) in Delta and 3 (.16%) in Imo. The suburban had an attrition of 8 (.40%) teachers, 3 (.15%) in Delta and 5 (.25%) in Imo and out of this, 5 (.25%) were male; 2 (.10%) in Delta and 3 (.15%) in Imo, whereas there were 3 (.15%) females; 1(.05%) in Delta and 2 (.10%) in Imo. In the rural area, attrition was 8 (.40%); 3 (.15%) in Delta and 5 (.25%) in Imo, 4 (.20%) males; 2 (.10%) in Delta and 2 (.10%) in Imo and 4 (.20%) females; 1 (.05%) in Delta, and 3 (.15%) in Imo. Table 11 shows the availability in the urban, suburban and rural areas in Delta and Imo states.

**Table 11: Summary of the Availability of Male and Female Science Teachers in the Urban, Suburban and Rural areas of Delta and Imo**

Location	Availability					
	Delta		Imo		Total	
	Male	Female	Male	Female	Male	Female
Urban	193	360	146	272	339	632
Suburban	129	240	98	181	227	421
Rural	88	164	67	124	155	288
<b>Total</b>	<b>410</b>	<b>764</b>	<b>311</b>	<b>577</b>	<b>721</b>	<b>1,341</b>

**Source: Fieldwork 2012**

Table 11 indicated that out of the 721 (35%), available male science teachers, 193 (26.7%) were in the urban, 129 (17.8%) in the suburban 88 (12.5%) in the rural area of Delta, whereas in Imo, the urban had 146 (20.2%), the suburban 98 (13.6%), and the rural 67 (9%). Similarly, the total female availability was 1,341 with 360 (27%), 240 (18%), and 164(12%) in urban, suburban and rural Delta respectively while in Imo, the urban had 272 (20.3%), the suburban 181 (13.5%), and the rural 124 (9%). This result shows that more female teachers were available than males. The highest availability of males (193) was in Delta urban, while the lowest (67) was in Imo rural. For the females, 360 in were Delta urban, and 124 in Imo rural. There were more male and female teachers in Delta than in Imo. Figure 5 further illustrates the result.



**Figure 5: Summary of the Availability of Male and Female Science Teachers in the Urban, Suburban and Rural Areas of Delta and Imo States**

Table 12 shows the availability of male and female science teacher in Delta and Imo states between the 2006/07 to 2010/11 academic years.

**Table 12: Availability of Male and Female Science Teachers in Delta and Imo States, from 2006/2007 to 2010/2011 Academic Years**

Academic Years	State	Availability					
		Supply			Retention		
			Male	Female		Male	Female
2006/2007	Delta	233	81	152	229	79	150
	Imo	173	61	112	174	65	113
	<b>Total</b>	<b>406</b>	<b>142</b>	<b>264</b>	<b>403</b>	<b>144</b>	<b>263</b>
2007/2008	Delta	232	80	152	230	78	150
	Imo	173	61	112	169	64	110
	<b>Total</b>	<b>405</b>	<b>141</b>	<b>264</b>	<b>399</b>	<b>142</b>	<b>260</b>
2008/2009	Delta	231	80	151	229	81	142
	Imo	182	61	121	179	61	118
	<b>Total</b>	<b>413</b>	<b>141</b>	<b>272</b>	<b>408</b>	<b>142</b>	<b>260</b>

<b>2009/2010</b>	<b>Delta</b>	238	82	156	236	80	156
	<b>Imo</b>	173	60	113	172	61	111
	<b>Total</b>	411	142	269	408	143	268
<b>2010/2011</b>	<b>Delta</b>	239	85	154	236	82	154
	<b>Imo</b>	188	64	124	183	59	124
	<b>Total</b>	427	149	278	419	144	278
<b>Total</b>		2,062	721	1,341	2,037	715	1,322

**Source: Fieldwork 2012**

The result in Table 12 showed that 2,062 science teachers were available, 2,037(98.7%) were retained, and 25(1.2%) left. In 2006/07, 406(19.8%) were available; 141(34.7%) male and 264(65.3%) female, 403(99%) were retained 140(34.3%) male and 263(65.7%) female, 3(.15%) left; 2(8%) males and 1(.05%). In 2007/08 405(19.7%) was available; 141(36%) male and 264(63.7%) female, 399 were retained, 139(34.8%) male and 263(65.9%) female, 6(.30%) left, 4(.20%) male and 2(.20%) female. In 2008/09, the availability was 413(20%); 144(34.2%) male and 272(65.8%) female, 408(20%) were retained; 141(34.8%) male and 262(64.2%) female. 5(.25%) left, 3(.15%) male and 2(.1%) female left. In 2009/10, 411(20%) was available; 142(35.6%) male and 269(64.4%) female, 408(20%) was the retention; 143(35.7%) and 262(64.2%) female, 3(.15%) left, 2(.10%) male and 1(.05%) female. In 2010/11, the availability was 427(20.7%), 149(33.7%) male and 278(64.4%) female, 417(20.5%) was the retention; 144(34.2%) male and 275(65.9%). 8(.4%) left, 4(.2%) male and 4(.2%) female. Table 13 shows a summary of the availability of science teachers in Delta and Imo within the period of study.



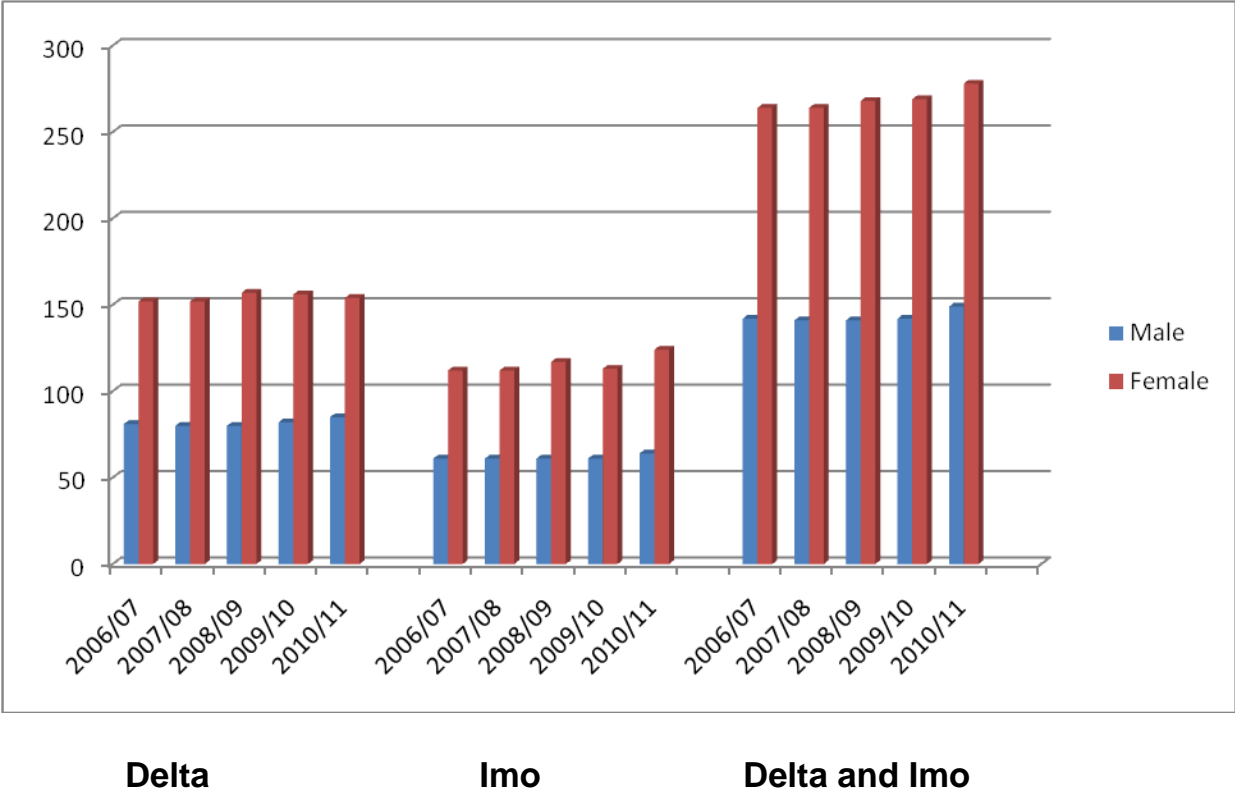
**Table 13: Summary of the Availability of Male and Female Science Teachers in Delta and Imo States from 2006/07 to 2010/11 Academic Years.**

Academic Years	Availability						
	Delta		Imo		Total		
	Male	Fem.	Male	Fem.		Male	Female
2006/07	81	152	61	112	406	142	264
2007/08	80	152	61	112	405	141	264
2008/09	80	151	61	117	413	141	268
2009/10	82	156	60	113	411	142	269
2010/11	85	154	64	124	427	149	278
<b>Total</b>	<b>408</b>	<b>765</b>	<b>307</b>	<b>582</b>	<b>2,062</b>	<b>721</b>	<b>1,341</b>

**Source: Fieldwork 2012**

The result in Table 13 indicated that in the 2006/07 academic years, a total of 406 teachers were supplied; 233 in Delta and 193 in Imo. The male teachers were 142; 81 in Delta and 61 in Imo while the female were 264; 152 in Delta and 112 in Imo. In 2007/08, there were 405 teachers; 232 in Delta and 173 in Imo, 141 were male; 80 in Delta and 61 in Imo while 264 were female; 152 in Delta and 112 in Imo. The rest of the analysis on the supply of male and

female science teachers are highlighted on Table 13. Figure 6 further illustrates this result.



**Figure 6: Summary of the Availability of Science teachers in Delta and Imo States, from 2006/07 to 2010/11 Academic Years**

The result of this analysis showed that out of the 2,631 available science teachers, 2,062 were retained, 1,341(65%) females, and 721(35%) males. The attrition was 25, 16(.78%) male and 9(.44%) female. More females were retained and more males left. Attrition was higher in Imo,14 (.60%) with 8 (.40%) male and 6 (.30%) female than Delta with 6 (.30%) male and 3 (.15%) female.

**Research Question Three: What is the rate of availability of science teachers in the urban, suburban and rural areas, from 2006/07 to 2010/11 academic years in Delta and Imo states of Nigeria?**

To answer this question, the available science teachers supplied within the 2006/2007 and 2010/2011 academic years in the urban, suburban and rural schools were investigated and analyzed. Table 14 shows the result.

**Table 14: Availability of Science Teachers in the Urban, Suburban and Rural Areas of Delta and Imo States from 2006/2007 to 2010/2011 Academic Years**

\*

Location	State	Availability									
		2006/2007		2007/2008		2008/2009		2009/2010		2010/2011	
		R	A	R	A	R	A	R	A	R	A
Urban	Delta	105	1	103	-	106	1	105	1	106	1
	Imo	77	1	78	1	80	1	79	-	83	2
	<b>Total</b>	<b>182</b>	<b>2</b>	<b>182</b>	<b>1</b>	<b>186</b>	<b>2</b>	<b>184</b>	<b>1</b>	<b>188</b>	<b>3</b>
Suburban	Delta	75	-	74	1	75	1	74	-	75	1
	Imo	54	-	53	2	57	2	56	1	59	-
	<b>Total</b>	<b>129</b>		<b>127</b>	<b>3</b>	<b>132</b>	<b>3</b>	<b>130</b>	<b>1</b>	<b>134</b>	
Rural	Delta	54	1	52	-	55	-	53	1	53	1
	Imo	39	-	41	2	41	-	41	-	43	3
	<b>Total</b>	<b>93</b>	<b>1</b>	<b>93</b>	<b>2</b>	<b>97</b>		<b>94</b>	<b>1</b>	<b>96</b>	<b>4</b>
Total	Delta	233		230		237		231		234	
	Imo	170		179		173		177		185	
	<b>Total</b>	<b>403</b>		<b>399</b>		<b>408</b>		<b>408</b>		<b>419</b>	
Attrition	Delta	2		2		2		2		3	
	Imo	1		4		3		1		5	
	<b>Total</b>	<b>3</b>		<b>6</b>		<b>5</b>		<b>3</b>		<b>8</b>	

**Source: Fieldwork 2012**

Table 14 revealed that 2037(98.9%) science teachers were retained out of the 2062 available from 2006/07 to 2010/11 academic years, and 25(1.2%) was

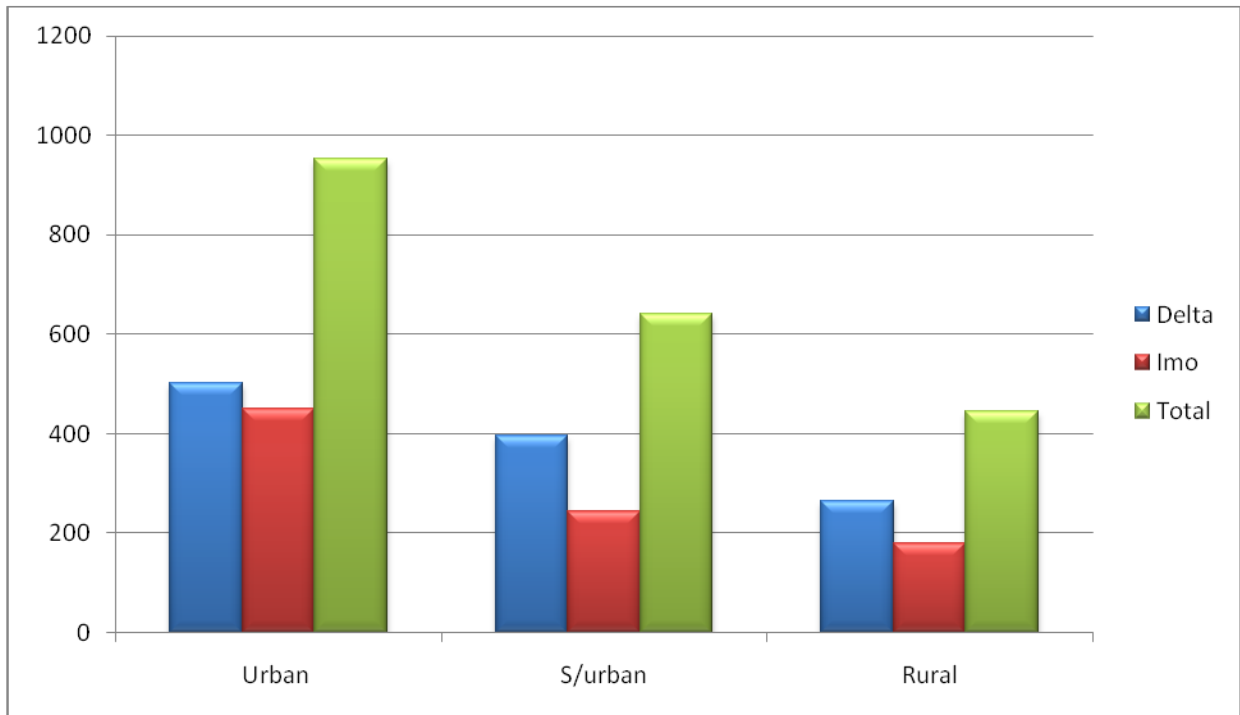
not retained. Indications showed that 962(45.5%) was retained in the urban; 548 (57%) in Delta and 414(43%) in Imo. In the suburban, 640(31%) was retained; 365(57%) in Delta and 275(43%) in Imo. In the rural area, 425(24%) was retained; 248(58%) in Delta and 187(44%) in the rural schools. Out of the total number 25(1.2%) that left, 9(36%); 5(.25%) in Delta and 4(.20%) in Imo was in the urban, 8(.40%) in the suburban; 3(.15%) in Delta and 5(.25% in Imo. The rural area had an attrition of 8(.40%); 3(.15%) in Delta and 2 (.20%) in Imo. Table 15 shows the rate of availability of science teachers in the urban, suburban and rural areas of Delta and Imo states.

**Table 15: Rate of Availability of Science Teachers in Urban, Suburban and Rural Locations of Delta and Imo States.**

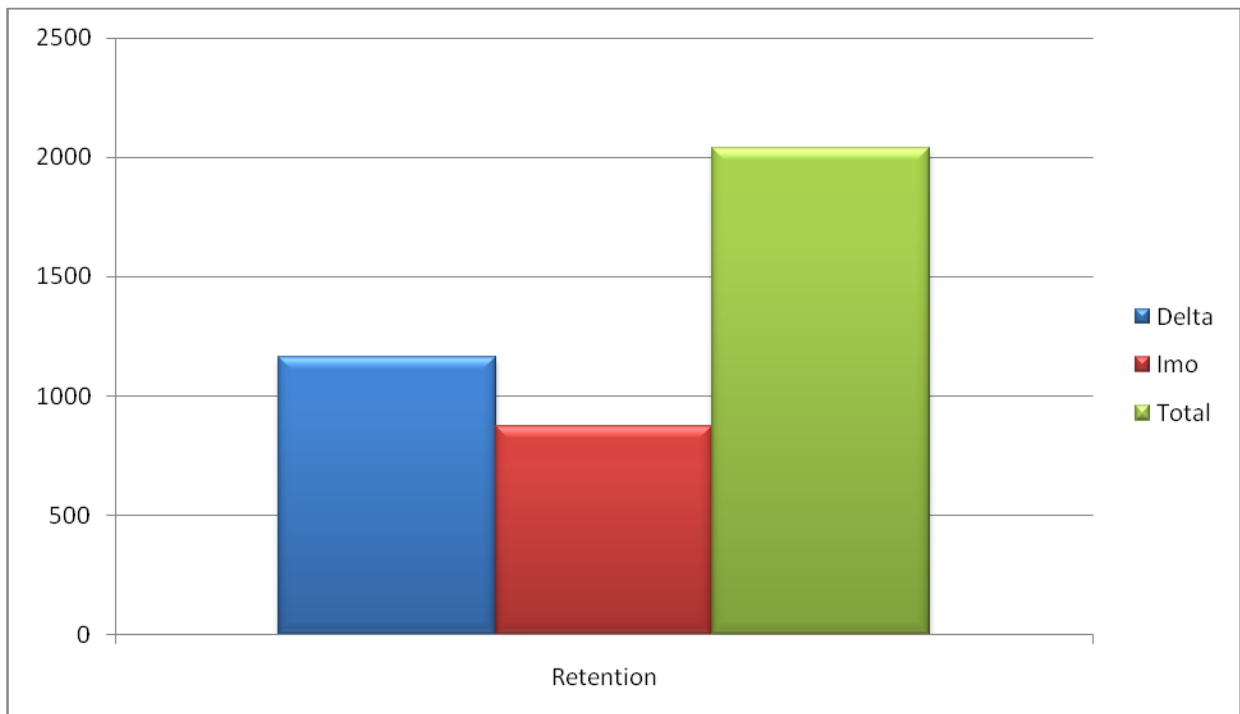
Location	Availability			
	Delta	Imo	Total	Attrition
Urban	502 (24.3%)	451 (21.9%)	953 (46.2%)	9 (.44%)
Suburban	396 (19.2%)	244 (11.8%)	640 (31%)	8 (.39%)
Rural	264 (12.8%)	180 (8.7%)	444 (21.5%)	8 (.39%)
<b>Total</b>	<b>1,162 (56.4%)</b>	<b>875 (42.6%)</b>	<b>2,037 (98.8%)</b>	<b>25 (1.2%)</b>
<b>Total Attrition</b>	<b>11 (.54%)</b>	<b>14 (.69%)</b>	<b>25 (1.2%)</b>	

**Source: Fieldwork 2012**

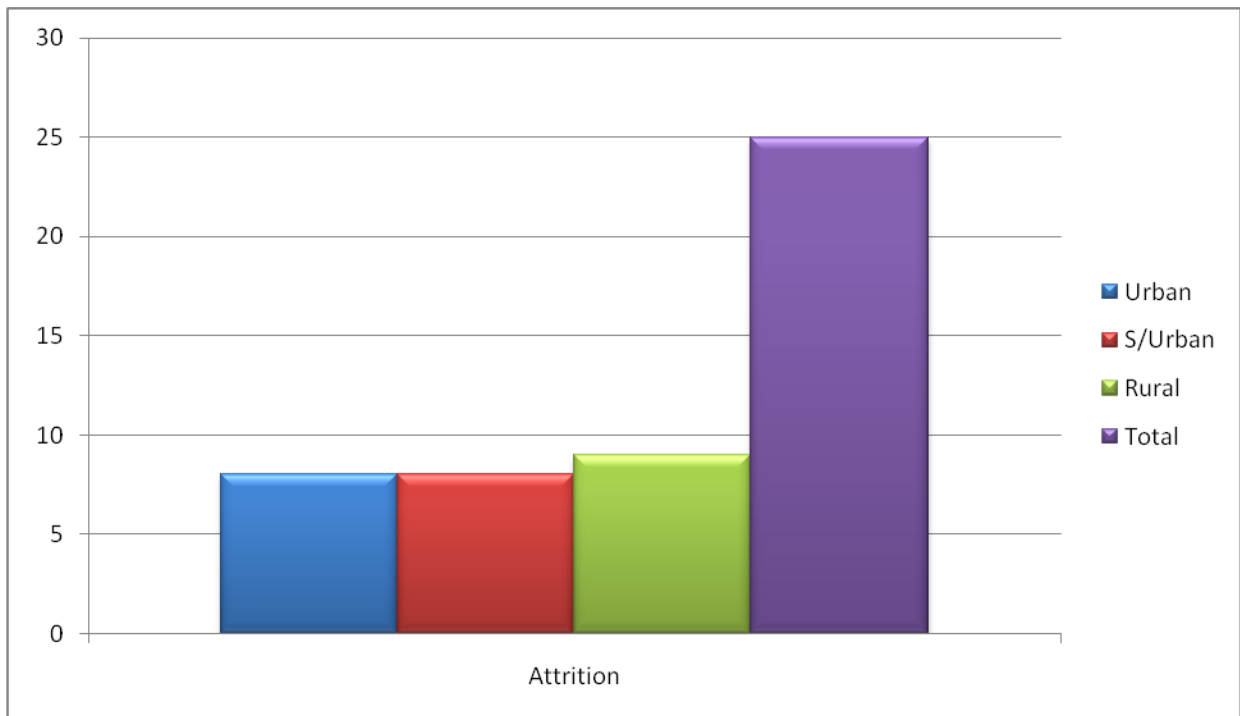
Table 15 indicated that Delta had an availability of 1,162 science teachers at a rate of 56.4 %, whereas Imo with science staff strength of 875 had a rate of 42, 6%. The total rate of availability in the urban was 46.2%; 24.3% in Delta and 21.9% in Imo. In the suburban the rate was 31%; 19.2% in Delta whereas in Imo it was 11.8%. The rural area had 21.5%; 12.8% in Delta and 8.7% in Imo. Figures 7, 8, 9 and 10 further illustrate the result.



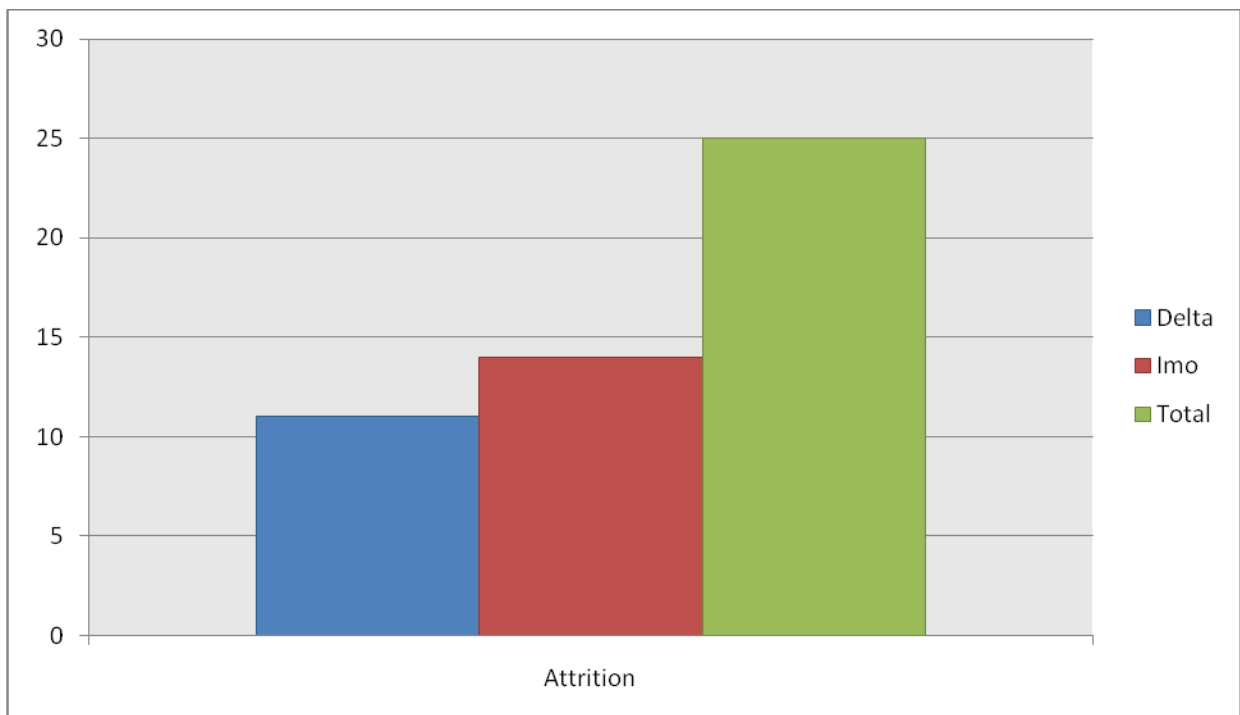
**Figure 7: Availability of Science Teachers in Urban, Suburban and Rural Locations.**



**Figure 8: Retention of Science Teachers in Delta and Imo.**



**Figure 9: Attrition in Urban, Suburban and Rural Locations.**



**Figure 10: Attrition of Science Teachers in Delta and Imo**

The result from Tables 14, 15 and Figures 7, 8, 9, and 10 indicated that out of the 2,062 science teachers available, 2,037(98.8%) were retained while

25(1.2%0 were not retained. The rate of retention was highest in the urban 953(47.8%), and lowest in the rural locations with 444(21.8%). Attrition was highest in the urban area, 9(.14%). Imo State had a higher attrition, 14(.69%)

**Research Question Four: What is the need and availability of science teachers in the public senior secondary schools in the senatorial districts, from 2005/07 to 2010/11 in Delta and Imo states of Nigeria?**

Data on students' enrolment with the government benchmark of 40 students per teacher was used to calculate the need, and data gathered on teacher availability were analyzed using tables, percentages and bar charts to answer this question. The result is presented in Tables 16, and Figure

**Table 16: Need and Availability of Science Teachers in the Senatorial Districts of Delta and Imo States from 2007/2007 to 2010/2011 Academic Years**

Districts	Academic Years	Need and Availability of Science Teachers														
		Delta					District	Imo					Total			
		E	N	Availability				E	N	Availability			E	N	Availab	
				S	R	A	S			R	A	S			R	
North	2006/2007	4,065	101	84	84		Okigwe	2,134	52	32	32		6,199	153	116	116
Central		4,799	119	75	75		Orlu	3,215	80	33	31	2	8,014	199	108	106
South		3,331	82	75	74	1	Owerri	4,063	101	108	108		7,394	184	183	182
		1,225	305	233	232	1	Total	9,412	234	173	171	2	21,637	539	406	403
North	2007/2008	4092	103	83	82	1	Okigwe	1,947	48	32	32		6,039	151	115	114
Central		4837	122	74	73	1	Orlu	2,987	75	33	33		7,824	197	107	107
South		3,374	84	76	75	1	Owerri	3,767	94	107	104	3	7,141	178	183	179
		1,2403	309	232	230	3	Total	8,672	218	170	166	3	21,075	527	405	399
North	2008/2009	4,295	109	85	84		Okigwe	1,632	41	34	33	1	5,627	150	129	127
Central		4,976	129	73	73		Orlu	2,742	64	33	32	1	7,572	193	107	106
South		3,446	89	79	78	2	Owerri	3,191	80	104	106	1	6,537	169	187	185
		1,2713	330	237	235	2	Total	7,421	185	174	171	3	20,134	515	413	408
North	2009/2010	4,329	105	85	85		Okigwe	1,792	44	33	32	1	6,121	149	118	117
Central		5,080	124	75	75		Orlu	2,742	68	34	34		7,822	192	119	119
South		3,517	87	78	76	2	Owerri	3,462	85	106	106		6,979	172	184	182
		13,027	317	238	236	2	Total	7,996	199	173	172	1	21,023	516	411	408
North	2010/2011	4,317	110	85	83	2	Okigwe	1,851	46	38	36	2	8,168	156	123	119
Central		5,231	128	75	74	1	Orlu	2,845	71	37	35	2	8,077	199	112	109
South		3,531	89	79	79		Owerri	3,591	89	113	112	1	7,122	178	192	191

	13,082	327	239	236	3	Total	8,287	207	188	183	5	21,369	534	427	419
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**Key: E - Enrolment, N- Need, S- Supply, R- Retention, A- Attrition.**  
**Source: Fieldwork 2012.**

Table 16 showed the need and availability of science teachers in each senatorial district for every year within the period of study. Further analyses of the data indicated the total need in each senatorial district as presented in Table 17.

**Table 17: Need and Availability of Science Teachers in Senatorial Districts in Delta and Imo States**

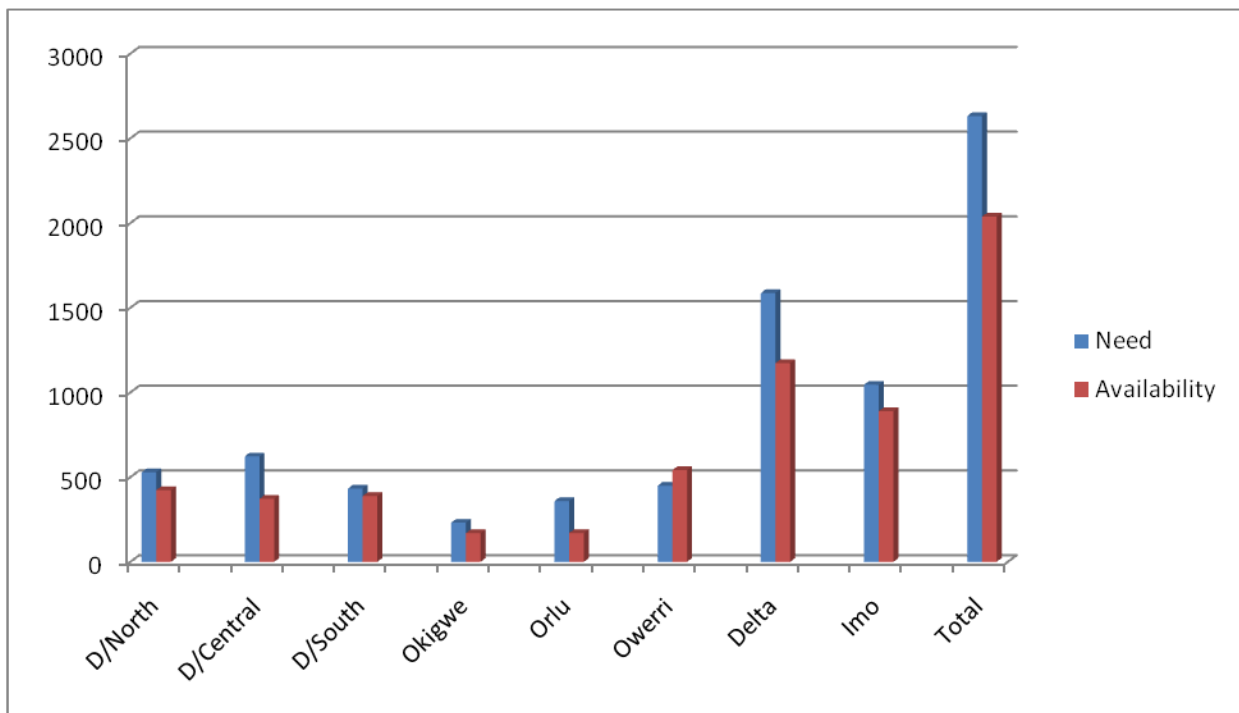
Senatorial Districts	Need and Availability of Science Teachers				
	State	Need	Availability		
			Supply	Retention	Attrition
Delta North	Delta	528	423	418	5
Delta Central		622	372	370	2
Delta South		432	388	374	4
<b>Total</b>		<b>1,586</b>	<b>1,173</b>	<b>1,162</b>	<b>11</b>
Okigwe	Imo	231	169	165	4
Orlu		358	170	165	5
Owerri		449	541	537	5
<b>Total</b>		<b>1,045</b>	<b>889</b>	<b>875</b>	<b>14</b>
<b>Grand Total</b>		<b>2,631</b>	<b>2,062</b>	<b>2,037</b>	<b>25</b>

**Source: Fieldwork 2012**

Table 17 indicated that the total need for science teachers was 2,631; 1,586(60%) in Delta, 1,045(40%) in Imo, the total availability of 2,062 (78%); 1,173(56%0 in Delta, 889(44%) in Imo, the total retention was 2,037(98.7%); 1,162(57%) in Delta, 875(43%) in Imo, 25(1.2%) science teachers left, 11(.53%) in Delta and 14(.67%) in Imo. In Delta North the need was



528(18%), Delta Central 622(20.7%), 432(13.9%) for Delta South. Okigwe, 231(11(%), Orlu 358(17.2%), and Owerri 449(21.5%). The availability in Delta North was 423(19.8%), Delta Central 372(17.7%) and Delta South, 388(18.7%). In Okigwe Senatorial district 169(15.2%), 170(23.8%) in Orlu, and 541(29.7%) in Owerri. Of the science teachers retained, 418(19.8%) was in Delta North, 370(17.8%) in Delta Central, 374(18.6%) in Delta South, 165(9.3%) in Okigwe, 165(9.4%) in Orlu and 537 (25.5%) in Owerri. Amongst the 25(1.2%) science teachers that left, 5(.25%) was in Delta North, 2(.1%) in Delta Central, 2(.40%), and 5(.25%) in Delta South. In Okigwe, 3(.15%) left, Orlu 5(.25%), and Owerri 5(.25%). Figure 11 further illustrates the result.



**Figure 11: Need and Availability of Science Teachers in Senatorial Districts of Delta and Imo States**

The results in Tables 16, 17 and Figure 11 showed that 2,631 science teachers was the need, availability was 2,062(78%). The highest need was in

Delta Central, 528(20.1%) the lowest in Owerri municipal with 449(17.1%) and the highest availability of 541(120.9%), an excess of 21 science teachers. The lowest availability was in Delta Central, 370(59.4%) out of a need of 622.

**Research Question Five: What is the availability of science teachers in the public senior secondary schools from 2006/07 to 2010/11 academic years in Delta and Imo States of Nigeria?**

To answer this research question, data on the availability of science teachers in Delta and Imo states were analyzed. The result is presented in Table 18.

**Table 18: Availability of Science Teachers in the Urban, Suburban and Rural Areas from 2006/2007 to 2010/2011 in Delta and Imo States**

Location	Acad/ Years	Availability								
		Delta			Imo			Total		
		S	R	A	S	R	A	S	R	A
Urban	2006/07	108	107	1	81	80	1	189	187	2
	2007/08	111	110	1	75	75		186	182	
	2008/09	111	110	1	82	81	1	193	191	2
	2009/10	111	110	1	84	84		195	194	1
	2010/11	118	117	1	85	83	2	207	204	3
	<b>Total</b>	<b>559</b>	<b>554</b>	<b>5</b>	<b>418</b>	<b>414</b>		<b>971</b>	<b>962</b>	<b>9</b>
Sub/Urban	2006/07	74	74		54	54		128	128	
	2007/08	75	74	1	57	55	2	132	129	3
	2008/09	74	71	1	57	55	2	129	126	3
	2009/10	72	72		55	54	1	127	126	1
	2010/11	74	73	1	57	57		131	130	1
	<b>Total</b>	<b>368</b>	<b>365</b>	<b>3</b>	<b>280</b>	<b>275</b>	<b>5</b>	<b>648</b>	<b>640</b>	<b>8</b>
Rural	2006/07	51	50	1	38	38		89	88	1
	2007/08	51	51		39	37	2	90	88	2
	2008/09	51	51		39	39		90	90	
	2009/10	49	48	1	38	38		87	86	1
	2010/11	50	49	1	39	36	3	89	85	4
	<b>Total</b>	<b>251</b>	<b>248</b>	<b>3</b>	<b>192</b>	<b>187</b>	<b>5</b>	<b>361</b>	<b>435</b>	<b>8</b>

**Source: Fieldwork 2012      Key: S – Supply, R – Retention, A- Attrition**

Table 18 revealed that 2,062(78%) science teachers were available 1,173(56%) in Delta, and 899(44%) in Imo. The retention was 2,037(98.8%);

1,162(56.4%) in Delta, and 875(43.5%) in Imo. The attrition was 25(1.2%), 11(.44%) in Delta, and 14(.68%) in Imo. Within the period of study, 971(45.2%) were available in the urban area; 548(56%) in Delta, and 418(44.2%), 962(45.4%) were retained, 548(56%) in Delta and 414(44.2%) in Imo. There was an attrition of 9(.44%) in the urban, 5(.25.6%), and 4(.20%) in Delta and Imo respectfully. In the suburban, 648(33.2%) were available; 369(55.8%) in Delta, and 280(44.2%) in Imo, 640(33.2%) was the retention; 364(56%) in Delta, and 275(43.9%) in Imo. The attrition was 8(.39%), 3(.15%) in Delta, and 5(.25%) in Imo. The rural area had a science teacher availability of 443(21.4%), 252(58.2%) in Delta, and 191(41.8%) in Imo, with a retention of 335(21.4%); 248(58.3%) in Delta, and 187(41.7%) in Imo. The attrition was 8(.39%), 3(.15%) in Delta, and 5(.25%) in Imo. The distribution of the science teachers in the urban, suburban and rural areas of Delta and Imo states is presented in Table 19

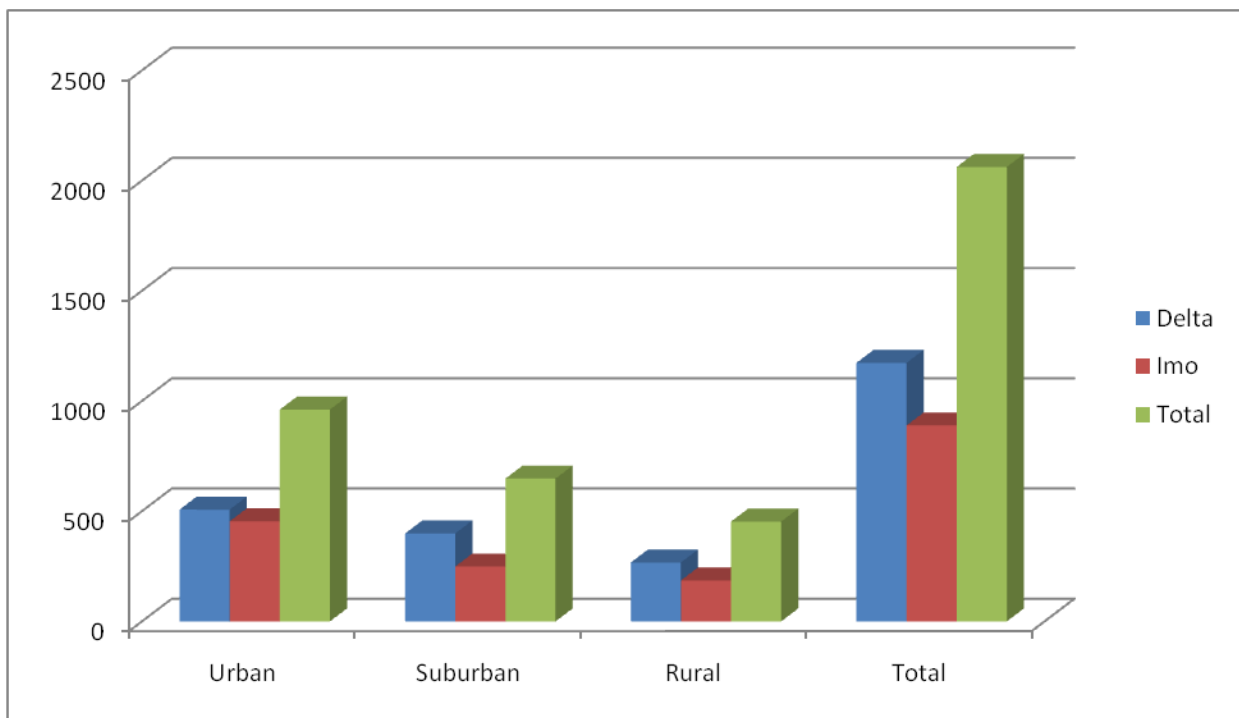
**Table 19: Availability of Science Teachers in the Urban, Suburban and Rural Areas of Delta and Imo States**

Location	Availability								
	Delta			Imo			Total		
	S	R	A	S	R	A	S	R	A
Urban	507	502	5	454	440	4	961	952	9
Sub-Urban	399	396	3	249	244	5	648	640	8
Rural	267	264	3	186	181	5	453	445	8
Total	1,173	1,162	11	889	875	14	2,067	2,037	25

**Key: S- Supply, R- Retention, A – Attrition. Source: Fieldwork 2012**

Table 19 showed that in Delta urban, the availability was 1,173(56.8%); 507(26.8%), suburban 399(17.8%), rural 252(12.2%), the total retention was 1 162(57%); 502(26.9%) in the urban, 396(17.9%) in the suburban, 264(12.2%) in the rural area. The total attrition in Delta was 11(.53%); urban 5(, 25%),

suburban 3(.15%) and rural 3(.15%). Imo had a availability of 889(43.1%); 454(20.3%) in the urban, 249(13.6%) in the suburban, 186(9.3%) in the rural. Retention was 875(43%); 450(20.3%), 244(13.5%), and 18(9.2%) respectively, while the attrition was 14(.68%); 4(.20), 5(.25%), and 5(.25%). The total availability for Delta and Imo urban was 961(47%), retention 952(47.2%), and attrition 9(.43%). The rural area had available 453(21.5%), a retention of 445(21.3%) with an attrition of 5(.25%). Figure 12 further illustrates the result.



**Figure 12: Availability of Science Teachers in the Urban, Suburban and Rural Areas of Delta and Imo States**

The results in Table 19 and Figure 12 showed that the availability was highest 961(46.3%) in the urban, and the lowest 445 (22%), was in the rural areas. Attrition was highest in the urban 9(.43%). The suburban and rural

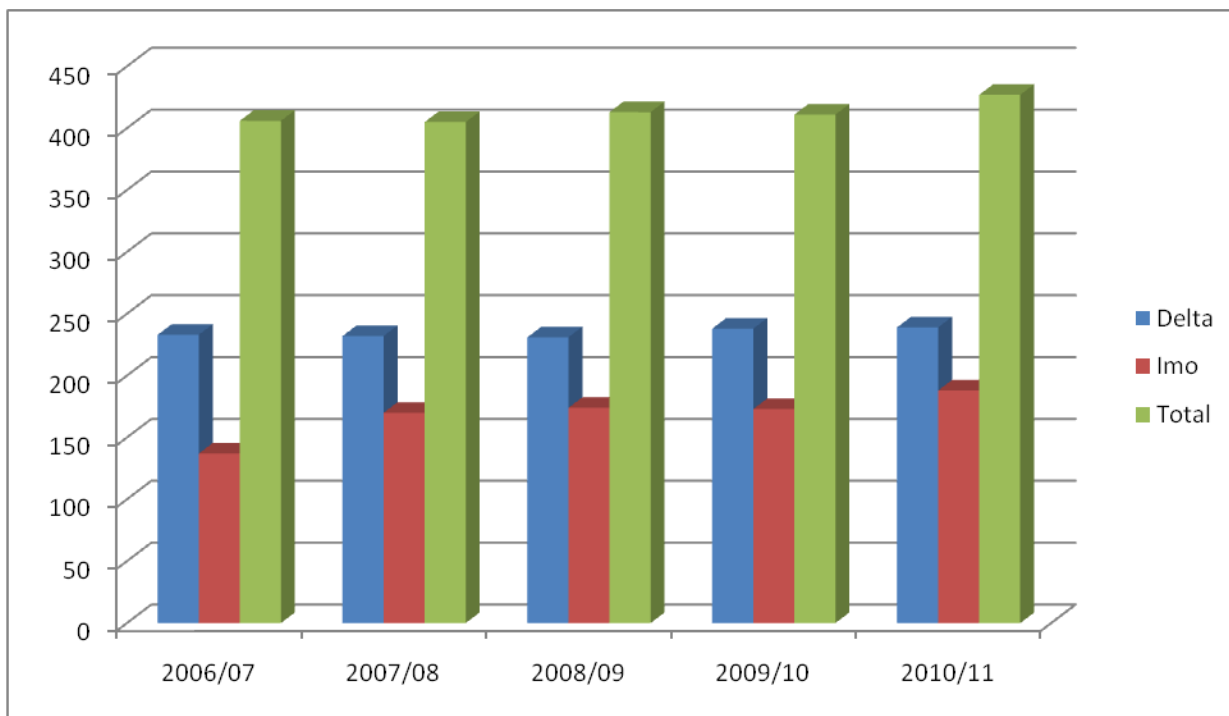
areas had 8(.39%) each. Table 20 shows the result from 2006/2007 to 2010/2011 academic years.

**Table 20: Availability of Science Teachers from 2006/2007 to 2010/2011 Academic Years in Delta and Imo States**

Academic Years	Availability								
	Delta			Imo			Total		
	S	R	A	S	R	A	S	R	A
2006/07	233	231	2	173	172	1	406	403	3
2007/08	232	230	2	170	166	4	405	399	6
2008/09	231	229	2	174	171	3	413	408	5
2009/10	238	236	2	173	172	1	411	405	3
2010/11	239	236	3	188	183	5	427	419	8
<b>Total</b>	<b>1,173</b>	<b>1,162</b>	<b>11</b>	<b>889</b>	<b>875</b>	<b>14</b>	<b>2,062</b>	<b>2,037</b>	<b>25</b>

**Key: S – Supply, R- Retention, A- Attrition**  
**Source: Fieldwork 2012.**

The result in Table 20 indicated that out of the 2,062 available science teachers; 406(19.7%) were in Delta and Imo in 2006/07, 405(19.6) in 2007/08, 413(20%) in 2008/09, 411(19.9%). in 2009/10, and 427(21%) in 2010/11. The total retention was 2,037(98.9%), 403(19.8%) in 2006/7, 399(19.6%) in 2007/08, 408(20%) in 2008/09, 405(19.6%) in 2009/10 and 419(20.6%) in 2010/11. The total attrition was 25(1.2%); 3(.15%) in 2006/07, 6(.32%) in 2007/08, 5(.25%) in 2008/09, 3(.15%) in 2009/10, and 8(.39%) in 2010/11. Figure 13 further illustrates this result.



### Availability

**Figure13: Availability of Science Teachers from 2006/07 to 2010/11 Academic Years in Delta and Imo**

The results presented in Table 20, and Figure 13 confirmed a high availability of 239 in Delta, and 188 in Imo 2010/11, the lowest availability of 231 in Delta was in 2008/09, whereas in Imo, it was 170 in the 2007/08 academic years..

**Research Question Six. What are the constraints on the need and availability of science teachers in the public senior secondary schools in Delta and Imo States?**

The State Ministries of Education Asaba and Owerri, work through the Post Primary Education Board, Asaba and the Senior Secondary Education Management Board, Owerri, as the sole employers of science teachers Need for science teachers is determined using the national benchmark of one

teacher per forty students. Data gathered and analyzed indicated that the Ministry of Education in Delta and Imo states determined the availability, while the schools (students and teachers), the science curriculum and the society influenced the level of retention. The results are presented in Tables 21, 22, 23, 24, and 25.

**Table 21: Constraints on the Need for Science Teachers: Constraints from the Government**

Constraints	Delta									Imo								
	Urban			Suburban			Rural			Urban			Suburban			Rural		
	R	NT	%	R	NT	%	R	NT	%	R	NT	%	R	NT	%	R	NT	%
Lack of Sci. Lab./ Equipment	2	9	9	1	14	20	13	2	4	1	31	31	1	16	28	2	5	15
High Teacher Pupil ratio	3	6	6	3	11	17	8	2	5	6	3	3	6	4	5	6	2	5
Bureaucracy of ministry	10	3	2	10	2	3	7	2	5	7	3	3	9	2	3	9	6	20
Non-sponsorship to seminars, etc.	6	3	3	7	3	3	6	3	5	5	7	9	4	7	11	7	2	5
Poor salary	8	2	2	9	4	3	11	2	4	13	1	1	10	5	3	4	5	7
Regular payment of teacher salary	13	1	.8	12	1	1	10	3	5	8	2	3	3	7	12	3	4	12
Too many periods for teachers	4	4	5	5	6	8	9	2	5	3	10	11	11	1	2	8	7	20
Lack of promotional prospects	12	2	2	11	2	3	12	2	4	4	2	2	13	1	2	13	1	2
Lack of qualified laboratory staff	5	3	2	4	8	11	4	3	7	7	11	11	8	2	3	5	2	5
Inadequate supervision of Sci. Tr.	9	3	2	8	3	3	5	3	7	7	2	2	7	2	3	10	1	2
Frequent transfers	11	3	3	13	1	1	3	4	9	9	2	2	12	1	2	11	1	2
Lack of fund	1	71	61	2	15	18	2	6	13	2	20	22	2	14	23	1	9	27
Posting to rural areas	7	3	3	6	5	5	1	15	27	11	2	2	5	3	5	2	1	2
<b>Total</b>		<b>114</b>		<b>75</b>			<b>50</b>			<b>92</b>			<b>59</b>			<b>37</b>		

The result in Table 21, revealed that the science teachers in the urban, suburban and rural locations, unanimously ranked item I, “Lack of fund”, and item a, “Lack of science laboratory and equipment as first or second in order of severity, except for the rural area of Delta where it was considered the least constraint. This could be because most of the schools are supposedly well

furnished with infrastructure, laboratories and science equipment, mostly provided by private oil companies such as Shell Pet. Dev. and Chevron/NNPC ventures. The greatest disparity seemed to be in the rankings for item m, “Posting to rural areas”. While the urban teachers ranked it 7(Delta), 11(Imo), the suburban ranked it 6(Delta), 5(Imo), but the rural teachers ranked it 1(Delta), and 12(Imo). The science teachers in rural Delta seriously complained about the solitary, perennial, and water-logged nature of the environment and sometimes the uncooperative attitudes of the inhabitants. All the localities are in fairly close agreement on items h, b, d, j, k, g, and c, while there seemed to be some incompatibility in the rankings for items l, and f. The major finding here is that inadequate funding is the greatest constraint to the adequate supply of science teachers, while lack of promotional prospects is the least. For the constraints on the availability of science teachers, the aggregate rankings are presented in Tables 22, 23, 24, and 25.

**Table 22: Constraints on the availability of Science Teachers:  
Constraints from the Science  
Students**

SN	Constraints	Delta									Imo					
		Urban			Suburban			Rural			Urban			Suburban		
		R	NT	%	R	NT	%	R	NT	%	R	NT	%	R	NT	%
<b>a</b>	Truancy from school activities	7	4	2	7	3	4	1	26	59	7	2	2	6	3	5
<b>b</b>	Poor reading and study habits	1	51	43	1	19	26	2	13	27	1	46	50	1	29	50
<b>c</b>	Lack of effective mastery of the language of instruction.	3	14	16	2	19	26	4	4	9	4	8	8	4	3	5
<b>d</b>	Lack of seriousness towards the study of science subjects	4	7	6	4	9	10	7	2	2	3	11	12	2	15	29
<b>e</b>	Indulgence in exam	5	7	6	5	7	10	3	2	13	6	3	4	7	2	2



	malpractice															
<b>f</b>	Overindulgence in social activities e.g. discos, internet.	2	27	26	3	12	17	6	1	2	2	17	18	5	4	5
<b>g</b>	Inadequate/lack of knowledge of basic scientific concepts	6	3	2	6	6	7	5	2	3	5	6	6	3	4	7
	<b>Total</b>		<b>114</b>			<b>75</b>			<b>50</b>			<b>92</b>			<b>59</b>	

The science teachers from Table 22 clearly placed item b, “Poor reading and study habits” first, item f, “Overindulgence in social activities” like discos, films, parties, internet etc. as second”. “Lack of effective mastery of the language of instruction”, item c, was ranked third. The other items, d, a, e, g were ranked 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> respectfully. “Overindulgence in social activities” was however ranked higher in the urban and lowest in the rural areas. This is possibly because the rural areas do not have much of the modern gadgets that promote social activities.

**Table 23: Constraints on the Availability of Science Teachers:  
Constraints from the Science  
Teacher**

SN	Constraint	Delta									Imo					
		Urban			Suburban			Rural			Urban			Suburban		
		R	NT	%	R	NT	%	R	NT	%	R	NT	%	R	NT	%
<b>a</b>	Use of poor teaching method	6	4	3	4	8	11	3	4	9	5	7	8	5	6	10
<b>b</b>	Inability to motivate students	2	18	16	2	14	17	2	14	27	1	26	28	1	17	29
<b>c</b>	Inadequate exposure of students to practicals.	1	57	49	1	22	34	1	21	41	2	20	21	2	12	21
<b>d</b>	Lack of proper knowledge of subject matter.	5	4	4	6	5	6	6	2	4	3	7	8	6	4	7
<b>e</b>	Lack of familiarity with the demands of the curriculum.	8	4	4	7	5	5	7	2	3	7	8	8	7	4	5
<b>f</b>	Delaying practical until exams are close	3	16	14	3	11	15	4	3	7	2	10	11	3	7	12
<b>g</b>	Non-challant behavior	7	4	3	5	5	6	5	2	5	6	5	5	8	3	4

	towards the teaching of science subjects.																
<b>h</b>	Insufficient time spent on giving and marking assignments.	4	7	6	8	5	6	8	1	2	4	9	10	4	7	12	7
	<b>Total</b>		<b>114</b>			<b>75</b>			<b>50</b>			<b>92</b>			<b>59</b>		

On constraints from Science Teachers, Table 23 revealed that “Inadequate exposure of students to practical work”, item c, item b, Inability to motivate students” were ranked second, while item f, “Delaying practical work until examination are close”, was placed third. They were in general agreement about the relative positions of items a, h, d, e and g, as these were ranked 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup> with items e and g ranked 7<sup>th</sup>. The findings show that science teachers contribute to their scarcity through among other things, inadequate exposure of students to practical work and their inability to motivate the students to learn science.

**Table 24: Constraints on the Availability of Science Teachers:  
Constraints from the  
Society**

S/N	Constraints	Delta									Imo					
		Urban			Suburban			Rural			Urban			Suburban		
		R	NT	%	R	NT	%	R	NT	%	R	NT	%	R	NT	%
<b>A</b>	Uncooperative attitudes of the parents	7	4	4	7	3	3	3	5	11	4	5	6	4	7	16
<b>B</b>	Poor status of the teaching profession	3	19	17	3	15	21	4	2	5	3	11	11	3	9	18
<b>C</b>	Low public image of teachers	2	31	24	6	4	5	5	2	5	2	12	14	2	11	20
<b>D</b>	Preoccupation of students in non-	5	8	7	2	6	8	2	15	30	5	4	6	7	6	12

	academics activities.															
<b>E</b>	Encouraging exam malpractice	4	20	16	5	4	5	6	4	5	7	5	5	5	7	14
<b>F</b>	Inability to provide learning materials	6	4	4	4	18	22	1	21	41	6	6	6	6	8	14
<b>G</b>	Overzealous attitude to study the discipline in vogue	1	32	27	1	28	36	7	1	2	1	49	52	1	11	23
	<b>Total</b>		<b>114</b>			<b>75</b>			<b>50</b>			<b>92</b>			<b>59</b>	

As indicated from Table 24, on the whole, the science teachers generally considered item g, “Parent’s overzealous attitudes to push their children to study the disciplines in vogue” as the greatest constraint, Item f, “Parents failure to provide learning materials” as second. Items b, c, d, e, and a are ranked 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, and 7<sup>th</sup> as measures that constrain the availability of science teachers.

**Table 25: Constraints on the Availability of Science Teachers: Constraints from Curriculum and Examinations**

Constraints	Delta									Imo							
	Urban						Rural			Urban			Suburban			Rural	
	R	ST	%	R	ST	%	R	ST	%	R	ST	%	R	ST	%	R	ST
Demand and content curriculum	1	57	50	1	43	58	4	3	6	1	47	51	1	38	65	3	5
Lack of emphasis on the technical aspect	2	12	10	4	2	3	3	8	16	3	9	10	4	4	7	4	4
Standard of examination questions	3	33	31	2	22	30	1	20	41	2	28	31	2	11	19	1	16
Quantity of tests and examinations	4	9	7	3	7	9	2	18	37	4	7	8	3	5	9	2	9

		114			75			50			92			59			37
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An analysis of the constraints from the curriculum and examinations revealed as evident in Table 25, that 220(47%) of the science teachers ranked item a, “High demand and irrelevance of the curriculum” first, and item c, “High standard of examination questions” second with 145(30.75%) ratings, “Tyranny of tests and examinations” third, with 62(13.1%), and “Lack of emphasis on the historical aspects of science last, with 45(9.5%).

**Research Question Seven: Did Location influence the need and availability of science teachers in the selected science subjects, from 2006/07 to 2010/11 academic years?**

In answering this question, data on science students’ enrolment in each selected science subject, on the teacher need and availability were collated. In determining teacher need the national norm of one teacher per forty students was used. The terms teacher surplus and shortage were used to refer to the difference between the need and availability of teachers in these subjects. The findings are presented in Table 26.

**Table 26: Need and Availability of Science Teachers in the Selected Science Subjects in Delta and Imo States**

Science Subjects	Need and Availability																
	Delta				Imo				Total								
	Need	Availability			Need	Availability			Need	Availability							
		Supply	Retention	Attrition		Supply	Retention	Attrition		Supply	Retention	Attrition					

Mathematics	396	334	331	3	250	261	260	1	646	595	591
Further Maths	63	71	71		41	58	57	1	104	129	128
Physics	190	124	121	3	125	97	94	3	315	221	215
Chemistry	206	128	127	1	135	103	99	4	341	231	226
Biology	351	188	186	2	240	148	146	2	591	336	332
Env./Sci.	237	163	162	1	159	136	134	2	395	299	296
Economics	143	105	104	1	96	86	85	1	239	191	190
Total	1,586	1,173	1,162	11	1,045	889	875	14	2,631	2,062	2,037

**Source: Fieldwork 2012**

Table 26 showed that the need and availability for science teachers in Delta and Imo states within the period of study. There were shortages in some subjects for instance, the need in biology was 593 353(59%) in Delta and 240(41%) in Imo but the availability was 336, a shortage of 257. The availability was 188(55%) and 148(45%), and the shortage 165(46%), and 92(62%) in Delta and Imo. Mathematics had the need for 646 and only 396(61%) was available in Delta and 250(39%) in Imo. Teacher surplus was common in Further Mathematics. Out of the need of 104, 63(60%) in Delta and 41(40%) in Imo, the availability was 129, an excess of 25. Availability was 74(57%). Table 27 presents the need and availability in the urban, suburban and rural areas.

**Table 27: Need and Availability of Science Teachers in the Selected Science Subjects in the Urban, Suburban and Rural Areas**

Science Subjects	State	Need and Availability						
		Urban		Suburban		Rural		Need
		Need	Availability	Need	Availability	Need	Availability	

		S	R	A		S	R	A		S	R	A		
Maths	Delta	123	103	102	1	146	122	122	1	127	106	105	1	396
	Imo	76	81	81		92	97	96	1	80	83	83		250
	Total	199	184	183	1	238	219	218	2	207	189	188	1	646
F/Maths	Delta	20	23	23		23	27	27		20	23	23		63
	Imo	13	16	15	1	15	21	21		13	18	18		41
	Total	33	39	38	1	38	48	48		33	41	41		104
Physics	Delta	59	38	37	1	70	46	45	1	60	40	39	1	190
	Imo	39	30	29	1	46	36	34	2	40	30	30		125
	Total	98	69	66	2	116	82	79	3	100	70	61	1	315
Chem.	Delta	64	39	39		76	48	47	1	66	40	40		207
	Imo	42	32	30	2	50	38	36	2	43	31	31		135
	Total	106	71	69	2	126	86	83	3	109	71	71		342
Biology	Delta	109	56	57	1	130	69	69		113	60	59	1	353
	Imo	74	48	45	1	88	54	54		76	47	46	1	240
	Total	183	104	102	1	218	123	123		189	107	102	2	593
Agric/Sc	Delta	74	50	50		88	60	59	1	76	52	52		238
	Imo	46	42	41	1	54	50	49	1	47	43	43		147
	Total	120	92	91	1	142	110	108	2	123	95	95		385
Home/Econs	Delta	44	32	32		52	39	38	1	45	33	33		143
	Imo	30	27	26		35	32	31		30	28	27	1	96
	Total	74	59	58		87	71	69	1	75	61	60	1	239
Total	Delta	706	553	548	5	636	368	365	3	258	252	252	4	1,588
	Imo	452	418	414	4	407	279	275	5	166	191	187	4	1,043
Grand Total		1,158	971	962	9	1,043	648	640	8	424	434	425	8	2,631

**Key: S – Supply, R – Retention, A - Attrition**

Table 27 showed the need and availability of science teachers in the selected science subjects in the urban, suburban and rural locations. The need was 706 and availability 553(78%) in Delta urban, 451 and 418(92.7%) in Imo Urban, Delta suburban 636, availability 368(58%) and Imo 407 and 279(68.5%). In the rural area, the need was 424, and availability 434, a surplus of 10. Delta had 258 and 252(97%) and Imo, 166 and 191 a surplus of 25. Out of a total need of 2,631, and availability of 2,062, the suburban had the highest shortage with a need of 1,043, and availability of 648(62%), a shortage of 397. Table 28 shows the need in the selected science subjects.

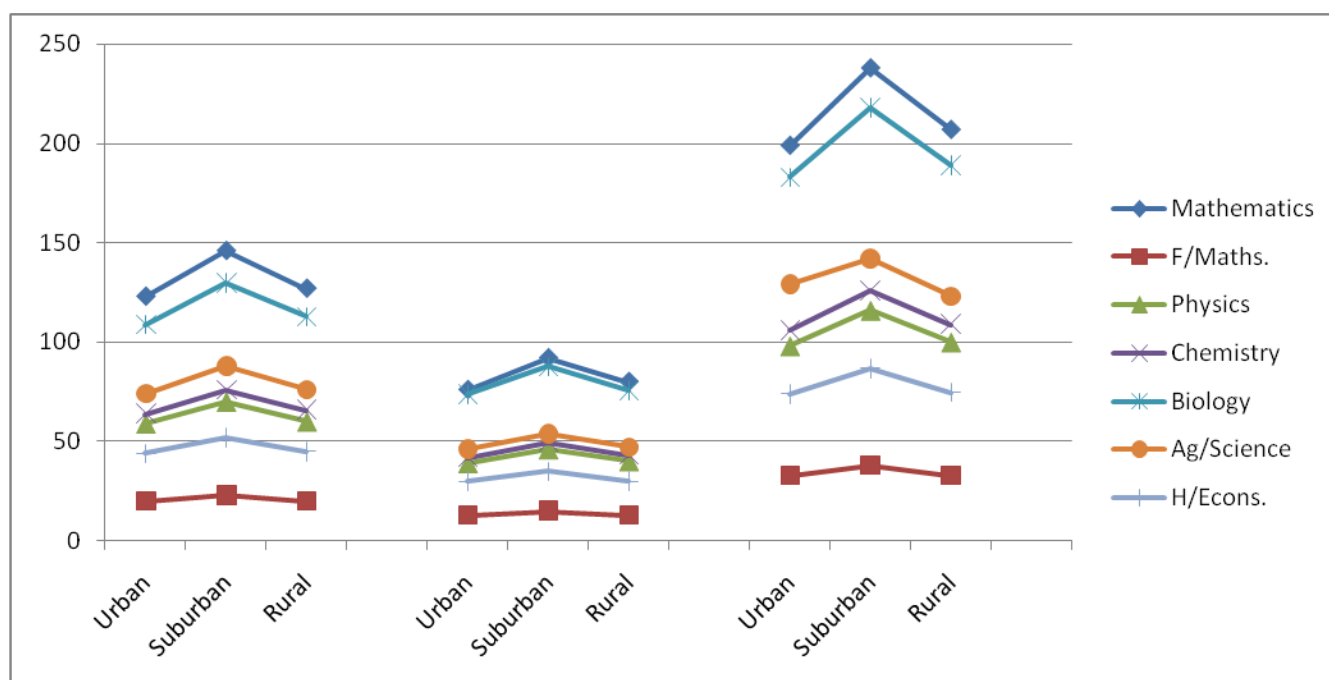
**Table 28: Need for Science Teachers in Selected Science Subjects in the Urban, Suburban and Rural Locations of Delta and Imo States**

	Need
--	------

Science Subjects	Delta			Imo			Total		
	U	S/Ub	R	U	S/Ub.	R	U	S/Ub.	R
Mathematics	123	146	127	76	92	80	199	238	188
F/Maths.	20	23	20	13	15	13	33	38	33
Physics	59	70	60	39	46	60	98	116	100
Chemistry	64	76	66	42	50	43	106	126	109
Biology	109	130	113	74	88	76	183	218	189
Ag/Science	74	88	76	46	54	47	120	142	123
H/Economics	44	52	45	30	35	30	74	87	75
<b>Total</b>	<b>706</b>	<b>636</b>	<b>365</b>	<b>452</b>	<b>407</b>	<b>166</b>	<b>1,158</b>	<b>1,043</b>	<b>424</b>

**Key: U- Urban, S/Ub.- Suburban, R - Rural**  
**Source: Fieldwork 2012**

Table 28 indicated a high need of 238 in Mathematics in the suburban, 146 in Delta and 92 in Imo, whereas the lowest was in Further Mathematics as indicated in the urban and rural areas of both Delta and Imo states. Figure 14 further illustrates this result.



**Delta**

**Imo**

**Total**

**Figure 14: Need for Science Teachers in Selected Science Subjects in the**

**Urban, Suburban and Rural Areas of Delta and Imo States**

Table 27 and Figure 14 confirm that the highest need in the selected subjects was in Mathematics in the suburban locations of Delta and Imo and the lowest in Further Mathematics in both the rural and urban locations of Delta and Imo states. Table 29 shows the Availability in of science teachers in the selected subjects in Delta and Imo states.

**Table 29: Availability of Science Teachers in the Selected Science Subjects**

**in the Urban, Suburban and Rural Areas of Delta and Imo States**

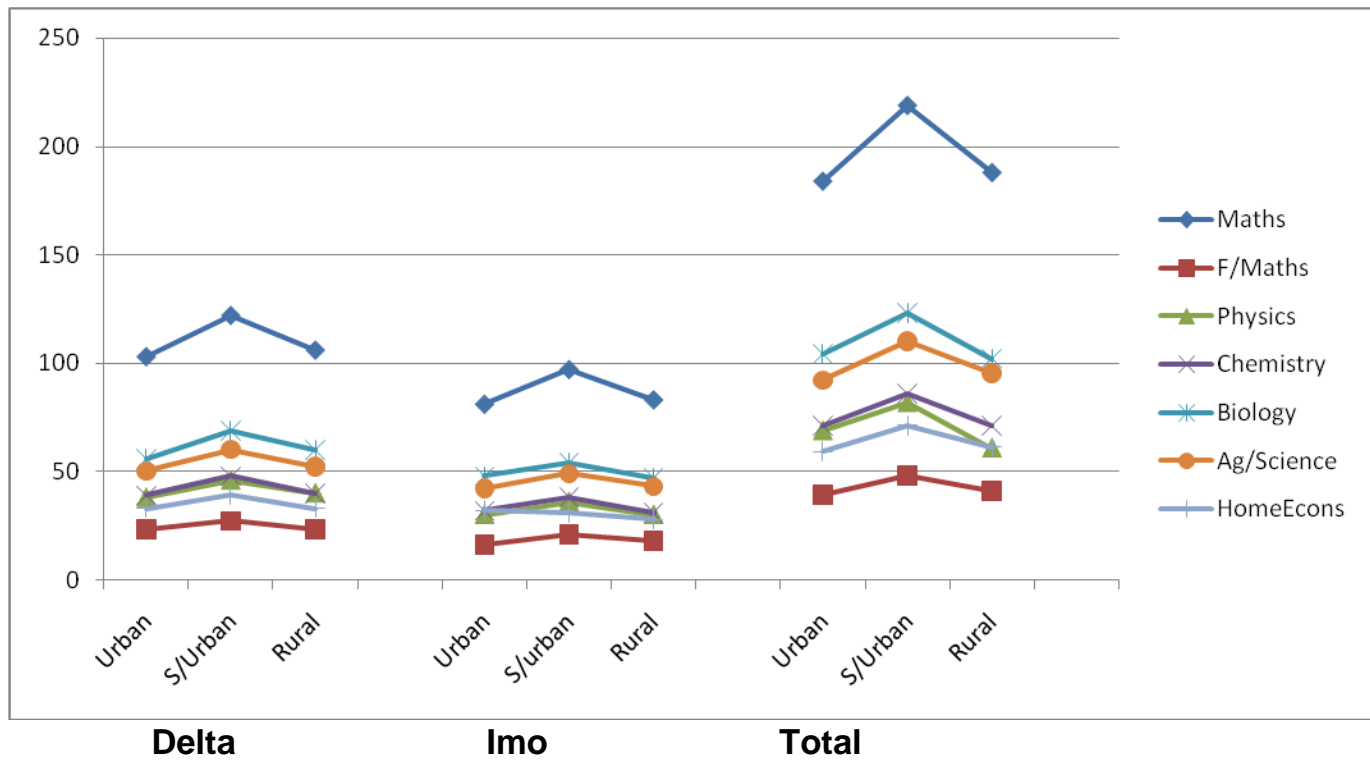
Science Subjects	Availability								
	Delta			Imo			Total		
	Urban	S/urban	Rural	Urban	S/urban	Rural	Urban	S/urban	Rural
Mathematics	103	122	106	81	97	83	184	219	189
F/Maths	23	27	23	16	21	18	39	48	41
Physics	38	46	40	30	36	30	69	82	70
Chemistry	39	48	40	32	38	31	71	86	71
Biology	56	69	60	48	54	47	104	123	107
Ag/Sc.	50	60	52	42	50	43	92	110	95
H/Econs	32	39	33	27	32	28	59	71	61
<b>Total</b>	<b>553</b>	<b>368</b>	<b>252</b>	<b>418</b>	<b>279</b>	<b>191</b>	<b>971</b>	<b>648</b>	<b>434</b>

**Source: Fieldwork 2012**

Table 29 showed that the highest availability in the selected science subjects was in Mathematics, 122 in Delta suburban, and 97 in Imo urban. The lowest was in Further Mathematics, 16 in the urban area in Imo, and 23 in



Delta urban and rural respectively. The availability in other science subjects is as presented on Table 29. Figure 15 further illustrates this result.



**Figure 15: Availability of Science Teachers in Selected Science Subjects in the Urban, Suburban and Rural Areas of Delta and Imo States**

Figure 15 confirms the result in Table 29, while Table 30 presents the need and availability in Delta and Imo states.

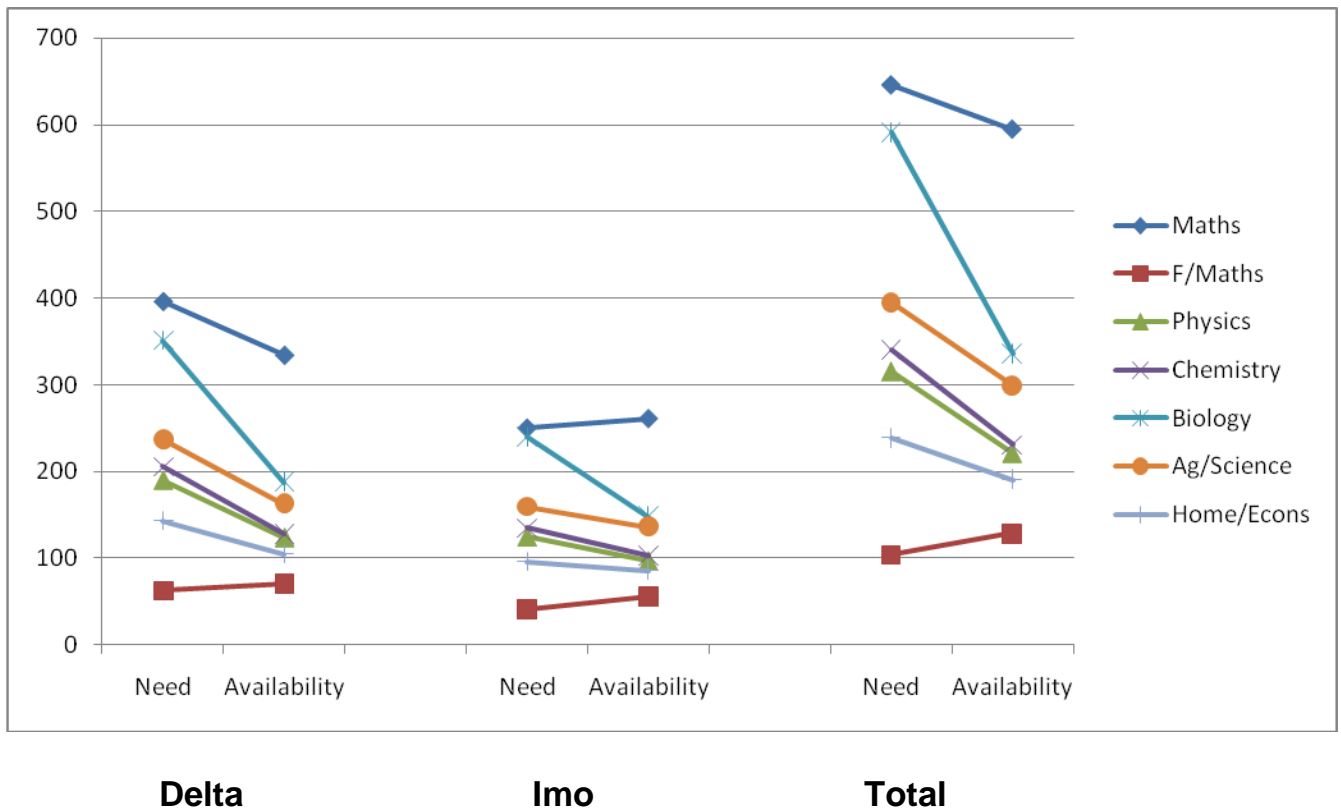
**Table 30: Need and Availability of Science Teachers in Selected Science Subjects in Delta and Imo States**

Science Subjects	Need and Availability								
	Delta			Imo			Total		
	N	A	S	N	A	S	N	A	S
Maths.	396	334	62	250	261	+11	646	595	51
F/Maths.	63	71	+ 8	41	58	+17	104	129	+25
Physics	190	124	66	125	97	28	315	221	94
Chemistry	206	128	78	135	103	32	341	231	110
Biology	351	188	163	240	148	92	591	336	255
Ag/Sc.	237	163	74	159	136	23	395	299	96
H/Econs.	143	105	38	96	86	10	239	191	48
<b>Total</b>	<b>1,586</b>	<b>1,173</b>	<b>413</b>	<b>1,045</b>	<b>889</b>	<b>156</b>	<b>2,631</b>	<b>2,062</b>	<b>569</b>

**Key: N – Need, A – Availability, S - Shortage**

**Source: Fieldwork (2012).**

Table 30 indicated that the total need was 2,631, 1,586 in Delta, and 1,045 in Imo. The total availability was 2,062; 1,173 in Delta, and 889 in Imo. There was a total shortage of 569; 413 in Delta and 156 in Imo. The highest need was in Biology, where out of a total need of 591; 351 in Delta and 240 in Imo, 336 was available; 188 in Delta and 148 in Imo. There is a shortage of 255; 163 in Delta and 92 in Imo. The highest availability was in Further Mathematics. There was a need for 104, 63 in Delta and 41 in Imo, but there was an availability of 129; 71 in Delta and 58 in Imo. There was a surplus of 25; 11 in Delta and 17 in Imo. Figure 16 further shows the result.



**Figure 16: Need and Availability of Science Teachers in Selected Science Subjects in Delta and Imo States**

On the whole, the analyses presented in Tables 26, 27, 28, 29 30, and Figures 14, 15 and 16 showed that there was need for science teachers in all the subject areas except for Further Mathematics. The greatest need was in Biology whereas the highest availability was in Further Mathematics, in the two states. The availability in Mathematics was higher in Imo with a surplus of 11 teachers unlike in Delta where there was a shortage of 62. Surpluses and shortages were the case in the subject areas between and within the various locations.

**Research Question Eight: What are the class sizes and teacher- pupil ratios in the public senior secondary schools in Delta and Imo States between 2006/2007 and 2010/2011 academic years?**

To answer this question, the enrolment data from the Statistics Division Post Primary Education Board of the Ministry of Education, Asaba, and the Directorate of Statistics Secondary School Management Board of Imo State Ministry of Education and the teacher availability from the responses were collated for senior secondary class one to senior secondary class three for the 2006/07 to 2010/11 academic years as presented in Tables 31, 32, 33 and 34.

**Table 31: Science Student Enrolment and Science Teacher Availability in the Urban, Sub-urban and Rural Areas of Delta and Imo States**

Loc.	Science Student Enrolment and Science Teacher Availability											
	Delta				Imo				Total			
	E	A	Sci.	C	E	A	Sci.	C	E	A	Sci.	C
Urban	25,643	507	65	520	20,674	454	40	480	46,317	961	105	1,000
S/U	31,688	399	65	520	10,287	249	60	415	41,975	648	125	935
Rural	6,119	267	50	215	10,827	186	60	385	16,946	453	110	600
Total	63,450	1,173	180	1,255	41,788	889	160	1,280	105,238	2,062	340	2,535

**Key: Loc- Location, E - Enrolment, A - Availability, Sci. – Schools, C – Classrooms.**

**Source: Statistics Division, Ministry of Education, Asaba (2011). Directorate of Statistics and Planning, Secondary School Management Board, Ministry of Education, Owerri (2012)**

The data in Table 31 showed science students enrolment, science teacher supply, number of schools and classrooms for senior secondary class one to senior secondary class three for 2006/2007 to 2010/2011 academic years. To calculate the class Sizes and teacher-pupil-ratios, the following indicators were used; Average Number of Teachers per Student (TPR), Average Number of Students per Class/Hours taught by the Teacher (ANSC), Average Number of Teachers per School (ANTS), and Average Number of Teachers per Class (ANTC). The result is presented in Table 32.

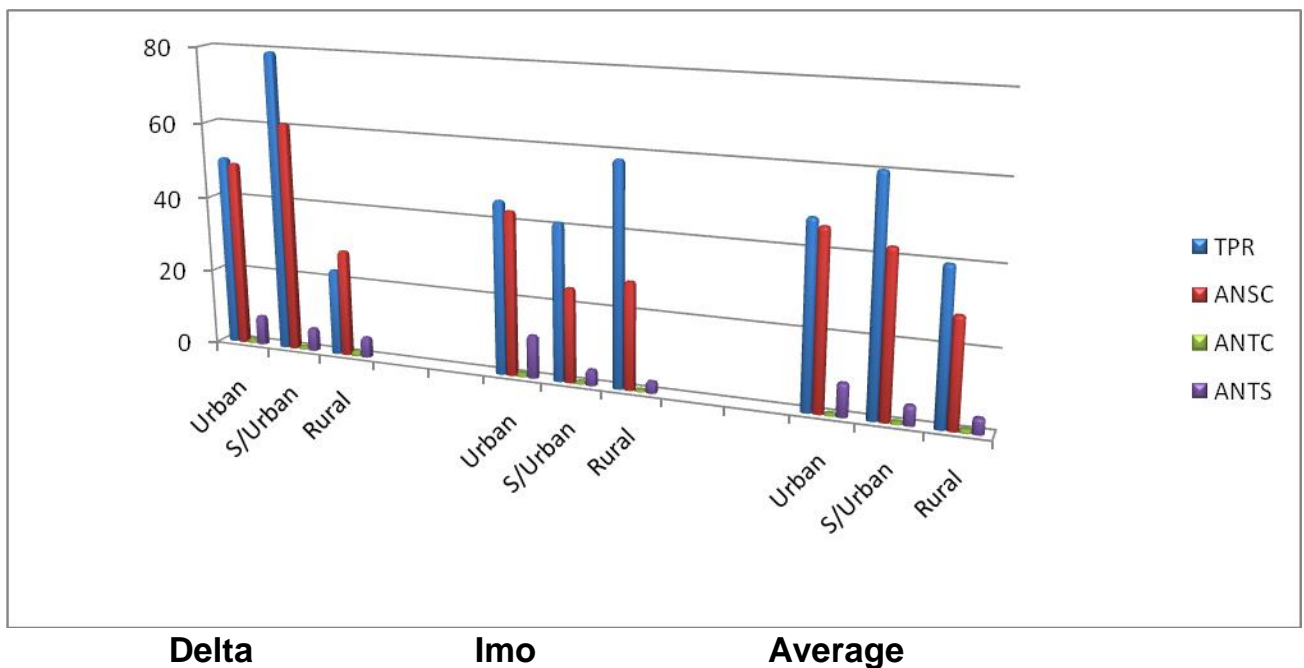
**Table 32: Class Sizes and Teacher–Pupil Ratios in the Urban, Sub-Urban and Rural Areas of Delta and Imo States**

Locations	Class Sizes				
	State	TPR	ANSC	ANTC	ANTS
Urban	Delta	50.6	49.3	.98	7.84
	Imo	45.5	43.1	.94	11.35
	<b>Total</b>	<b>96.6</b>	<b>92.4</b>	<b>1.9</b>	<b>19.2</b>
	<b>Average</b>	<b>48.1</b>	<b>46.2</b>	<b>.6</b>	<b>8.75</b>
Suburban	Delta	79.4	61	.76	6.1
	Imo	41.3	24.8	.68	4.2
	<b>Total</b>	<b>120.7</b>	<b>85.7</b>	<b>1.36</b>	<b>10.3</b>
	<b>Average</b>	<b>60.4</b>	<b>42.8</b>	<b>.68</b>	<b>5.2</b>
Rural	Delta	22.9	28.3	1.3	5.4
	Imo	58.2	28.1	.48	3.1
	<b>Total</b>	<b>81</b>	<b>56.4</b>	<b>1.8</b>	<b>8.4</b>
	<b>Average</b>	<b>40</b>	<b>28.2</b>	<b>.89</b>	<b>4.2</b>

**Key:** TPR – Teacher Pupil Ratio, ANSC – Average Number of Students per Class, ANTC Average Number of Teachers per Class, ANTS – Average Number of Teachers per School.

**Source:** Fieldwork (2012).

The data presented in Table 32 indicated that the highest class size was in Suburban; Delta with a TPR of 79, ANSC 61, ANTC .76, and ANTS 7.8, and the lowest was in Rural Delta with A TPR of 23, ANSC 28, ANTC 1.3, and ANTS 8.4. In Imo, the highest class size was in the rural locality with a TPR of 58, ANSC 28, ANTC .48, and ANTS 3, and the lowest in suburban Imo, with a TPR of 41, ANSC 25, ANTC .68, and ANTS 5. Figure 17 further illustrates the result.



**Figure 17: Class Sizes and (TPR) in the Urban, Sub-Urban and Rural Areas, of Delta and Imo States**

Figure 17 showed that the highest TPR (79.4) and ANSC (61) were in suburban Delta, and the lowest TPR (22.9) and ANSC (22.8) were in rural Imo. ANTC (1.3) was highest in Delta rural and lowest in Imo rural with (.48).

Imo urban had the highest ANTS (11.5), while Imo rural had the lowest ANTS (3.1).

**Table 33: Science Student Enrolment, Teacher Availability, Number of Schools and Classrooms from 2006/2007 to 2010/2011 Academic Years, in Delta and Imo States**

Academic Years	Science Student Enrolment and Science Teacher Availability								
	Delta				Imo				Total
	Enrollment	Availability	Schls	Cl/rms	Enrollment	Availability	Schls	Cl/rms	Enrollment
2006/07	12,225	233	36	273	9,412	173	32	256	21,637
2007/08	12,403	232	36	273	8,672	170	32	256	21,075
2008/09	12,713	231	36	273	7,421	174	32	256	20,134
2009/10	13,027	238	36	273	7,996	173	32	256	21,023
2010/11	13,082	239	36	273	8,287	188	32	256	21,369
<b>Total</b>	<b>63,450</b>	<b>1,173</b>	<b>180</b>	<b>1,255</b>	<b>41,788</b>	<b>889</b>	<b>160</b>	<b>1,280</b>	<b>105,238</b>

**Key: Schls- Schools, Cl/rms -Classrooms**

**Source: Statistics Division, Post Primary Education Board, Ministry of Education, Asaba (2011), Directorate of Statistics, Secondary School Management Board, Ministry of Education, Owerri (2012).**

The result presented in Table 33 indicated that the enrolment was 105,238 during the period of study, 63,459 in Delta and 41,788 in Imo. The supply was 2,062, 1,173 in Delta and 889 in Imo. The number of schools was 340, 180 in Delta and 160 in Imo. The number of classrooms was 2,535; 1,255 in Delta

and 1,280 in Imo. The result of the calculated class sizes are shown in Table 34.

**Table 34: Class Sizes and Teacher-Pupil-Ratios from 2006/2007 to 2010/2011 Academic Years in Delta and Imo States**

Academic Years	Class Sizes and Teacher- Pupil Ratios				
	State	TPR	ANSC	ANTC	ANTS
2006/2007	Delta	52.5	44.8	.85	6.5
	Imo	54.4	36.7	.68	5.4
	Total	106.9	81.6	1.5	11.9
	Average	53.5	40.7	.76	6
2007/2008	Delta	53.5	45.4	.85	6.3
	Imo	51	33.9	.66	5.6
	Total	104.5	79.3	1.5	11.9
	Average	52.3	39.7	.76	5.9
2008/2009	Delta	55	46.7	.84	6.4
	Imo	43.	28.9	.67	5.4
	Total	98	75.6	1.43	11.8
	Average	48.8	37.8	.7	5.9
2009/2010	Delta	54.7	47.7	.87	6.4
	Imo	46.2	31.3	.68	5.4
	Total	100.9	79	1.58	11.8
	Average	50.5	39.5	.79	5.9
2010/2011	Delta	54.8	48	.87	6.6
	Imo	44	32.4	.73	5.8
	Total	98.8	80.4	1.6	12.5
	Average	49.3	40.2	.8	6.3

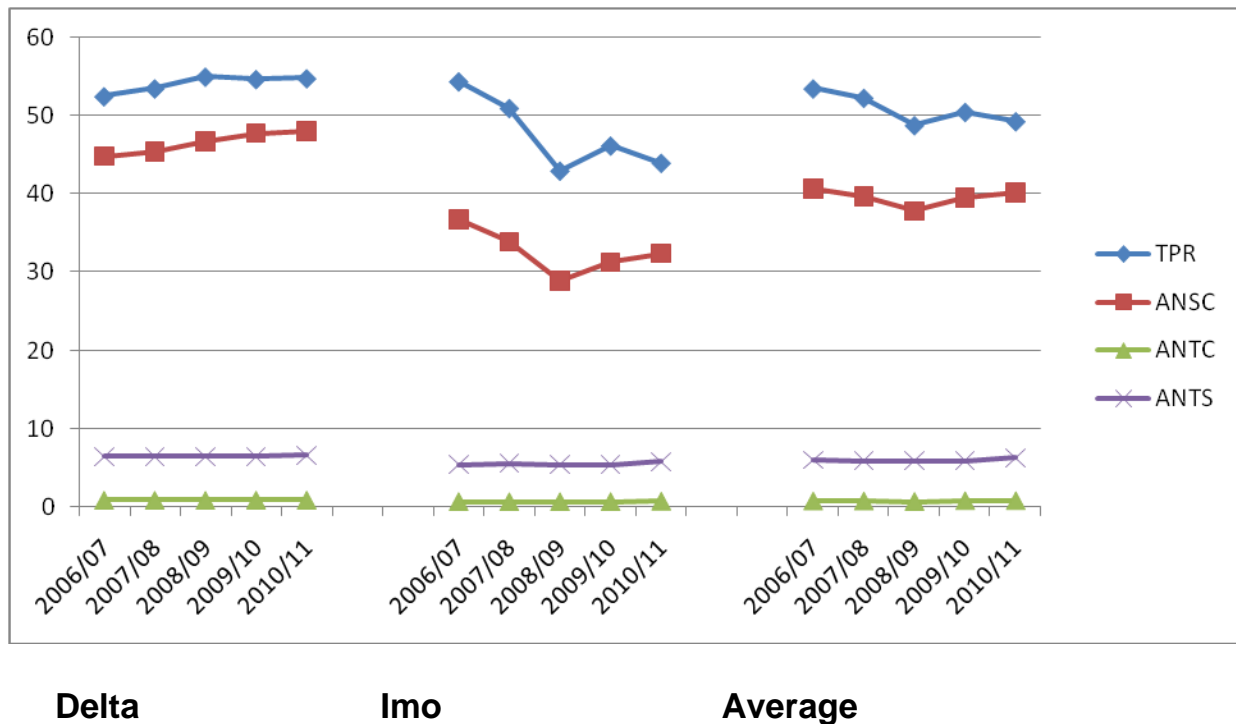
**Key: TPR – Teacher – Pupil Ratio, ANSC – Average number of Students per Class, ANTC – Average Number of Teachers per Class, ANTS – Average Number of Teachers per School.**

**Source: Fieldwork (2012).**

The result in Table 34 showed that the highest TPR, 55 was in Delta and the lowest 43 in Imo in 2008/09. ANSC was highest in Delta (46.7) and lowest in Imo (28.9) in 2008/09. ANTC was highest in Delta (.87) in 2009/10 and 2010/11 academic sessions, while the lowest was in Imo in 2006/07. The highest ANTS (6.6) was in Delta in 2010/11 and the lowest (5.4) in Imo in



2006/07, 2008/09 and 2009/10. This result is graphically illustrated in Figure 18.



**Figure 18: Class Sizes and Teacher-Pupil-Ratios from 2006/2007 to 2010/2011 Academic Years, in Delta and Imo States**

The analysis on class sizes from Tables 31, 32, 33, 34 and Figures 17 and 18 indicated that Delta had the highest class sizes in 2008/09, followed closely by other years except for 2006/07 when Imo had the highest.

**Research Question Nine: What are the Sources of the Science Teachers in the public senior secondary schools, from 2006/07 to 2010/11 academic years in Delta and Imo states of Nigeria?**

To answer this research question, data indicating the mentoring schools of the science teachers used in the study as an indication of their quality were collated and tabulated. The result is presented in Table 35

**Table 35: Sources of Science Teachers in the Public Senior Secondary Schools in Delta and Imo States from 2006/2007 to 2010/2011 Academic Years**

S/N	Sources of Science Teachers						
	Name of Institutions	Delta		Imo		Total	
		NS	%	NS	%	NS	%
1	Abia State University, Okigwe	2	.8	12	7	14	3.6
2	A'hmadu Bello University, Zaria	2	.8	-	-	2	.45
3	Alvan Ikoku College of Education, Owerri	-		41	22.6	41	10.6
4	Ambrose Alli University, Ekpoma	5	2.4	-	-	5	1.3
5	Anambra State College of Education, Awka	-		5	3	5	1.3
6	Bayero University, Kano	2	.8	-	-	2	.45
7	College of Agriculture, Anwai, Asaba	4	1.6	-	-	4	.89
8	College of Education, Agbor	14	8.7	-	-	14	4.6
9	College of Education, Bama, Bornu	1	.4	-	-	1	.22
10	College of Education, Warri	34	15.4	-	-	34	8.7
11	Delta State University, Abraka	55	22.9	-	-	55	13.6
12	Ebonyi State University, Abakalike	-		3	1.5	3	.67
13	Federal College of Agriculture, Umudike, Umuahia	-		8	4.5	8	2
14	Federal College of Education, Abeokuta	-		2	1	2	.45
15	Foreign Institutions	9	3.7	5	3.5	14	3.6
16	Imo State University, Owerri	4	1.2	22	12.6	25	6.2
17	Nnamdi Azikiwe University, Awka	3	1.6	10	5.5	13	3.3
18	Obafemi Awolowo University, Ile-Ife	2	.8	3	1.5	5	1.1
19	Ondo State College of Education	-		2	1	2	.45
20	Rivers State Col. Of Education, Port Harcourt.	10	4.5	3	1.5	13	3.13
21	Umar Ibn Ibrahim College of Education, Bornu	1	4	-	-	1	22
22	University of Benin, Benin-City	32	12.7	7	4.5	39	, 8.9
23	University of Calabar	3	1.2	7	3.5	10	2.2
24	University of Ibadan	5	2	-	-	5	1.1

25	University of Ilorin	2	.8	-	-	2	.45
26	University of Mau'dugiri	3	1.5	-	-	3	.67
27	University of Nigeria, Nsukka	19	7.9	31	15.6	50	11.1
28	University of Port Har Court	17	6.9	12	6.5	29	6.7
29	University of Uyo	-		8	4.5	8	2
	<b>Total number of respondents</b>	<b>236</b>		<b>183</b>		<b>419</b>	
	<b>Total number of teachers</b>	<b>239</b>		<b>188</b>		<b>427</b>	

**Source: Fieldwork (2012).**

The presentation in Table 35 showed that science teachers in the teaching service of Delta and Imo states were deployed from three main sources. The first source is the higher institutions within the states. The second source comprised of some neighboring higher institutions with these states as catchment zones, and the third, institutions of higher learning in other states and outside the country. The principal source of science teacher supply was the University of Nigeria Nsukka, 50(11.1%), followed by the University of Benin, 39(8.9%). This could be because the two schools are the closest Federal and older Universities to the states under study. When individual states were considered, Delta State University, Abraka, trained 55(24.6%), seconded by College of Education, Warri, 39(15.4%), in Delta, while in Imo, Alvan Ikoku College of Education, Owerri, 41(22.6%), and Imo State University, Owerri, 25(12.%) mentored the highest number of teachers. Seven percent (7%) of the science teachers were trained in schools within the country though outside the catchment area, while 3% came from foreign institutions. Out of the 427 science teachers that participated in the study, 56(13%) had only NCE, 147(35%) NCE plus B.Ed. or B.Sc. Ed., 121(29%)

B.Ed. or B.Sc. Ed. 72 (19%) B. Ed. plus M.Ed. or B.Sc. Ed. plus M.Ed. and 14 (3.3%) NCE and B.Ed. or B.Ed., M.Ed. and PhD. This is an indication of the high academic quality of the science teachers in Delta and Imo states.

**Research Question Ten: What is the need and availability of science teachers in the public senior secondary schools, in the urban, suburban and rural areas, from 2006/07 to 2010/11 academic years in Delta and Imo states?**

Data on enrolment collected from the relative Ministries of Education, using the 40 students per teacher norm was calculated to determine the demand. The supply, retention and attrition were derived through the analyses of the data collated from the sampled schools. The results are presented in Tables 36, 37, 38, and 39.

**Table 36: Need and Availability of Science Teachers in Delta and Imo States from 2006/2007 to 2010/2011 Academic Years.**

		Need and Availability of Science Teachers										
Acad. Years	L	Delta					Imo					E
		E	N	Availability			E		Availability			
				S	R	A			S	R	A	
2006/2007	U	5,012	125	108	107	1	4,612	115	81	80	1	9,624
	S	5,990	149	74	74		2,352	58	54	54		8,342
	R	1,223	31	51	50	1	2,448	61	38	38		3,671
	T	12,225	305	233	231	2	9,412	234	173	172	1	20,897
2007/2008	U	5,085	127	111	110	1	4,250	106	75	75		9,325
	S	6,017	150	71	70	1	2,168	55	57	55	2	8,185
	R	1,241	32	50	50		2,254	57	39	37	2	3,494
	T	12,403	309	232	230	2	8,672	218	171	167	4	21,075
2008/2009	U	5,212	130	111	110	1	3,636	91	82	81	1	8,848
	S	6,229	155	75	75		1,856	46	57	55	2	8,085
	R	1,272	32	45	44	1	1,929	48	39	39		3,201
	T	12,713	317	231	229	2	7,421	185	178	175	3	18,234
	U	5,341	133	115	114	1	3,918	98	84	84		9,269

<b>2009/ 2010</b>	<b>S</b>	6,383	159	74	74		1,999	50	55	54	1	8,382
	<b>R</b>	1,303	33	49	48	1	2,079	51	38	38		3,382
	<b>T</b>	13,127	328	238	236	2	7,996	199	177	176	1	20,022
<b>2010/ 2011</b>	<b>U</b>	4,954	125	117	114	1	4,061	101	85	83	2	9,015
	<b>S</b>	5,920	148	72	73	1	2,071	52	57	57		7,991
	<b>R</b>	1,208	31	50	49	1	2,155	54	39	36	3	3,363
	<b>T</b>	12,082	304	239	236	3	8,287	207	186	181	5	21,363
<b>Grand Key: E – Enrolment, N – Need, S – Supply, R – Retention, A – Attrition L- Location, U- Urban, S- Suburban, R- Rural, T- Total</b>	<b>U</b>	25,643	641	507	502	5	20,674	517	454	451	3	46,317
	<b>S</b>	31,688	792	399	396	3	10,287	257	249	244	5	41,975
	<b>R</b>	6,119	153	267	264	3	10,827	271	186	180	6	16,946
	<b>T</b>	63,450	1,586	1,173	1,162	11	41,788	1,045	889	875	14	105,238
<b>Total</b>												

The result in Table 36 showed that the enrolment was 105,238, 63,450(60%) in Delta and 41,788(40%) in Imo. The total need was 2,631; 1,586(60%) in Delta and 1,045(40%) in Imo, availability was 2,062; 1,173(56%) in Delta and 889(44%) in Imo, retention was 2,037; 1,162(57%) in Delta and 875(43%) in Imo. The attrition was 25, 11 (.44 in Delta, and higher in Imo 14 (.68%).The need and availability in Delta and Imo in the urban, suburban and rural locations are presented in Table 37.

**Table 37: Need and Availability of Science Teachers in Urban, Suburban and Rural Locations of Delta and Imo states**

Location	State	Need and Availability					
		Enrol.	Need	Availability			Shortage
				S	R	A	
Urban	Delta	25,643	641	507	502	5	134
	Imo	20,674	517	454	451	3	63
	<b>Total</b>	<b>46,317</b>	<b>1,152</b>	<b>961</b>	<b>953</b>	<b>8</b>	<b>197</b>
Suburban	Delta	31,688	792	399	396	3	393
	Imo	10,287	257	249	244	5	8
	<b>Total</b>	<b>42,975</b>	<b>1,049</b>	<b>648</b>	<b>640</b>	<b>8</b>	<b>401</b>
Rural	Delta	6,119	153	267	264	3	114*
	Imo	10,827	271	186	180	6	85
	<b>Total</b>	<b>16,946</b>	<b>424</b>	<b>453</b>	<b>444</b>	<b>9</b>	<b>29*</b>
Total	Delta	63,450	1,586	1,173	1,162	11	413
	Imo	41,788	1,048	889	875	14	156
<b>Grand Total</b>		<b>105,238</b>	<b>2,631</b>	<b>2,062</b>	<b>2,037</b>	<b>25</b>	<b>569</b>

**Key: S- Supply, R – Retention, A – Attrition, Enrol., - Enrolment**

**Source: Fieldwork (2012)**

Table 37 revealed a total enrolment of 63,450 in Delta; 25,643(40%) was in the urban, 31,688(50%) in the suburban, and 6119(10%) in the rural, a total need of 1,586, 641(40%) urban, 792(50%) suburban and 153(10%) in the rural. The availability in the urban was 1,173; 553(47%), suburban 368(31%) and rural 252(21%), with a retention of 550(47%) in the urban, 364(31%) suburban, 248(21%) rural and an attrition of 3(.15%), 4(.20%) and 4(..20%) respectively. In Imo State, the total enrolment was 41,788; 20,675(49%) urban, 10,287(25%) suburban and 10,827(26%) rural. The need was 1,045; 517(49%) urban, 257(25%) suburban, 271(26%) rural, availability was 454(51%) urban, 249(28%) suburban, 186(21%) rural, retention 451(52%)

urban, 244(27%) suburban and 180(20%) rural. the attrition was 3(.15%), 5(.25%) and 6(.30%). There was a total shortage of 569, 423 (72.6%) in Delta and 156 (27.4%) in Imo. Table 38 shows the need and availability within the period of study.

**Table 38: Need and Availability of Science Teachers from 2006/2007 to 2010/2011 Academic Years in Delta and Imo States**

Academic Years	Need and Availability						
	States	Enrolment	Need	Availability			Shortage
				S	R	A	
2006/2007	Delta	12,225	305	233	231	2	72
	Imo	9,412	234	173	172	1	61
	<b>Total</b>	<b>21,637</b>	<b>539</b>	<b>406</b>	<b>403</b>	<b>3</b>	<b>133</b>
2007/2008	Delta	12,403	310	232	230	2	75
	Imo	8,672	217	170	166	4	40
	<b>Total</b>	<b>21,075</b>	<b>527</b>	<b>402</b>	<b>396</b>	<b>6</b>	<b>115</b>
	Delta	12,713	330	231	229	2	99

<b>2008/2009</b>	<b>Imo</b>	7,472	185	174	171	3	11
	<b>Total</b>	20,134	515	405	400	5	100
<b>2009/2010</b>	<b>Delta</b>	13,128	328	238	236	2	90
	<b>Imo</b>	7,996	199	174	173	1	25
	<b>Total</b>	20,134	512	412	409	3	110
<b>2010/2011</b>	<b>Delta</b>	12,082	327	239	236	3	98
	<b>Imo</b>	8,287	209	188	183	5	21
	<b>Total</b>	20,369	536	427	419	8	109
<b>Total</b>	<b>Delta</b>	63,450	1,586	1,173	1,162	11	413
	<b>Imo</b>	41,788	1,045	889	875	14	156
<b>Grand Total</b>		<b>105,238</b>	<b>2,631</b>	<b>2,062</b>	<b>2,037</b>	<b>25</b>	<b>569</b>

**Key: S – Supply, R – Retention, A - Attrition**  
**Source: Fieldwork (2012).**

Considering the years of study with a total need of 2,631 science teachers; Table 38 showed that in 2006/07, the need was 305(11.6%) in Delta and 234(9%) in Imo, the total availability was 2,062; 233(11.3%) in Delta and 173(7 %) in Imo; the total retention 2,037; 231(8.7%) in Delta and 172(6.5%) in Imo, the attrition was 25 (1.2%); 2(.1%) in Delta and 1(.05%) in Imo. In 2007/08, the need was 309(11.7%) in Delta and 218(8.3%) in Imo, 232(11.3%) was the availability in Delta and 171(8.3%) in Imo; the retention, was 230(11.3%) in Delta and 167(8.2%) in Imo, and the attrition, 2(.10%) in Delta and 2(.10%) in Imo. The need in 2008/09 was, 325(12.4%) in Delta and 185(9%) in Imo, availability was 231(11.2%) and 178(8.6%); retention 229(11.2%) and 175(8.6%), attrition 2(.10%) and 3(.15%) respectfully. In



2009/10; the need was 325(12.4%) in Delta and 199(7.6%) in Imo, availability was 238(11.55%) in Delta and 177(8.6%) in Imo; the retention was, 236(11.6%) and 176(8.6%), and attrition was, 2(.10%) and 1(.05%) in Delta and Imo respectfully. The teacher need in 2010/11 was 304(11.6%) in Delta and 207(7.7%) in Imo, availability was 239(11.6%) and 186(9%); retention, 236(11.6%) and 181(8.9%), and attrition, 4 (.20%) in Delta, and 4(.20%) in Imo. There was a total shortfall of 569, 413 in Delta and 156 in Imo. However the highest shortage was in 2006/07 with 133, 72 in Delta and 61 in Imo. Table 39 shows the total need, availability of science teachers in Delta and Imo states.

**Table 39: Summary of the Need and Availability of Science Teachers in Delta and Imo States**

States	Need and Availability					
	Need		Availability			
	Enrollment		Supply	Retention	Attrition	Shortage
Delta	63,450	1,586	1,173	1,162	11	413
Imo	41,788	1,045	899	875	14	156
<b>Total</b>	<b>105,238</b>	<b>2,631</b>	<b>2,062</b>	<b>2,037</b>	<b>25</b>	<b>569</b>

From the summary of the need and availability of science teachers in senior secondary schools in Delta and Imo states as presented in Table 39, the total enrollment of science students from the 2006/07 to 2010/2011 was 105,238, the need was 2,631, 1,586 (60.2%) in Delta and 1,045 (39.8%) in Imo. Out of the availability of 2,062, 1,173 (56.8%) in Delta, and 889 (43.2%) in Imo; 1,162 were retained in Delta and 875 in Imo, whereas the attrition was 25 (1.2%); 11 (.46%) in Delta and 14 (.66%) in Imo. The total shortage was 569, 413 (72.5%) in Delta and 156 (27.5%) in Imo.

## **Discussion of the Results**

The study was carried out to comparatively analyze the need and availability of science teachers in public senior secondary schools in Delta and Imo states, and to determine their distribution in the urban, sub-urban and rural locations between the 2007/2008 and 2010/2011 academic years. The discussion of results would be carried out under the following subheadings. These include: Need for Science Teachers in the Public Senior Secondary Schools in Delta and Imo States, Availability of Male and Female Science Teachers in the Public Senior Secondary Schools in Delta and Imo States, Availability of Science Teachers in the Public Senior Secondary Schools in the Urban, Suburban and Rural areas of Delta and Imo States, Need and Availability of Science Teachers in the Public Senior Secondary Schools in the

Senatorial Districts of Delta and Imo States, Availability of Science Teachers in the Public Senior Secondary Schools in Delta and Imo States, Constraints on the Need and Availability of Science Teachers in the Public Senior Secondary Schools in Delta and Imo States, Influence of Location on the Need and Availability of Science Teachers in the Selected Science Subject Areas, Science Class Sizes and Teacher Pupil Ratios (TPR), Source of Availability of Science Teachers in the Public Senior Secondary Schools in Delta and Imo States, and Need and Availability of Science Teachers in the Public Senior Secondary Schools in Delta and Imo States.

### **Need for Science Teachers in the Public Senior Secondary Schools in Delta and Imo States**

The findings revealed that the total student enrolment during the period of study (2006/2007 to 2010/2011) was 105,238; 63,450 in Delta, and 41,788 in Imo. The total need was 2,631, based on the national benchmark of one teacher per forty students, 1,586 in Delta, and 1,045 in Imo. The need in the urban was 641 and 517, suburban 792 and 257, and rural 153 and 271 in Delta and Imo respectively. Comparing the years of study, in 2006/07, the need was 305 and 234, 2007/2008, 309 and 218, in 2008/09, 330 and 185, 2009/10, 315 and 199, and 2010/11 327 and 209 in Delta and Imo respectively. This pattern of need for science teachers revealed also that science teachers play a very essential role in students' learning. Adesina (1981) called them the "key input of a highly- skilled labour resource", Aghenta (2000) described them as "key factors in formal education:", and Adeyemi

(2004), regarded them as the hub of the educational system (in Adeyemi 2011.304).

### **Availability of Male and Female Science Teachers in the Public Senior Secondary Schools in Delta and Imo States**

The result of the study showed that the total number of science teachers supplied was 2,062; 721(34%) were male; 410 (56.8%) in Delta and 311 (43.2%) in Imo, 1,341(66%) female; 784 (77%) in Delta and 577 (43 %) in Imo. The number of science teachers retained was 2,037, 715(34.9%) male; 305 (42.7%) in Delta and 410 (47.3%) in Imo, 1,322(65.1%) female; 754 (57%) in Delta and 564 (43%) in Imo. Imo had more male teachers whereas Delta had more females. Of the 25 (1.2%) science teachers that left, 16(.76%) male; 8 (.39%) in Delta and 8 (.39%) in Imo, and 9(.44%) female; 3 (.15%) in Delta and 6 (.30%) in Imo. As noted by Hedges (2002), in Cassandra et al. (2006.176) more females are retained as more of the males leave for other professions. Boe and Clifford (1992), also in Cassandra et al. (2006.176), affirmed that teaching is socially defined as a line of work for women, as society ascribes certain value traits to men and women, with women seen as supportive, gentle, kind, cooperative and dependable. Women also bear a greater share of child rearing responsibility and so find the teaching profession very compatible with this constraint. In line with the same reasoning, Cassandra et al. (2006) also acclaimed that men see teaching as a stepping stone, prior to their real career in one of the male dominated, skilled, white collar job occupations or blue collar professions.

## **Availability of Science Teachers in the Public Senior Secondary Schools in the Urban, Suburban and Rural Locations of Delta and Imo States**

The availability of science teachers in senior secondary schools in Delta and Imo states was very high in the urban, suburban and rural localities. As revealed through the analysis, 2,062 teachers were available, 2,037(98.9%) were retained, 1,162(57%) in Delta, and 875(43%) in Imo. The total attrition was 25(1.2%) , 11(.44%) in Delta, and 14(.68%) in Imo. In the urban, the retention was 1,158(57%); 641(55%) in Delta with an attrition of 5(.24%), and 517(45%) in Imo, and the attrition as 4(.20%). The suburban in Delta retained 396(34.3%) and 3(27%) left, while in Imo 244(27%) were retained out of 875(43%). 5(36%) were not retained. In the rural location, out of 444(22%) retained 264(59%) was in Delta, and 3(.15%) were not retained, while in Imo 180(41%) were retained and 5(.25%) left. This result debunks research claims that science teachers are not retained (Ingersol 2001) and Nigerian Union of Teachers (NUT 1970). The result corroborates research conclusions by Johnson (2006) that teaching could remain the most attractive in terms of the intrinsic rewards it offered, as it allowed time for the family, contributes to society and involved work that one loved to do.

## **Need and Availability of Science Teachers in the Public Senior Secondary Schools in the Senatorial Districts of Delta and Imo States**

The results presented in Tables 15, 16 and Figure 11 indicated that the need for science teachers was highest in Delta Central, 622 was the need and availability 372 with a shortage of 250, followed by Orlu in Imo, where the

need was 358 and availability was 170 with a shortage of 188. The lowest need was in Owerri municipal district with a need of 449, and availability of 541, a surplus of 98 science teachers, followed by Delta South with a need for 432, availability of 388 and a shortage of 44. The findings further revealed a disturbing availability situation. For instance, the researcher while distributing the checklist visited a suburban town with two schools within a kilometer apart, one of the schools with an enrolment of less than 200 science students had 15 science teachers whereas the next school within less than a kilometer with an enrolment of more than 500 students had just 4 science teachers. This result is attested to by Lewin (2002), who quipped that in many African countries, distribution of science teachers is uneven, with surpluses co-existing with shortages in certain areas, and negates the findings of Bankole (2002), and Akinduro (2003), (in Adeyemi, 2011.314) who reported in their study of higher shortages in rural and surpluses in urban districts.

### **Availability of Science Teachers in the Public Senior Secondary Schools in Delta and Imo**

The availability of science teachers in the public senior secondary schools was 2,062 (78%), of a need of 2,631, 1173 (56%) in Delta and 889 (44%) in Imo with a shortfall of 569(28%); 413(72.6%) in Delta, and 156 (27.4%) science teachers in Imo state. The level of retention was adequate. 2,037(98.0%) were retained; 1,162(99.1%) in Delta and 875(97.3%) in Imo. 25 science teachers left, 11(44%) in Delta and 14(56%) in Imo. This showed that the level of supply was low, that of retention was very high with a very low

attrition. This is in line with the findings of Nnebuchi and Obisogu (2010), Ajaju (2009), Uwadiae (2009), the Sub-committee on Standards (2007) who reported of inadequate availability of science teachers in their various studies. The Nigerian Education Sector Diagnosis (NESD, 2007) also reported that most developing countries including Nigeria are plagued with science teacher shortages.

### **Constraints on the Need and Availability of Science Teachers in the Public Senior Secondary Schools in Delta and Imo States**

To answer this question, the data presented in Tables 20, 21, 22, 23 and 24 were used. On the constraints from the government, 146(31%) out of the 419 science teachers unanimously agreed that “lack of adequate financing of education” was the greatest constraint to the availability of science teachers, followed by “lack of adequate science laboratories, equipment and facilities”, by 83(14.6%). Majason in (1989) observed that insufficient allocation of fund, and inadequate provisions of laboratories were major contributors to the short supply of science teachers. His view on funding is in line with Utulu (2001) in (Oyeniyi 2007.60), Nwadiani and Akpotu (2002), Ukeje (2002), as they remarked that the budget allocation to education at both Federal and State level is poor and erratic. In the same vein Urah (2001), Olaniyan (2003), Alabi (2005), in (Oyeniyi 2007.60) observed that poor funding has been a major setback to the development of education in Nigeria.

An analyses of the constraints to the retention of science teachers from these students revealed that “poor reading and study habits” of the students was ranked the highest constraint by 183(31.7%) science teachers, and “overindulgence in social activities”, second by 72(15.2%).

As revealed by the findings on the constraints from teachers, the respondents 157(21.9%) selected “inadequate exposure of students to practical work” as the greatest constraint, followed by “inability to motivate students to learn”, by 106(19.5). These corroborate the findings of the Sub-Committee on Standards, Ministry of Education Asaba (2007), Ajaju (2009, Uwadiae (2009), Nnebuchi et. al. (2010) and Oyekanmi (2010) who reported of a predominantly theoretical and less practical approach by science teachers in the classrooms. Because laboratories are grossly deficient, teachers are compelled to introduce the new teaching approach known as “Theory of Practicals” (TOP) or generally referred to as alternative to practical. This has a devastating implication on the Nigerians’ quest for science and technological breakthrough. On constraints from the society, the analysis showed that “Parents overzealous attitudes to push their children to study the discipline in vogue” was generally considered the greatest constraint by 137(29%) of the science teachers, while “Parents failure to provide learning materials” was ranked second by 78(17%) of the respondents.

As evident through the responses to the constraints from curriculum and examination, “high demand and irrelevance of the curriculum” was ranked first by 220(46.6%), and “High standard of examination questions” second by



145(30.7%) of the respondents. This result is in line with research assertions that the science taught in schools is irrelevant, content laden, teacher centered and examination oriented (Kosamani, 2005). Brown (2009) commenting in a write up on curriculum content emphasized that the size and relevance of the curriculum may have some effect on how much science the students can learn. Obisogu et al. (2010), Oyekanmi (2010) also confirmed that non-adherence to the stipulated curriculum by the science teachers can make students lose interest in studying science.

### **Influence of the Urban, Sub-urban and Rural Locations on the Need and Availability of Science Teachers in Selected Science Subject Areas**

The results as presented in Tables 25, 26, 27, 28, 29 and Figures 14, 15 and 16 revealed a need for science teachers in all the subject areas in the urban, suburban and rural areas except for instance Further Mathematics that had an excess of 28, in Delta rural (3), suburban (5) and urban (3), and Imo urban (3), Suburban (6) and rural (5), and in Mathematics a surplus of 11 in Imo urban. The greatest need was in Biology, with a total need of 593; 351 in Delta and 242 in Imo with an availability of 336 and a shortage of 255. The study also revealed that the level of retention was very high in all the locations. This finding debunks research claims that science teachers are not retained (Ingersol 2001), the Nigerian Union of teachers (NUT), and the Science Teachers Association of Nigeria's (STAN) continued hue and cry of mass exodus, and an alarming brain drain of highly skilled science teachers.

## **Science Class Sizes and Teacher Pupil Ratios in the Public Senior Secondary Schools in Delta and Imo States**

The results as presented in Tables 30, 32, 32, 33, and Figures 17, and 18 showed that the highest TPR (79.4) and ANSC (61) were in suburban Delta, and the lowest TPR (22.9) and ANSC (22.8) were in rural Imo. ANTC (1.3) was highest in Delta rural and lowest in Imo rural with (.48). Imo urban had the highest ANTS (11.5), while Imo rural had the lowest ANTS (3.1). Class sizes affect the process of learning especially in science education. Students may receive more attention in smaller class sizes, just as the teacher's morale, interest, attitudes and the teaching methods employed may remain more favorable to the students. Hanusheck and Darling-Harmond (1999) however warned that a reduced class size may lead to a dramatic increase in the cost of schooling, and may not lead to achievement gains except when accompanied by highly qualified teachers.

## **Source of the Availability of Science Teachers in the Public Senior Secondary Schools in Delta and Imo State**

The findings indicated that the University of Nsukka was the highest source of supply (11.1%), followed by the University of Benin (8.9%), and the University of Port Harcourt (6.5%). When individual states were considered, Delta State University Abraka (24.6%), and College of Education Warri (15.4%) were the highest suppliers in Delta. In Imo state, Alvan Ikoku (22.6%) and Imo State University (12.6%) supplied the highest number of science teachers. Out of the 419 science teachers that participated in the study,

56(13%) had only NCE, 147(35%) NCE plus B. Ed. or B. Sc. Ed, 121(29%) B.Ed. or B.Sc. Ed. 72 (19%) B. Ed. plus M.Ed., or B. Sc. Ed, plus M.Ed. and 14(3.3%) NCE and B.Ed. or B.Ed., with M.Ed. and PhD. This is an indication of a sound academic quality of the science teachers in Delta and Imo states. This is in line with the reasoning of Osarenren-Osaghae and Irabor (2012), as they stated that the growth and development of skill-based courses in any country of the world largely depend on the quality and adequacy of teachers in these areas of professional endeavour.

### **Need and Availability of Science Teachers in the Public Senior Secondary Schools in Delta and Imo States**

The study revealed that the total need within the period of study was 2,631, 1,586 in Delta, and 1,045 in Imo. The availability was 2,062; 1,173 in Delta, and 899 in Imo. The shortage was 569; 413 in Delta, and 156 in Imo. Out of the available number, 2,037 was retained; 1,162 in Delta, and 875 in Imo. Attrition was 25; 11 in Delta and 14 in Imo.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **Summary of the Study**

The study, an ex-post-facto research, comparatively analyzed the need and availability of science teachers as well as their constraints in the public senior secondary schools in Delta and Imo states. The sample for the study comprised of 68 senior secondary schools, The instruments used to collect data were two specific and validated checklists, the Principal's Checklist on the Need and Availability of Science Teachers (PCNAST), and the Senior Secondary School Science Teacher's Checklist (SSSSTC). The instruments were administered on the sixty eight (68) principals of the sampled schools, and the four hundred and twenty seven (427) science teachers that were available during the 2010/11 academic year. The data collected were analyzed using frequency counts, percentages, ratios, bar charts, and line graphs. Ten research questions were raised and answered.

#### **Findings**

1. There was a need for 2,631 science teachers, 1,586 (60.3%) in Delta, 1,045 (39.7%) in Imo. Availability was 2,062, 1,173 (56.8%) in Delta and 889 (43.2%) in Imo, 2,037 science teacher were retained, 1,162 (57%) in Delta and 875 (43%) in Imo. Attrition was 11 (.44%) in Delta and 14 (.68%) in Imo, There was a shortage of 569 science teachers, 413 (77%) in Delta, 156 (27.4%) in Imo, and only twelve (12, nine (9) in Delta and four (4 in Imo out of the Sixty eight (68) sampled schools offered the selected subjects,
2. Findings revealed that 1,341 female science teachers were available, 784 (77%) in Delta and 577 (43%) in Imo, a total of 721 male science teachers, 410 (56.8%) in Delta, 311 (43.2%) in Imo. Of the 1322 female science teachers retained, 754 (57%) was from Delta and 568 (43%) was from Imo. Attrition was 16(.78%) for the male, 4 (.20%) in Delta with 12 (.60%) in Imo, 9(.44%) for the female, 6 (.30%) and 3 (.15%) in Delta and Imo respectively.
3. The need was 2,631, and availability was 2,062(78%) in Delta and Imo. The highest need was in Delta Central, 622 (23.6%), while the lowest was in Okigwe Senatorial district, with 231(8.7%). Availability was highest in Owerri municipal district with 541 (26.2%) and lowest in Okigwe with 169 (8.2%).
4. The greatest constraint on the need for science teachers was lack of adequate funding for education, as attested to by 123(29.3%) of the 427 science teachers, followed by inadequate provision of science

laboratories and equipments with 74 (8%). The greatest constraints on availability of science teachers from the students were their “poor reading habits”, 165, (39.4%) and their “over indulgence in social activities”, 63 (15%). Science teachers did not “expose science students to practical work” (139, 33%) and “failed to motivate them to learn”, 95 (22.6%). Parents “overzealous attitudes to push their children to study the disciplines in vogue”, 126, (30%) and their “failure to provide learning materials”, 67 (15.9%) were the greatest constraint from the society. “High demand and irrelevance of the curriculum”, 193(46%), closely followed by “high standard of examinations”, 133 (31.7%) were the greatest reasons for the student’s loss of interest in the science disciplines.

5. Shortages and surpluses existed in different science subject areas and in different locations. In biology, there was a shortage of 255 (43.2%), 163 (63.9%) in Delta, and 92 (36.1%), 67 (16.9%) in mathematics across all locations in Delta. Excesses were revealed in further mathematics, 8 (32%) in Delta and 17(68%) in Imo, and in Owerri municipal, 11(4.2%) in mathematics.

6. It was established that the current class sizes varied from the urban, suburban and rural localities. The TPR was highest in Delta suburban, with 79.4 and lowest in Delta rural with 22. ANSC was highest in Delta suburban, 61, and lowest in suburban Imo, with 24.8. ANTC was highest in rural Delta with 1.3, and lowest in Imo rural with

- .48. The highest ANTS was in Imo urban with 11.35 and the lowest in Imo rural with 3.1 The average PTR was 50.9 in Delta and 49 in Imo, ANSC, 46.2 in Delta and 32 in Imo, ANTC, 1.01 in Delta and .7 in Imo and ANST 6.44 and 6.21 in Delta and Imo respectfully.
7. The University of Nigeria Nsukka was the highest source of supply of science teachers (50, 11.1%). When individual states were considered, Delta State University was the highest supplier (55, 24.6%) in Delta and Alvan Ikoku College of Education the highest (41, 22.6%) in Imo. The academic quality of the science teachers ranged from NCE, 56(13%), NCE, B.Ed. or B.Sc. Ed.147 (35%), B.Ed. or B.Sc. Ed., 121(29%), NCE, B.Ed., B.Sc. Ed.+ M.Ed81(19%), and B.Ed., M.Ed. + PhD, 14(3.5%).
  8. The need was 2,631, availability 2,062, retention 2,037, attrition 25 and shortage 569. The level of need was 1,586 (60.3%) in Delta, 1,045 (39.7%) in Imo, availability 1,173 (56.8%) in Delta, 889 (43.2%) in Imo, retention was 1,162; (57%) in Delta and in Imo 875 (43%), and attrition 11(.44%) in Delta, 14(.68%) in Imo.

## **Conclusion**

There was a need for 569 science teachers, 413 (72.6%) in Delta and 156 (27.4%) in Imo. It was concluded that there was a shortfall in teacher availability. The availability rate amongst the female science teachers' points to the need for the supply of more male science teachers. Although shortages and surpluses were found within and between urban, suburban and rural schools, the shortages were more pronounced on subjects' basis than on the

basis of school location, leading to the conclusion that teacher availability whether shortage or surplus is a function of class size. As a class size indicator, average number of students per teacher (PTR) was found inadequate to measure science teacher need. It was therefore concluded that it should be used in collaboration with class size indicators that specify the average number of students per science teacher, teachers per class, students per class, and teachers per school as the benchmark to determine science teacher need. If government could make provision for increased allocation to science education, it was also concluded that the perennial problem of shortfall in the availability of science teachers would be reduced.

### **Implications of Findings for Educational Planning**

1. The huge disparity between the need and availability of science teachers as revealed in this study implies that effective teaching of science subjects may not have taken place. For instance only 12 (17.6%) out of the 68 schools (Appendix C) used in the study offered all the science subjects because science classrooms were not properly staffed. Inadequate availability of sciences teacher hinder students' mastery of theory and practical skills. This could be detrimental to the achievement of the science teaching set objectives.
2. The imbalance in the distribution of science teachers between and within the urban, suburban and rural localities causes a risk to such areas of not ensuring equality of educational opportunities amongst the science students. For instance, in Owerri municipal district the need was 449, the



availability was 541, but in Orlu, the need was 358 and the availability just 170, in Delta rural, the need was 153 and the availability 267, whereas in Delta suburban the need was 792 and the availability 399. This is a case of a surplus supply of science teachers in Owerri urban and Delta rural senatorial districts whereas the suburban districts of Delta and the rural districts of Imo suffered scarcity. There was imbalance in supply within towns. For instance a situation of disproportionate deployment of science teachers to two different schools within very close proximity, one with an enrolment of 203 students had 16 science teachers whereas the other with an enrolment of more than 500 had just 4 science teachers. Student's progress in these shortage areas are daunted because science teachers are not available.

3. If the short supply of science teachers persists, the quality of science education will remain in doubt because of the likelihood that the quality and capacity of Nigerian graduates in science and technology based disciplines will continue to deplete with very grave consequences for employment, productivity, economic growth and overall national development.
4. Enrolment keeps increasing in leaps and bounds, necessitating the lumping of students in few classrooms. As much as possible, enrolment in the sciences should be limited to available space. Class sizes should not be too large like a TPR of 79.4 (average) in Delta suburban or too low, 22.9 (average) in Delta rural for effective management by the teacher. A

reduced class size may however lead to an increase in the cost of schooling necessitating a higher need, just as a large class size will reduce the cost leading to a decreased need for science teachers.

5. In this era of globalization, information and communication technology, the call for every nation to strive to achieve the United Nations mandate, the 2015 Millennium Development Goals, and in this nation, the Seven Point Agenda, the Transformation Agenda, and the Vision at 20:20 Goals, the level of relevance of science and technology for national development is tightly linked to the scientific and technical skills of the workforce and therefore achievement of these mandates and the creation of wealth. Economic developers and educational planners believe that there is a strong link between the quality of science education received and the level of societal progress and economic development attained. This implies that senior secondary schools must be adequately staffed with properly mentored science teachers, qualified laboratory assistants and optimally provided with proper, material resources necessary for learning science.

### **Recommendations**

1. The availability of science teachers, 541, as was observed in Owerri municipal district, was high, where the need was 449, but in Orlu, the need was 358 and the availability was just 170 (47%). In Delta rural, the need was 153 and the availability 267, an excess of 114, whereas in Delta suburban the need was 792 and the availability 39950 (%). This calls for a reallocation of science teachers from Owerri urban to Orlu Senatorial

district and from the rural to the suburban districts of Delta for their proper utilization.

2. There was a surplus supply of teachers in Further Mathematics. It may be necessary to reassign some Further Mathematics teachers to teach Mathematics. Enrolment in Further Mathematics was very low, 4,160 (3.9%) of a total enrolment of 105,238. There is need to encourage and motivate science students to read Further Mathematics. The supply in Biology, 236 (43%) out of a need of 539 should be increased because Biology is a compulsory subject.
3. It should be necessary to restore science teachers' rural, extra transport and housing allowances as a measure of encouraging and motivating science teachers.
4. To raise the standard of science education, available school resource necessary for the teaching and learning of science such as infrastructural facilities, functional laboratories and workshops both in the senior secondary schools, and the universities where science teachers are mentored should be upgraded on a regular basis. Proper motivation of teachers and students to undertake training in science based vocations, through appropriate government and societal recognition, support and remuneration should be encouraged, so that the much desired orientation towards science education and technology do not continue to elude the nation.

5. There should be need for regular supervision and auditing of science teachers and the state of science laboratories by the Ministry of Education. Such assessment reports should form the basis of enrolment and funding of science education in senior secondary schools.
6. Considerations should be given to an equitable distribution of science teachers to senior secondary schools by subject specializations, using some additional science class indicators such as, the number of teachers per school, and the science teacher's workload per week as a measure to combat surpluses and shortages within and between localities. Science teachers could teach in more than one school at close proximities, as an effective deployment strategy to ensure maximum teacher utilization.
7. There is a need to show commitment at the policy level aimed at upgrading the recruitment and deployment of science teachers. Such policies should be specific, for instance the recruitment of science teachers on a 60:40 percentage ratio, in line with the policy of 60:40 ratio of admission into the tertiary institutions.
8. Policies should also consider the posting of teachers to localities, by introducing specialized mentoring and induction programs specially designed for teachers in such localities. This will go a long way to encourage teachers to accept postings to such localities.
9. Inadequate provision of fund is a huge constraint to the development of science education. At the policy level, government should step up the level of funding to senior secondary education. Funding goes beyond paying

teacher's salaries. It is also used to provide appropriate resource' in view of the role of this level of education in the skilled formation of low level workforce, and the nurturing of prospective middle and high level manpower for entrance into higher institutions.

### **Contributions to Knowledge**

1. The study has revealed the need 2,631, science teachers, 1,586 in Delta, and 1,045 in Imo, an availability 2,067; 1,173 in Delta, and 889 in Imo. There was a shortage of 569; 413 in Delta and 156 in Imo. It also revealed an availability of 1,341 female; 765 in Delta and 582 in Imo, 721 male; 408 in Delta and 582 in Imo. There was an attrition of 25; 16 male, 8 in Delta and 8 in Imo and 9 female, 3 in Delta and 5 in Imo,
2. It has identified surpluses and shortages between and within rural, suburban and urban locations, and across subject areas. The urban districts in Imo had a surplus of 92, the rural a shortage of 188. The rural districts in Delta had a surplus of 144, and the suburban a shortage of 392. Only 12, (17%) of the 68 schools offered all the science subjects, Further Mathematics had a surplus of 21, while Biology, a compulsory subject a shortage of 255.
3. The study also established that TPR as a class indicator is not enough when used as a benchmark to determine the need and availability of science teachers, and has identified other class indicators; the average number of students per class (ANSC), average number of teachers per

class (ANTC), and average number of teachers per school (ANTS) that can be used in addition to TPR, to measure science teacher need.

### **Suggestions for Further Studies**

1. Analysis of the Need and Availability of Science Teachers in Senior Secondary Schools in other States of Nigeria.
2. A Comparative Analysis of Science Teacher Need and Availability in Public and Private Senior Secondary schools.
3. An Analysis of the Level of Need and Availability of Art/Social Science Teachers in Senior Secondary Schools.
4. The Role of the Federal Government Policy on Science Education on the Need and Availability of Science Teachers in Senior Secondary Schools.
5. The cost Implication of the Shortage of Science Teachers in Senior Secondary Schools on the Sustainable Development of a Nation.

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**APPENDIX A**  
**PRINCIPALS' CHECKLIST ON THE AVAILABILITY**  
**OF SCIENCE TEACHERS**

**Section I**



These questions are for the comparative analysis of the Need and Availability of Science Teachers in Senior Secondary Schools in Delta and Imo States. All information here will be treated as highly confidential and you may not reveal your identity.

Please indicate by placing (✓) in the box/space that best describes either yourself or your school.

1. Name of School:  
Level of School: (a) Senior Secondary (b) Junior Secondary.
2. Location of School: (a) Urban (b) Sub-Urban (c) Rural
3. Year school was Founded:
4. Type of School: (a) All boys (b) All girls (c) Mixed
5. Size of School: (a) Below 500 students (b) 500-1000 students  
(c) 1000-1500 students (d) Above 1500 students
6. Length of stay in School as Principal: (a) 0-3yrs (b) 4-6yrs  
(c) 6-10yrs (d) Above 10yrs
7. Academic Qualification: (a) M.Ed. + (b) B.Ed. + (c) NCE  
(d) Others
8. Experience (in years): (a) 1-5 (b) 6-10 (c) 11-15 (d) Over 15
9. Science Teacher: (a) Yes (b) No
10. Sex: (a) Male (b) Female
11. Age (Approx.): (a) 25-30 (b) 31-40 (c) 41-50 (d) Over 50
12. Marital Status: (a) Married (b) Single (c) Others

## Section II

13. Science subjects taught in this School. Please complete the table below.

### Table – List of Science Subjects taught in the School

Key: Number of Teachers-NT; No. of Periods-NP; Time on the Time Table-T

Class	Subjects																				
	Mathematics			Further Math			Physics			Chemistry			Biology			Agricultural Science			Home Econom		
	NT	NP	TT	NT	NP	NP	NT	NP	TT	NT	NP	TT	NT	NP	TT	NT	NP	TT	NT	NP	
SS I	A																				
	B																				
	C																				
	D																				
	E																				
	F																				
SS II	A																				
	B																				
	C																				
	D																				
	E																				
	F																				
SS III	A																				
	B																				
	C																				
	D																				
	E																				
	F																				

1. 1. For Science Subjects not taught, choose from the list below to complete the table.

Subjects	Reason(s) subject is not taught
Mathematics	
Further Math	
Physics	
Chemistry	
Biology	
Agricultural Science	
Home	

Economics	
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List of possible reasons:

- i. Lack of teachers /human resource
- ii. Lack of facilities/material resource
- iii. Students are not interested
- iv. Students have too many subjects
- v. Students do not consider them relevant

#### 14. Number of Science Teachers and areas of specialization

Year	Category			Total no. of teachers	Math	Further Math	Physics	Chemistry	Biology	Agricultural Science	Home Economics
	M.Ed. +	B.Ed.	N.C.E.								
2006/07											
2007/08											
2008/09											
2009/10											
2010/11											
TOTAL											

16. For the science teachers that left, choose from the list below to complete the table.

Subject	Category			Length of Stay in School	Subject taught	No. of periods per week	Reasons for Leaving
	M.Ed. +	B.Ed.	N.C.E.				
Math							
F/Math							
Physics							
Chemistry							
Biology							
Agricultural Science							
Home Economic							

List of possible reasons

- i. Transfer
- ii. Retirement
- iii. Further studies
- iv. Resignation for other occupations
- v. Health reasons
- vi. Dismissal
- vii. Death
- viii. Abscondment

17. For the Science Teachers who resigned, provide the required information:

Classes		Science Subjects taught							Class Enrollment	Length of Stay
		Math	F/Math h	Physics	Chemistry	Biology	Agricultural Science	Home Economics		
SS I	A									
	B									
	C									
	D									
	E									
	F									
SS II	A									
	B									
	C									
	D									
	E									
	F									
SS III	A									
	B									
	C									
	D									
	E									

	F									
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Please, any additional comments/information will be appreciated.

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Thank you for your co-operation.

God Bless you.

**APPENDIX B**  
**THE SECONDARY SCHOOLS'**  
**SCIENCE TEACHERS CHECKLIST**

**Section I**

These questions are intended for the comparative analysis of the Need and Availability of Science Teachers in Senior Secondary Schools in Delta and Imo States. All information here will be treated as highly confidential and you do not need to reveal your identity.

Please indicate by placing (√) in the box/space that best describes either yourself or your school.

1. Name of School:  
Level of School: (a) Senior Secondary      b) Junior Secondary.
2. Location of School: (a) Urban    (b) Semi-Urban    (c) Rural
3. Type of School: (a) All boys    (b) All girls    (c) Mixed
4. Size of School: (a) Below 500 students    (b) 500-1000 students  
(c) 1000-1500 students    (d) Above 1500 students
5. Length of stay in School as Principal: (a) 0-3yrs    (b) 4-6yrs

- (c) 6-10yrs      (d) Above 10yrs
- 6. Academic Qualifications: (a) B.A/B.Sc.    (b) B.Ed.      (c) B.A./B.Sc. + PGDE    (d) M.A./M.Sc.    (e) M.A/M.Sc. + PGDE    (f) Others
- 7. Experience (in years): (a) 1-5    (b) 6-10      (c) 11-15    (d) Over 15
- 8. Sex: (a) Male      (b) Female
- 9. Age (Approx.): (a) 25-30    (b) 31-40    (c) 41-50    (d) Over 50
- 10. Marital Status: (a) Married    (b) Single    (c) Others
- 11. Class taught:
- 12. How were you deployed to the School? Through    Transfer    New Appointment    Others (Specify) .....
- 13. Where were you trained? Name the Institution, State and Country:  
.....

**Section II**

Consider each of the following clusters of constraints to the Need and Availability of Science Teachers in Senior Secondary Schools in Delta State and rank them in their order of importance with the most important ranked No. 1:

1. Constraints from the Government/Ministry                      Rank from 1-13
  - a) Lack of science laboratories and equipment.                      \_\_\_\_\_
  - b) High student teacher ratio/class size.                                      \_\_\_\_\_
  - c) Bureaucratic nature of the Ministry                                      \_\_\_\_\_
  - d) Non sponsorship of teachers to Seminars, Workshops and Conferences.                      \_\_\_\_\_
  - e) Poor salary
  - f) Irregular payment of teachers salaries.                                      \_\_\_\_\_
  - g) Too many periods for teachers                                      \_\_\_\_\_
  - h) Lack of promotional prospects.                                      \_\_\_\_\_
  - i) Lack of qualified laboratory staff.                                      \_\_\_\_\_
  - j) Inadequate supervision of science teaching in scol                      \_\_\_\_\_
  - k) Frequent transfers.                                      \_\_\_\_\_
  - l) Lack of fund.                                      \_\_\_\_\_
  - m) Posting to rural areas.                                      \_\_\_\_\_
2. Constraints from the Students                                      Rank from 1 – 7

- a) Truancy from school activities. \_\_\_\_\_
- b) Poor reading and study habits. \_\_\_\_\_
- c) Lack of effective mastery of language of instruction. \_\_\_\_\_
- d) Lack of seriousness towards science subjects. \_\_\_\_\_
- e) Indulgence in examination malpractice. \_\_\_\_\_
- f) Over indulgence in social activities such as  
discos, films, parties, internet. \_\_\_\_\_
- g) Inadequate or lack of knowledge of basic  
scientific concepts and principles. \_\_\_\_\_

3. Constraints from Teachers Rank from 1 – 8

- a) Use of poor teaching method. \_\_\_\_\_
- b) Inability to motivate students \_\_\_\_\_
- c) Inadequate exposure of students to practicals. \_\_\_\_\_
- d) Lack of proper training, knowledge of subject matter. \_\_\_\_\_
- e) Lack of familiarity with the demands of the  
syllabus/curriculum. \_\_\_\_\_
- f) Delaying practicals until examinations are close. \_\_\_\_\_
- g) Nonchalant behavior towards teaching science  
subjects. \_\_\_\_\_
- h) Insufficient time spent on giving, and marking students  
assignments \_\_\_\_\_

4. Constraints from the Society. Rank from  
1 – 7

- a) Uncooperative attitudes of parents. \_\_\_\_\_
- b) Poor status of the teaching profession. \_\_\_\_\_
- c) Low public image of teachers. \_\_\_\_\_
- d) Pre-occupation of students in non-academic  
activities at home. \_\_\_\_\_
- e) Encouraging examination malpractice. \_\_\_\_\_

- f) Parents failure to provide learning materials. \_\_\_\_\_
- g) Parents over-zealous attitudes to push their children to study the disciplines in vogue \_\_\_\_\_

5. Constraints from Curriculum and Examination. Rank from 1 – 4

- a) High demand and irrelevance of the curriculum. \_\_\_\_\_
- b) Lack of emphasis on the historical aspects of science. \_\_\_\_\_
- c) High standards of examination questions. \_\_\_\_\_
- d) Tyranny of tests and examinations. \_\_\_\_\_

Please, any additional comments will be highly appreciated.

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Thanks for your patience and co-operation. God bless you.

### APPENDIX C

#### LIST OF SAMPLED SENIOR SECONDARY SCHOOLS IN DELTA AND IMO STATES

STATE/ ZONE	LGA	NAME OF SCHOOL	YEAR FOUNDED	LOCATION	TYPE OF SCHOOL	NO. OF SCI. TS		
						T	M	F
DELTA NORTH	Aniocha North	Pilgrims Bap. Sc. Iseluku	1955	Urban	Girls	9	4	5
		Boys M/ Sc Onicha-Olona	1956	Sub-urban	Boys	7	5	2
	Aniocha South	St. R. Gs Sc Ogwashiukwu	1964	Urban	Girls	8	2	6
		Ang. Gr Sc Ubolu-Uku	1956	Sub-urban	Mix	11	4	7
	Ika Nth East	Ika Gr Sc Boji-Boji Owa	1960	Sub-urban	Boys	14	5	9
		Umunede S. Sc Umunede	1972	Sub-rural	Mix	6	3	3
	Ika South	Baptist M/Sc Agbor	1947	Urban	Girls	14	5	9
		Alidenma S S S Alidenma	1980	Rural	Boys	4	3	1
	Nd. E.	Obetim-uno S Sc Obetim	1980	Rural	Mix	5	3	2
	Ndokwa West	Utagbe Ogbe Gr. School	1960	Sub-urban	Mix	6	4	2
		Ogume Sec Sch Ogume	1980	Rural	Mix	5	3	2
	Osh. S.	St Pat. College Asaba	1944	Urban	Boys	11	3	8
Osh. N.	Ibusa Girls Sec Sc Ibusa	1940	Urban	Girls	7	3	4	
Ukwani	Obianiku Gram. Sch.	1940	Sub-urban	Mix	7	2	5	
DELTA CENTRAL	Ethiophe East	Umiagha S.S Oriabraka	1980	Sub-rural	Mix	8	4	4
		Bap. High School Eku	1968	Sub-urban	Mix	6	3	3
	Eth. W.	Oghareki Snr Sec School	1970	Rural	Mix	7	4	3
	Okpe	St Pt Clavers Aghalaokpe	1954	Sub-urban	Boys	9	5	4
	Sapele	Okpe Sn Sc Scl Sapele	1941	Urban	Mix	4	2	2
		St Itas Grs Sc Sch Sapele	1960	Urban	Girls	8	7	1
	Udu	Aladja Grammar School	1974	Sub-urban	Mix	12	8	4
	Ughelli	Aragba Grammar School	1980	Rural	Mix	5	3	2



	North	Agbarho Sn Gram. School	1964	Sub-urban	Mix	11	3	8
	Ugh. S.	Otokutu Gram. School	1978	Rural	Mix	5	1	4
	Uvwie	Urhobo Coll. Effurun	1948	Urban	Boys	11	2	8
		Army Day S Sch Effurun	1980	Urban	Mix	11	4	7

STATE/ ZONE	LGA	NAME OF SCHOOL	YEAR FOUNDED	LOCATION	TYPE OF SCHOOL	NO. OF SCI. TS			SUBJECTS TAUGHT	
						T	M	F	MTH	FMT
DELTA SOUTH	Bomadi	Govt. College Bomadi	1970	Sub-rural	Mix	6	3	3	√	X
	Burutu	Ayakoromo Gram. Schl	1977	Rural	Mix	3	2	1	√	X
	Isoko. N	James W. Gr Sc Emevor	1957	Sub-urban	Boys	12	5	7	√	X
	Isoko South	St. Mich. College Oleh	1939	Sub-urban	Mix	6	2	4	√	X
		Owhe S S S Otor Owhe	1980	Rural	Mix	7	3	4	√	X
	Patani	Boys Model Schl Patani	1980	Sub-rural	Boys	9	4	5	√	X
	Warri N.	Iwere College Koko	1970	Rural	Mix	8	3	5	√	X
	Warri	Dom Dom. Coll. Warri	1980	Urban	Mix	12	4	8	√	X
	South	Delta Sec Sch. Warri	2007	Urban	Mix	14	3	11	√	√
Wri SW	Ogbe Ijoh Gram. School	1980	Rural	Mix	3	2	1	√	X	
IMO OKIGWE	Ehime Mbano	Com S Umuzelaogwara	2005	Rural	Boys	2	2	-	√	X
		Nsu Comp. S S S	1977	Rural	Mix	4	3	1	√	X
	Ih. Ubo.	Madonna S S School	1956	Sub-urban	Mix	11	4	7	√	√
	Isiala Mbano	Umuozu Sec Schl Ugiri	1980	Sub-urban	Mix	3	2	1	√	X
		Anara Com. Sec. School	1971	Sub-urban	Mix	5	2	3	√	X
	Obowu	Ebunachi Comp S Schl	2005	Rural	Mix	5	3	2	√	X
	Okigwe	Urban S S S Okigwe	1992	Urban	Mix	8	3	5	√	√
Onuimo	Okwelle Snr Sec School	1986	Sub-urban	Mix	4	2	2	√	X	
ORLU	Ideato N	Ih. Mem S S Arondizogu	1951	Urban	Mix	4	3	1	√	X
	Ideato S	Comp. S S S Ntueke	1981	Sub-urban	Mix	3	2	1	√	X
	Isu	Comp. Sec School Attah	1978	Sub-urban	Mix	4	2	2	√	X
	Nkwere	Owerri Nkworji Sec Schl	1981	Rural	Mix	3	1	2	√	X
	Nwang.	Comm Sec Schl Abaja	1978	Rural	Mix	3	2	1	X	X
	Njaba	Cp S Sc Nkume-umukpo	1981	Rural	Mix	2	1	1	√	X
	Orlu	Girls Sec School Orlu	1971	Urban	Girls	4	1	3	√	X
	Orsu	Ihunansa Sec School	1975	Rural	Mix	4	2	2	√	X
	Oru E.	Akatta Sec. School	1979	Rural	Mix	3	2	1	√	X
Oru W.	Mgbidi Sec. School	1976	Sub-urban	Mix	5	2	3	√	X	

STATE/ ZONE	LGA	NAME OF SCHOOL	YEAR FOUNDED	LOCATION	TYPE OF SCHOOL	NO. OF SCI. TS			SUBJECTS TAUGHT	
						T	M	F	MTH	FMT
	Ab. Mbs	Mbutu Sec. School	1977	Rural	Mix	6	3	3	√	√
	Ah. Mbs	Ahiazu Sec. School	2005	Sub-urban	Mix	5	3	2	√	X
	Ezinihite	Eziudo High School	1978	Sub-urban	Girls	6	3	3	√	X

OWERRI		Umucheke								
	Ikeduru	Uzoagba Sec. School	2005	Sub-urban	Boys	4	2	2	√	X
		Amaimo Com. Grls Schl	2005	Rural	Girls	4	1	3	√	X
	Mbait.	Umunneoha High Sch.	1978	Rural	Mix	4	2	2	√	X
		Ogbuku Girls Sec School	1981	Rural	Girls	3	2	1	√	X
	Ngor Ok	Okpala Sec School	1964	Sub-urban	Mix	10	4	6	√	√
	Oguta	Agwa Sec. School	1981	Sub-urban	Mix	4	2	2	X	X
	Oh. Egb.	Umuapu Sec. School	1998	Sub-urban	Mix	6	2	4	√	X
	Owerri Municipl	Urban Sn Sec School	1992	Urban	Mix	13	5	7	√	√
		Govt. Sec. Schl Owerri	1935	Urban	Boys	22	9	13	√	√
	Owerri North	Akwakuma Girls School	1998	Urban	Girls	9	4	5	√	√
		Uratta Sec. School	2005	Urban	Mix	7	3	4	√	√
	Owerri West	Nekede Sec. School	1979	Urban	Mix	10	4	6	√	√