EVALUATION OF THE IMPLEMENTATION OF THE BASIC SCIENCE CURRICULUM COMPONENT OF THE UNIVERSAL BASIC EDUCATION PROGRAMME IN SOUTH-WEST, NIGERIA

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ABSTRACT

Most people suffer avoidable health hazard because they lack basic knowledge of science. The old Integrated Science curriculum fell short of what is required to give students a solid foundation in science. The new Basic Science programme is designed to address its inadequacies such as attainment of life and coping skills, and is yet to be evaluated. Even, the previous evaluation studies on the old curriculum were based on its content and not the different components. This study, therefore, evaluated the implementation of Basic Science Curriculum component of Universal Basic Education Programme in South-west, Nigeria.

The study adopted descriptive survey design using Stake's countenance Antecedent Transaction Outcome model. Participants were ministry officials (33), principals of schools (89), year tutor/heads of department (166), classroom teachers (269) and JSS III students (588). These were selected by stratified random sampling technique from ten local government areas each from the six south-western states. Five research instruments: Science Programme Objectives Rating Scale (r = 0.72); Basic Science Course Material Assessment Questionnaire (r = 0.81); Basic Science Classroom Observation Schedule (r = 0.73); Basic Science Achievement Test (r = 0.69) and Students' Attitude Questionnaire (r = 0.58) were used. Eleven research questions were answered. Data were analysed using descriptive statistics and multiple regression at 0.05 level of significance.

The programme objectives were rated as very good ($\bar{x}$ = 3.76, max 5). Infrastructural facilities ($\bar{x}$ = 2.33, max 5) and students achievement in basic science ($\bar{x}$ = 8.76, max 20) were inadequate and course materials for basic science were available ($\bar{x}$ = 2.66, max 5). Students possessed positive attitude towards basic science ($\bar{x}$ = 3.04, max 5), most teachers of basic science were not professionally qualified to teach the subject (66.5%) and many teachers prefer to use lecture method (31.4%) to other methods. Composite contribution of antecedent and transaction variables to the variance of students' achievement in basic science was 10.7% and they contributed 24.7% to the variance of students' attitude towards science. The relative contribution showed that staff training (β = -.407) made negative contribution to achievement in basic science, followed by programme objective (β =

-.251) and instructional technique (β = -.084), while manpower requirement (β = .217), availability of text (β = .044) and infrastructure (β = .034) made positive contribution to students' achievement in basic science. Also, availability of text (β = .427) made significant positive contribution to attitude towards science, followed by infrastructure (β = .357) and manpower requirement (β = .090), while instructional technique (β = -.321), programme objective (β = -.197) and staff training (β = -.090) made negative contribution to students' attitude towards science.

Availability of text, infrastructural requirement and manpower contribute positively to students' learning outcomes in basic science. Basic Science curriculum component of the basic education programme was not well implemented because right personnel were not engaged in its implementation. Hence, greater effort should be invested in ensuring that in-service training is improved upon to experience positive impact on the implementation of the curriculum.

Key words: Evaluation of Basic Science Curriculum, Universal Basic Education, South-west, Nigeria, ATO model.

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DEDICATION

This work is dedicated to my Creator and sustenance of life, who, through His marvellous grace and mercies saw me through the entire work – GOD ALMIGHTY, THE ONE WHO WAS, WHO IS, AND IS TO COME and my children – Ewuoso Boluwatife, Ayodele Ayodeji, Ewuoso Toluwalope, Ayodele Ayobami and Ewuoso Fiyinfoluwa for always giving me joy and blossom my life.

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Olufunmilola Taiwo OGUNGBESAN

CERTIFICATION

I certify that this work was carried out by Olufunmilola Taiwo OGUNGBESAN in the Department of Teacher Education, University of Ibadan, Ibadan.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Science, in its very simple term, is regarded as the attempt by humans to gain better understanding and clearer interpretation of human beings and of the environment. Helping to gain better understanding of the world, however, puts science in a better position to influence positively, conditions for life on planet. Also, science is an act of inquiry, which includes empirical observation and experimentation. Alebiosu (2003) posits that science aims at searching for causes and providing reasons for or solutions to phenomena or experiences in life. Umeoduagu (2000) equally opines that right from the time of creation; human was not only faced with the task of finding explanations to the vagaries of this universe but also, with the task of finding answers to the myriad problems encountered each passing day, in which case science has been a veritable tool. Marx (1998) believes that, science has been described as one of the greatest weapons human has ever invented for leaping into the unknown phenomenon. It has also been described as the language of nature, without which communicating with the world, within or outside becomes impossible.

A good background in science enables people to quickly learn and understand how things around them work. Hall-Rose (2004) asserts that people need to master a minimum amount of scientific and technological knowledge to understand the world around them. Diallo (2004) also adds that people worldwide need to have sufficient understanding of basic science and technology concepts to understand issues relating to water shortage, pollution, health, forests and climate change. Therefore, having the necessary science background and knowledge goes a long way to affect people's life positively. As such, science is essential to understanding our world. It is therefore pertinent, that every individual, young, old, male or female be scientifically literate in order to have a better survival. This has made the study of science and technology (which grows out of scientific discovery) indispensable to the survival of every individual on the one hand, and on the other hand an integral part of the culture of a nation, which has to be sustained, developed and passed on to incoming generations. The basis of teaching science early is so that children can develop the critical thinking skills necessary to sort through all the information that they will be bombarded with in their lives, and make intelligent decision about what to believe and how to value their world and environment. Basic science that is taught in schools has developed as a process of gradual curriculum reform in science.

The emergence of science as a formal discipline could be traced to the middle ages with the contributions of Plato, Aristotle and Ptolemy. Though their contributions may have been haphazard, unorthodox and erroneous, it actually laid the foundation of modern science [Encyclopaedia Britannica Ready Reference, 2007]. So, the 1908 Educational Ordinance which laid down the subject to be taught in secondary and elementary (primary) schools made many schools to introduce Nature Study as a course, and it was made compulsory for boys in order to attract grants from the colonial government. Hence, the introduction of science into the Nigerian school system is dated back to the time of the Christian missionaries who brought western type of education to Nigeria. The teaching of science was, however, delayed by the missionaries and the colonial administrators for obvious reasons. One of which was because the motive for colonization was essentially trade, the issue of science education could not have arisen. Another reason for non introduction of science was the erroneous belief that Africans were inferior human beings and as such not capable of understanding science. Hence, what existed between 1895 and 1920 was the teaching of only Biology-related subjects like Physiology, Nature study and Botany in a few mission schools [Science Teachers Association of Nigeria Newsletter, 1970].

Later, General Science was taught at the Post- Primary Institutions. According to Taiwo (1975), General Science later disintegrated to the three basic science disciplines, but General Science as a course was retained and taught to lower class as a science course for less able, the least science oriented and those who do not wish to pursue science beyond the secondary level. Attempt was also made to teach it to higher classes but the point against it was that it was the joining of subjects that are naturally different. It was in the midst of this confusion that the euphoria of integration globally caught up with the Science Teachers Association of Nigeria (STAN), thus leading to the dramatic birth of Nigerian Integrated Science Project (NISP). This inherited confusion, along with other factors such as lack of enlightenment and trial testing, led to the erroneous belief in some quarters that Integrated Science was the old General science 'rechristened'. Nigeria then had to move with the global curriculum changes from the old Nature study and Hygiene through General Science to Integrated Science. Integrated Science then was supposed to lay foundation for subsequent science in the future.

Nigeria as part of the global deliberations on Education for All (EFA) reflected her response in the national education policies and programmes of attaining the Millennium Development Goals (MDGs) by 2015 and the critical target of the National Economic Empowerment and Development Strategies (NEEDS) decided to introduce the 9-year Basic Education programme. Basic Science and Technology as a subject has been introduced as the science subject to be offered at the Lower Basic and Middle Basic levels. Also, Basic Science and Basic Technology as two separate subjects are the sciences to be offered at the Upper Basic level.

The Basic Science of the Universal Basic Education is the outcome from the Education For All (EFA) conference that was organized in Thailand between 5th – 9th March, 1990. The Federal Government of Nigeria, complying with resolution of the conference, launched the Universal Basic Education (UBE) programme in Sokoto on the 30th of September, 1999, as soon as the nation returned to democratic rule. The introduction of the UBE demonstrates President Olusegun Obasanjo's eagerness and interest to reactivate the spirit of Universal Primary Education (U.P.E), which was his 'brainchild' in 1976.

The decision to start Universal Primary Education in September 1976 and make it compulsory in 1979 was a clear demonstration of good intention of the government (Osokoya, 1995). UPE concept stems from the realization that education is not only an investment in human capital, but also a prerequisite for, as well as a correlate of economic development. UPE then, was a scheme that was indispensable for progressive leadership and enlightened society. It aimed at establishing equal opportunities for all children of school age in Nigeria and also to gradually eliminate illiteracy and ignorance. But the resultant effect of the introduction of the UPE programme was that pupils' enrolment burgeoned rapidly from 6.2million in the 1975/76 session to 14.8million in 1992 and within a short period, this burst of educational activity brought in its wake a plethora of changes, some positive, others problematic [http://www.onlinenigeria.com]. The administration of the programme was poor and inefficient owing to the incompetence and ineffectiveness of many Local Education Authorities as well as a fall in standard due to inadequate financial provision, and a consequent lack of essential equipment and facilities, lack of textbooks and material for the children, inadequate provision, guidance and control, poor staffing and low morale among the teachers, lack of support from the local communities and interest of parents in the education of their children [Osokoya, 1995].

Obanya (2002) asserts that in the Nigerian context, EFA goals would translate into the following:

(i) Full mobilization of all classes in the society in favour of comprehensive and quality early childhood care and education.

(ii) Full access of children and adolescents to Primary and Junior Secondary schooling and eliminating all forms of social, economic, political, gender, cultural and pedagogic obstacles in the process of:

(a) curriculum enrichment,

(b) career-long teacher improvement,

(c) promotion of lifelong learning skills.

(iii) Raising functional literacy to the level needed to empower the adult population for full participation in nation-building; and

(iv) Enriching and streamlining the nation's non-formal education endeavour to improve the socio-economic relevance and productivity of the beneficiaries of complementary education opportunities.

Also, the Federal Ministry of Education (2000) states the specific objectives of the UBE programme as:

(i) Developing in the entire citizenry a strong consciousness for education and a strong commitment to its vigorous promotion.

(ii) Providing for free Universal Basic Education for every Nigerian Child of school age;

(iii) Reducing drastically the incidence of drop-out from the formal school system (through relevance, quality and efficiency);

(iv) Catering for the learning needs of young persons who for one reason or the other have had to interrupt their schooling through appropriate forms of complementary approaches to the provision and promotion of basic education; and

(v) Ensuring the acquisition of the appropriate levels of literacy, numeracy, manipulative, communicative and life skills as well as the ethical, moral and civic values needed for laying a solid foundation for lifelong learning.

The UBE consists of:

(i) Formal Basic education which covers the first nine years of schooling, that is, six years of primary school and three years of junior secondary school (JSSI-III) for all children.

(ii) Nomadic education for school age children of pastoral nomads and migrant fishermen.

(iii) Literacy and non-formal education for dropout children and illiterate adults.

By and large, the National Policy on Education (FGN, 2004) entrenches the teaching of science at all levels of education. This may be connected to the fact that the valuable role of science in the development of a nation needs not be over emphasized. Ibole (2000) believes that science rules the universe. It serves and ensures human survival. Jegede (1983) asserts that, the development in science and technology has so greatly affected the lives of every human being so much that, to be ignorant of the basic knowledge of this development is to live an empty, meaningless, and probably unrealistic life. Valley and Withier (2009) strongly believe that, a solid foundation in basic sciences is essential to free-thinking participation in the world. It is also clear that, this basic scientific preparation is essential to unlocking doors to a wide variety of professional opportunities.

It is evident that, the idea of promoting scientific and technological literacy is so important that the Ministry of Science and Technology was established as a separate entity in 1985. The National Policy on Science and Technology (NPST) (section 1.4.4.) clearly states that "Science and Technology should form the basis of our development and should influence our thinking and working processes" (page 10). It further stresses the importance of education as a tool for the much desired technological breakthrough. The National Policy on Education (FGN, 2004) (section 2 sub-sections 13) has stressed that, "the need for scientific and technological progress necessitates the inculcation of the spirit of enquiry and creativity in the Nigerian child thus would be achieved through the exploration of nature and local environment from the pre-primary level" (page 11) with a view to laying down a solid foundation for scientific and reflective thinking in the Nigerian child. The resultant effect of this was the teaching of primary science at the primary level, and integrated science at the post-primary school level. This integrated approach to the teaching of science stresses the fundamental unity of science, de-emphasizing subject boundaries, and made learners see the concepts and themes that embody science as a whole.

Diallo (2004) equally identifies that, young people are more interested than ever in using new technology and further adds that, every citizen (irrespective of age, gender, social class and race) should have a basic understanding of science and technology. He advocates for policies that will compel young people (who are eager to use new technologies) to match their eagerness to the use of new technologies with eagerness to study the discipline that underlies them. In her contribution, Nneji (2002) opines that Integrated Science that was taught at the junior secondary education level then, was a course targeted at the youth in tackling the turbulence of adolescence and to emerge as effective adults. This then gives Basic Science, a position of prominence and importance in the UBE programme.

Basic Science has been chosen as one of the core subjects offered at the junior secondary school. It is taught in order to expose students to the basic workings of the scientific enterprise and it also provides the learners with the necessary foundation upon which to build subsequent science learning in the senior secondary school. Basically, core curriculum is intended to provide all students with an education that will serve them well regardless of their choices after leaving school. It reinforces the teaching of basic skills and introduces an expanded range of new knowledge and skills to the curriculum. Rutherford (2000) enunciates four properties that science course content should have: First, it should be significant; second, it should be accurate; third, it should be aligned with desired or declared learning goals and finally, it should be coherent. The science core curriculum places emphasis on understanding and using skills. Hence, the Basic Science curriculum has been designed to build into the present generation, the skills to meet present and future challenges.

More importantly, the Millennium Development Goals (MDGs), which were formulated as guiding aims for the global community to meet, in order to eradicate extreme poverty, has its eight goals as: achieving Universal Primary Education; reducing Child Mortality; improving Maternal Health; combating HIV/AIDs, Malaria and other diseases; and ensuring Environmental Sustainability. These have given Basic Science a prominent position in the Universal Basic Education programme (UBE). Nigeria, as a signatory to the Millennium Development Goals, is committed to eradicating poverty among her populace, and has modified existing school curricula to take care of the MDGs resolution.

Alani (2002) notes that the implementation of universal education programmes in Nigeria has always been characterized by ineffective planning often based on faulty premise. In some circumstances, there are deficiencies like inadequacy of trained teachers, as well as insufficient classrooms, materials, equipment, finance and supervision. Badejo (2004) identifies manpower requirement as a major challenge that the UBE programme may encounter when implemented. He wondered whether the quality of education would not be sacrificed for quantity.

The Basic Science teacher's role is one of a facilitator of learning experience. The teacher is the one who provides learning opportunities and necessary guidance, to increase both the quality and quantity of learning acquired by the students. Educational researchers have shown that, teachers who are able to guide their students through learning situations by indirect influence such as questioning, prompting or leading rather than by direct teaching, informing or explaining, produce students who are less dependent and in general learn more effectively (Adegoke, 2002). Ben – Yunus (2002) asserts that, the classroom teacher forms the cornerstone in curriculum implementation as the main force and the last person that ensures that any curriculum is implemented according to specification. Therefore, if a teacher is untrained or unwilling to implement curriculum plans, his or her desired success cannot be attained.

Also, there is the need for the teacher to be equipped with appropriate instructional resources. Nduanya (1986) opines that teaching and learning are more effective when teachers locate and use appropriate instructional materials. These instructional resources could be in the form of books, charts, models, maps, laboratory materials and equipment, projectors; computers and so on. The book has been regarded as an important single resource to both the science teacher and the learner. Some commentators in education have remarked that if education is the road out of poverty, books are the wheels needed for the journey. Books and other materials that will aid learning must be available and adequately provided in schools. Dike (2000) asserts that if we want children and all citizens to acquire literacy, we must provide reading materials, the abundant and pleasurable reading materials found in libraries.

The fact that the provision of teaching and learning facilities is a pre-requisite to the attainment of educational objectives calls for concerted effort at ensuring that, these and other elements be adequately provided in schools. Nwagwu (2002) therefore recommends that, a panel of information experts, intellectuals and educators with planning and management experience should ensure that the UBE programme does not take off without adequate preparation to guarantee successful implementation.

Jegede (1983) reviews the problems and prospects of the former Integrated Science programme. His findings revealed that, lack of pilot testing of the materials, dearth of trained teachers and low readability level of textbooks are some of the problems the programme encountered, even though, it was reported that it has the prospect of helping students to develop positive attitude. Odetoyinbo (2004) carries out an evaluation of the Nigerian Integrated Science Programme with a view to identifying its strengths and weaknesses, as well as the perceptions of the status of the objectives by the stakeholders. The study empirically determines how some of the input and process variables determine learning outcomes. The findings show that all stakeholders agreed that the objectives are ideal and relevant; and that, the variables when taken together are effective in predicting the criterion variable; also that, specialist teachers in the field are lacking.

Though, the UBE programme was to officially take off in October, 2000 for the 2000/2001 academic session [Obanya, 2002], documents from the Universal Basic Education Commission reveals that the new 9-year basic education curriculum actually came into effect in September, 2007 with only primary 1 and Junior Secondary 1. The introduction of the 9-year basic education curriculum only in primary 1 and Junior Secondary 1 is to gradually phase out the old curriculum being used in primaries 2 – 6 by June 2013, and Junior Secondary 2&3 by June 2010. It is therefore hoped that the full implementation of the new 9-year basic education curriculum at all levels of basic education (primaries 1-6 and JS 1-3) would be achieved by September 2015, the target date to achieve Education For All (EFA, 2008).

It is, therefore, worthy to note that the success of this programme is very much dependent on the state of the antecedent variables, which are manpower requirements, infrastructural requirements, instructional materials and the programme objective. For instance, in the area of manpower requirement, Kalusi (2000) reports that, all over the world, services of teachers have been employed to ensure continuity in terms of manpower supply and maintenance of a steady socio-economic, cultural, scientific and political advancement. Surprisingly, the engineers, scientists, architects, medical doctors, bank managers, the police or the army officers have been under the tutelage of the teacher. In fact, the role of the teacher in national development would be more appreciated when we recognize that the most precious of our natural resources (endowment), which is our children, are entrusted to their care at an impressionistic stage in life. They, therefore, not only make but they could also mar the prospect of a nation. More so, Adesoji (1998) opines that the work of the teachers will be influenced tremendously by the contents of the curriculum, the available teaching resources and the quality of the teachers. Also, for effective teaching and learning, school buildings, utilities, facilities and educational goals should be viewed as being closely interwoven and interdependent. School buildings as well as facilities are seen as a controlled environment, which facilitates the teaching-learning process as well as projecting the physical well being of the students. In the secondary school, modern teaching of sciences, social science, arts and other vocational studies would require the use of laboratories and many other learning aids/ facilities such as films, overhead projectors, microfilms, transparencies, programmed instruction packages and computers.

This informs Obanya's (2002) assertion that ensuring full attainment of the great ambition of the UBE programme will depend on the following curriculum implementation elements such as social mobilization, infrastructure, teachers, out-of-school youths, the curriculum, instructional materials, special needs education and library development.

Alani (2002) also adds that for the UBE programme to be successful, the plan for the programme should focus on the following elements such as educational data collection, survey of skills, creating awareness for the programme, teacher demand and supply, funding, provision of materials, equipment and facilities, inducement/welfare support for pupils/learners, curriculum preparation and enrichment and research, monitoring and evaluation.

These elements of curriculum implementation are essential in recording the success of the UBE programme in general and Science programme of UBE in particular. Hence, ascertaining availability and adequacy of these elements becomes inevitable.

It is expected that once a curriculum is designed, it may be evaluated by internal evaluation, expert appraisal and confidential review. Testing and implementation of the curriculum should be accompanied by evaluation. Evaluation involves the assessment of activities that occur when the curriculum is implemented in the classroom. The idea of formative, summative and even process evaluation is a pointer to the fact that, evaluation is an on-going process. In the words of Obashoro (2002), evaluation is to assess and place value on: programme objectives and needs; programme input and process; availability and adequacy of resources (human and material); characteristics of participants; teaching and learning methodologies; and programme outcome and impact. Evaluating the implementation of the basic science curriculum will help in ascertaining that the essential elements for the attainment of the programme objective are put in place, thereby putting the programme on a sound footing. Also, evaluation prevents the programme from facing problems of lack of essential equipment and facilities such as textbooks and poor staffing that hampered the success of the previous UPE programme.

There is a broad agreement that curriculum evaluation has to be both formative and summative. The traditional outlook of using evaluation as an instrument of making final curriculum judgment on academic performance is being discarded. Instead, modern procedures of evaluation which emphasize system clinical supervision and monitoring as an instrument of quality assurance are being adopted (Galabawa, 2008).

More so, there seems to be the need to have a more versatile and coherent evaluation model to meet the ever – increasing challenges and complexity of science curricula. Evidences abound in literature that science teaching is a complex phenomenon and the elements therein are not clearly discrete entities but interlocked in web of relationships (Okebukola, 2002). Any science curriculum is a coherent whole whose components are interdependent rather than discrete units. Evaluation model should, therefore, provide the procedure where the entire curriculum is evaluated as a system in which the elements of input, process and outcome are interdependent and interrelated in a continuous way. Antecedent, Transaction and Outcome Evaluation Model of Stake, whereby elements of Antecedent, Transaction and Outcome would be evaluated as a whole is appropriate for the study. These elements which are science programme objectives, manpower requirements, infrastructural requirements, availability of texts, instructional techniques, staff training, students' achievement in basic science and students' attitude towards basic science needed to be given primary attention since they are primary components of the instructional programme. They are treated as components of the instructional plan. Also, implementation of the curriculum is made up of elements of planning, delivering, assessment and evaluation that are inter-related and occur as part of an implementation cycle.

The choice of carrying out the evaluation in the Southwest - Nigeria is due to the fact that when Western education was introduced, it was first embraced by the southern part of the country, recording higher student enrolment than other parts. Also, the Universal Primary Education (UPE) commenced first in the Western region resulting in the education of a large number of children with the advantageous effect on productivity in the markets, workshops, farming, trade and business enterprises. The Southwest - Nigeria, which consists of six states comprising Ekiti, Lagos, Ogun, Ondo, Osun and Oyo are the states that were in the forefront of Western education and it is still leading the Nigeria nation educationally. It also witnessed increase in the number of girls who complete primary education, which augurs well for the future of Nigerian mothers (Taiwo, 1969). Ironically, Yara (2008) observes that in the recent past, students from this zone are losing interest in learning and have resulted to engaging in other areas of life such as playing football, snookers, watching home videos, becoming money-conscious and the craze for instant wealth. Children of secondary school age in this zone no longer have the desire to further enhance their education rather; they are engaged in things that can bring them instant wealth. This is a great concern to the development of the states in this zone and the ripple effect of it on the nation on the long run could be disturbing, hence the focus on Southwest - Nigeria.

It is based on the above premise that this study sets out to evaluate the implementation of the Basic Science curriculum component of the Universal Basic

Education programme in the Southwest - Nigeria.

1.2 Statement of the Problem

The dynamic nature of science necessitates its curricula to accommodate different innovations and changes in Science, Science education and the context in which science education takes place. A new science curriculum programme should of necessarily be evaluated, more so that the implementation has entered three years when the first set of the programme are at the verge of completion. Essentially, it is the component of the new science programme of UBE that is evaluated in this study.

Evaluation in the context of this study is to ascertain the availability and adequacy of resources (i.e., human, physical and instructional material) for successful implementation of the UBE Basic Science. It is believed that this would reveal elements that are missing, which when addressed would give the programme a sound footing, when compared with other educational programmes (such as UPE and 6-3-3-4 system) that existed before this UBE. Coupled with Galabawa (2008) notion of modern procedures of evaluation, which emphasizes systematic clinical supervision and monitoring as instruments of quality assurance, the programme needs to be evaluated. Furthermore, the fact that individual components of the UBE science curriculum are the essential foundation for the programme, it is of necessity that these core components be evaluated to ensure that the stated goals/objectives of the curriculum are achieved. Hence, the gap this study fills is to evaluate the implementation of a new programme at the Upper Basic level of the UBE programme.

The study sets out to determine the following objectives by ascertaining the extent of implementing the Basic Science curriculum component of the Universal Basic Education programme:

(i) analysing stakeholders' rating of the objective of the programme;

(ii) assessing the extent of availability and adequacy of resources;

(iii) obtaining the students' level of performance in Basic Science Achievement Test and attitude towards Science

(iv) determine the composite and relative contributions of the selected variables: science programme objectives, manpower requirements, infrastructural requirements, availability of texts, instructional techniques and staff training to students' achievement in Basic Science and students' attitude towards Basic Science.

1.3 Research Questions

This study attempts to answer the following research questions:

1. What are the profiles of the following stakeholders as indicated by the following socio-demographic variables?
   a. Ministry officials: age, gender, qualifications, area of specialization and years of service.
   b. School Principals: age, gender, qualifications, area of specialization and years of service.
   c. Year Tutors/Heads of Department: age, gender, qualifications, area of specialization and years of service.
   d. Classroom teachers: age, gender, qualifications, area of specialization and years of service.
   e. Students: age, gender and intended career
2. What are the stakeholders' ratings of the objectives of Basic Science?
3. To what extent are the infrastructural facilities for teaching Basic Science in place?
4. To what extent are teachers of Basic Science professionally qualified to teach the subject?
5. To what extent are the course materials, such as: students' textbooks, workbooks and teachers' guide for Basic Science readily available?
6. What are the ratings of instructional techniques employed by teachers of Basic Science?
7. How often do teachers who are teaching Basic Science receive any form of in-service training?
8. What is the students' level of performance in Basic Science Achievement Test?
9. What is the students' attitude towards Basic Science?
10. What are the composite contributions of both the antecedent and transaction variables to students' learning outcomes in Basic Science?
11. What are the relative contributions of the antecedent and transaction variables to students' learning outcomes in Basic Science?

1.4 Scope of the Study

The areas of coverage for the study were the six states in southwest geopolitical zone of Nigeria. These are: Lagos, Ogun, Osun, Oyo, Ondo and Ekiti States. The sample was 1200 respondents from the target population in the states. They include Ministry officials, Principals, Year Tutors/Heads of Departments, Classroom Teachers and Students at the Junior Secondary Level of Education. Basically, the study evaluated antecedent, transaction and outcome variables of the Basic Science Programme in the Universal Basic Education of the Federal Republic of Nigeria.

The study analysed stakeholders' rating of the objective of the programme; assessed the extent of availability and adequacy of resources; obtained students' level of achievement in Basic Science Achievement Test and attitude towards Science. In addition, the study determined the composite and relative contributions of Antecedent and Transaction variables to Outcome variables.

1.5 Significance of the Study

Evaluation is the sign post for quality assurance and quality improvement. Evaluation at inception of any programme is deemed to offer opportunities for policy implementers to adapt, alter, and revise the programme or intervention in order to achieve the intended objectives. Evaluating the implementation of the Basic Science curriculum component of the Universal Basic Education programme will reveal elements that are missing, which when addressed would give the programme a sound footing, when compared with other educational programmes (such as UPE, 6-3-3-4 system) that existed before this transition to UBE. The earlier programme had encountered challenges ranging from ineffective planning, inadequately trained teachers, classroom materials, equipment, finance and supervision which had hampered the successful implementation of the programmes. The plan of the Universal Basic Education Commission to gradually phase out the old curriculum being used in junior secondary school by 2010, the proposed year of full implementation of UBE programme at the Junior Secondary School level, calls for evaluation.

More importantly, taking cognisance of human and material resources for the implementation of the Basic science curriculum of the UBE programme is just appropriate. This is because science is dynamic making its curricula to be able to accommodate different innovations and changes in response to changes in science, science education and the context in which science education takes place. Also, the fact that Basic education is development-oriented and because its curriculum also combines technical, vocational and commercial education in addition to science-oriented subjects that are considered to be more relevant, functional and worthwhile call for a study of this nature. Again, ascertaining that the pre-requisite conditions to meeting the objectives of educational programme have been fulfilled, evaluation of the programme is necessary.

This study is significant to policy makers and curriculum planners. The Policy makers and Curriculum planners would be provided with evidence that the programme is in compliance with the provincial requirement. It is significant to the Federal Ministry of Education, State Ministry of Education and Local Government Education Authorities (LGEA). The Federal Ministry of Education, State Ministry of Education and Local Government Education Authorities would be equipped with statistics that would be necessary for planning and also guide them in the provision of an enabling environment that would make Basic Science of the UBE programme flourish. The information so obtained would therefore enable documentation of events, identifying areas of deficiency thereby pointing to the direction where there is need for improvement in the programme and aids administrative decision making.

It is as well significant to Ministry of Science and Technology, Science Teachers' Association, and Principals of Schools. The ministry of Science and Technology, Science Teachers' Association and Principals of schools would now have report as to the success of the programme and identified areas of strength and areas which require additional attention, helping to detect institutional vitality, record of student change and increase understanding of teaching and learning of Basic Science in schools. This shall in turn facilitate continuous improvement in the programme. It would also contribute to the existing literature on education in general and science education in particular.

1.6 Operational Definition of Terms

Curriculum Evaluation: This is ascertaining availability and adequacy of resources (i.e., human, physical and instructional) towards successful implementation of the UBE science programme. Also, curriculum evaluation helps in throwing light on whether UBE science programme as developed and organised actually produces the desired results.

Curriculum Implementation: This entails putting the Basic Science curriculum into work for the achievement of the goals for which the curriculum is designed.

Curriculum: Curriculum is an organized framework that delineates (i.e., outlines) the content children are to learn, the processes through which children achieve the curricular goals, what teachers do to help children achieve these goals, and the context in which teaching and learning occur.

Basic Science: One of the science subjects offered at the Upper Basic Level of education in Nigeria.

Component: This is a part of something, usually of something bigger. It comprises Basic Science programme objective and resource viz-a-viz human, physical and material.

Universal Basic Education Programme: Formal education of 9-year duration comprising 6 years of Primary education and 3 years of Junior Secondary education. It is intended to be universal, free and compulsory.

South-west Nigeria: A geopolitical zone in Nigeria that comprises Lagos, Ogun, Oyo, Osun, Ondo and Ekiti States.

Stakeholders: These are ministry officials, principals of junior secondary schools, year tutor/heads of departments, classroom teachers and junior secondary school students.

Antecedents: These are conditions that may relate to the outcomes of a programme but these conditions must have existed prior to the implementation of the programme. They include: manpower, infrastructure and programme objectives.

Transaction: These are the various kinds of activities and interactions that take place during the development and implementation of a programme. They include: instructional materials such as relevant texts, availability of learning aids and instructional techniques.

Outcome: These are the various effects of implementing the programme. They include: students' achievement in Basic Science and attitude towards Science.

Staff training: In-service training received by teachers teaching Basic Science in schools

Ministry officials: Education officers at Local Education Districts from the six south west states.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The literature was reviewed under the following sub-headings:

2.1 Theoretical Framework

2.2 Systems Theory

2.3 History and Development of Science in Nigeria

2.4 History and Development of Science Education in Nigeria

2.5 Science and Technology in National development

2.6 Science Programme at the Junior Secondary educational level in Nigeria

2.7 Trends from Integrated Science to Basic Science

2.8 Universalizing Education in Nigeria

2.9 Evaluation in Education

2.10 The Stake's Antecedent, Transaction and Outcome (ATO) model

2.11 Curriculum Implementation

2.12 Programme objective and learning outcome in Basic Science

2.13 Human, Physical and Instructional Resources in Science Curriculum implementation

2.14 Appraisal of literature review

2.1 Theoretical Framework

The Systems theory propounded by Bertalanffy (1968) provides the theoretical framework for this study. The systems' view is a world-view that is based on the discipline of system inquiry. Central to systems' inquiry is the concept of system. In the most general sense, 'systems' means configuration of parts connected and joined together by a web of relationships. A system from this frame of reference is composed of regularly interacting or interrelating groups of activities. Hence, the Primer group defines system as a family of relationships among the members acting as a whole. Bertalanffy, therefore, defines system as "elements in standing relationships".

Systems Theory became a nomenclature that early investigators used to describe the interdependence of relationships in organizations by defining a new way of thinking about science and scientific paradigms. It is a combination of theories such as: Chaotic Theory which recognizes that, systems are sensitive to initial conditions, Fuzzy Logic Theory which states that, things appeared fuzzy only until we understand them and Cantor's Hypothesis which indicates that understanding these things should be by categorizing them. The theory is basically a conceptual anchoring point of variety of specific formulations rather than any single formulation. The theory recognizes that, there are elements that make up a system and that, the elements are defined. It equally identifies that; there is an order of interaction that exists between the elements. The implication of the theory to this study is that, the implementation of the Basic Science curriculum would be successful when the totalities of the human, physical and instructional resources required are adequately harnessed. The Basic Science curriculum is the anchoring point of these resources.

The system's view was based on several fundamental ideas. First, that, all phenomena can be viewed as a web of relationships among elements, or a system. Second that all systems, whether electrical, biological or social, have common patterns, behaviours and properties that can be understood and used to develop greater insight into behaviour of complex phenomena, moving closer towards a unity of science. System's philosophy, methodology and application are complementary to this science.

Chaotic Theory propounded by Ruelle and Lorenz (1980) is the science of the global nature of systems. It is an attempt to explain and model the seemingly random components of a system. It recognizes that, systems are sensitive to initial conditions, so that, seemingly small changes can produce large changes in the system. Chaotic systems depend on the nonlinear nature of its components, which can have both stable and unstable components. One of the most important discoveries from Chaotic Theory is that a relatively small, but well-timed or well-placed jolt to a system, can throw the entire system into a state of chaos.

Fuzzy Logic Theory propounded by Zadeh (1969) states that, things appeared fuzzy (i.e., not well defined) only until we understand them. The Cantor's hypothesis indicates that understanding these things should be by categorizing them. Cantor's (1845 – 1918) studies of the relationship of sets led to precise definition of intersections and unions. The key to "fuzzy" membership is that judgment and context are used to assign values to membership.

Based on the above premise, framework that anchors two or more ideas or provides a forum for bringing together many component elements will be qualified to be categorized under Systems theory. Invariably, evaluating the implementation of the Basic Science curriculum component of the UBE programme is best carried out through framework that allows evaluation of the various segments as well as combination of many variables possible. Hence, Stake Countenance (ATO) Evaluation Model was considered appropriate for the study. The antecedent variables are essential in the attainment of the objective of the scheme. The factors then interact with each other and the environment (this refers to transaction variables) to result in the outcome variables. Each component part of the system should function well to have a functional system.

The Systems theory is relevant to this study in that the programme objectives and the resources (human, physical and instructional) are the components that make up the curriculum which have been defined and the interactions between them identified in the ATO evaluation model, which would eventually bring out the desired output. The Antecedent, Transaction and Output (ATO) is conceived as a system because of the interrelationships that exist between them.

2.2 Systems Theory

A system is an organized, purposeful structure regarded as a whole and consisting of interrelated and interdependent elements (components, entities, factors, members, parts etc). These elements continually influence one another (directly or indirectly) to maintain their activity and the existence of the system, in order to achieve the goal of the system (Heylighen & Joslyn, 1992). All systems contain:

(i) Inputs, outputs, and feedback mechanisms;

(ii) Maintain an internal steady-state (called homeostasis) despite a changing external environment;

(iii) Display properties that are peculiar to the whole (called emergent properties) but are not possessed by any of the individual elements, and

(iv) Have boundaries that are usually defined by the system observer.

Systems underlie every phenomenon and are in every direction of focus. They are limited only by the observer's capacity to comprehend the complexity of the observed entity, item or phenomenon. Every system is a part of a larger system. It is composed of subsystems, and shares common properties with other systems that help in transferring understanding and solutions from one system to another. Systems obey rules that cannot be understood by breaking them into parts. They stop functioning (or malfunction) when an element is removed or altered significantly. Together, they provide a coherent and unified way of viewing and interpreting the universe as a meta-system of interlinked wholes, and of organizing our thoughts about the world.

Although, different types of systems (from a cell to the human body, soap bubbles, to galaxies, ant colonies to nations) look so very different on the surface, they have remarkable similarities. At the most basic level, the systems are divided into two categories:

(i) Closed Systems: theoretical constructs that have solid boundaries and where only the components within the system are assumed to exist in a self-sufficient state. All other influences or variables from outside the system are considered to be non existence or insignificant for the purpose of the system analysis.

(ii) Open Systems: the real-world systems that have permeable boundaries through which they continually exchange energy, material and information with their external environment, the larger system in which they exist. Different systems' methodologies (such as systems' dynamic and systems' thinking) classify systems differently.

Systems Theory is an interdisciplinary field of science and the study of the nature of complex systems in nature, society and science. More specifically, it is a framework by which one can analyze and/or describe any group of objects that work in concert to produce some result. This could be a single organism, any organization or society, or any electro-mechanical or informational artifact. Systems theory first originated in biology in the 1920s based on the need to explain the interrelatedness of organisms in ecosystems. As a technical and general academic area of study, it predominantly refers to the science of systems that resulted from Bertalanffy's General Systems Theory (GST), among others, in initiating what became a project of systems' research and practice. It was Margaret Mead and Gregory Bateson who developed interdisciplinary perspectives in systems theory (such as positive and negative feedback in the social sciences).

Systems Theory became a nomenclature that early investigators used to describe the interdependence of relationships in organization by defining a new way of thinking about science and scientific paradigms. A system from this frame of reference is composed of regularly interacting or interrelating groups of activities.

2.3 History and Development of Science in Nigeria

Modern science started from a humble beginning in Nigeria after the introduction of Western education in 1842. Prior to this period, Nigerians like other Africans had earlier been carrying out traditional scientific activities, though relatively under–developed to describe, predict and explain some phenomena around them.

The introduction of Science into the school system came through the teaching of Nature Study and Hygiene. The teaching of Nature Study and Hygiene graduated to the teaching of General Science. The teaching of General Science further graduated to the teaching of Physics, Chemistry and Biology in the school. However, the euphoria of integration globally caught up with Science Teachers Association of Nigeria (STAN) thus leading to the birth of Nigerian Integrated Science Project (NISP).

The implementation of the 6-3-3-4 system of education in 1982 introduced the teaching of Integrated Science as the science subject to be taken at the junior secondary school (JSS). But in the real sense, the emergence of Integrated Science in Nigeria has its historical base in 1878 when General Science was taught at the post-primary institution. According to Taiwo (1975), General Science later disintegrated to the three basic science disciplines, but General Science as a course was retained and taught to lower class as a science course for less able, the least science oriented and those who do not wish to pursue science beyond the secondary level. Attempt was also made to teach it to higher classes but the point against it was that it was the joining of subjects that are naturally different. It was in the midst of this confusion that the euphoria of integration globally caught up with Science Teachers Association of Nigeria (STAN), thus leading to the dramatic birth of Nigerian Integrated Science Project (NISP). This inherited confusion, along with other factors such as lack of enlightenment and trial testing led to the erroneous belief in some quarters that Integrated Science was the old General Science ‘rechristened’. Nigeria then had to move with the global curriculum changes from the old Nature Study and Hygiene through General Science to Integrated Science. Integrated Science unites people of different science backgrounds. It, therefore, unites or integrates these sciences in such a way as to produce students who are scientifically literate in terms of unity of science (Adesoji, 1998). Also, the subject is supposed to lay foundation for subsequent science in the future.

Studies have revealed that, the first International Conference on the use of Integrated Approach in Science teaching was held in Droubja (Bulgaria) in 1968. That conference became a five-yearly affair, which was why in 1973, the Maryland conference was held in the United States of America and the Nigmegen Conference in the Netherlands in the year 1978 (Adesoji, 2002). The conferences were organized and supported by eight International bodies including the International Council of Scientific Unions (ICSU), International Council of Associations of Science Education (ICASE) and United Nations Educational, Scientific and Cultural Organization (UNESCO). There were also participants from Nigeria at the conference and among other things, the nature of Integrated Science; ways of Integrating Science and the problems of Science Teachers of Education were considered.

Following this, a unified approach to teaching science as Integrated Science was presented in such a way that pupils gained:

- the concepts of the fundamental unity of science.
- the commonality of approach to problems of a scientific nature, and
- understanding of the role and function of Science in everyday life and the world in which they live (FGN, 2004).

This informed scholars' description of Integrated Science as an approach to the teaching of science in which concepts and principles are presented so as to express the fundamental unity of scientific thought and avoid premature or undue stress on the distinctions between the various scientific fields.

With the introduction of the Universal Basic Education, Basic Science and Technology has been taken as a core subject at the Lower Basic and Middle Basic educational levels; and Basic Science and Basic Technology taken as core subjects at the Upper Basic level of education.

Camara (2006) asserts that promoting quality Basic Education is a global challenge all over the world, citing that the reason for such a focus pertains to the ultimate human right to quality life improvement which is the fundamental right to quality Basic Education. Appropriate means that can ensure positive transformation of Basic Education are targeted. Science and Technology as means of improving the quality of life are major substantive components of quality Basic Education. This has given Basic Science and Basic Technology place of prominence in Universal Basic Education.

2.4 History and Development of Science Education in Nigeria

The knowledge in science is imparted through science education whose two main aims are those of the production of scientifically literate society and the development of potential scientific and technological manpower. Ayodele (2000) views promoting the scientific development of the nation as the ultimate objective of science education. Education in the sciences must be based on the information that has rich survival value and upon strategies of inquiry that facilitate better adjustment to life. Ukoli (1985) perceived that the ultimate goal of science education in Nigeria is to transform the society into a scientific society, a society in which it will become possible to:

(i) Achieve generalized theoretical knowledge concerning fundamental conditions determining the occurrence of various types of events and processes.

(ii) Free humans minds from superstitions.

(iii) Undermine the intellectual foundations for moral and religious dogmas.

(iv) Develop among increasing numbers, a questioning intellectual temper towards traditional beliefs, so that issues, which were formerly accepted without questions are now subjected to systematic and critical thought, and logical methods for assessment are accepted instead.

The type of science education that will achieve the objectives highlighted above will be one that will equip the child with the knowledge of who a scientist is and how a scientist works. The implications of the above are that any science education existing or proposed should be relevant to and involve the Nigerian child for it to have any meaningful impact.

According to Onocha (1985), the emergence of science education in Nigeria dates back to 1859 when the rudiment of science in the form of Nature study was introduced into the curriculum of Church Missionary Secondary School, Lagos. Prior to this period, there was nothing like science in the curriculum of either primary or secondary schools in Nigeria.

2.4.1 Pre-independent Later Development of Science Education in Nigerian Schools

Until the beginning of 1930s, science teaching in most Nigerian schools was a glorification of Nature study, although in some schools, time tables listed such science subjects as biology, chemistry, physics and sometimes botany, physiology and zoology. However, by 1950 most Nigerian secondary schools were offering general science in one form or another but the general trend was to offer it as a single subject up to the school certificate examination. By the mid 1950s, general science in Nigerian schools, began to experience a failure as an approach to science teaching because when higher school certificate (H.S.C.) courses were started by 1951 in the more developed secondary schools, students who had successfully completed school certificate general science, could not be easily accepted into H.S.C. courses to study chemistry, biology and physics except a distinction was made in the course.

Because of the above, by the mid 1950s, most Nigerian schools had returned to the science education pattern with a two-tier approach. General science was taught during the first two years to every student in a five year secondary education programme. Students are subsequently allowed to specialize during the last three years so that those who desire careers in science could choose two or the three basic sciences depending on their abilities.

In an effort to popularize science in the schools, science teachers all over the country met on 30th November, 1957 and the association named Science Teachers' Association of Nigeria (STAN) was born. Later development in popularizing science in the country also involved the establishment of the Federal School of Science located in Lagos by the Federal Government in 1958. The school specialized in offering basic sciences for those who desired to sit for ordinary and advanced levels in the General Certificate Examinations (GCE).

2.4.2 Post-independent Later Development of Science Education in Nigerian Schools

With the advent of political independence on the 1st October, 1960, the country became aware of great manpower shortages, especially in the areas of science and technology. The leaders of the country realized that there could be no economic independence without an adequate supply of scientific and technological manpower. To solve this problem, they turned to the school system, but realized that the type of science being taught in the schools was not compatible with the aspirations of the country. There was a wide gap between the needs of the society and the level of scientific and technological manpower to meet those needs. There was a strong belief that the way to correct this state of affairs was to develop a sound science education programme.

As a result of the above, further development in the area of university education started almost immediately after independence. In 1962, the Ahmadu Bello University was opened at the Zaria branch of the Nigeria College of Arts, science and technology. In the same year, the University of Ife opened temporarily at the Ibadan branch of the Nigerian College of Arts, science and technology and the University of Lagos also commenced. The University of Nigeria, Nsukka had opened two years earlier. These universities coupled with Advanced Teachers College established as a result of recommendation of Ashby commission in 1960, provided sources for steady flow of science teachers to Nigerian secondary schools as well as serving as research centre for further improvement of science and technology in the country.

Today in Nigeria, it has been recognized that science is not only an academic discipline for scientists, but also an important tool of industry, medicine, agriculture and domestic comfort. For this reason, a ministry of science and technology was established by the then civilian government in the country. By the turn of 1980s, education in science has grown in popularity at rates that seem to be outs ripping the resources and facilities that are available for science teaching. Thus, the enterprise into science which started in the form of rudiments of science in our secondary schools and teacher training colleges has now metamorphosed through appropriate and relevant curriculum projects into a modern scientific enterprise.

2.4.3 The Future of Science Education in Nigeria

The awareness of the importance of science and technology is already in the mind of almost all the citizens in Nigeria. The government is budgeting a lot of money every year for the development of science and science teaching, the curriculum and professional groups such as the Nigerian Educational Research Council (NERC), the Comparative Education Study and Adaptation Centre (CESAC), the Science Teachers' Association of Nigeria (STAN) and the Science Association of Nigeria (SAN) are trying their best, yet the objectives of science education has not been realized. The problems of planning and implementation as well as precise policies have been the most agonizing problem in this area. For example, crash programmes for the training of science teachers and laboratory technicians, crash erection of classrooms and laboratories, crash implementation of a new policy on education, and so on. Whether or not positive results will emerge from these activities is totally irrelevant to our government.

If the future of science education is to be robust and effective, significant changes in the following areas must take place:

(1) The knowledge we already possessed on how to prepare effective teachers of science for all students must be disseminated and implemented.

(2) Educational reforms, state and national standards, and assessments based on a competitive rivalry model must be replaced with pedagogical approaches sustained by knowledge developed in the educational environment instead of the legislative political areas.

(3) The urban and rural educational problems of this country must dictate our nation's research agenda.

(4) Collaborative educational research among various educational entities and non-educational community components must be supported over sustained periods of time so that long-term effects can be ascertain.

2.5 Science and Technology in National Development

Science is an attempt to gain better understanding and clearer interpretation of human kind and the environment. Alebiosu and Bilesanmi (2005), states that science aims at searching for the causes and providing reasons for or solutions to phenomena or experiences in life. Science is the foundation upon which the bulk of technological breakthrough is built. Meanwhile, Technology is the bedrock of the development of any country. The national goal for education is to ensure national development in areas of better living condition, healthier and happier individual, improved transportation and communication system; and enlightenment among students (Kehinde, 2000).

Science is the foundation of all technological advancements and breakthroughs in the world. It is a tool for attitude towards the questions of life and nature. We depend upon scientific knowledge and understanding for economic and material advancements. Through science, a lot of things that make life good and easy have been produced such as antiseptics, drugs, aircraft, television, radio, computers and lots of others. Some laymen look at science and technology as the cause of most environmental hazards experienced today. At the same time, the knowledge of science and technology helps to rectify these hazards. The acquisition of basic scientific literacy makes man less at the mercy of his environment. The whole world is growing smaller and coming closer as a result of technological breakthrough - computer, global system of mobile communication (GSM) and satellites-, everyone is trying to meet up with the technological world i.e., there is computer revolution. Developed nations had to build a very strong and virile scientific base upon which all other developments are built owing to the fact that science and technology hold the key to the sustainable development of the world.

Essentially, from the discovery of fire to the launching of space vessels, the world has been experiencing formidable changes impacting on everyday life, after individual revolution. Nowadays, the e – revolution couples with laser and generic revolutions stand as a driving force that every region, every continent has to factor in. The operationalisation of Science has always been a source of inspiration to scientists and decision makers. From the law of Archimedes to the Relativity Relation of Einstein, or from the medical principles and laws consolidated by Ibn Siinaa to the various United Nation conventions and regulations on Health and Biodiversity, the issue of effect/impact of Science and Technology on the existence of human beings, the biomass and eco-systems is still of paramount importance.

According to Ali (1983), Nigeria's scientific and technological development depends largely on the acquisition and application of Science, Technology and Mathematics (STM). However, knowledge in science is imparted through science education whose two main aims are those of production of scientifically literate society and development of potential scientific and technological manpower. This might have informed Oladiran's (1998) position that the future of any nation depends on her scientific and technological development.

In this regard, science and technology of a nation are integral part of her culture and have to be sustained, developed and passed on to her incoming generations. It is vital, therefore, that, nations wake up not only to the importance of science and technology, but also to the fact that every citizen - male and female should have a basic understanding of both. More so, science and technology education contribute to three of the Education for All goals: attainment of life skills for youth, elimination of gender disparities in education and enhancement of the overall quality of education. It is, above all, ensuring sustainable environmental development.

The National Policy on Education (FGN, 2004) has, therefore, entrenched the teaching of Science at all levels of education. This is as a result of the valuable roles that Science play in the development of a nation.

2.6 Science Programme at the Junior Secondary Educational Level in Nigeria

The main objectives of teaching science to the youth are to enable them to:

(i) Observe, measure, record, collect and analyse data; hypothesise and predict data and events in an accurate and honest manner. These are the scientific skills necessary for further work in science later in life.

(ii) Acquire the ethics of science, which include honesty, skepticism, perseverance, objectivity, rationality, aversion to superstitions and taboos, and so on. These are moral values which must be acquired at the early age. They are the scientific attitudes needed in the future academic pursuits of the individuals.

(iii) Give the youth sufficient doses of scientific literacy capable of preparing them for some worthwhile vocations in the fields of science and technology.

(iv) Give a preponderant number of the youth for future adult roles by equipping them with skills and competences to identify societal issues and problems that have science components; and to contribute meaningfully to the discussion and possibly resolution of such socio-scientific and technological problems.

(v) Produce a scientifically literate populace some of whom will be professional scientists and technologists while others will be well informed, attentive citizens whose daily activities are guided by the products, ethics and process of science they have acquired.

There has been a notion that school science is a basic preparation for a science degree that is, a route into science. However, the contention is that such education does not meet the needs of the majority of students who require a broad overview of the major ideas that science offers, how it produces reliable knowledge and the limits to certainty. Also, a growing body of recent research has shown that most students develop their interest in and attitude towards school science before the age of 14. Therefore, much greater effort is being invested in ensuring that the quality of science education before this age is of the highest standard and that the opportunities to engage with science, both in and out of school are varied and stimulating.

When 6-3-3-4 system of education was introduced in 1982, Primary (Elementary) science was taken as a core subject at the primary educational level; and Integrated Science was equally taken as a core subject at the Junior Secondary level of education.

Nneji (2002) describes Integrated Science as a course targeted at the adolescents, which should thus assume a position of prominence and importance in preparing Nigerian adolescents to wade through the turbulence of adolescence and to emerge as effective adults. Hence, Integrated Science is seen as the science that seeks to improve the quality of life of humans by providing necessary information for individual and society to make rational decisions about their lives and well-being.

More so, based on the fact that the essence of an integrated Science course as stated in the National Policy on Education (2004) is to introduce scientific concept to pupils at the early level of education, the integrating principles are intended to produce a course which:

- Is relevant to students' needs and experience.
- Stresses the fundamental unity of science.
- Lays adequate foundation for subsequent specialist study.
- Adds a cultural dimension to Scientific Education (FGN, 2004).

However, following the decision to introduce the 9-year Basic Education programme, Basic Science and Technology has been introduced as a science subject to be offered at the Lower Basic and Middle Basic levels. Also, Basic Science and Basic Technology are introduced as two separate science subjects to be offered at the Upper Basic level.

If scientific and technological education is to meet learners' needs, it is important to know what learners find interesting. For instance, children in developing countries are interested in learning about nearly everything, probably because they perceive education as a luxury and a privilege.

2.7 Trends from Integrated Science to Basic Science

The Integrated Science syllabus as presented in the National curriculum for Junior Secondary School (as approved by the National Council on Education in April, 1982) was structured around six themes:

- You as a living thing;
- You and your home;
- Living components of the environment;
- Non-Living components of the environment;
- Saving your energy;
- Controlling the environment.

The themes were called units in the series and each unit contains a number of chapters. The contents are theoretical; the methods are activity loaded as a strategy to make the theories vivid. But the objectives appear to have ignored the psychological aspect of human survival, and the application of knowledge and skills for social well-being. This omission seems to render integrated science less integrated for survival. And just like the Nigerian Integrated Science Project (NISP), the Integrated Science Curriculum was equally child - centered and activity - oriented. However, there is hope.

Following the decision to introduce the 9-year Basic Education programme and the need to attain the Millennium Development Goals (MDGs) by 2015 and the critical target of the National Economic Empowerment and Development Strategies (NEEDS), the 6-3-3-4 curricula for primary and junior secondary schools were reviewed, re-structured and re-aligned. Basic Science and Technology is therefore introduced as a science subject to be offered at the Lower Basic and Middle Basic levels. Also, Basic Science and Basic Technology are introduced as two separate science subjects to be offered at the Upper Basic level.

The curriculum reflects depth, appropriateness and inter–relatedness of the curricula contents. Also, emerging issues which covered value orientation, peace and dialogue, including human rights education, family life, Humane Immune deficiency Virus (HIV) and Acquired Immune Deficiency syndrome (AIDs) education, entrepreneurial skills and so on were incorporated into the relevant contents of the new 9-year Basic Education curriculum. In selecting the Basic science contents, three major issues shaping the development of nations worldwide and influencing the world knowledge today were identified. These are globalization, information/communication technology and entrepreneurial education. The desire of Nigeria to be identified with contemporary development worldwide, calls for the infusion of relevant contents of four non-school curriculum innovations in areas of:

(i) Environmental Education (EE)
(ii) Drug Abuse Education (DAE)
(iii) Population and Family Life Education (POP/FLE)
(iv) Sexually Transmitted Infection (STI), including HIV/AIDs.

Four themes were used to cover knowledge, skills and attitudinal requirements. These are:

(i) You and Environment
(ii) Living and Non-Living Things
(iii) You and Technology
(iv) You and Energy.

Given the large number of adolescent in Nigerian secondary schools, basic science has given concerted attention to issues relating to water shortage, pollution, forest, climate change, health and reproductive behavior of these adolescents. Knowledge and skills in basic science and its effect on the entire life would help in solving problems (such as rape, abortion, abandoned babies, single parenthood, school dropout, cultism, gynecological complications, sexually transmitted diseases, HIV/AIDs, Violence and so on) associated with adolescent in Nigeria.

Since the UBE programme includes the junior secondary schools, the national policy on education stipulates the objectives to include effective thinking, communication skills, making relevant judgement, making the student a useful member of one's family, understanding basic facts about health and sanitation, understanding and appreciating one's role as a useful member of the country (Babalola, 2000).

2.8 Universalizing Education in Nigeria

In 1948, the Universal Declaration of Human Rights asserts that everyone has the right to education. The Federal Government of Nigeria in its effort to make education accessible to all school age children in the country thereby introduced Universal Primary Education scheme in 1976 which was short-lived. Then in 1990 came, the World Conference on Education For All held in Jomtien, Thailand for the purpose of forging global consensus and commitment to provide basic education for all. The Universal Basic Education is the programme which grew out of the conference.

Therefore, Nigeria as a signatory to the Declaration of the Jomtien World Conference on Education for All in 1990, the Delhi E-9 countries conference (1993), the Ouagadougou Conference on the Education of Girls (1992), the Organisation of Africa Union (OAU) Decade of Education in Africa (1997-2006), and the Dakar EFA forum (2000) is committed to universalizing education through the Universal Basic Education (UBE) programme of the Federal Government of Nigeria.

Obioma (2008) posits that the UBE holds the key to the country's quest for total emancipation as an independent entity. Also, the UBE is to correct the abnormalities of the former curriculum, which is lacking in the area of human development. The Universal Basic Education programme is a nine-year school programme comprising Primary Education (of six years duration) and Junior Secondary Education (the first segment of 3-3 structure), which are intended to be free, universal and compulsory.

World Education Forum that was held in 2000 at Dakar set 2015 as the target date to achieve Education for All (EFA). Midway between the World Education Forum and the target date of 2015, access to and participation in primary education have sharply increased. Number of new entrants into primary education worldwide grew by 4%, from 130million to 135million, between 1999 and 2005 (EFA, 2008). This 4% increase in the number of new entrants in sub-saharan Africa is a key achievement.

While there is no Dakar goal pertaining to secondary and tertiary education per se, these levels of education are explicit part of the Education for All and Millennium Development Goals concerning gender parity and equality. The expansion of primary education creates demand for post-primary education. Expansion is also dependent on secondary and tertiary education for an adequate supply of teachers.

2.8.1 The Global Education for All (EFA) Commitment

Progress in education revealed that Universal Primary Education became an official policy for the Nigerian nation in the 1970s. The goal could not be reached despite pressure throughout the 1980s to do so. In actual fact, the Universal Declaration of Human Rights as far back as 1948 asserts that everyone has the right to education. Over 40 years later, it is clear that many people are still being denied this basic human right. Indeed, the 1980s saw more backward than forward movement in most countries of the world. It was at that point that a World conference on Education for All was held in Jomtien, Thailand between 5th-9th March, 1990 for the purpose of forging a global consensus and commitment to provide basic education for all. Universal Basic Education (UBE) is the programme which grew out of that conference (Dike, 2000).

The participants from all nations of the world:

- recalled that, education is a fundamental right for all people, women and men, of all ages throughout the world;
- understood that education can help ensure a safer, healthier, more prosperous and environmentally sound world, while simultaneously contributing to social, economic and cultural progress, tolerance, and international co-operation;
- knew that education is an indispensable key to, though not a sufficient condition for, personal and social improvement;
- recognized that traditional knowledge and indigenous cultural heritage have a value and validity in their own right and capacity to both define and promote development;

- acknowledged that, overall, the current provision of education is seriously deficient and that it must be made more relevant and qualitatively improved, and made universally available;
- recognized that sound basic education is fundamental to the strengthening of higher levels of education and of scientific and technological literacy and capacity and thus to self-reliant development; and
- recognized the necessity to give to present and coming generations an expanded vision of, and a renewed commitment to, basic education to address the scale and complexity of the challenge.

They thereby proclaimed the following:

- Basic education should be provided to all children, youth and adults. To this end, basic education services of equality should be expanded, and consistent measures must be taken to reduce disparities:
- For basic education to be equitable, all children, youth and adults must be given the opportunity to achieve and maintain an acceptable level of learning.
- The most urgent priority is to ensure access to, and improve the quality of, education for girls' and women, and to remove every obstacle that hampers their active participation. All gender stereotyping in education should be eliminated.
- An active commitment must be made to removing educational disparities. Underserved groups - the poor; street and working children; rural and remote population; nomads and migrant workers; indigenous people; ethnic, racial and linguistic minorities; refugees; those displaced by war; and people under occupation - should not suffer any discrimination in access to learning opportunities.
- The learning needs of the disabled demand special attention. Steps need to be taken to provide equal access to education to every category of disabled persons as an integral part of the education system.

Hence, the representatives from Nations of the World declared their commitment at:

- Meeting basic learning needs.
- Shaping the vision of Education for All.

- Universalizing access and promoting equity.
- Focusing on learning acquisition
- Broadening the means and scope of basic education
- Enhancing the environment for learning; and
- Strengthening partnerships.

2.8.2 The Millennium Summit on Millennium Development Goals (MDGs)

In September, 2000, building upon a decade of major United Nations Conference and summits, world leaders came together at the United Nations Headquarters in New York to adopt the United Nations Millennium Declaration. This was to commit their nations to a new global partnership, to reduce extreme poverty and set out a series of time – bound targets, with a deadline of 2015. That has become known as the Millennium Development Goals (MDGs).

The eight MDGs were set by the United Nations with specific targets for each goal as:

(i) Eradicate extreme poverty and hunger

Targets:

- Halve the proportion of people living on less than a dollar a day by 2015
- Halve the proportion of people who suffer from hunger by 2015.

(ii) Achieve Universal Primary Education

Target

- Ensure that by 2015, all children will be able to complete a full course of primary education.

(iii) Promote gender equality and empower women

Target:

- Eliminate the gender disparity in primary and secondary education, preferably by 2005 and in all levels of education by 2015.

(iv) Reduce child mortality

Target:

- Reduce by two-thirds the mortality rate for children under five.

(v) Improve maternal health

Target:

- Reduce the maternal mortality rate by three-quarters by 2015.

(vi) Combat HIV/AIDs, malaria and other diseases

Target:

- Halt and begin to reverse the spread of HIV/AIDs, the incidence of malaria and other major diseases by 2015.

(vii) Ensure Environmental Sustainability

Targets:

- Integrate the principles of sustainable development into country policies and programmes, and reverse the loss of environmental resources.
- Reduce by half the proportion of people without access to safe drinking water by 2015.
- Achieve significant improvements in the condition of slum dwellers by 2020.

(viii) Develop a global partnership for development

Targets:

- Develop an open, rule-based, predictable, non-discriminatory trading and financial system.
- Raise official development assistance.
- Encourage debt sustainability by dealing with developing countries debt problems.
- Develop decent and productive work for youth.
- Provide access to affordable and essential drugs in developing countries in cooperation with pharmaceutical companies.
- In cooperation with the private sector, make available the benefits of new technologies especially information and communication technologies.

Without Science and Science education, goals (iv), (v), (vi) and (vii) would be unachievable because attainment of those goals is only certain when science curriculum is well-implemented.

2.9 Evaluation in Education

Evaluation refers to an appraisal, which is seen as an indicator of progress. It is a process that is undertaken everyday and everywhere. The stages of evaluation can be classified broadly into three as: pre-active, transactive and post-active, or with respect to evaluation, precursive, formative and summative. Various evaluation models employ different terms to denote these stages. The language of four of such models is compared in Table 1 below.

Table 1: Terminology for three evaluation stages in four evaluation models

Model	**Precursive**	**Formative**	**Summative**
Stake (1967)	Antecedents	Transactions	Outcomes
Stufflebeam (1967)	Content Inputs	Process	Products
Taylor and Maguire (1965)	Broad Objectives Interpretations	Strategies (Elicitations, presentations)	Specific Outcomes Generalized Outcomes
Provus (1971)	Program Design	Program Operation Program Interim Product	Program Terminal Product Program Cost

Precursive evaluation is related to prior summative evaluations. Some of the purposes that precursive evaluation may serve are:

(i) to determine whether any action is needed in a given situation

(ii) to determine the constraints and resources which a course of action must be devised, and

(iii) to determine whether the conditions required for a particular proposed course of action are present.

Formative evaluation on one hand is usually narrowed down to a particular aspect or segment of a course of study; it comes up anytime within the process of a project while Summative evaluation on the other hand is the type of evaluation designed to find out whether the overall objectives of the course of study or programme have been achieved. It comes up at the end of the programme. It, therefore, aims at passing judgement on the worth or value of the programme undertaken.

However, factors to be looked into in carrying out educational programme evaluation include books or other instructional materials, course of study, physical sites, concrete objects, achievements and endowment or behaviour of our students (Abodunrin, 1998). Hence, course evaluation is an important means of providing constructive feedback to instructors and department regarding the course, its content, textbooks and other learning materials that were utilized. In the same vein, teaching evaluation is an important means of providing constructive feedback to instructors regarding teaching techniques employed and manner in which the classroom environment is organized and run. More importantly, programme evaluation is carefully collecting information about a programme or some aspects of a programme in order to make necessary decision about the programme. However, the type of evaluation that is undertaken to improve programme depends on what is to be learnt about the programme.

Studies have been carried out on different aspects of the curriculum, these include: course unit (Scriven, 1967); a lesson (Abiri, 1987); the student, the teacher, the planning process, teaching strategies, materials, personnel and facilities (Rowntree, 1981; Oloruntegbe, 1996); the socio-psychological and material environment (Frazer. 1981; Parlett and Hamilton, 1972: Jegede and Okebukola, 1992). Recent researches in curriculum evaluation equally include those of Mustapha (2001) on “Evaluation of NCE double major Integrated Science Curriculum”; Ogunleye (2002) on “Evaluation of Environmental aspects of Senior Secondary School Chemistry Curriculum in Ibadan”; Bamikole (2004) on “Evaluation of Computer Science Curriculum in Junior Secondary Schools in Oyo, Osun and Ogun States”; and Falola-Anoemuah (2004) on “Formative evaluation of national sexuality education curriculum in Nigeria”.

Odubunmi (1981) investigated teaching strategies and pupils’ attitude to Integrated Science and consequently reported among other things; that favourable attitude of students is likely to be influenced by their parents and peer. This research equally indicated that the teaching strategies employed by teachers were not in line with the philosophy of the subject. Jegede (1983) reviews the problems and prospects of the Integrated Science programme. The findings revealed that, lack of pilot testing of the materials, dearth of trained teachers and the low readability level of the textbooks are some of the problems bedeviling the programme. This is in spite of the fact that it was reported to have the prospect of helping students to develop positive attitude. Odetoyinbo (2004) also carries out an evaluation of the Nigerian Integrated

Science Programme with a view to identifying its strengths and weaknesses, as well as the perceptions of the status of the objectives by the stakeholders. The study attempts to empirically determine how some of the input and process variables determine learning outcomes. His findings show that, all stakeholders agreed that the objectives were ideal and relevant. The variables when taken together were effective in predicting the criterion variable. Finally, specialist teachers in the field were lacking.

2.9.1 Evaluation Models in Education

Evaluation model is a plan for a researcher or an evaluator to adequately, appropriately, and skillfully effect appraisal of a project/programme or a task confronting him (Kerlinger, 1973). Several evaluation models have been put forward by evaluators based on the nature, purpose and scope of the educational programme being evaluated. Lewy (1977) identified four major models as:

(i) Goal-Attainment model by Tyler (1949);
(ii) Judgmental model by Scriven (1967);
(iii) Countenance (ATO) model by Stake (1967), and
(iv) CIPP model by Stufflebeam (1967).

Other models are:

(i) Provus Discrepancy model (1971);
(ii) McDonald Holistic model (1971);
(iii) Parlett and Hamilton illuminative model (1972);
(iv) Goal-Free evaluation model (Scriven, 1973) and
(v) Responsive Evaluation model (Stake. 1975).

The evaluation strategy selected may be insider evaluation, outsider evaluation or combined strategies. How these are combined may follow a classical model such as empirical/scientific/quantitative type at one extreme or a qualitative model such as "teacher as researcher" or "briefing the decision makers" type at the other extreme. It may even follow the eclectic model, which has features of both quantitative and qualitative type (Lawton, 1980).

Literature on evaluation has shown the use of several categorisation schemes. Three of which are:

(i) Approach-based categorization

(ii) Purpose-based categorization

(iii) Model-based categorization.

However, each of this categorisation has further been categorised by several scholars among who are:

Stecher and Davis (1987) cited in Bamikole (2004) categorises the approach-based into: Responsive Approach, Goal-oriented Approach, Decision-Focused Approach and Experimental Approach.

Patton (1997) cited in Bamikole (2004) classifies evaluation based on the purpose which its findings tend to serve the intended users into: Judgement-oriented evaluation, Improvement-oriented evaluation and Knowledge-oriented evaluation.

Fitz-Gibbon (1978) cited in Bamidele (2004) posits that, evaluation models serve mainly to conceptualise the field and draw the boundaries of the evaluation. In this way, evaluation is used to structure the type of questions to be asked and the type of data to be collected.

2.9.2 Curriculum Evaluation

Evaluation is the process of collecting data on a programme to determine its value or worth with the aim of deciding whether to adopt, reject, or revise the programme. Programmes are evaluated to answer questions and concerns of various parties. The public want to know whether the curriculum implemented has achieved its aims and objectives; teachers want to know whether what they are doing in the classroom is effective; and the developer or planner wants to know how to improve the curriculum product.

Onyeachu (2011) gives different scholars opinion of what curriculum evaluation is as:

- McNeil (1977) as cited in Onyeachu (2011) states that "curriculum evaluation is an attempt to throw light on two questions: Do planned learning opportunities, programmes, courses and activities as developed and organised actually produce desired results? How can the curriculum offerings best be improved?"
- Also, Ornstein and Hunkins (1998) defines it as "a process or cluster of processes that people perform in order to gather data that will enable them to

decide whether to accept, change, or eliminate something- the curriculum in general or an educational textbook in particular"

- Furthermore, Worthen and Sanders (1987) describes it as "the formal determination of the quality, effectiveness, or value of a programme, product, project, process, objective, or curriculum". Gay (1985) as cited in Onyeachu (2011) in his contribution argues that the aim of curriculum evaluation is to identify its weaknesses and strengths as well as problems encountered in implementation; to improve the curriculum development process; to determine the effectiveness of the curriculum and the returns on finance allocated.
- Finally, Oliva (1988) as cited in Onyeachu (2011) defines curriculum evaluation as the process of delineating, obtaining, and providing useful information for judging decision alternatives. The primary decision alternatives to consider based upon the evaluation results are: to maintain the curriculum as is; to modify the curriculum; or to eliminate the curriculum.

The conclusion from the above is that evaluation is a disciplined inquiry to determine the worth of things. 'Things' may include programmes, procedures or objects.

Generally, research and evaluation are different even though similar data collection tools may be used. The three dimensions on which they may differ are:

(i) First, evaluation need not have as its objective the generation of knowledge. Evaluation is applied while research tends to be basic.

(ii) Second, evaluation presumably, produces information that is used to make decisions or forms the basis of policy. Evaluation yields information that has immediate use while research needs not.

(iii) Third, evaluation is a judgement of worth. Evaluation results in value judgements while research needs not and some would say should not.

2.9.3 Curriculum Evaluation Models

Several experts have proposed different models describing how and what should be involved in evaluating a curriculum. Models are useful because they help you define the parameters of an evaluation, what concepts to study and the procedures to be used to extract important data. Numerous evaluation models have been proposed but three models are discussed here:

1. Context, Input, Process, Product Model (CIPP Model)

Daniel L. Stufflebeam (1971), who chaired the Phi Delta Kappa National Study Committee on Evaluation, introduced a widely cited model of evaluation known as the CIPP (context, input, process and product) model. The approach when applied to education aims to determine if a particular educational effort has resulted in a positive change in school, college, university or training organisation. A major aspect of the Stufflebeam's model is centred on decision making or an act of making up one's mind about the programme introduced. For evaluations to be done correctly and aid in the decision making process, curriculum evaluators have to:

(i) First, delineate what is to be evaluated and determine what information that has to be collected (eg. how effective has the new science programme has been in enhancing the scientific thinking skills of children in the primary grades)

(ii) Second, obtain or collect the information using selected techniques and methods (eg., interview teachers, collect test scores of students);

(iii) Third, provide or make available the information (in the form of tables, graphs) to interested parties. To decide whether to maintain, modify or eliminate the new curriculum or programme, information is obtained by conducting the following 4 types of evaluation: context, input, process and product.

Stufflebeam's model of evaluation relies on both formative and summative evaluation to determine the overall effectiveness of a curriculum programme (see Figure 1). Evaluation is required at all levels of the programme implemented.

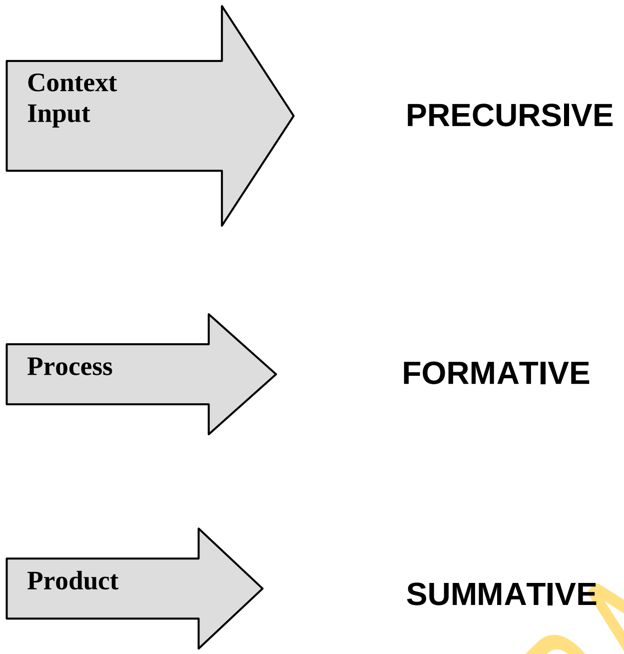

Figure 1: Precursive, formative and summative evaluation in the CIPP Model
Adapted from Ornstein, A. C. and Hunkins, F. P. 2004. *Curriculum – Foundations, Principles, and Issues.* (Fourth Edition). Boston: Pearson.

The components of this model are explained thus:

(a) Context Evaluation (What should be done and in what context)?

This is the most basic kind of evaluation with the purpose of providing a rationale for the objectives. The evaluator defines the environment in which the curriculum is implemented, which could be a classroom, school or training department. The evaluator determines needs that were not met and reasons why the needs were not being met. Also identified are the shortcomings and problems in the organisation under review (eg., a sizable proportion of students in secondary schools are unable to read at the desired level, the ratio of students to computers is large, a sizable proportion of science teachers are not proficient to teach in English). Goals and objectives are specified on the basis of context evaluation. In other words, the evaluator determines the background in which the innovations are being implemented.

The techniques of data collection would include observation of conditions in the school, background statistics of teachers and interviews with players that are involved in implementation of the curriculum.

(b) Input Evaluation (How should it be done?)

The purpose of this type of evaluation is to provide information for determining how to utilize resources to achieve objectives of the curriculum. The resources of the school and various designs for carrying out the curriculum are considered. At this stage, the evaluator decides on procedures to be used. Unfortunately, methods for input evaluation are lacking in the Nigerian educational system. The prevalent practices include committee deliberations, appeal to the professional literature, the employment of consultants and pilot experimental projects.

(c) Process Evaluation (Is it being done?)

This is the provision of periodic feedback while the curriculum is being implemented. This is geared to fully understanding how a programme works – how does it produce that results that it does? This evaluation is useful if programme is long-standing and have changed over the years, employees or customers report a large number of complaints about the programme, there appear to be large inefficiencies in delivering programme services and it is also, useful for accurate portraying to outside parties how a programme truly operates.

(d) Product Evaluation (Did it succeed?) or outcomes of the initiative.

In this type, the data is collected to determine whether the curriculum managed to accomplish what it sets out to achieve (eg. to what extent students have developed more positive attitudes towards science). Product evaluation involves measuring the achievement of objectives, interpreting the data and providing with information that will enable them to decide whether to continue, terminate or modify the new curriculum. For example, product evaluation might reveal that students have become more interested in science and are more positive towards the subject after introduction of the new science curriculum. Based on these findings the decision may be made to implement the programme throughout the country.

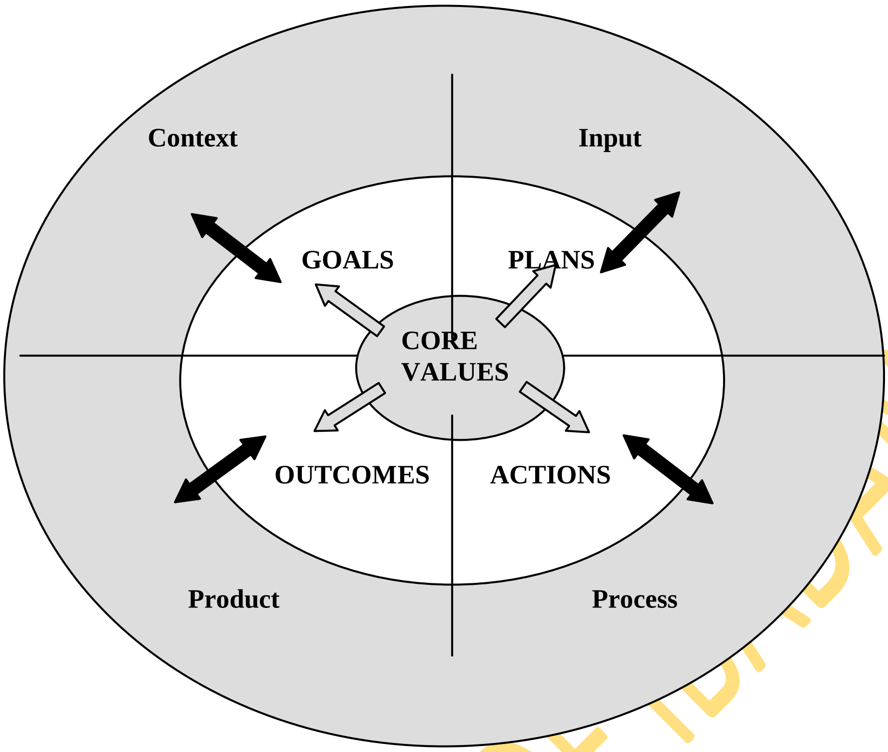

Figure 2: Context, Input, Process, Product Model
Adopted from Ornstein, A. C. and Hunkins, F. P. 2004. *Curriculum – Foundations, Principles, and Issues.* (Fourth Edition). Boston: Pearson.

2. Stake's Countenance Model

The model proposed by Robert Stake (1967) suggests three phases of curriculum evaluation: the antecedent phase, the transaction phase and the outcome phase. The antecedent phase includes conditions existing prior to instruction that may relate to outcomes. The transaction phase constitutes the process of instruction while the outcome phase relates to the effects of the programme. Stake emphasises two operations; *descriptions* and *judgements.* Descriptions are divided according to whether they refer to what was intended or what actually was observed. Judgements are separated according to whether they refer to standards used in arriving at the judgements or to the actual judgements.

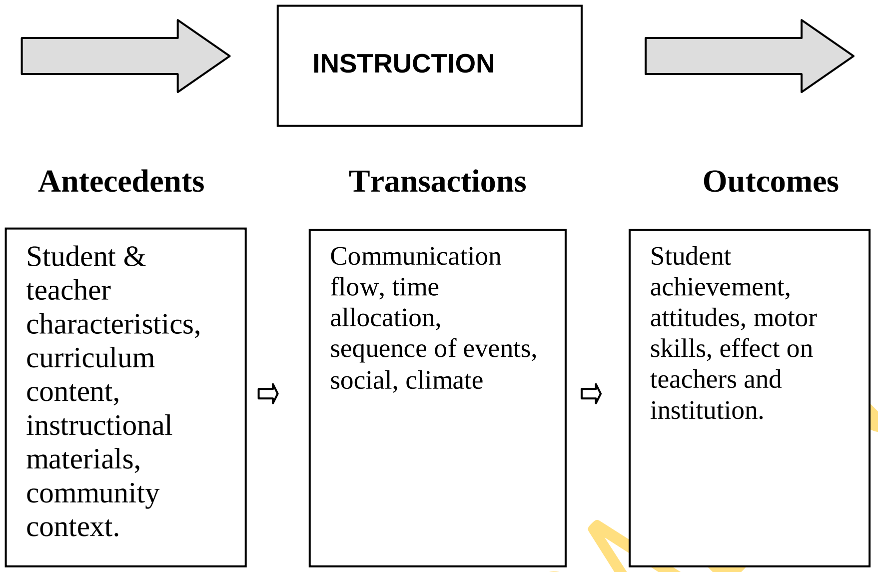

Figure 3: Stake's Countenance Model
Adopted from Ornstein, A. C. and Hunkins, F. P. 2004. *Curriculum – Foundations, Principles, and Issues.* (Fourth Edition). Boston: Pearson.

3. Eisner's Connoisseurship Model

Elliot Eisner, a well known art educator argued that learning was too complex to be broken down to a list of objectives and measured quantitatively to determine whether it has taken place. He argued that the teaching of small manageable pieces of information prohibits students from putting the pieces back together and applying them to new situations. As long as we evaluate students based on the small bits of information, students we will only learn small bits of information. Eisner contends that evaluation has and will always drive the curriculum. If we want students to be able to solve problems and think critically, then we must evaluate problem solving and critical thinking, skills which cannot be learned by rote practice. So, to evaluate a programme, we must make an attempt to capture the richness and complexity of classroom events.

He proposed the *Connoisseurship Model* in which he claimed that a knowledgeable evaluator can determine whether a curriculum programme has been successful, using a combination of skills and experience. The word 'connoisseurship' comes from the Latin word *cognoscere*, meaning to know. For example, to be a connoisseur of food, paintings or films, you must have knowledge about and experience with different types of food, paintings or films before you are able to criticise. To be a food critic, you must be a connoisseur of different kinds of foods. To be a critic, you must be aware and appreciate the subtle differences in the phenomenon you are examining. In other words, the curriculum evaluator must seek to be an educational critic. When employing the procedure of *educational criticism*, the following questions may be asked:

- What has happened in the classrooms as a result of implementation of the new curriculum?
- What are some of the events that took place? (eg. more students are participating in field work, more students are asking questions in class, even academically weak students are talking in group activities)
- How did students and teachers organise themselves in these events?
- What were the reactions of participants in these events? (eg. students enjoyed working collaboratively in projects)
- How can the experiences of learners be made more effective as suggested by students, teachers and administrators? (eg. more resources are needed for fieldwork, more computers are needed to integrate the internet in teaching and learning).

The ATO model agrees with the theory that will facilitate our evaluation of the implementation of the Basic Science curriculum component of UBE. It would therefore, be discussed in details.

2.10 The Stake's Antecedent, Transaction and Outcome (ATO) model

The Stake model, also referred to as Countenance model has three basic components which are Antecedents, Transactions and Outcomes (ATO). Antecedents are taken to mean conditions that may relate to the outcomes of a programme but these conditions must have existed prior to the implementation of the programme, hence they are antecedents. Transactions are the various kinds of activities and interactions that take place during the development and implementation of a programme, while Outcomes are the various effects of implementing the programme.

Ogunleye (2002) and Mustapha (2003) are among researchers who have identifies each of these elements according to a number of sub-elements:

Antecedents

(i) Existing political, social economical and cultural setting

(ii) Existing human and material resources

(iii) Existing programme

(iv) Existing administrative structures

Transaction

(i) Material resources input

(ii) Human resources input

(iii) Implementation process

(iv) Management process

Outcome

(i) Learning outcomes

(ii) Outcomes on administration and management

(iii) Political, economic, social and cultural outcomes

(iv) Outcomes on the quality of life and living.

Adegbile (2004) also, presented a modified form of the model proposed by Stake as shown in Table 1below:

Table 2: Modified Antecedent, Transaction and Outcome model

Events to be evaluated	Variables	Objectives	Instruments/ Techniques	Judgement/ Decision
Antecedents	1. Manpower-Quality	-to establish the level of efficiency.	1. Interview Schedule	Based on data from objectives.
	-Qualification		Observation Schedule	
	- Experience			
	-Predisposition			
	- Non-teaching Staff			
	2. Students	-to establish students' ability to cope academically and their level of preparedness.	2. Interview schedule	
	-Intellectual Ability		Observation schedule	
	-Social Economic Background			
	-Cognitive Styles			
	3. Learning Environment	-to assess the extent to which the environment is condusive to learning	3. Observation schedule :	
	- School setting		Interview schedule	
	- Administration			
	-Economic Resources			
	-Cultural setting			
Transactions	1 .Instructional Materials		1. Readability indices	
	-relevant texts		-task analysis	
	-availability of learning aids		-cost effectiveness	

	-library		analysis	
	2. Instructional Techniques	-to assess the appropriateness of the teaching Techniques	2. direct observational technique	
	-teacher-child Material Interaction			
	3. Supportive Strategies	-to evaluate the amount of the policy makers and resource people	3. direct observational technique	
	-training interaction with policy makers		Interview schedule	
	-training.			
Outcomes	Interaction with resource people	-to assess the cognitive, affective and Psycho motor Skills	-Direct observation technique	
	1. The child			
	2. The teacher		-Interview schedule	
	3. Parents			
	4. Educational Administration and policy	-to assess the Efficiency	-Direct observation technique	
	5. Economic Implications	-to assess its Reliability		
	6. Pattern of relationship.	-to assess its relevance to the wider society		

Source: Adegbile, J.A. 2004: Application of the 'ATO' model in the Evaluation of the Junior Secondary School Programme. *West African Journal of Education.* 24:1.

Mustapha (2003) posits that any science curriculum is a coherent whole, whose components are interdependent rather than discrete units, which informs that evaluation model that will be adopted should be one that will provide the procedure where the entire curriculum will be evaluated as a system in which the elements of input, process, and outcome are interdependent and interrelated in a continuous way.

Stake's Countenance (ATO) model as one of the most valuable yet conceived evaluation models, views evaluation on three contiguous dimensions along which the success or failure of any education programme is measured. These are Antecedents, Transactions and Outcomes. The evaluation at each stage of the ATO does not operate as a discrete entity but in relation to each other. The relational concepts are contingencies and the interaction is considered crucial for the illuminative evaluator because it is where the action is. The interaction between the instructional system and the learning experience determines the actual effect or outcome of the innovation programme.

The Countenance ATO scheme that provides an intensive study of the Basic Science curriculum component of the UBE programme holistically was adapted for this study. The scheme is as presented in figure 4 below:

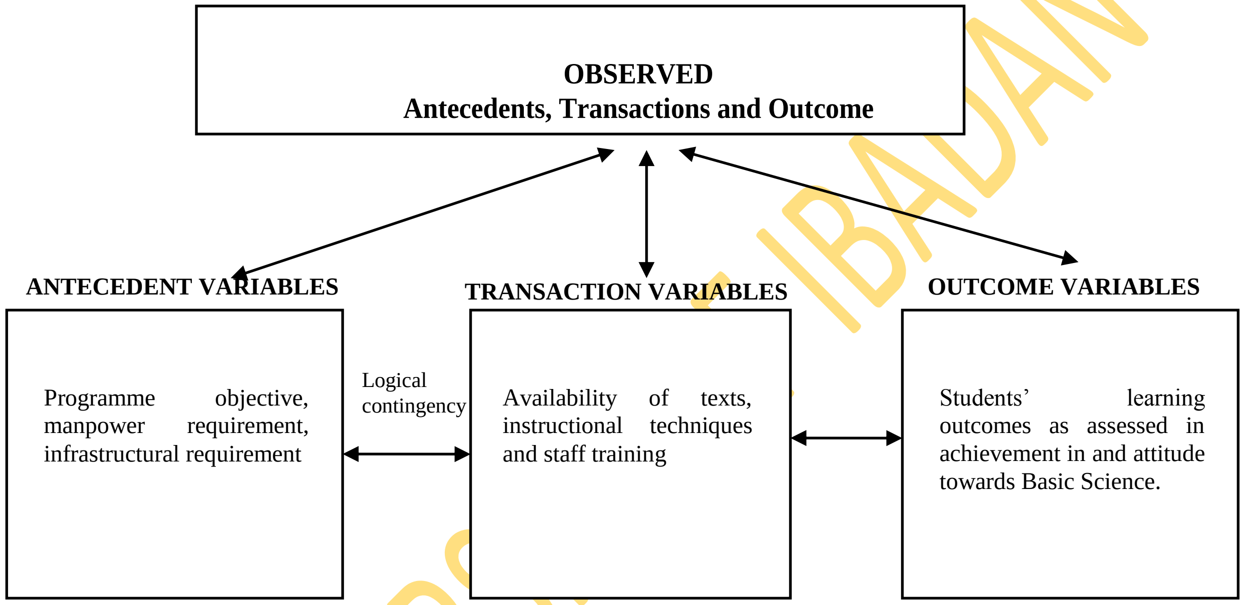

Figure 4: Adapted Antecedent, Transaction and Outcome scheme for the study

2.11 Curriculum Implementation

The term implementation, in a broad sense, conceptualises the process through which a proposed concept, model, topic or theory and so on is taken up by some practice. Fullan and Stiegelbauer (1991) distinguish three sub-processes in which an innovation is made to work (or not) in order to produce outcomes as shown in figure 5 below:

The processes that eventually lead up to and end with the decision to take up a specific innovation proposal have been called *initiation phase* (also mobilization or adoption). In the *implementation phase* (i.e. "implementation" in a more narrow sense) participants attempt to use the innovation proposal (or the curriculum in our case) in order to change their practice. Frequently, extra support for translating the innovatory ideas into reality is offered on a project basis. Thus, while the initiation phase is 3 concerned with the *nominal use* of a curriculum, the implementation phase focuses on the *actual* use. The study of implementation processes is concerned "with the nature and extent of actual change, as well as the factors and processes that influence how and what changes are achieved." (Fullan, 1994) Thereby, it aims to find out what type of extra support in the 'project phase' is appropriate to promote actual use of the innovation. In the *continuation phase* (also called institutionalization, incorporation, or routinization) the innovation (or what has been made out of the innovation during implementation) is built into the routine organization, and extra support (if there had been any during the implementation phase) is withdrawn. Thus, while implementation is concerned with initial use of the innovation under project conditions, continuation deals with mature use under standard conditions.

Initiation → **Implementation** → **Continuation** → **Outcome**

Figure 5: Curriculum implementation process
Adopted from Ornstein, A. C. and Hunkins, F. P. 2004. *Curriculum – Foundations, Principles, and Issues.* (Fourth Edition). Boston: Pearson.

The term curriculum implementation has been defined in different ways by different scholars. Mkpa (1987) defined curriculum implementation as: "The task of translating the curriculum document into the operating curriculum by the combined efforts of the students, teachers and others concerned. Garba (2004) viewed curriculum implementation as: "putting the curriculum into work for the achievement of the goals for which the curriculum is designed." Okebukola (2004) described curriculum implementation as: "the translation of the objectives of the curriculum from paper to practice." Ivowi (2004) defines curriculum implementation in a nutshell as "the translation of theory into practice, or proposal into action" Onyeachu (2008) viewed curriculum implementation as the process of putting all that have been planned as a curriculum document into practice in the classroom through the combined effort of the teachers, learners, school administrators, parents as well as interaction with physical facilities, instructional materials, psychological and social environment. All these definitions show that curriculum implementation is the interaction between the teachers, learners and other stake holders in education geared towards achieving the objectives of education.

Many implementation issues in secondary education curriculum have been identified. They include: Provision of facilities, Provision of instructional materials, Teachers' participation in decision-making and curriculum planning, Adequacy of qualified teachers, Funding, Application of Information and Communication Technology and Motivation of Teachers.

2.11.1 Provision of Facilities

Facilities are plants, equipment, buildings, furniture such as table, chairs which enable workers to perform their work effectively. To Ehiametalor (2001) facilities are: "those factors which enable production workers to achieve the goals of an organization." Olokor (2006) in supporting Ehiametalor (2001) notes that the use of instructional facilities enhance learning experiences and leads to interaction within the learning environment. Onyeachu's (2006) study questions such as "what extent are facilities being provided for effective implementation of secondary education curriculum?" Findings revealed that facilities are not provided adequately. What is found in most secondary schools in Nigeria are dilapidated buildings, leaking roofs, lack of chairs and tables for students and teachers use. These affect students' performance. Lamenting on the type of building found in our secondary schools, Nwachuku (2005) remarks that, the public sector of education (primary and secondary levels) has witnessed stagnation and decay. Nwachuku (2005) further complains with dismay that most schools are caricatures of what schools should be in a modern state – collapsing buildings, leaking roofs, unkempt surroundings, houses with few or no public toilets, a disdain for aesthetics, schools that are designed and run merely to maintain the *status quo*, that is, poor quality services for majority of the populace. This issue needs to be re-addressed because of its negative effects.

Appreciating the importance of facilities, Ehiametalor (2001) opines that: "school facilities are the operational inputs of every instructional programme. The school is like a manufacturing organization where plants and equipment must be in a top operational shape to produce result". In line with the views of Ehiametalor (2001), Ivowi (2004) notes that to ensure that curriculum is effectively implemented, infrastructural facilities, equipment, tools and materials must be provided in adequate quantities.

2.11.2 Provision of Instructional Materials

This is another implementation issue in secondary education curriculum. Instructional materials which Dike (1987) describes as alternative channels of communication which teachers can use to compress information and make them more vivid to their learners are needed for effective implementation of secondary education curriculum. Appreciating the need to provide instructional materials for effective teaching and learning in Nigerian schools, Onyejemezi (1991) posits that, all learners in the various levels of the nation's educational system are expected to be provided with appropriate learning experiences. A systematic integration of variety of resources in a teaching – learning process or environment produces appropriate learning experiences, which in turn result in effective (active) or meaningful learning. Onyejemezi (1991) further adds that, since experience implies activity of some kind –it is not simply something that happens, experiencing for the learners means having them (learners) see, hear, touch, taste, make, do and try. In line with the views of Dike (1987) and Onyejemezi (1991), Ughamadu (1992) agrees that curriculum materials are indispensable in the teaching learning process/ curriculum implementation. To that end, Babalola (2004) express the view that: "instructional materials are designed to promote and encourage effective teaching-learning experiences."

Instructional materials are ways and means of making the teaching and learning process easy, more meaningful and understandable. Babalola (2004) argues that as ingredient is to soup, so also is resource materials to curriculum implementation. These instructional materials are lacking in Nigerian secondary schools, as a consequence, teachers take to teacher chalk and talk as they have no visual or audio-visual materials which the students can see, touch, smell and hear in the process of teaching and learning. Onyeachu (2006) concludes that when instructional materials are not available learners cannot do well. This means that when learners are not doing well, the set objectives of education cannot be achieved.

2.11.3 Teachers' Participation in Decision-making and Curriculum Planning

For the set objectives of secondary education to be achieved, teachers must be involved in decision-making and planning of curriculum. Observing the importance of involving teachers in decision-making and planning of curriculum, Obinna (2007) explains that:" no government policy on education can be realized if it does not first of all perceive the problems and opportunities before initiating decision-making process." The teacher is in the best position and most qualified resource person to be consulted. Mkpa (1987) succinctly remarks that: "as a most important person in the programme of curriculum implementation, the teacher must be involved in all stages of the curriculum process." Obinna (2007) establishes that in most cases, teachers are deliberately neglected when major decisions on education and matters concerning their welfare are taken. This ugly situation has tragic and negative consequences on curriculum implementation. This is an implementation issue that needs to be looked into. This is necessary because, as Ugwu (2005) observes, the relevance of a curriculum is determined only when it is implemented. Kanno (2004) recognises the fact that the success of any curriculum, significantly, depends on the extent to which the classroom teacher is able not only to interpret the curriculum but to implement it. No wonder Ereh (2005) concludes that the quality of teachers can make or mar curriculum implementation since the responsibility of interpreting and putting the curriculum into use solely rests with the teachers. Unfortunately, these teachers are not involved in decision-making and curriculum planning. This is a very big impingement to the implementation of curriculum content and learning experiences.

This issue needs to be looked into because a situation where teachers who are the key implementers of curriculum are not involved in decision-making and curriculum planning, effective implementation of the content and learning experiences will be very difficult. Confirming this, Onwuka (1981), notes, that a curriculum has been planned to feature appropriate learning experiences is not a guarantee that appropriate learning experiences will result because most of the activities required depends on the teachers.

2.11.4 Availability of Qualified Teachers

This is one of the critical issues in implementing secondary education curriculum. For any programme to be successfully implemented, the implementer must be adequate. It is disheartening to note that in most secondary schools; very few teachers are in existence to the extent that in most cases, teachers are compelled to teach subjects that are not their areas of specialization. For instance, a situation where a teacher who read Christian Religious Knowledge is allowed to teach English Language and Mathematics, one wonders the type of knowledge such a teacher is going to impart to the learners since no teacher teaches what he/she does not know. The question that arises is how can we get adequate number of qualified subject teachers to handle effectively all the subjects meant for secondary education? This need to be looked into for appropriate action because as Offiong (2005) observes the teacher is a major hub around which the success of education revolves. Lassa (2007), therefore, views the teachers as the key to proper development of the child and consequently they are needed in greater number in all the secondary schools.

Evidence from studies and research clearly suggests that teachers may be lacking in essential competence areas. The response to this problem has often been to provide more in-service training or provide teachers with further opportunities to either re-train or seek higher teaching qualification (Akyeampong, Sabate, Hunt and Anthony, 2009).

2.11.5 Funding

Funding is another issue that affects implementation of secondary education curriculum. Fund refers to money. Every project requires money for its effective implementation. Confirming this, Onyeachu (2006) notes that, no organization functions effectively without fund. Unfortunately, budgetary allocation for education year in, year out is grossly inadequate. This affects implementation of a well designed curriculum. A situation where there is no money for payment of teachers salaries, purchase of equipment, books, furniture and other facilities, teachers cannot perform effectively. Commenting on the negative effects of inadequate funding of education in Nigeria, Nwachuku (2005) lamented that the present level of underfunding by the state, the public sector of education (primary and secondary levels) has witnessed stagnation and decay. Supporting Nwachuku (2005), Gwany (2006) adds that: "In Nigeria, education receives less per capita funding than many other African countries." Gwany further noted that the education industry is usually the first and easiest victim of budget cuts during "Austerity" "Low profile" "Structural Adjustments" and other economic reform strategies. This means that for the well designed curriculum of secondary education to be implemented, the issues of money have to be addressed.

2.11.6 Application of Information and Communication Technology (ICTS) in Teaching in Secondary Schools

The question to ask is can information and communication technology be applied in teaching secondary school subjects? ICT as an innovation proved very useful and effective in the teaching of secondary school subjects. For instance, a teacher can demonstrate what he is going to teach through motion pictures. A teacher can also type his lessons, save it in the system so that students can open it and use the information for their personal studies.

Teachers' inability to apply ICT in teaching school subjects in our secondary schools is one of the problems militating against effective implementation of secondary education curriculum. Majority of secondary school teachers do not use computers while teaching their lessons. This can be attributed to many factors which include problem of electricity. Onyeachu (2007) observes that since ICTs require electricity for their use, where there is power failure, users will be stranded. Another factor is lack of computer as well as expertise knowledge in the use of computer. There are complains that: the poor socio-economic condition in most developing countries of the world, including Nigeria, has compelled the governments and institutions to show little concern for the application of ICT in education. Many institutions in these countries cannot afford to buy or have access to computers and even where computers are available or can be purchased; there is lack of the human and material resources to use ICT.

2.11.7 Motivation of Teachers

Motivation can be described as anything that encourages an individual to perform his or her duty in an expected manner. Ofoegbu (2001) views motivation as any force that would reduce tension, stress, worries and frustration arising from a problematic situation in a person's life. Ofoegbu further argues that where such an incidence of tension, stress and worries are traceable to as work situation, it might be referred to as negative organisational motivation. Ofoegbu (2001), therefore, describes teachers' motivation as those factors that operate within the school system which if not available to the teachers but would hamper performance, cause stress and frustration, all of which subsequently reduce student quality output. This means that in order to improve performance on the part of students, teachers have to be motivated. To Ugwu (2005), when a person is gingered to do something, that person is motivated. To that end, Ugwu (2005) notes for a worker to live up to expectations, such a worker must be motivated. He/she must, in addition to getting his salaries and entitlements, be given other incentives and materials which will make his work easier and faster for him/her.

In implementing secondary education curriculum, the teacher who is the key actor needs to be motivated. The issue at stake now is how can a teacher be motivated so that he/she can do the work of implementing secondary education curriculum well? Teachers can be motivated by all the stake holders in education by realizing the need to regard teachers as the number one worker in their list to be cared for in terms of prompt payment of salaries, promotion and payment of other allowances and remuneration.

Motivation of teachers is very important because without teachers, the educational objectives as specified in National Policy on Education for all levels of education will not be achieved. Again, reformers of education may establish new schools, effect changes on the structure and curriculum, recommend and prescribe teaching methods and aids but in the end, the teacher will be responsible for applying them. When the applier is not happy, he cannot apply the changes in the curriculum.

Non-motivation of teachers affects their performance. When teachers' salaries, allowances and other remunerations are not given to them, they cannot implement the content of the curriculum. A case in point is the National strike embarked upon by the Nigerian Union of Teachers (NUT) from time to time. A proverb says, a hungry man is an angry man. The angry teachers embarked on industrial action on the request for a promise made to them for over 17 years (Request for Teachers' Salary Structure). In a situation such as this, how can a well designed curriculum be fully implemented. Ipaye (2002) explains that the prime motive of men engaging in some activities or going into a career is to obtain the resources to meet his psychological needs and support family among others. Unfortunately, teachers' monthly take-home salaries and allowances are very poor and unattractive, and as such, cannot sustain them in the face of the rising cost of living.

2.12 Programme Objectives and Learning Outcomes in Basic Science

Obioma (2008) declares that, every learner who has gone through nine years of basic education should have acquired appropriate levels of literacy, numeracy, manipulative, communicative and life skills, as ethical, moral and civic values needed for laying solid foundation for life-long learning as a basis for scientific and reflective thinking.

The objectives of teaching science in the Universal Basic Education programme as stated in Obanya (2002) include:

- Providing trained manpower in the applied Science, Technology and Commerce at sub-professional level,
- Endowing individuals with tools for learning, problem solving, analytical thinking and rational decision taking,
- Stimulating interest in Sciences,
- Facilitating early learning of difficult scientific concepts, and
- Providing opportunity for education at a higher level.

Attainment of these objectives will be evident in the kind of outcome that is obtained. These are the students' performance in Integrated Science Achievement Test (ISAT) and attitude towards Integrated Science. Boyejo (1990) examines how Integrated Science predisposes students to the learning of single science subjects and reports that students are positively disposed to science as a result of their exposure to Integrated Science. A student impact study conducted by South Eastern Regional Vision for Education (SERVE, 1996) on the Integrated Science programme of the University of Alabama reveals that, the Integrated Science programme has improved students' achievement in Science as assessed by standardized tests. The SERVE study also reported that, in a test of Science process skills, Integrated Science students performed better than non-Integrated Science students and that, Integrated Science students reported a significantly greater liking and interest in Science class.

2.13 Human, Physical and Instructional Resources in Science Curriculum Implementation

Resources, according to Akinsola (2000), are the sum total of everything used directly or indirectly for the purpose of educational training to support, facilitate or encourage the acquisition of knowledge, competence, skill and know - how. Resources can also be defined as anything that aids the actualization of the teaching and learning goals/ objectives. These resources can be grouped into human and non-human resources.

The human resources include the Integrated Science teacher, trained laboratory technologist, while the non-human resources include materials such as chemicals, visual and audiovisual aids, and specimens, which when carefully selected for use to enhance the teaching and learning of Integrated Science. The studies of Ojo (1995) and Eshiet (1996) confirmed the fact that resources generally are inevitable tools to effective teaching and learning.

Adequacy of resource materials from the literature reviewed have shown that with the laboratory experience, students will be able to translate what they have read in their texts to practical realities, thereby enhancing their understanding of the learnt concepts. With adequate resource materials, it is expected that there will be enough materials and equipment to go round the students at any given time of practicals. Classroom teachers and their partners need to do much more than simply ensuring access or providing the wide range of appropriate learning resources, they must ensure that students' learning environment is properly structured so that learning will occur.

2.13.1 Human Resources

Teachers are a key factor in successful implementation of a curriculum. The nature of Science teaching at the Junior Secondary school requires that, competent professionals should guide the teaching activities at this level. This is because; the curriculum is both academic and pre-vocational. Hence, teachers with sufficient exposure and training in both content and pedagogy are required.

Kathy (2000) is of the view that teachers are central to implementing the vision of a project and to keeping curriculum, assessment and instruction closely linked. Okpala and Onocha's summary review of some studies in 1988, as reported by Egbugara (1992), observes that, most teachers teaching Integrated Science are specialists in single science subjects and that, they rarely used expository approach and a few being pragmatic in their approach.

The teachers' role in ensuring that, the desired learning outcome is achieved cannot be under-estimated while their expertise came into play.

2.13.2 Physical Resources

School buildings as well as the facilities are seen as a controlled environment, which facilitate the teaching - learning process as well as projecting the physical well being of the students. In secondary schools, modern teaching of sciences, social science, arts and other vocational studies would require the use of laboratories and many other learning aid/ facilities such as electronic aids comprising films, overhead projectors, microfilms, transparencies, programmed instructional packages and computers.

People in many professions use library resources to assist themselves in their work. Students use libraries to supplement and enhance their classroom experiences, to learn skills in locating source of information, and to develop good reading and study habits (Microsoft students 2008 DVD).

2.13.3 Instructional Resources

Teachers needed to be equipped with the appropriate instructional resources. These instructional resources could be in the form of books, charts, models, maps, laboratory materials and equipment, projectors; computers etc. The book has been regarded as an important single resource to both the science teacher and the learner.

Instructional materials have been found out to be grossly inadequate in our schools (NPEC, 1999), despite Ojo's (1995) and Eshiet's (1996) confirmation that resources generally are inevitable tools to effective teaching and learning. Teaching science with appropriate teaching materials aids learning, which manifest in students' performance in Basic Science Achievement Test and attitude towards science.

2.14 Appraisal of Literature Review

Various studies relating to this study has been reviewed and appraisal is hereby presented. Odubunmi (1981) investigates teaching strategies and pupils' attitude to Integrated Science and consequently reports among other things; that favourable attitude of students is likely to be influenced by their parents and peer group. This research equally indicates that the teaching strategies employed by teachers are not in line with the philosophy of the subject. Jegede (1983) reviews the problems and prospects of former Integrated Science programme. His findings reveals that, lack of pilot testing of the materials, dearth of trained teachers and low readability level of textbooks are some of the problems the programme encountered. Even though, it was reported that it has the prospect of helping students to develop positive attitude. Ivowi and Odunusi (1982) carry out a study on the evaluation of the Junior Secondary School Science curriculum, assessing the opinions of some secondary school science teachers who will teach the curriculum content on some of its desired objectives. The study assesses its possible respectability and suitability for Junior Secondary School pupils, testing its receptability across teachers experience and training. The results establish that majority of the teachers have received special training in science education. In addition, half of the teachers have taught in the classroom for over five years. Odetoyinbo (2004) also carries out an evaluation of the Nigerian Integrated Science Programme with a view to identifying its strengths and weaknesses, as well as the perceptions of the status of the objectives by the stakeholders. The study attempts to empirically determine how some of the inputs and process variables determine learning outcomes. The findings show that all stakeholders agree that the objectives are ideal and relevant; and that, the variables when taken together are effective in predicting the criterion variable; also that, specialist teachers in the field are lacking.

Camara (2006) reviews the Basic education curriculum to integrate the Science and Technology contents required in transforming the teaching – learning process to get appropriate impact on learners. It reveals low level of qualification of many teachers, lack of teaching/learning materials in the field of Science and Technology, that pupils have no idea of the Basic science principles and knowledge at their level. A student impact study conducted by South Eastern Regional Vision for Education (SERVE) on the Integrated Science programme of the University of Alabama revealed that, the Integrated Science programme has improved students' achievement in Science as assessed by standardized tests. The SERVE study also reports that, in a test of Science process skills, Integrated Science students perform better than non-Integrated Science students and that, Integrated Science students report a significantly greater liking and interest in Science class (SERVE, 1996).

From the review of literature, we have that studies that have been conducted on Integrated Science programme in Nigeria had focused on problems and prospects, strengths and weaknesses, opinions on some of its desired objectives and so on. None of these evaluations have carried out assessment on the state of readiness of teaching resources (human, physical and instructional material) for the programme. Moreover, Galabawa (2008) opines that, the combination of summative and formative evaluation facilitates the assessment of the best possible use of limited resources in implementing educational curricula. Hence, the gap this study intends to fill is to evaluate the implementation of a new programme (Basic Science) at the Upper Basic level of the UBE programme. The study intends to ascertain the availability and adequacy of resources (i.e. human, physical and instructional material) towards the implementation of the UBE science programme (FME, 1999) and also determines the composite and relative contributions of these antecedents' and transactions' variables to learning outcome in Basic Science.

CHAPTER THREE

METHODOLOGY

3.1 Research Design

The study is an evaluative one which adopted survey research design of the ex-post facto type because the independent variables involved were not manipulated. Evaluation is assessing and placing value on programme objective and needs, programme input and process, availability and adequacy resources, teaching and learning methodologies and so on. The Countenance Antecedent, Transaction and Outcome model is a comprehensive model whose focus is to provide an intensive study of the programme hollistically.

3.2 Variables in the Study

The variables in the study include:

1. **Antecedent variables:** These are

(i) Science programme objectives

(ii) Manpower requirements

(iii) Infrastructural requirements

2. **Transaction variables:** These are

(i) Availability of texts

(ii) Instructional techniques

(iii) Staff training

3. **Outcome variables:** These are

(i) Students' achievement in Basic Science

(ii) Students' attitude towards science.

The variables are explained diagrammatically in table 3 below:

Table 3: Variables in the Study

Antecedent variables	Transaction variables	Outcome variables
Science programme objectives	Availability of texts	Students' achievement in Basic Science.
Manpower requirements	Instructional techniques	Students' attitude towards Science.
Infrastructural requirements	Staff training	

Table 4: Evaluation Framework

Variable	Instruments	Statistical Tools	Research Questions
Antecedent			
(i) Science programme objectives	Science programme objective rating scale (SPORS):section B	Frequency counts and percentages	2
(ii) Infrastructural requirements	Basic Science Course Material Assessment Questionnaire (BSCMAQ): section D		3
(iii) Manpower requirements	Science programme objective rating scale (SPORS): section A		1
	Basic Science Course Material Assessment Questionnaire (BSCMAQ): section A		4
Transaction			
(i) Availability of Texts	Basic Science Course Material Assessment Questionnaire (ISCMAQ): section C	Frequency counts and percentages.	5
(ii) Instructional techniques	Basic Science Classroom Observation Schedule (BSCOS)		6
(iii) Staff training	Basic Science Course Material Assessment Questionnaire (BSCMAQ): section B		7
Outcome			
(i) Achievement in Basic Science.	Basic Science Achievement Test (BSAT)	Means and standard deviations	8
(ii) Attitude towards science	Student Attitude Questionnaire (SAQ)	dito	9
Relationship between antecedent & transaction variables and learning outcomes	All instruments	Regression analysis	10 & 11

Table 4 shows the framework for the evaluation of the implementation of the Basic Science curriculum component of UBE. It highlights the instruments and statistical tools employed for each variable in the study, as well as the research questions that is being answered.

3.3 Target Population

The target population for the study was categorized into two namely:

(i) All Upper Basic students from the six states that comprise Southwestern Nigeria

(ii) All ministry officials, Principals of schools, Year tutors/Heads of departments and teachers teaching Basic science at the Upper Basic class from the six states that comprise Southwestern Nigeria.

The population is referred to as stakeholders (which are ministry officials, principals, year tutors/heads of departments, classroom teachers and junior secondary school III students) from the six states that make up Southwest geopolitical zone of the nation, which are Lagos, Ogun, Osun, Oyo, Ondo and Ekiti States.

3.4 Sample and sampling procedure

A sample of 1200 respondents was drawn using purposive and stratified sampling techniques. The procedure was by selecting ten local governments from each state comprising Southwestern Nigeria. The ten Local governments were spread among the three senatorial districts in each of the states as shown in Tables 5 – 10 below:

Table 5: Local Governments Distribution in Lagos Senatorial Districts

LAGOS	SENATORIAL DISTRICTS		
	East	**Central**	**West**
	Shomolu*	Eti osa*	Ikeja*
	Kosofe	Island	Agege
	Ikorodu*	Mainland*	Ifako/ijaiye
	Epe	Surulere	Alimosho*
	Ibeju Lekki*	Apapa*	Mushin
			Oshodi/isolo*
			Amuwo odofin
			Ojo
			Badagry*
			Ajeromi/ifelodun

Key: * the local governments engaged in the study

Table 6: Local Governments Distribution in Ogun Senatorial Districts

OGUN	SENATORIAL DISTRICTS		
	East	**Central**	**West**
	Remo North*	Abeokuta North*	Imeko-afon*
	Ikenne	Abeokuta South	Egbado North
	Sagamu	Odeda	Egbado South*
	Ijebu North*	Obafemi/owode*	Ipokia
	Ijebu North East	Ewekoro	Ado odo/ota*
	Ijebu ode*	Ifo*	
	Odogbolu		
	Ijebu East		
	Ogun waterside*		

Table 7: Local Governments Distribution in Osun Senatorial Districts

OSUN	SENATORIAL DISTRICTS		
	East	**Central**	**West**
	Ife South*	Osogbo*	Ayedaade*
	Ife North	Boripe	Isokan
	Ife East	Olorunda	Irewole
	Ife Central*	Irepodun	Ayedire
	Atakumosa West	Orolu	Iwo*
	Atakumosa East*	Odo-otin*	Olaoluwa
	Oriade	Boluwaduro	Ejigbo
	Ilesha East	Ila*	Egbedire
	Ilesha West*	Ifedayo	Ede North
	Obokun		Ede South*

Table 8: Local Governments Distribution in Oyo Senatorial Districts

OYO	SENATORIAL DISTRICTS		
	North	**Central**	**South**
	Saki West*	Afijio	Ibadan North*
	Saki East	Akinyele	Ibadan North East
	Atigbo	Egbeda*	Ibadan North West
	Irepo	Ogo-oluwa	Ibadan South East*
	Olorunsogo	Surulere	Ibadan South West
	Kajola	Lagelu	Ibarapa Central*
	Iwajowa	Oluyole*	Ibarapa North
	Itesiwaju*	Ona-ara	Ibarapa East
	Ogbomosho North	Oyo East*	Iddo
	Ogbomosho South	Oyo West	
	Orire	Atiba*	
	Oorelope		
	Iseyin*		

Table 9: Local Governments Distribution in Ondo Senatorial Districts

ONDO	SENATORIAL DISTRICTS		
	North	**Central**	**South**
	Akoko North West*	Ifedore	Ile oluji/okeigbo*
	Akoko North East	Akure North*	Odigbo*
	Akoko South East*	Akure South	Okitipupa*
	Akoko South West	Ondo East	Irele
	Owo*	Ondo West*	Ilaje*
	Ose	Idanre*	Ese odo

Table 10: Local Governments Distribution in Ekiti Senatorial Districts

EKITI	SENATORIAL DISTRICTS		
	North	**Central**	**South**
	Ido/osi*	Ado*	Ekiti East*
	Ikole*	Efon	Ekiti South*
	Ilejemeje	Ekiti West*	Emure
	Moba	Ijero	Gbonyi
	Oye*	Irepodun/Ifelodun*	Ikere*
			Ise/orun*

The selection was at least three local governments from each senatorial district as marked in each table. The number of local government in each state and as distributed to senatorial district as shown in Tables 5 – 10 are:

(i) Lagos State has twenty (20) local governments

(ii) Ogun State has twenty (20) local governments

(iii) Osun State has thirty (30) local governments

(iv) Oyo state has thirty-three (33) local governments

(v) Ondo State has eighteen (18) local governments

(vi) Ekiti State has sixteen (16) local governments

The mode of selection from each of the Local government was five policy makers, five Basic Science teachers and ten students. This gave a total of Two hundred (200) respondents from each state as shown below:

Number of ministry officials	-	50
Number of teachers	-	50
Number of beneficiaries	-	100

Eventually, the overall distribution gave:

Total number of ministry officials	-	300
Total number of teachers	-	300
Total number of beneficiaries	-	600
Grand Total		**1200**

3.5 Instruments

The evaluation model informs the type of questions to be asked and the type of data to be collected. Hence, this study requires the use of:

1. Science Programme Objectives Rating Scale (SPORS)
2. Basic Science Course Material Assessment Questionnaire (BSCMAQ)
3. Basic Science Classroom Observation Schedule (BSCOS)
4. Basic Science Achievement Test (BSAT)
5. Students' Attitude Questionnaire (SAQ)

3.5.1 Science Programme Objectives Rating Scale (SPORS)

This is in two sections: Section A is on the profile of the stakeholders in terms of their age, gender, qualifications, area of specialization and years of service. Section B is a 10-item statement of objectives of Science taught at the Junior Secondary School level. This is based on the objectives of Science of the UBE programme. Stakeholders indicated their rating of the objective of science at the Junior Secondary educational level. The ratings are: 5= Excellent, 4= Very Good, 3= Good, 2= Fairly Good, 1= Fair.

Validity

The instrument was given to three researchers, Integrated Science teachers in junior secondary schools and researcher's supervisor for construct and content validity. They confirm the adequacy of the ten statements of basic science objectives. Thereafter, the instrument was pilot tested among ten policy makers and ten secondary school teachers in Epe Local Government Area of Lagos State. They were requested to rate each statement, which they did. The data generated was used in calculating the reliability coefficient for the SPORS which was determined to be 0.72 (i.e., r =0.72) using Cronbach alpha.

3.5.2 Basic Science Course Material Assessment Questionnaire (BSCMAQ)

This is in four sections: Section A – Basic Science Manpower Assessment Questionnaire (BSMAQ) meant to provide information about the teachers implementing the programme. It touches on their gender, highest academic qualification and area of specialization. Section B – Basic Science Manpower In-service Training Assessment Questionnaire (BSMITAQ) was designed for Basic Science teachers at the Junior Secondary Schools to indicate their assessment of the extent of in-service training acquired. Section C - Basic Science Course Material Assessment Questionnaire (BSCMAQ) was designed to enable assessment of the extent of availability of Course material for the teaching and learning of Basic Science at the Junior Secondary Schools. Section D – Infrastructural Facility Questionnaire (IFQ) was designed to enable assessment of the extent of availability and adequacy of Infrastructural facilities for teaching Basic Science at Junior Secondary Schools.

Validity

The instrument was given to three researchers, Basic Science teachers in junior secondary schools and researcher's supervisor for construct and content validity. The instrument was pilot tested among twenty teachers comprising of Principals, Year tutors and Basic Science teachers in Epe Local Government Area of Lagos state. They were requested to assess the extent of availability and adequacy of course material for the teaching of basic science, which they did. The data generated was used to calculate the reliability coefficient of the ISCMAQ which was determined to be 0.81 (i.e., r = 0.81) using Cronbach alpha.

3.5.3 Basic Science Classroom Observation Schedule (BSCOS)

This is an observation schedule adopted from Odetoyinbo (2004) for Basic Science classroom practices. It consists of three categories and twenty-six subcategories. The researcher along with some trained research assistants carried out the observation.

Validity

The instrument has already been validated with inter rater reliability of 0.73 using Scott's formula.

3.5.4 Basic Science Achievement Test (BSAT)

This is a twenty-item achievement test in Basic Science for Junior Secondary School III students. It tests the students' acquisition of knowledge and skills in Basic Science. The twenty items were those with difficulty index in the range of 12.50 – 87.50% and discrimination index in the range of 0.25 – 0.50; selected from the initial thirty items that were formulated. The test blue print for the items is as presented in table 11 below:

Validity

The instrument was given to three researchers and researcher's supervisor for face and content validity. The instrument was pilot tested among forty Junior Secondary III students in Epe Local Government Area of Lagos State. They were requested to underline the correct option among five alternative responses, which they did. The instrument was scored by awarding 1mark for each correct response and 0mark for incorrect response. The scores of these sets of students in ISAT was then used to calculate its reliability coefficient which was determined to be 0.69 (i.e., r = 0.69) using Kuder Richardson KR_{20}.

Table 11: Test Blue Print for 20-items on BSAT

	Topics	Remembering	Understanding	Application	Total
1	Measurement	2(2,9)	-	-	**02**
2	Growth and Development	1(1)	1(10)	-	**02**
3	Pollution	1(16)	1(14)	-	**02**
4	Physical and Chemical change	-	-	1(18)	**01**
5	Science and Development	-	2(6,13)	-	**02**
6	Digestion	-	2(7,11)	-	**02**
7	Reproductive health	2(12,19)	-	-	**02**
8	Elements, Mixture and Compounds	-	1(3)	1(5)	**02**
9	Acids, Bases and Salts	-	1(14)	1(15)	**02**
10	Work, Energy and Power	-	2(4,17)	1(20)	**03**
	Total	**06**	**10**	**04**	**20**

Key: Figures in parentheses are the item numbers.

3.5.5 Students' Attitude Questionnaire (SAQ)

This is a twenty-item questionnaire on attitude towards Science for Junior Secondary School III students. They indicated the option that best represents their response to each statement on a 4-point scale of

SA = Strongly Agree　　　　A = Agree

D = Disagree　　　　SD = Strongly Disagree.

There are 10 positive and 10 negative statements. The positive statements are rated 4=Strongly Agree, 3=Agree, 2=Disagree and 1=Strongly Disagree; and the reverse for the negative statements.

Validity

The instrument was given to three researchers and researcher's supervisor for construct and content validity. The instrument was pilot tested among forty Junior Secondary III students in Epe Local Government Area of Lagos state. They were requested to tick (√) the column that best represents their attitude towards basic science, which they did. The data generated was used to calculate the reliability coefficient of the SAQ which was determined to be 0.58(i.e., r = 0.58) using Cronbach alpha.

3.6 Procedure for Data Collection

The researcher employed the services of trained research assistants from the six states that made up Southwestern geopolitical zone of Nigeria. They assisted in the administration and retrieval of the instruments lasting between two to four weeks. Four of the five instruments (SPORS, BSCMAQ, BSAT and SAQ) were administered simultaneously. The fifth instrument (BSCOS) was handled by another set of trained research assistants and this definitely took longer period (two months duration) to complete.

3.7 Data Analysis

The data collected were analyzed by using descriptive statistics of frequency counts, the percentage, mean and standard deviation for research questions 1-9, as well as inferential statistics of multiple regressions for research questions 10 and 11.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter presents the results of the study. This is done based on the eleven research questions earlier raised for the study.

4.1 Answering Research Questions

Research Question One: What is the profile of the following stakeholders as indicated by the following socio-demographic variables?

a. Ministry official: age, gender, qualifications, area of specialization and years of service

b. School Principals: age, gender, qualifications, area of specialization and years of service

c. Year Tutors/Heads of Departments: age, gender, qualifications, area of specialization and years of service

d. Classroom teachers: age, gender, qualifications, area of specialization and years of service

e. Students: age, gender and intended career

Table 12: Profile of Stakeholders from the Six South-west states

CATEGORY		A = 557				B = 588	Total
		Ministry officials	**Principal**	**Year Tutor / H.O.D**	**Classroom teacher**	**Students**	
State:	Lagos	3 (0.26)	18 (1.57)	29 (2.52)	45 (3.93)	96 (8.38)	191 (16.68)
	Ogun	3 (0.26)	18 (1.57)	26 (2.27)	42 (3.67)	97 (8.47)	186 (16.24)
	Oyo	10 (0.87)	3 (0.26)	27 (2.36)	45 (3.93)	100 (8.73)	185 (16.16)
	Osun	4 (0.35)	14 (1.22)	35 (3.06)	42 (3.67)	100 (8.73)	195 (17.03)
	Ondo	3 (0.26)	16 (1.40)	30 (2.62)	44 (3.84)	95 (8.30)	188 (16.42)
	Ekiti	10 (0.87)	20 (1.75)	19 (1.66)	51 (3.45)	100 (8.73)	200 (17.47)
Grand Total							**1145**

Key: Category A – Implementers Category B – Beneficiaries

Figures in parentheses are in percentages

Table 12 shows the profile of the stakeholders of the Universal Basic Education programme. These constitute the implementers and beneficiaries of the programme. The implementers are categorised as A which are Local Education District officials, Principals of Schools, Year Tutors/Heads of Departments and Classroom teachers. There were Five hundred and fifty-seven (557) of them drawn from the six states that constitute South-west geopolitical zone of the country. The beneficiaries were categorised as B which are Junior Secondary School III students. There were Five hundred and eighty-eight (588) of them drawn from One hundred and twenty (120) Junior Secondary Schools from the six South-west states of Nigeria.

These subjects that were drawn using Stratified random sampling technique from the six South-west States were as follows: 191, constituting 16.68% from Lagos State; 186, constituting 16.24% from Ogun State; 185, constituting 16.16% from Oyo State; 195, constituting 17.03% from Osun State; 188, constituting 16.42% from Ondo State and 200, constituting 17.47% from Ekiti State.

Graphical illustration of the profile of stakeholders from the six south-west states is as Shown in Figure 6 below:

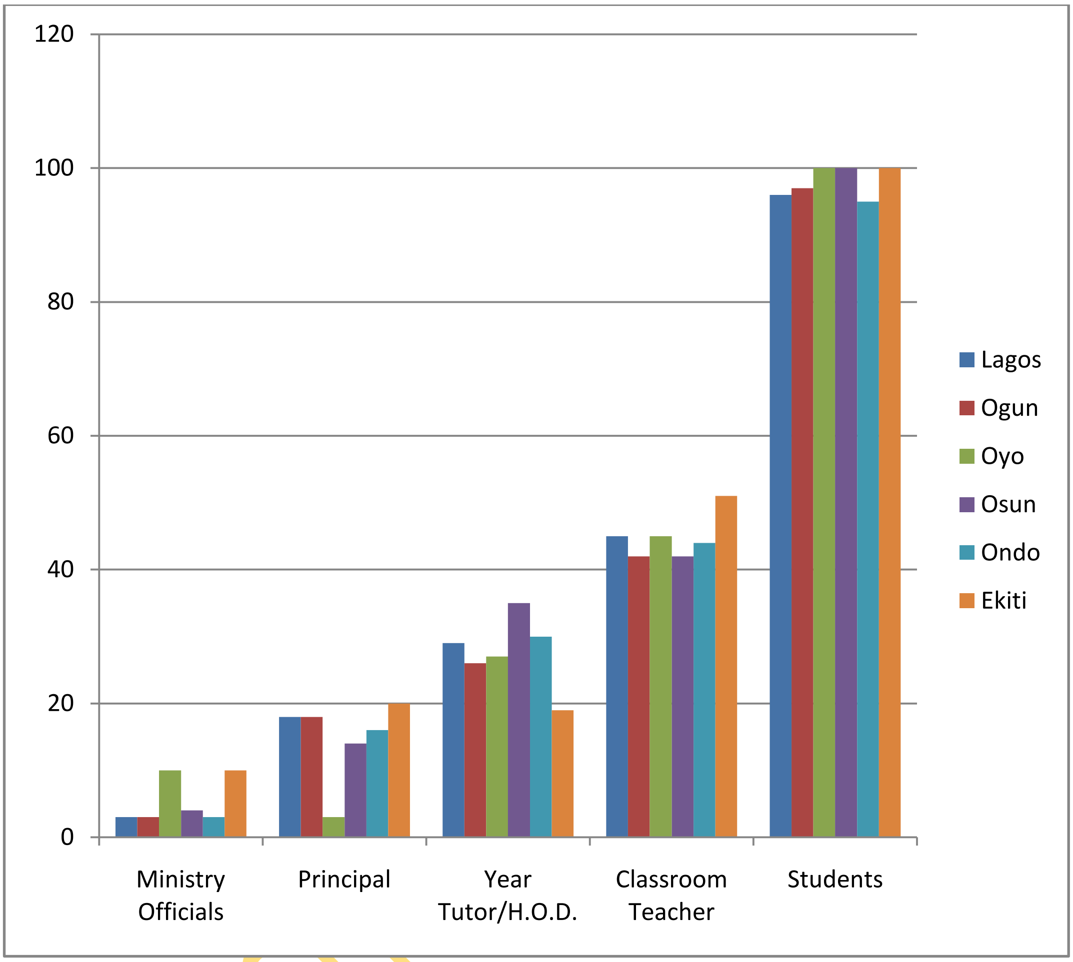

Figure 6: Bar Chart Showing Distribution of Respondents from the six south-west states.

Ministry officials were represented in the six states that comprise South-west zone of Nigeria. However, it was in Oyo and Ekiti States that sizeable number of ministry officials responded to the study. Also, the number of Principal that responded to the study in Oyo State was very small. This may be because most of the Principal claimed to have tight schedule and do not attach importance to the study. Some of them collected the questionnaire and returned it without filling it, while a few others did not bother to return the questionnaire. But for the remaining respondents (Year Tutor/H.O.D, Classroom teachers and students), equitable distribution was achieved in the six states.

From observation and interaction, the Ministry officials from Oyo and Ekiti States have higher educational qualification than those from other states. It is assumed that this must have given them a better appreciation for research, evident in their proper filling and returning of the questionnaire. Also, the Year Tutor/H.O.D. and Classroom teachers show high appreciation for research work. The reasons for this may be because they are directly involved in the implementation of the programme and oblige to contribute to its betterment. Again, many of them are/have people around them who are engaged in various academic programme such as master's and Ph.D.

Table 13 below shows the distribution of respondents by age. It reveals that 139 constituting 12.14% were under 12years old; 449 constituting 39.21% were in the age bracket 13 -19years old; 53 constituting 4.63% were in the age bracket 20 – 25years old; 263 constituting 22.97% were in the age bracket 26 – 40years and 241 constituting 21.05% were above 40years of age.

Table 13: Profile of Stakeholders by Age

CATEGORY		A = 557				B = 588	Total
		Ministry officials	**Princip al**	**Year Tutor / H.O.D**	**Classroom teacher**	**Students**	
Age :	Under 12yrs	-	-	-	-	139 (12.14)	139 (12.14)
	13 – 19yrs	-	-	-	-	449 (39.21)	449 (39.21)
	20 – 25yrs	1 (0.09)	-	16 (1.40)	36 (3.14)	-	53 (4.63)
	26 – 40yrs	5 (0.44)	20 (1.75)	82 (7.16)	156 (13.62)	-	263 (22.97)
	41yrs & above	13 (1.14)	68 (5.94)	69 (6.03)	91 (7.95)	-	241 (21.05)
Grand Total							**1145**

Graphical illustration of the profile of stakeholders by age is as shown in Figure 7.

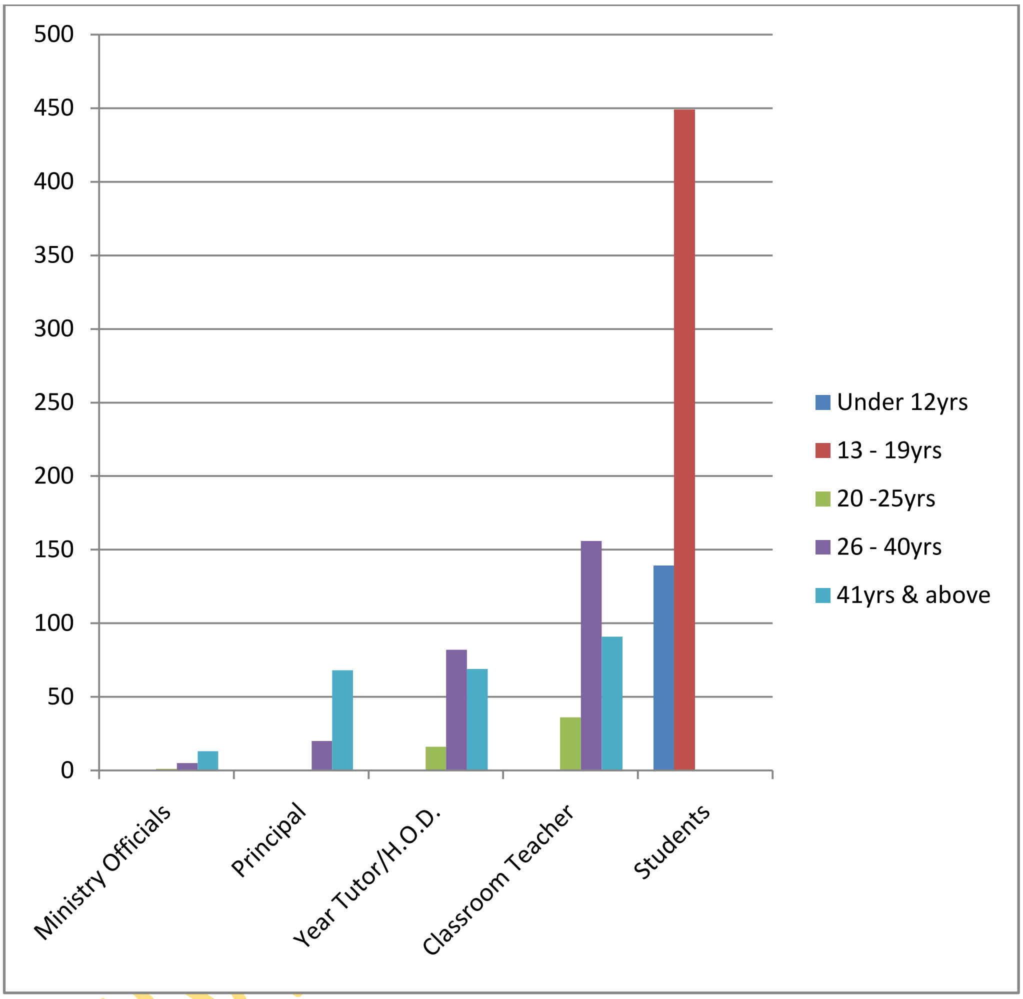

Figure 7: Bar Chart Showing Distribution of Respondents by Age

Though the age of Ministry officials and Principal of schools ranges from 26years and above, many of them are quite above 40years of age. This point to the fact that as people that are advanced in age, they are likely to have matured in service. This made them qualified to be able to rate the objectives of the UBE science programme. Also, the age of Year Tutor/H.O.D and Classroom teachers ranges from 20years and above, with many of them in the age bracket 26yrs – 40yrs. They are much younger than the Ministry officials and Principal of schools, and as such may not have much experience as they do. The age of a good number of the students lie between 13yrs – 19yrs of age. This brought to mind the report of growing body of recent research that students develop their interest in and attitude towards Science before age 14years. Science education before this age should be interesting and stimulating. UBE science programme is set to achieve this.

Table 14 below shows distribution of respondents by gender. Out of the 1145 stakeholders engaged in this study, 542 constituting 47.34% were males and the remaining 603 constituting 52.66% were females.

Table 14: Profile of Stakeholders by Gender

CATEGORY		A = 557				B = 588	Total
		Ministry officials	**Principal**	**Year Tutor / H.O.D**	**Classroom teacher**	**Students**	
Gender	Male	14 (1.22)	54 (4.72)	79 (6.90)	122 (10.66)	273 (23.84)	542 (47.34)
	Female	5 (0.44)	35 (3.06)	87 (7.60)	161 (14.06)	315 (27.51)	603 (52.66)
Grand Total							**1145**

Graphical illustration of the profile of stakeholders by gender is as shown in Figure 8.

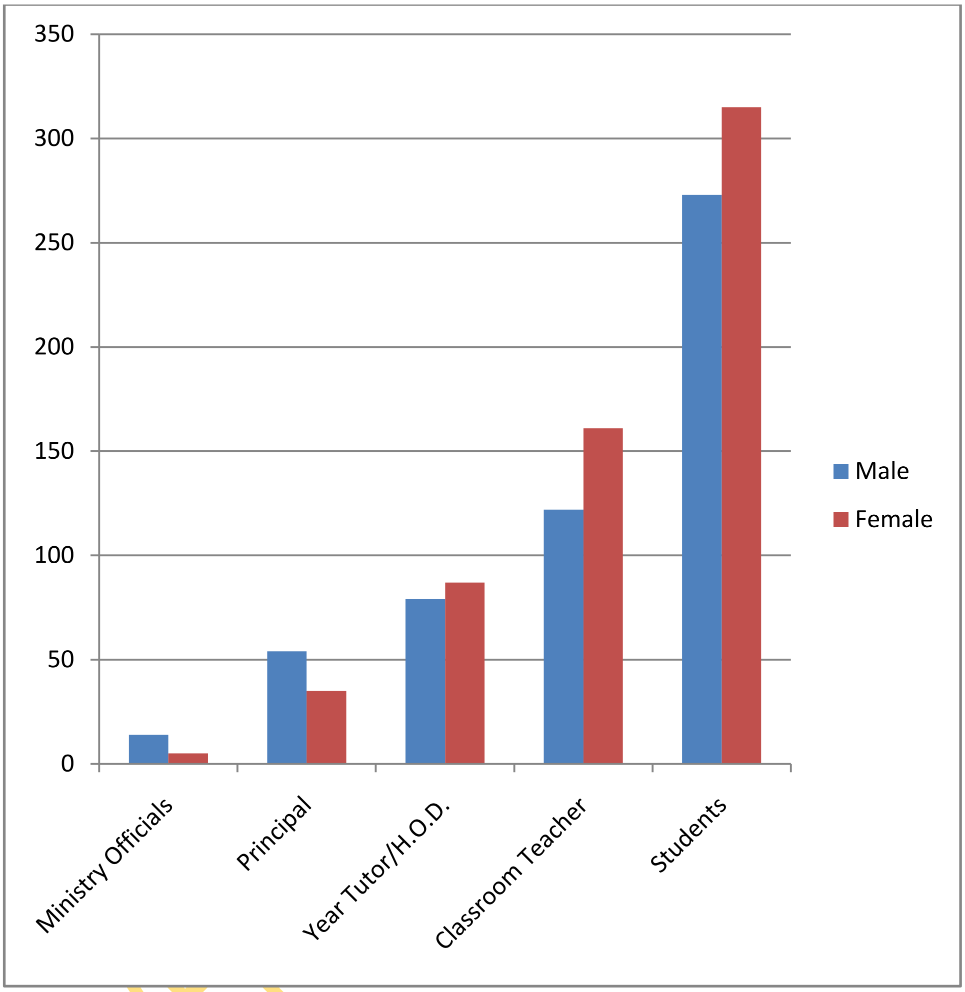

Figure 8: Bar Chart Showing Distribution of Respondents by gender

For Ministry officials and Principal of schools, there are more Males than Females. It may be because males tend to stay longer in service than females. More females engage in one form of trading or the other and sometimes resign early from active service to go into full-time business. Whereas, for the remaining respondents (Year Tutor/H.O.D, Classroom teachers and students), there are more females than males. When it comes to educational system, there are in most cases more females than males, as well as in most social gathering. Most school record would reveal more females attendance than males.

Summarily, observation in the table shows that more females are involved in the actual implementation (classroom teachers), while only a few of them get to the top which is position of influence. Therefore, leadership training, incentives and encouragement on the part of female teachers to stay longer in service will go a long way in bridging the gap between the policy makers (Ministry officials and Principals who stand in for the government) and the implementers of the programme.

Table 15 shows the distribution of respondents by qualification. Out of the 557 implementers of the programme, 18 constituting 3.23% are OND/HND holders; 128 constituting 22.98% are NCE holders; 312 constituting 56.01% are First degree holders and 99 constituting 17.77% are Second degree holders.

Table 15: Profile of Stakeholders by Qualification

CATEGORY		A = 557				B = 588	Total
		Ministry officials	**Principal**	**Year Tutor / H.O.D**	**Classroom teacher**	**Students**	
Qualification	OND/ HND holder	-	-	7 (1.26)	11 (1.97)	-	18 (3.23)
	NCE holder	2 (0.36)	4 (0.72)	32 (5.75)	90 (16.16)	-	128 (22.98)
	First Degree holder	8 (1.44)	47 (8.44)	94 (16.88)	163 (29.26)	-	312 (56.01)
	Second Degree holder	9 (1.62)	38 (6.82)	33 (5.92)	19 (3.41)	-	99 (17.77)
Grand Total							**557**

Graphical illustration of the profile of stakeholders by qualification is as shown in Figure 9:

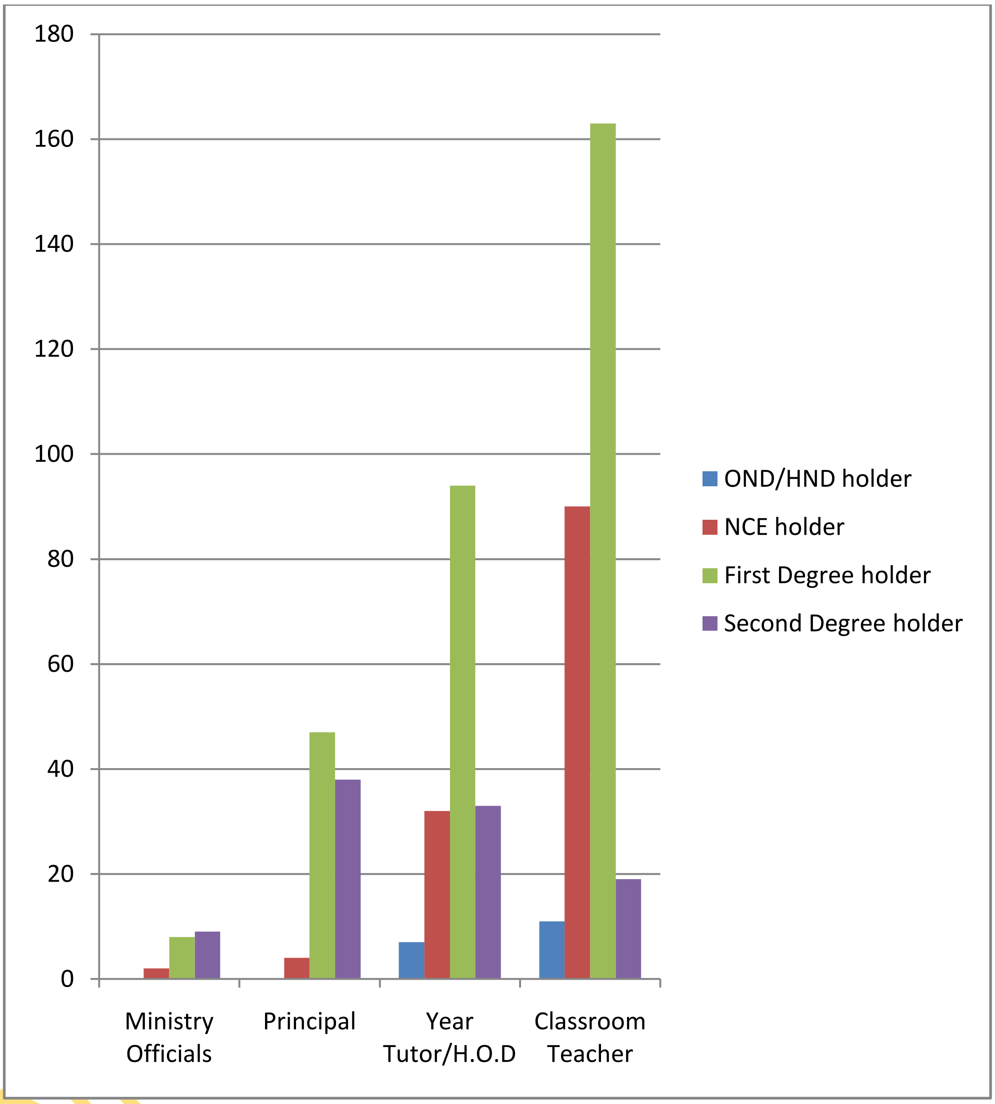

Figure 9: Bar Chart Showing Distribution of Implementers by Qualification

Among Ministry officials and Principal of schools, there are no OND/HND holders, even though there are a handful of them among Year Tutor/H.O.D and Classroom teachers. Because OND/HND holders did not have teaching qualification, they are not expected to be engaged in classroom teaching in schools.

The implication of this is that, implementation of the Basic Science curriculum of UBE by OND/HND holders would not be thorough and effective as desired. In view of this, firstly, government should desist from employing non-qualified personnel to teach, more especially at the basic level. Secondly, those non-qualified personnel who are already on the job should be mandated to go for professional training.

Table 16 shows the distribution of respondents by their areas of specialisation. Out of these 557 implementers, 278, constituting 49.91% specialise in Pure Science; 182, constituting 32.68% specialise in Applied Science and 97, constituting 17.41% specialise in Humanities.

Table 16: Profile of Stakeholders by their Area of Specialisation

CATEGORY		A = 557				B = 588	Total
		Ministry officials	Principal	Year Tutor / H.O.D	Classroom teacher	Students	
Area of Specialization	Pure Science	4 (O.72)	35 6.28	60 (10.77)	179 (32.14)	-	278 (49.91)
	Applied Science	8 (1.44)	28 (5.03)	71 (12.75)	75 (13.46)	-	182 (32.68)
	Humani ties	7 (1.26)	26 (4.67)	35 (6.28)	29 (5.21)	-	97 (17.41)
Grand Total							**557**

Graphical illustration of distribution of respondents by their areas of specialization is as shown in Figure 10:

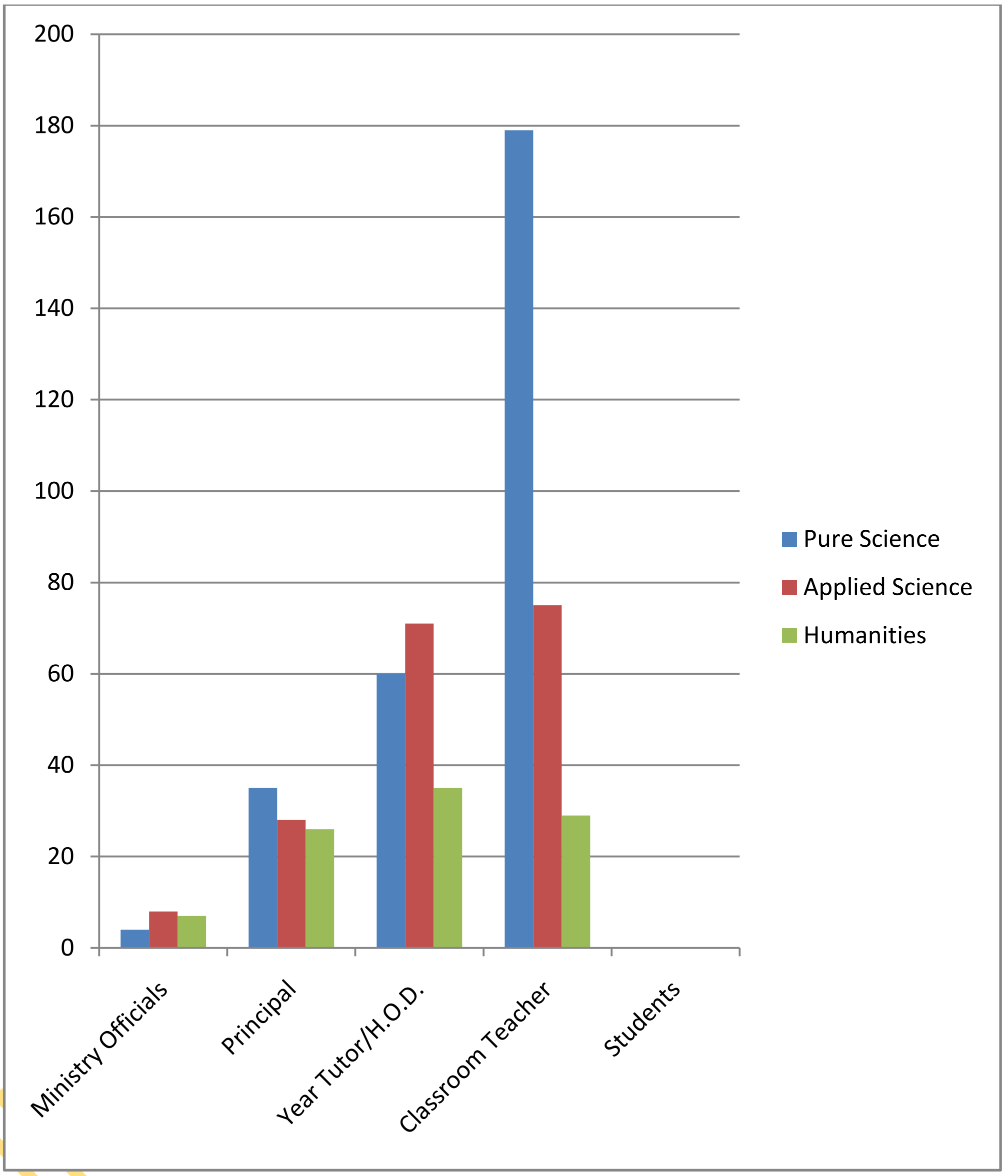

Figure 10: Bar Chart Showing Distribution of Implementers by their area of specialisation

For Ministry officials and Principal of schools, their area of specialisation cut across the three categories of Pure Science, Applied Science and Humanities. Although 39, constituting 7% specialise in Pure Science, though, this is not a criterion for appointment to this cadre. However, For Year Tutor/H.O.D and Classroom teachers, 239, constituting 42.91% specialises in Pure Science and 146 constituting 26.21% specialise in Applied Science, while those who specialise in Humanities were 64, constituting 11.49%.

Table 17 below shows the distribution of respondents by their years of service. Out of these implementers, 111, constituting 19.93% have spent between 0 – 5years in service; 115, constituting 20.65% have spent 6 -10years in service; 159, constituting 28.55% have spent 11 – 20years in service and 172, constituting 30.88% have spent 21years and above in service.

Table 17: Profile of Stakeholders by their Years of Service

CATEGORY		A = 557				B = 588	Total
		Ministry officials	Principal	Year Tutor / H.O.D	Classroom teacher	Students	
Year of service	0 – 5yrs	1 (0.18)	-	17 (3.05)	93 (16.70)	-	111 (19.93)
	6 – 10yrs	1 (0.18)	5 (0.90)	28 (5.03)	81 (14.54)	-	115 (20.65)
	11 – 20yrs	10 (1.80)	16 2.87	61 (10.95)	72 (12.93)	-	159 (28.55)
	21yrs & above	7 (1.26)	68 (12.21)	60 (10.77)	37 (6.64)	-	172 (30.88)
Grand Total							**557**

Graphical illustration of profile of respondents by their years of service is as shown in Figure 11:

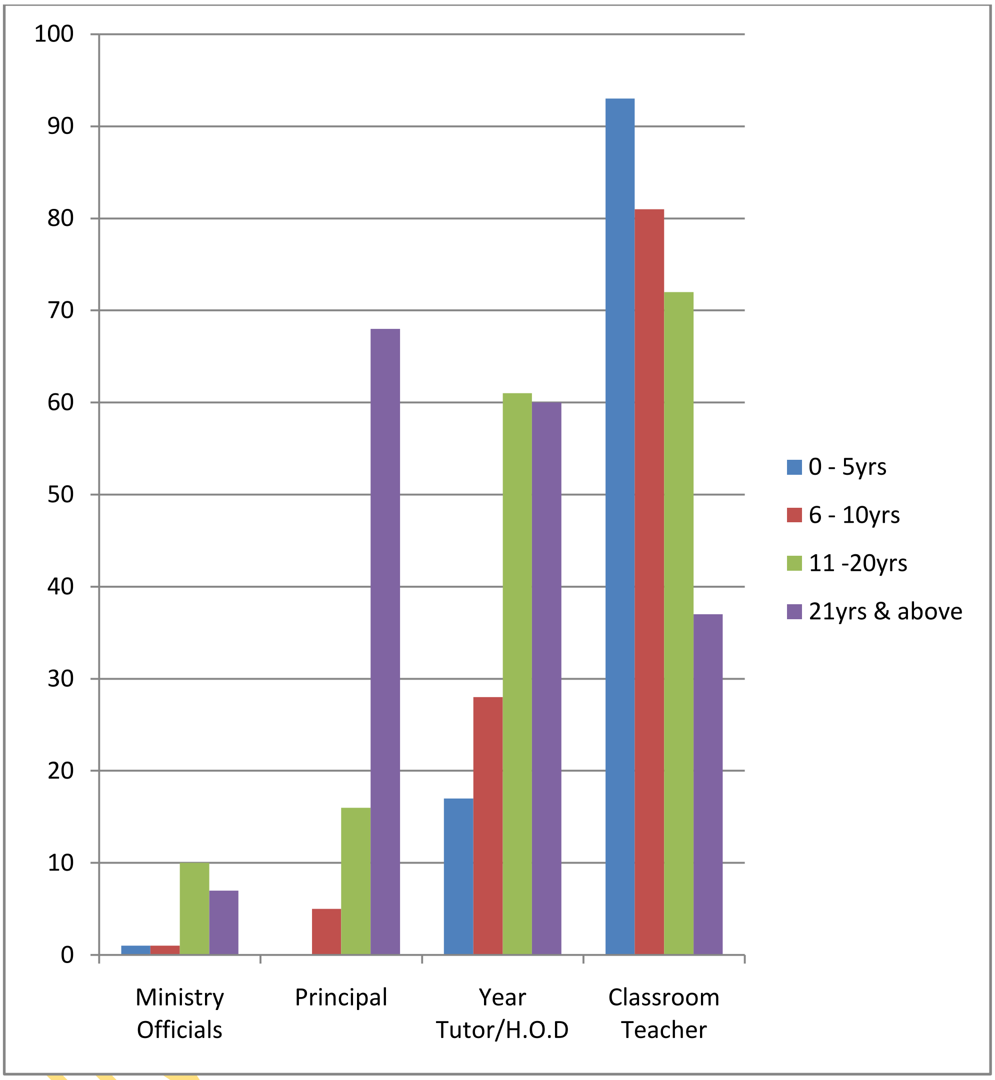

Figure 11: Bar Chart Showing Distribution of Implementers by their Years of Service

For Ministry officials and Principal of schools, a good number of them have been in active service for more than 11years. It is worthy to note that majority of the Principals of schools have been in active service for more than 21years. Whereas for Year Tutors/H.O.Ds and Classroom teachers, there are new entrants (people that have only spent between 0 – 5yrs in service) into the teaching profession. But majority of these new entrants are among classroom teachers, recording decreasing number as the years of service increase.

This trend conforms to expectation, where experienced and matured personnel should be in position of authority.

Table 18 below shows the distribution of respondents by career choice. Out of the 588 Junior Secondary III students (the beneficiaries of the programme), 443, constituting 75.34%, intend to study Science-based courses in future and the remaining 145, constituting 24.66%, intend to study Non-science based courses in future.

Table 18: Profile of Beneficiaries by Career Choice

CATEGORY		**A = 557**				**B = 588**	**Total**
		Ministry officials	**Principal**	**Year Tutor / H.O.D**	**Classroom teacher**	**Students**	
Intended career	Science-based	-	-	-	-	443 (75.34)	443 (75.34)
	Non-Science based	-	-	-	-	145 (24.66)	145 (24.66)
Grand Total							**588**

Graphical illustration of beneficiaries by career choice is as shown Figure 12 below:

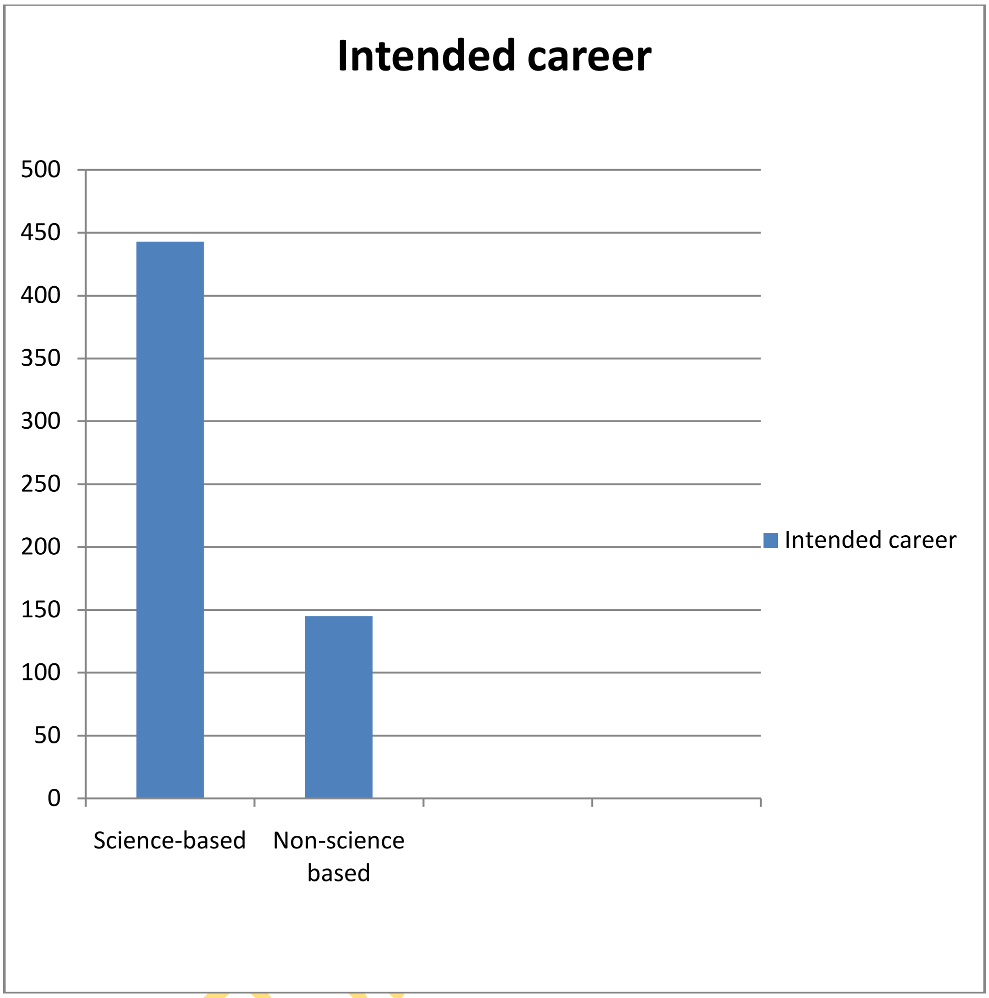

Figure 12: Bar Chart Showing Distribution of Beneficiaries' Career Choice

A good number of the students indicated that they intend to study Science – based courses in the future. All things being equal and with the assumptions that parental background, government input and other agencies of education, have positive influence on students choice of career, it can be said that science must have been presented to these students in an interesting and stimulating way.

Research Question Two: What are the stakeholders' ratings of the Objectives of Basic Science?

Table 19: Frequency Count, Percentage, Mean and Standard Deviation of Stakeholders' Rating of the Objectives of Basic Science

ITEM	STATEMENT OF OBJECTIVES	EXCELLENT (5)	VERY GOOD(4)	GOOD (3)	FAIR (2)	POOR (1)	MEAN $(\overline{X})$	SD
1	Acquire basic knowledge in science and technology.	149 (26.75)	243 (43.63)	134 (24.06)	28 (5.03)	03 (0.54)	3.91	0.87
2	Acquire basic skills in science and technology.	128 (22.98)	243 (43.63)	150 (26.93)	31 (5.57)	05 (0.90)	3.82	0.88
3	Apply scientific and technological knowledge to meet societal needs.	125 (22.44)	200 (35.91)	178 (31.96)	44 (7.90)	10 (1.80)	3.69	0.97
4	Apply scientific and technological skills to meet societal needs.	125 (22.44)	205 (36.80)	164 (29.44)	48 (8.62)	15 (2.69)	3.68	1.00
5	Apply basic intelligent skills.	140 (25.13)	216 (38.78)	146 (26.21)	40 (7.18)	15 (2.69)	3.76	1.00
6	Endow individuals with tools for learning, problem solving, analytical thinking and rational decision.	111 (19.93)	187 (35.57)	166 (29.80)	75 (13.47	18 (3.23)	3.54	1.05
7	Take advantage of numerous career opportunities offered by science and technology	130 (23.34)	203 (36.45)	165 (29.62)	49 (8.80)	10 (1.80)	3.71	0.98
8	Recognize stages of development.	92 (16.52)	227 (40.75)	178 (31.96)	46 (8.26)	14 (2.51)	3.61	0.94
9	Develop interest in science and technology	240 (43.09)	190 (34.11)	99 (17.77)	26 (4.67)	02 (0.36)	4.15	0.90
10	Become prepared for further studies in science and technology.	139 (24.96)	195 (35.01)	162 (29.08)	46 (8.26)	15 (2.69)	3.71	1.01
	Weighted average	**3.76**						

Figures in parentheses are in percentages

Table 19 above reveals the mean ratings and standard deviation of the ten statements of objectives of Basic Science by the implementers of the programme. Developing interest in Science and Technology is rated to be very good ($\bar{x}$ = 4.15). Acquiring Basic knowledge in Science and Technology is rated to be very good ($\bar{x}$ = 3.91). Acquiring Basic skills in Science and Technology is rated to be very good ($\bar{x}$ = 3.82). Applying Scientific and Technological knowledge to meet societal needs is rated to be very good ($\bar{x}$ = 3.69). Applying Scientific and Technological skills to meet societal needs is rated to be very good ($\bar{x}$ = 3.68). Taking advantage of numerous career opportunities offered by Science and Technology is rated to be very good ($\bar{x}$ = 3.71). Endowing individual with tools for learning, problem solving, analytical thinking and rational decision is rated to be very good ($\bar{x}$ = 3.54). Becoming prepared for further studies in Science and Technology is rated very to be very good ($\bar{x}$ = 3.71). Recognising stages of development is rated to be very good ($\bar{x}$ = 3.61). Also, applying Basic intelligent skills is rated to be very good ($\bar{x}$ = 3.76). Respondents rated the objective of Basic Science to be very good (Weighted average = 3.76).

With this rating, it can be said that government and policy makers have done their part as it relates to setting standard objective for the Basic Science curriculum of the UBE programme. The area of focus should then be on successful implementation of the programme, which hinges on availability, adequacy and utilization of resources to achieve the desired goal.

Research Question Three: To what extent are the infrastructural facilities for teaching Basic Science in place?

Table 20: Frequency Count, Percentage, Mean and Standard Deviation of Responses to Available Infrastructural Facilities for Teaching Basic Science.

S/N	STATEMENT	SA	A	D	SD	Mean	Standard Deviation
1	Science laboratory is provided in the school	59 (21.93)	85 (31.60)	60 (22.30)	65 (24.16)	2.51	1.08
2	Science kits are brought to the classroom to aid teaching and learning	25 (9.29)	121 (44.98)	85 (31.60)	38 (14.13)	2.49	0.85
3	The laboratory is functional at the moment	26 (9.67)	62 (23.05)	122 (45.35)	59 (21.93)	2.20	0.89
4	Equipment and materials are adequately provided in the laboratory	22 (8.18)	73 (27.14)	120 (44.61)	54 (20.07)	2.23	0.86
5	Library is stocked with Science materials	23 (8.55)	74 (27.51)	108 (40.15)	64 (23.79)	2.21	0.90
	Weighted average	**2.33**					

Key: Figures in parentheses are in percentages

Table 20 above reveals the mean scores and standard deviations for the provision of infrastructural facilities for teaching Basic Science in schools. The respondents agreed that laboratories are provided in schools ($\bar{x}$ = 2.51) and rarely agreed that science kits are brought to the classrooms to aid teaching and learning ($\bar{x}$ = 2.49). However, the result shows that the laboratories are not functional at the moment ($\bar{x}$ = 2.20); equipment and materials are not adequately provided in the laboratories ($\bar{x}$ = 2.23); and the libraries are not well-stocked with science materials ($\bar{x}$ = 2.21). This implies that the infrastructural facilities for teaching Basic Science are lacking (Weighted average = 2.33).

Though, Basic Science objectives have been rated to be very good (Research question two), attainment of it largely depend on the provision of infrastructural materials, functional laboratories and well-stocked libraries. Unfortunately, these three issues were rated poorly. This necessitate that government must revisit these issues, make necessary provisions in terms of fund to adequately provide necessary equipment and materials to make laboratories functional and stock the libraries with necessary science materials. Thereafter, the government should constitute monitoring agent that would ensure proper use by implementers of the programme.

Research Question Four: To what extent are teachers of Basic Science professionally qualified to teach the subject?

Table 21: Frequency Count and Percentage of Area of Specialization cum Qualifications of Teachers Teaching Basic Science.

AREA OF SPECIALIZATION	QUALIFICATION					Total
	NCE	OND/HND	B.Sc(Ed)/ B.Ed	B. Sc	M.Sc/M.Ed	
Integrated Science	36 (13.38)	-	52 (19.33)	-	2 (0.74)	**90 (33.46)**
Biology	3 (1.12)	-	13 (4.83)	2 (0.74)	-	**18 (6.69)**
Physics	2 (0.74)	-	6 (2.23)	-	1 (0.37)	**09 (3.35)**
Chemistry	2 (0.74)	-	15 (5.58)	-	-	**17 (6.32)**
Mathematics	3 (1.12)	-	19 (7.06)	1 (0.37)	-	**23 (8.55)**
Agricultural Science	21 (7.81)	5 (1.86)	20 (7.43)	-	-	**46 (17.10)**
Physical & Health Education	7 (2.60)	-	2 (0.74)	-	-	**09 (3.35)**
Computer Science	2 (0.74)	-	15 (5.58)	-	-	**17 (6.32)**
Other applied sciences	-	2 (0.74)	9 (3.35)	-	2 (0.74)	**13 (4.83)**
Humanities	14 (5.20)	8 (2.97)	4 (1.49)	-	1 (0.37)	**27 (10.04)**
Total	**90 (33.46)**	**15 (5.58)**	**155 (57.62)**	**03 (1.12)**	**06 (2.23)**	**269**

Key: Figures in parentheses are in percentages

Table 21 above shows that out of the 90, constituting 33.46% teachers who are teaching Basic Science in schools and who specialise in Integrated Science, 36, constituting 13.38% of them are holders of NCE certificate, 52, constituting 19.33% are holders of B.Sc(Ed)/B.Ed certificate and 2, constituting 0.74% are holders of M.Sc/M.Ed certificate. Of the 18, constituting 6.69% who specialise in Biology, 3, constituting 1.12% are holders of NCE certificate, 13, constituting 4.83% are holders of B.Sc(Ed)/B.Ed certificate and 2, constituting 0.74% are holders of B.Sc certificate. Of the 9, constituting 3.35% who specialise in Physics, 2, constituting 0.74% are holders of NCE certificate, 6, constituting 2.23% are holders of B.Sc(Ed)/B.Ed certificate and 1, constituting 0.37% is holder of M.Sc/M.Ed certificate. Of the 17, constituting 6.32% who specialise in Chemistry, 2, constituting 0.74% are holders of NCE certificate and 15, constituting 5.58% are holders of B.Sc(Ed)/B.Ed certificate. Of the 23, constituting 8.55% who specialise in Mathematics, 3, constituting 1.12% are holders of NCE certificate, 19, constituting 7.06% are holders of B.Sc(Ed)/B.Ed certificate and 1, constituting 0.37% is holder of B.Sc certificate. Of the 46, constituting 17.10% who specialise in Agricultural science, 21, constituting 7.81%are holders of NCE certificate, 5, constituting 1.86% are holders of OND/HND certificate and 20, constituting 7.43% are holders of B.Sc(Ed)/B.Ed certificate. Of the 9, constituting 3.35% who specialise in Physical and Health Education, 7, constituting 2.60%are holders of NCE certificate and 2, constituting 0.74% are holders of B.Sc(Ed)/B.Ed certificate. Also, of the 17, constituting 6.32% who specialise in Computer Science, 2, constituting 0.74% are holders of NCE certificate, while 15, constituting 5.58% are holders of B.Sc(Ed)/B.Ed certificate. The result shows that teachers of Basic Science are not professionally qualified to teach the subject.

Diagrammatic presentation of area of specialization of teachers teaching Basic science in schools is equally shown in Figure 13 below:

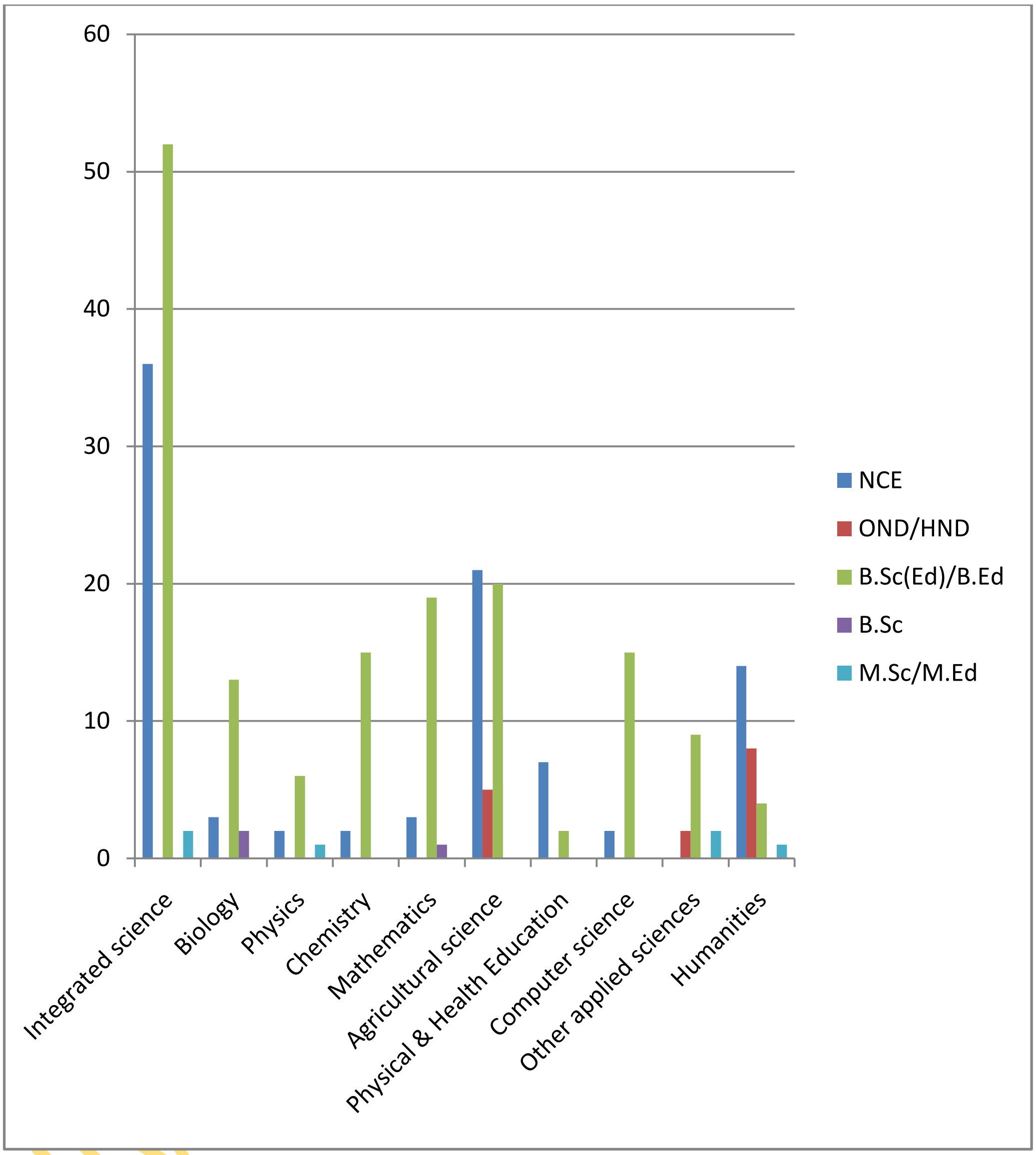

Figure 13: Chart Showing Qualification cum Area of Specialization of Teachers teaching Basic Science in schools.

Most of the teachers teaching Basic Science in schools possess the minimum teaching qualification except for a handful of OND/HND holders that specialises in Agricultural science, other applied sciences and Humanities, it has been revealed that majority of the teachers teaching Basic Science in schools specialise in other science subjects. However, it is only those who specialise in Integrated Science that are professionally qualified to teach the subject.

According to the National Policy on Education (2004), the Nigeria Certificate of Education (NCE) is the minimum teaching qualification for the basic education level. Therefore, holders of OND/HND certificate are not supposed to be in the classroom. In the same vein, those who have the required minimum qualification but who do not specialise in Integrated Science ought not to teach Basic Science. The reason being that, such people would not be able to effectively handle areas that are different from their specialty. Government would need to put round pegs in round holes, and in the least train and re-train teachers would be able to teach Basic Science effectively.

Research Question Five: To what extent are the course materials, such as students' textbooks and Teachers' Guide for Basic Science readily available?

Table 22: Frequency Count, Percentage, Mean and Standard Deviation of Responses On Availability of Course Material for teaching Basic Science.

S/N	STATEMENT	SA	A	D	SD	Mean	Standard Deviation
1	Students' textbook and workbook in the Sciences are available	77 (28.62)	135 (50.19)	48 (17.84)	09 (3.35)	3.04	0.77
2	Teacher's manual in Basic science is available	33 (12.27)	148 (55.02)	68 (25.28)	20 (7.43)	2.72	0.77
3	Science materials are available in the school library	30 (11.15)	85 (31.60)	118 (43.87)	36 (13.38)	2.41	0.86
4	The Science materials in circulation are readily affordable	25 (9.29)	68 (25.28)	150 (55.76)	26 (9.67)	2.34	0.78
5	Basic science materials is in conformity with the National curriculum content	55 (20.45)	122 (45.35)	70 (26.02)	22 (8.18)	2.78	0.86
	Weighted average	**2.66**					

Key: Figures in parentheses are in percentages

Table 22 above reveals the mean scores and standard deviation of available course material for the teaching of Basic Science in schools. The respondents agreed to the fact that: students' textbook and workbook in the sciences are available ($\bar{x}$ = 3.04); teachers' manual in Basic science is available ($\bar{x}$ = 2.72) and that the materials are in conformity with the National curriculum content ($\bar{x}$ = 2.78). However, the result shows that science materials are not available in the school libraries ($\bar{x}$ = 2.41) and that the materials in circulation are not readily available ($\bar{x}$ = 2.34). The implication is that course materials for Basic Science are relatively available (Weighted average = 2.66).

Still, government and school authorities should improve on library resources in the school, to complement students' textbooks, workbooks and teachers' guide.

Research Question Six: What are the ratings of instructional techniques employed by teachers of Basic Science?

Table 23 below shows the methodology employed by teachers of Basic Science. It shows that Basic Science teachers prefer to use "Lecture" method rated 175 representing 31.36%; "Discussion" method rated 109 representing 19.53%; "Enquiry" method rated102 representing 18.28%; "Demonstration" method rated 69 representing 12.37% and "Practical" rated 103 representing 18.46%.

The National Curriculum for Junior Secondary Schools recommends the use of inquiry method of teaching because of its obvious advantages over the other methods. "Lecture" method which is popularly employed by teachers teaching Basic Science in schools has actually been criticized by scholars not as effective as "Inquiry" method. This would therefore adversely affect successful implementation of the Basic Science curriculum of the UBE programme.

Table 23: Ratings of Instructional Techniques Employed by teachers teaching Basic Science

ITEM	FEATURES	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	TOTAL
1	Lecture (L)	11	-	13	-	9	16	11	-	12	10	-	10	10	12	12	10	-	12	12	15	175 (31.36)
2	Discussion (DI)	11	12	12	11	-	-	9	11	11	10	-	-	-	11	-	-	11	-	-	-	109 (19.53)
3	Enquiry (EN)	-	11	11	12	-	-	-	11	-	-	10	-	-	11	-	11	12	-	-	13	102 (18.28)
4	Demonstration (DE)	-	12	-	-	-	11	-	11	-	-	12	-	-	-	-	12	11	-	-	-	69 (12.37)
5	Practical (P)	-	-	-	11	-	10	-	11	-	10	12	10	-	-	-	15	12	-	-	12	103 (18.46)

Figures in parentheses are in percentages

Research Question Seven: How often do teachers who are teaching Basic Science receive any form of in-service training?

Table 24: Frequency Count and Percentage Rating of In-service Training Acquired by Basic Science Teachers

		Frequency count	Percentage (%)
Additional qualification	None	187	69.52
	First Degree	76	28.25
	Second Degree	6	2.23
Participation at Workshop:	Never	33	12.27
	Once	105	39.03
	Often	131	48.70
Computer Literacy:	None	92	34.20
	Certificate	126	46.84
	Diploma	51	18.96

Table 24 reveals the frequency counts and percentage ratings of in-service training acquired by Basic Science teachers. It reveals that of the 269Basic Science teachers engaged in this study, 187 (representing 69.52%) received no in-service training since they joined the teaching service; 76 (representing 28.25%) had First degree as additional qualifications and 6 (representing 2.23%) had Second degree as additional qualification.

Also, the table reveals that 131 (representing 48.70%) of these teachers often participated in workshop; 105 (representing 39.03%) participated in workshop once; while 33 (representing 12.27%) never participated in workshop.

Again, 126 (representing 46.84%) of these teachers offered Certificate Course in Computer Studies; 51 (representing 18.96%) offered Diploma Course in Computer Studies; while 92 (representing 34.20%) are not computer literate.

This indicates that teachers teaching Basic Science relatively receive in-service training since they joined the teaching service.

The finding implied that the classroom teachers do not aspire to add to their qualifications. Though, the minimum qualification is NCE, it is expected that teachers, especially those holders of OND/HND and NCE certificates at the point of entry into the profession would add higher academic qualifications and not remain stagnant at a point. Also, those with first degree should aspire to go for specialisation courses that would improve their performance and efficiency on the job.

It is disheartening, that, more than half, 138 teachers representing 51.3% had never attended/attended workshop once. Science is dynamic in nature, the body of findings keeps expanding at a rapid rate, and as such classroom teachers cannot and should not relent in their effort to continue to upgrade their knowledge. Participation at workshops is an avenue for upgrading knowledge, learning new skills and reviewing teaching methodologies. Hence, it is suggested that attendance at workshops minimally on a yearly-basis be made mandatory for classroom teachers.

Also, teachers need to be Computer-literate (not necessarily certificated), because the internet as a vital up-to-date source of information will assist the teacher in knowledge and skills. Teaching notes, laboratory manuals and demonstrations are readily available free on the net for classroom teachers to access and help improve efficiency on the job.

Research Question Eight: What is the students' level of performance in Basic Science Achievement Test?

Table 25: Mean and Standard Deviation of Students' Achievement Score in Basic Science

N	Minimum	Maximum	Mean	Standard Deviation	Standard Error
588	1.00	16.00	8.76	3.03	.12

Table 25 shows Mean and Standard deviation of students' Achievement score in Basic Science. It shows the mean score as 8.76 out of 20marks obtainable with standard deviation 3.03. This reveals that student's achievement score in Basic Science on the average is 43.8%, which indicates that the students' performance in Basic Science Achievement Test is below average.

The students engaged in this study were the second set of the UBE programme, which is just trying to get its bearing and may be adduced for the observed poor performance. Other reasons may be:

(i) Non-preparedness (training and attendance at workshop) of teachers for the programme (as shown in the answer to research question seven)

(ii) The engagement of non-qualified personnel and non-professional in the classroom (as shown in the answer to research question four)

(iii) Inadequate provision of equipment and materials in the laboratories; and inadequate stocking of libraries with science material (as shown in the answer to research question three)

Successful implementation of the Basic Science curriculum of UBE depends on revisiting the issues raised above.

Research Question Nine: What is the students' attitude towards Basic Science?

Table 26: Frequency Count and Percentage of Students' Response to Attitude towards Basic Science

S/N	STATEMENT	SA	A	D	SD	Mean	Stand. Dev
1.	Studying science is exciting	337 (57.31)	225 (38.27)	19 (3.23)	7 (1.19)	3.52	0.62
2.	I always enjoy science lesson	286 (48.64)	268 (45.58)	25 (4.25)	9 (1.53)	3.41	0.61
3.	Certain terms used in science made me to like the subject	240 (40.82)	252 (42.86)	73 (12.41)	23 (3.91)	3.21	0.80
4.	I don't have interest in science	45 (7.65)	55 (9.35)	181 (30.78)	307 (52.21)	3.28	0.92
5.	Studying science has helped to develop scientific attitude and skills	334 (56.80)	198 (33.67)	36 (6.12)	20 (3.40)	3.44	0.75
6.	Science lesson is not fascinating to me	53 (9.01)	82 (13.95)	201 (34.18)	252 (42.86)	3.11	0.96
7.	Science has no benefit to me	46 (7.82)	46 (7.82)	161 (27.38)	335 (56.97)	3.34	0.92
8.	1 will love to have science material as a birthday gift	211 (35.88)	225 (38.27)	81 (13.78)	71 (12.07)	2.98	0.99
9.	Science lesson is not a waste of time	295 (50.17)	203 (34.52)	38 (6.46)	52 (8.84)	1.74	0.92
10.	Science has not helped to erase superstitious belief	92 (15.65)	123 (20.92)	195 (33.16)	178 (30.27)	2.78	1.04
11.	Science has not helped to increase power of observation	57 (9.69)	80 (13.61)	190 (32.31)	261 (44.39)	3.11	0.98
12.	Science is not a tool for rational decision making	77 (13.10)	125 (21.26)	203 (34.52)	183 (31.12)	2.84	1.01
13.	1 will like to take more science courses in the future	290 (49.32)	190 (32.31)	44 (7.48)	64 (10.88)	3.20	0.98
14.	I don't like studying science in my spare time	52 (8.84)	88 (14.97)	211 (35.88)	237 (40.31)	3.08	0.95
15.	Knowledge gained in science is useful for daily living	323 (54.93)	197 (33.50)	37 (6.29)	31 (5.27)	3.38	0.82
16.	Science subject as taught in school is not interesting	68 (11.56)	57 (9.69)	183 (31.12)	280 (47.62)	3.15	1.01
17.	I always look forward to science lesson	271 (46.09)	234 (39.80)	59 (10.03)	24 (4.08)	3.28	0.81
18.	Learning Science is fun	210 (35.71)	204 (34.69)	90 (15.31)	84 (14.29)	2.92	1.04
19.	Science lesson is boring	54 (9.18)	59 (10.03)	193 (32.82)	282 (47.96)	1.80	0.95
20	Experimenting in science is not exciting	43 (7.31)	61 (10.37)	168 (28.57)	316 (53.74)	3.29	0.92
	Weighted average	**3.04**					

Key: Figures in parentheses are in percentages

Table 26 above shows respondents' agreement to the fact that: studying science is exciting ($\bar{x}$ = 3.52); they always enjoy science lessons ($\bar{x}$ = 3.41); certain terms used in science made them to like the subject ($\bar{x}$ = 3.21); they have interest in science ($\bar{x}$ = 3.28); studying science has helped to develop scientific attitude and skills ($\bar{x}$ = 3.44); science lesson is fascinating to them ($\bar{x}$ = 3.11); science has no benefit to them ($\bar{x}$ = 3.34); they will love to have science materials as birthday gift ($\bar{x}$ = 2.98); science has helped to erase superstitious belief ($\bar{x}$ = 2.78); science has helped to increase power of observation ($\bar{x}$ = 3.11); science is a tool for rational decision making ($\bar{x}$ = 2.84); they will like to take more science courses in the future ($\bar{x}$ = 3.20); they like studying science in their spare time ($\bar{x}$ = 3.08); knowledge gained in science is useful for daily living ($\bar{x}$ = 3.38); science subject as taught in school is interesting ($\bar{x}$ = 3.15); they will always look forward to science lessons ($\bar{x}$ = 3.28); learning science is fun ($\bar{x}$ = 2.92); experimenting in science is exciting ($\bar{x}$ = 3.29). However, they disagreed to the two statements: science lesson is a waste of time ($\bar{x}$ = 1.74) and science lesson is boring ($\bar{x}$ = 1.80). The weighted average indicates that the students have positive attitude towards Basic Science (Weighted average = 3.04).

The result refutes the idea of science lesson being a waste of time and boring. This positive attitude is good the future of this programme in that student would always look forward to science lessons.

Research Question Ten: What are the composite contributions of both antecedent and transaction variables to students' learning outcomes in Basic Science?

Table 27: Regression Analysis of Antecedent and Transaction Variables on Students' Achievement in Basic Science

Model	R	R square	Adjusted R square	Std. Error of the Estimate
1	.445	.198	.107	2.93903

Table 27 above shows that there is positive multiple correlation (R = 0.445) among the six independent variables and the dependent measure. This implies that the factors are relevant towards successful implementation of the Basic Science curriculum, specifically students' achievement in Basic Science. Also, the adjusted R^2 value of 0.107 reveals that the six antecedent (Manpower, Infrastructure and Programme objective) and transaction (Availability of text, Staff training and Instructional technique) variables accounted for 10.7% of the total variance in the dependent measure (achievement in Basic Science). The remaining 89.3% could be due to errors and factors such as socio-economic background, cognitive styles, school environment, economic resources, cultural setting and so on that are not considered in this study.

Table 28: Analysis of Variance of Antecedent and Transaction Variables to Students' Achievement in Basic Science

Model	Sum of squares	Df	Mean square	F	Sig
Regression	113.193	6	18.865	2.184	.059
Residual	457.807	53	8.638		
Total	571.000	59			

Table 28 shows the composite contribution of antecedent (Manpower, Infrastructure and Programme objective) and transaction (Availability of text, Staff training and Instructional technique) variables to students' achievement in Basic Science. It shows that the variables did not make significant contribution to achievement in Basic Science ($F_{(6, 53)} = 2.184$; $P > .05$).

Table 29: Regression Analysis of Antecedent and Transaction Variables on Students' Attitude towards Basic Science

Model	R	R square	Adjusted R square	Std. Error of the Estimate
1	.569	.324	.247	6.37269

Table 29 shows that there is positive multiple correlation (R = 0.569) among the six independent variables and the dependent measure. This implies that the factors are relevant towards successful implementation of the Basic Science curriculum, specifically students' attitude towards Basic Science. Also the adjusted R^2 value of 0.247 reveals that the six antecedent (Manpower, Infrastructure and Programme objective) and transaction (Availability of text, Staff training and Instructional technique) variables accounted for 24.7% of the total variance in the dependent measure (attitude towards Basic Science). The remaining 75.3% could be due to errors and factors that are not considered in this study.

Table 30: Analysis of Variance of Antecedent and Transaction Variables to Students' Attitude towards Basic Science

Model	Sum of squares	Df	Mean square	F	Sig
Regression	1030.005	6	171.668	4.227	.002
Residual	2152.395	53	40.611		
Total	3182.400	59			

Table 30 shows the composite contribution of antecedent (Manpower, Infrastructure and Programme objective) and transaction (Availability of text, Staff training and Instructional technique) variables to students' attitude towards Basic Science. It shows that the variables made significant contribution to attitude towards Basic Science ($F_{(6, 53)} = 4.227$; $P < .05$).

Research Question Eleven: What are the relative contributions of the antecedent and transaction variables to students' learning outcomes in Basic Science?

Table 31: Relative Contribution of Antecedent and Transaction Variables to Students' Achievement in Basic Science

Model	Unstandardised coefficients		Standardized coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	15.25	4.357		3.501	.001
Objective	-.137	.077	-.251	-1.768	.083
Infrastructure	.037	.176	.034	.212	.833
Available text	.066	.223	.044	.295	.769
Manpower requirement	.881	.574	.217	1.536	.130
Staff training	-.721	.239	-.407	-3.009	.004*
Instructional technique	-.018	.027	-.084	-.668	.507

Key: * represent significance at .05level

Table 31 reveals relative contribution of antecedent (Manpower, Infrastructure and Programme objective) and transaction (Availability of text, Staff training and Instructional technique) variables to students' achievement in Basic Science. It reveals that only Staff training (β = -.407) of transaction variables contributed to students' achievement in Basic Science. Table 16a reveals that, out of the six factors, staff training made the greatest contribution (β = -.407) followed by programme objective (β = -.251) and manpower requirement (β = .217). The fourth in the rank of contribution is instructional technique (β = -.084). The fifth and sixth contributions in order of decreasing magnitude are available text (β = .044) and infrastructure (β = .034).

Table 32: Relative Contribution of Antecedent and Transaction Variables to Students' Attitude towards Basic Science

Model	Unstandardised coefficients		Standardized coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	74.487	9.446		7.885	.000
Objective	-.253	.168	-.197	-1.506	.138
Infrastructure	-.928	.382	-.357	-2.427	.019*
Available text	1.524	.484	.427	3.148	.003*
Manpower requirement	.864	1.244	.090	.695	.490
Staff training	-.375	.519	-.090	-.723	.473
Instructional technique	-.166	.059	-.321	-2.789	.007*

Key: * represent significance at .05level

Table 32 reveals relative contribution of antecedent (Manpower, Infrastructure and Programme objective) and transaction (Availability of text, Staff training and Instructional technique) variables to students' attitude towards Basic Science. It reveal that Infrastructure (β = -.357) of antecedent variable contributed to students' attitude towards Basic Science. Also, Availability of text (β = .427) and Instructional technique (β = -.321) of transaction variables contributed to students' attitude towards Basic Science. Table 16b reveals that, out of the six factors, available text made the greatest contribution (β = .427) followed by instructional technique (β = -.321) and infrastructure (β = .357). The fourth in the rank of contribution is programme objective (β = -.197). The fifth and sixth contributions in order of decreasing magnitude are staff training (β = -.090) and manpower requirement (β = .090).

4.2 Discussion of Findings

The findings from this study reveals that though the variables considered in this study may not make significant contributions to students' achievement in Basic Science (when taken together), but they made significant contributions to their attitude towards Basic Science. However, when taken singly, staff training contributed to achievement in Basic Science, other variables like infrastructure, availability of texts and instructional techniques contributed in enhancing students' interest in Basic Science. It confirms that these variables are essential towards the success of the UBE science programme justifying the step taken towards ascertaining the state of readiness of these curriculum components.

Since it is believed that the best form of evaluation is the one that is carried out by those who have stake in the programme, therefore, Ministry officials, Principal of schools, Year Tutor/H.O.D and Classroom teachers are in the best position to rate the UBE Science programme objectives. They rated the programme objectives as very good.

Also, the study requested stakeholders to ascertain the availability and adequacy of resources (i.e. human, physical and instructional material) towards the implementation of the UBE science programme since these constitute the implementers and beneficiaries of the programme. The implementers are categorised as A which comprised Local Education District officials, Principals of Schools, Year Tutors/Heads of Departments and Classroom teachers. There were five hundred and fifty-seven (557) of them drawn from the six states that constitute South-west geopolitical zone of the country. The beneficiaries are categorized as B made up of Junior Secondary School III students. There were five hundred and eighty-eight (588) of them drawn from One hundred and twenty (120) Junior Secondary Schools from the six South-west states of Nigeria. Ivowi & Odunsi (1982) agrees that evaluation studies should focus on three important groups involved in the implementation of school curriculum. These are: teachers, who are the final executors of the programme; learners, whose mental and physical behaviours the programme intends to change; and the society, including policy maker, school administrators and parents, whose support is essential for the achievement of the programme objectives.

Furthermore, general goals and specific measurable learning objectives are critical to the success of the evaluation process. Without them, there will not be evidence for determining levels of success or for identifying specific areas needing improvement. The objectives of Basic Science have been rated to be very good (as answered in research question two). This is consistent with Odetoyinbo's (2004) study on the Nigerian Integrated Science Programme with a view to identifying its strengths and weaknesses, as well as the perceptions of the status of the objectives by the stakeholders. The findings shows that all stakeholders agreed that the objectives are ideal and relevant.

The study equally reveals that infrastructural facilities are not in place despite expectation of favourable outcome from the programme. Going by Dike's (2000) assertion that if we want learners to develop skills for lifelong learning, we must give them opportunities to enquire, to search, to explore, to practice, to solve problems – such as are found in libraries – and if we want to introduce them to the world of knowledge and teach them to handle information in many forms, we need the resources of a well-equipped library. The necessary government agents need to expedite action towards putting required facilities in place. Again, the finding is in consonance with Nwachukwu's (1984) discovery that there was a general inadequacy of resources for the teaching and learning of Biology in some new secondary schools in Lagos. The study found among other things that:

(a) Out of 80% of the old schools that had laboratories, none had a well-equipped laboratories; and

(b) 40% of the new schools had no laboratory at all, while the remaining 60% had rooms' labeled 'laboratory' without adequate apparatus.

Pascal (1996) posits that it is important that equipment be readily made available for children to practise their newly acquired skills. Children need opportunities in becoming proficient when they are ready. In the situation where skills and dispositions towards learning are not encouraged, accidents are more likely. Aniemena (2003) laments about the type of laboratory amenities in most schools today, most of the facilities are old and no longer in use. Moreso, it is shocking to know that despite the importance of laboratory adequacy in the teaching and learning of chemistry, government is spending less on the funding of the laboratories in various schools. Most schools now have and still use outdated equipment (if they have at all). Sometimes the number of apparatus available is not enough for half the population of the student. Visit to the schools during this study still reveals that most instructional/laboratory facilities are inadequate, old and no longer in use.

In addition, Bajah (1999) opines that the success of our science programme depends greatly on the classroom teacher as he is the one to translate all our thoughts into action. Ogunsola-Bamidele (1999) reports that research report in Nigeria indicated that several science teachers teach out of their areas of specialisation; and that this has been more evident with Basic Science. It has been found that most teachers teaching Basic Science in schools are actually qualified in other disciplines (see Table 21), due to lack of qualified teachers in Integrated Science. Finding from this study equally reveals that with the introduction of Basic Science in schools, most teachers teaching Basic Science specialise in other disciplines aside from Integrated Science. Balogun (1995) had earlier stressed the importance of using teachers' guide to help teach Integrated Science. According to him, professionally trained science teachers can do a good job of teaching Integrated Science if they have access to the teachers' guide and are willing to make effort.

Again, result of this study shows that: students' textbook and workbook in the sciences are available; teachers' manual in Basic Science is available and that the materials are in conformity with the National curriculum content. NPEC (1999) observes that instructional materials are grossly inadequate and that less than forty percent of pupils have basic textbooks and writing materials. Ayodele & Balogun (2008) reports that resources form the fulcrum of any educational system and instruction by concretizing learning; arousing interest; and saving time which implied the need to optimize their use for maximum instructional output. Maduabum (1992) observes that students need a rich store of concrete sensory experience to aid understanding of their learning. Also, it is a known fact that whenever apparatus is used for science practical lessons and demonstrations, students' learning is enhanced. Ojo (1995) and Eshiet (1996) confirm the fact that resources generally are inevitable tools to effective teaching and learning.

The study equally establishes the fact that the characteristics of the teacher and their experiences and behaviours in the classrooms contribute to the learning environment of their students, which in turn will have an effect on students' learning outcomes. This is in agreement with Bajah (1999). Studies have shown that students are passive participants in the classroom which is contrary to expectation. An ideal Basic Science class is supposed to be a beehive of activity and not a graveyard, for the teacher has the role of making the class to be lively. The expository method employed by most teachers cannot lead to the development of process skills, scientific methods and scientific attitudes which are necessary for science literacy; it can only be acquired through active participation of students (Odetoyinbo, 2004).

The number of unqualified teachers in the system has dropped from fifty percent in 1989 to six percent in 1997 in the South, forty-two percent in the North

(NPEC, 1999) and presently, seven percent in the southwestern Nigeria, contrary to expectation that cases of unqualified teachers in the classrooms should not have risen. The reason may be because the number of qualified teachers that is being produced does not match the growing demand in the educational sector.

When teachers prop up students through various science activities, students are challenged to want to explore further especially with their inquisitive nature. The UBE science programme was designed with this idea in mind but unfortunately, the strategies employed as shown in this study are a corruption of the intention. If this practice continues, it might be a bit difficult to realize the broad objective of producing science literate citizenry at the Junior Secondary School level which is what Basic Science as a programme of intervention stands for.

Bajah (1980) and Wisconsin, Allen and Helming (1991) supports the view that attending seminars and workshops would enhance teachers' productivity and update their skills in the subject. This will bring them up-to-date and thus closer to the frontiers of knowledge in their special subject area. Attending workshops will also improve their teaching, which hopefully will be evident in the performance of their pupils. Furthermore, teacher-in-service opportunities accompanied by reduced classes will enhance development and reinforcement of appropriate teaching, which will in turn facilitate student achievement in the subject area.

Another study that agrees with the findings from this study is Camara (2006), which ascertains that in many primary schools in Africa, due to the low level of qualification of many teachers and the lack of teaching/learning materials in the field of science and technology, the pupils have often no idea of the Basic Science principles and knowledge at their level. The type of teaching process based on lecturing and memorizing by students is not helping the understanding of Basic Science and Technology. The students tend to learn by heart science lessons and are able to reproduce what is read or written by the teacher. Understanding the Basic Science principles/phenomena at each cognitive development state is a priority in the qualitative transformation of Basic Education and Education in general.

The revelation from the findings from this study that teachers teach science in a way that merely requires the pupils to listen, read and regurgitate, which does not reinforce students' positive attitude towards science is not in agreement with Bolaji (2005). In a study of the influence of students' attitude towards Mathematics, it was found that the teacher's method of Mathematics teaching and his personality greatly accounted for the students' positive attitude towards Mathematics.

CHAPTER FIVE

Summary, Conclusion and Recommendations

This chapter presents the summary of findings from this study. It states the conclusion as well as the recommendation made.

5.1 Summary of Findings

The results of the study are summarized below in the order in which they are presented:

(i) The implementers of the UBE science programme rated the objectives of the programme as very good.

(ii) Science laboratory and library that are provided in schools are not functional. This implied that infrastructural facilities for teaching Basic science in most schools are lacking.

(iii) Although, most science teachers have degree in education, but they specialise (although it is science-based courses) in areas other than Integrated Science. Therefore, they teach out of their areas of specialisation. Only teachers that specialise in Integrated Science are professionally qualified to teach Basic Science in schools, as such, teachers of Basic Science in most schools are not professionally qualified to teach the subject.

(iv) The available students' textbooks and workbook, as well as teachers' guide cannot be found in the school library. They are not readily affordable. Hence, the course materials for Basic science are not readily available in most schools.

(v) Lecture method is the most frequently employed method of teaching by the teachers teaching Basic science in schools.

(vi) Most of the teachers teaching Basic science in schools did not have additional qualification, neither participated in workshops nor are they computer literate. This point to the fact that these teachers did not receive the necessary in-service training.

(vii) The students' performance in Basic science Achievement Test is below average.

(viii) Basic science students possess positive attitude towards science.

(ix) Antecedent and transaction variables, when taken together, did not make significant contribution to students' achievement in Basic Science.

(x) Antecedents and transaction variables, when taken together, made significant contribution to students' attitude towards Basic Science.

(xi) Only staff training contributes to students' achievement in Basic Science when taken singly

(xii) Infrastructure, availability of text and instructional technique contributes to students' attitude towards Basic Science when taken singly.

5.2 Implications of Findings

The implication of the finding of this study is highlighted accordingly:

(i) The objective of the programme is laudable and will be beneficial to the nation if well-implemented.

(ii) The teaching and learning of Basic Science will be adversely affected when the resources and materials needed for proper teaching and learning of Basic Science are absent.

(iii) Unqualified teachers are teaching Basic Science in schools and this would have negative impact on the learning and teaching of the subject. The unqualified teachers may not be able to use variety of instructional method that is appropriate for teaching the subject.

(iv) When course materials are not available, it will have negative implication on students' learning, since they will not have access to basic textbooks needed to aid their learning.

(v) The teachers are not using methods that will actively involve the students in the teaching-learning process. The students will not learn maximally since they are not actively involved in the lessons.

(vi) The teacher will not be abreast of recent development in pedagogy of teaching and learning and this will have negative implications on their productivity.

(vii) Poor academic performance is not unexpected since the teachers are not qualified and necessary materials that will aid their learning are not available.

(viii) The students are favourably disposed to learning Basic Science may be because of the benefit they know that can accrue to them by studying science.

(ix) The contribution of staff training to achievement in Basic Science outweighs the contributions of the five other variables.

(x) Combination of contribution of infrastructure, availability of text and instructional technique to attitude towards science outweighs the contribution of combination of the remaining variables.

(xi) Because it is only staff training that contributed to achievement in Basic Science, the contribution of the other factors are negligible.

(xii) Contribution of infrastructure, availability of text and instructional technique to attitude towards Basic Science are overwhelming.

Summarily, this programme has been discovered to be lacking in the area of human and material development.

5.3 Conclusion

The result of this study has established the fact that one antecedent variable (Infrastructural requirement) and the three transaction variables (Availability of text, Instructional techniques and Staff training) contribute to outcome variables (students' achievement in and attitude towards Basic Science). In specific terms, the result shows that staff training contributes to achievement in Basic Science. The importance of this variable to the prediction of achievement in Basic Science points to the fact that the effort of government, policy makers and school administrators in training and re-training of teachers in schools, generally and specifically those teaching Basic Science in this present dispensation is rather inadequate. It is a pointer to the fact that if the government and other stakeholders in the education industry ensure that teachers are well motivated, it is most likely that students' achievement in Basic science would be greatly improved.

Also, the result of the findings shows that infrastructure, availability of text and instructional technique contribute to attitude towards Basic Science. The importance of these variables to the prediction of attitude towards Basic Science points to the fact that government, policy makers and school administrators need to provide striving environment for students to learn Basic Science. Since most students develop their interest in and attitude towards school science before age 14, much greater effort should be invested in ensuring that the quality of science education before this age is of the highest standard and that the opportunities to engage with science, both in and out of school should be varied and stimulating.

5.4 Contribution to Knowledge

This study establishes that out of the six variables considered, one antecedent variable (Infrastructural requirement) and the three transaction variables (Availability of text, Instructional techniques and staff training) contribute significantly to learning outcomes in Basic Science.

The study has shown that staff training, programme objective and instructional technique made negative contribution to students' achievement in Basic Science, while, manpower requirement, availability of text and infrastructure made positive contribution to students' achievement in Basic Science.

Also, availability of text, infrastructure and manpower requirement made positive contribution to students' attitude towards Basic Science, while instructional technique, programme objective and staff training contributes negatively to students' attitude towards Basic Science.

The study establishes that both antecedent and transaction variables are essential if positive impact (in terms of greater students' achievement in and attitude towards Basic Science) must be experienced on the implementation of the Basic Science curriculum component of the UBE programme. It concludes by recommending that relevant agencies should improve on training and re-training of teachers; and provision of infrastructural facilities and necessary text.

5.5 Recommendations

The following recommendations are made:

(i) There is a need to invest in improving the human and physical resources available in schools for informing students, both about careers in science (where the emphasis should be on why working in science is an important cultural and humanitarian activity) and careers from science (where the emphasis should be on the extensive range of potential careers that the study of science affords).

(ii) Also, there is the need to employ teachers of science that are of highest quality for students in lower, middle and upper Basic schools. The reason is that good quality teachers, with up-to-date knowledge and skills are the foundation of any system of formal science education. Hence, systems should ensure that the recruitment, retention and continuous professional training of such individuals are policy priority.

(iii) Implementers of the Universal Basic Education programme to ensure that opportunities to engage in science, both in and out of school are varied and stimulating.

(iv) Developing and extending science delivery strategy is essential for improving students' engagement. Transforming teacher practice is a long – term project and will require significant and sustained investment in continuous professional development.

(v) The emphasis in science education before age 14 should be on engaging students with science and scientific phenomena. Much greater effort should be invested in ensuring that the quality of science education before age 14 is of the highest standard.

5.6 Limitation of the Study

One of the constraints that were encountered in the process of carrying out this study was that the study could not accommodate all variables (antecedent, transaction and outcome) like socio-economic background, cognitive styles, school environment, economic resources, cultural setting and so on, required for successful implementation of the UBE science programme. The study was delimited to three antecedent variables (programme objective, manpower requirement and infrastructural requirement), three transaction variables (availability of texts, instructional techniques and staff training) and two outcome variables (achievement in Basic Science and attitude towards Basic Science). This study was conducted in each of the senatorial districts in the South-west part of Nigeria, hence there is need to replicate this study using other senatorial districts from the remaining geo-political zones of the country. There was also much resistance from the Principal and teachers of these schools in answering the questionnaires hence, not all the Principal and teachers returned the questionnaires given to them.

5.7 Suggestions for Further Research

The following suggestions for further studies are made:

(i) This study should be replicated using the variables (like socio-economic background, cognitive styles, school environment, economic resources, cultural setting) not considered in this study and more secondary schools in each of the senatorial districts from the remaining geo-political zones of the country so that a more valid generalization could be made.

(ii) The contribution of the variables considered in this study to students' scientific skills could be explored.

(iii) Qualitative evaluation of the implementation of UBE science curriculum component could be explored.

REFERENCES

Abiri, J. O. O. 1987. An evaluation of the post-graduate programme of the University of Ilorin (1977-1985). *Ilorin Journal of Education*. 7:1-17.

Abodunrin, R. 1998. *Test and Measurement in Education.* Oyo, Odumatt Press.

Adegbile, J. A. 2004. Application of the 'ATO' model in the Evaluation of the Junior Secondary School Programme. *West African Journal of Education*. 24:1.

Adegoke, A. B. 2002. Teachers influence as a determinant of Dependent-prove students' learning outcomes in geometrical aspects of Senior Secondary School Mathematics. Unpublished Ph.D. Thesis, University of Ibadan, Ibadan.

Adesoji, F. A. 1994. Indigenisation of science teaching in Nigerian primary schools and its implication for curriculum implementation. Paper presented at a conference on "Language in science: some critical perspectives" at Obafemi Awolowo University, Ile – ife.

Adesoji, F. A. 1998. An Appraisal of Integrated Science teaching in Nigeria. *Journal of Educational Research* (JOEREV), 2:134-138.

Adesoji, F. A. 2002. Modern Strategies in the Teaching of Integrated Science. Ed. *Teaching Strategies for Nigerian Secondary Schools: Secondary Education Pedagogical support.* Ibadan. Powerhouse Press and Publishers.

Adeyemi, M. A. 1995. *Curriculum Change and Innovation: Impact on Science Curriculum Projects*. Lagos. Deutchetz publishers.

Ahmed, C. A. 1999. An evaluation of the nomadic education programme in North-Eastern Nigeria. Unpublished Ph.D Thesis, University of Ibadan, Ibadan.

Akyeampong, K., Sabate, R., Hunt, F. and Anthony, J. 2009. Review of Research on Basic Education Provision in Nigeria. Centre for International Education, University of Sussex, May.

Alade, I. A. 2006. Evaluation of Technical Education Curriculum in Colleges of Education in Southwestern Nigeria. Unpublished Ph.D Thesis, University of Ibadan, Ibadan.

Alani, R. A. 2002. Planning for Universal Basic Education in Nigeria. *Planning and Administration of Universal Basic Education in Nigeria.* T. Ajayi, J.O. Fadipe, P.K. Ojedele and E.E. Oluchukwu, Eds.

Alebiosu, K. A. 2003. Modelling: Initiative for obtaining the participation of Girls in primary science. *Standards for Science, Technology and Mathematics Educational Research (NASER book of reading).* T. D. Baiyelo and 'Temi Busari, Eds. Lagos. Victory Printers Nigeria Limited.

Alebiosu, K. A. and Bilesanmi-Awoderu, J. B. 2005. Efficiency in curriculum Development: The science curriculum. *Issues in school organization.* S. V. Erinosho, M. O. Arikewuyo and B. J. Ogunkola, Eds. Lagos. African Cultural Institute Publishers.

Ali, A. 1983. The effect of laboratory classes on Motivation and levels of achievement in Physics in Nigerian Schools. *Ilorin Journal of Education.*

Allison, P. D. 1999. Multiple Regression. Thousand Oaks. CA: Fine forge press

Altrichter, H. 2005. Curriculum implementation – limiting and facilitating factors. *Context based learning of science.* P. Nentuig and D. Waddington, Eds. Waxmann: Munster

Akinsola, M. K. 1994. Comparative effects of mastery learning strategies on students achievement of Self – Concept in Mathematics. Unpublished Ph.D Thesis, University of Ibadan, Ibadan.

Akinsola, M. K. 2000. Enriching Science Technology and Mathematics Education: Effect of Resource Utilization on students' Achievement in Geometry. *Proceedings at the 41st Annual Conference of Science Teachers Association of Nigeria*, 289-291.

Angela Little, WimHoppers and Roy Gardner. Eds. 1994. *Implementing Education for All*. London and Basinstoke. Macmillan Press Limited.

Aniemena, J. I. 2003. Laboratory facilities in schools. *Dassi Magazine* 8: 30-31.

Anon. 2007. New curriculum 'll address education ills. *New Nigeria.* November 19:A65

Areola, E. O. 1988. Evaluation of the implementation of Nigerian Integrated Science Programme in selected states of Nigeria. Unpublished Ph.D Thesis, University of Ibadan, Ibadan.

Ayodele, O. T. 2000. Towards improving the development of Science and Technology education in Nigeria. LACOPED. The ACADEMIC REVIEW: *COEASU Journal of Educational Practice in Nigeria.* 3:1-9.

Ayodele, O. T. and Adekoya, A. F. 2002. A survey into the level of on-the-job Professional Training Acquired by STM Teachers at the Primary and Secondary School level. *Proceedings of the 43rd Annual Conference and Inaugural Conference of CASTME Africa*, 136 – 140.

Ayodele, O. T. and Balogun, S. A. 2008. Status of resources for the Teaching and Learning of Integrated Science in Lagos State Junior Secondary Schools. *Journal of Science and Information Technology.* College of Science and Information Technology, Tai Solarin University of Education.

Babalola, S. K. 2000. Blue print for the management of the Universal Basic Education at the Secondary School Level. Paper presented at a National workshop organized by All Nigeria Conference of Principals of secondary school, 9.

Babalola, V. O. 2004. Resource materials in the implementation of curriculum in the 21[st] century. *curriculum implementation and professionalizing teaching in Nigeria.* A. O. K. Noah, D. O. Shonibare, A. A. Ojo, and T. Olujuwon, Eds. Lagos: Central educational services.

Badejo, A. O. 2004. Challenges of the Universal Basic Education: Issues and Implications for counseling for All round Development. *Teachers mandate in Education and Social Development in Nigeria.* D. F. Elaturoti and K. Babarinde Eds. Ibadan, Stirling-Horden Publishers (Nig) Ltd

Bajah, S. T. 1980. Correlates of Students' Extrinsic School Environment Factors with level of attainment in a Standardized Test in Chemistry. *African Journal of Educational Research* 3(1&2) 16.

Bajah, S. T. 1999. The Challenges of Science Technology and Teacher Education in Nigeria Beyond the year 2000. *African Journal of Education* 1(91) 43-49.

Balogun, T. A. 1975. Some current science curriculum development; levels and global rationale. Unpublished mineogragh, University of Ibadan, Ibadan.

Balogun, T. 1995. *The experience of integrated science teaching in Nigeria,* UNESCO, Dakar.

Balogun, T. A. 1995. Integrated science teaching concept, problem and progress. Ed. *Integrated Science Teaching in Africa Schools*. UNESCO Dakar.

Bamikole, B. B. 2004. Evaluation of Computer Science Curriculum in junior secondary schools in Oyo Osun and Ogun states. Unpublished Ph.D Thesis, Faculty of Education, University of Ibadan, Ibadan.

Bebefiani, I. A. 2000. A critical look at the 3-3 system of Secondary Education and Implications for the 21st century. *Education and the Challenge of Patrotism in Nigeria*. S. A. Babarinde, Ed. A publication of the Philosophy of Education Association of Nigeria.

Ben-Yunus, M. 2002. *Issues on curriculum.* Ahmadu Bello University Press, Zaria.

Bertalanffy, L. V. 1968. *Organimistic Psychology and Systems Theory*. Worchester: Clark University Press.

Biological Sciences Curriculum Study. 2000. *Making Sense of Integrated Science. A guide for High Schools*. Colorado Springs.

Bolaji, C. 2005: A study of factors influencing students' attitude towards mathematics in the Junior Secondary Schools; Mathematics teaching in Nigeria. Retrieved on November, 2005 from http://www2.ncsu.edu/ncsu/aern/bolajim.html

Boyejo, B. B. 1990. Integrated Science objectives students' disposition to science. Unpublished M.Ed project, Faculty of Education, University of Ibadan, Ibadan.

Bruner, J. S. 1961. *The Process of Education.* Cambridge Mass, Harvard University Press.

Calgary Science School Evaluation. 2007. Retrieved April 23, 2009 from http//www.sciencexpress.org

Camara, B. 2006. Paper presented at Trainers Workshop on Effective Learning Techniques at University of Alabama, South Africa.

Danmole, B. T. 2011. Emerging Issues on the Universal Basic Education Curriculum in Nigeria: Implications for the Science and Technology Component. *Pakistan Journal of Social Sciences, 8(1):62-68.*

Diallo, A. B. 2004. Reversing Waning Interest In Science. *Education Today*. The Newsletter of UNESCO's Education Sector, 11:4.

Diallo, A. B. 2004. Science Education in danger. *Education Today*. The Newsletter of UNESCO'S Education Sector. No 11, October-December.

Dike, H. I. 1987. Production and utilization of educational technology materials in *Nigerian research in education.*

Dike, V. W. 2000. School library facilities required for successful implementation of the Universal Basic Education in Nigeria. Paper presented at the Annual Conference of the Nigerian School Library Association, University of Nigeria, Nsukka.

Duyilemi, A. N. 2005. The jets programmes and the attitude of girls to science and technology in Nigeria. *Educational Thought 4(1):32-38*

Education for All global Monitoring Report. 2008. Education for All by 2015 will we make it. http//www.unesco.org/publishing

Egbugara, U. O. 1992. Pre-service education of Integrated Science teachers in Nigeria. Paper presentation at the international workshop on Integrated Science teaching, College of Education, University of Ibadan, Ibadan.

Ehiametalor, E. T. 2001. School facilities management practice in Nigeria. *Current issues in educational management in Nigeria.* N. A. Nwagwu, E. T. Ehiametalor, M. A. Ogunu, and M. Nwadiani, Eds. Benin: Nigerian association for educational administration and planning (NAEAP).

Emily, D. 2011. What Are the Requirements to Become a Science Teacher? http://www.ehow.com/facts_4925827_what_requirements_become_science teacher.html. Retrieved 11 June, 2011

Encyclopaedia Britannica 2007. The New Encyclopaedia Britannica. 15th edition volume 27. Chicago. Encyclopeadia Britannica page 42A.

Ereh, C. E. 2005. Teacher characteristics and school curriculum implementation in Nigerian secondary schools: A Theoretical Review. *Journal of the Nigerian academy of education.* Nigeria: JONAED 2(1):111 -120.

Erinosho, S. T. 1998. Gender discrimination in science education in Nigeria: which way forward. Paper presented at a seminar supported by FAWE, Nairobi, Kenya.

Etti, A. I. I. 1980. Science Laboratory Teaching. *International Encyclopedia of Teaching and Teacher Education*. Oxford. Pergamon Press.

Eshiet, I. T. 1996. *Improvisation in Science Teaching: Philosophy and Practice.* Abak: Belpot Nigeria Com.

Expansion of Primary Education. Retrieved August 17, 2005 from http: //www.onlinenigeria. Com/links/LinksReadPrint.asp?blurb = 538.

Falola-Anoemuah, O. A. 2004. Formative Evaluation of national sexuality education curriculum in Nigeria. Unpublished Ph.D Thesis, Faculty of Education, University of Ibadan, Ibadan.

Federal Government of Nigeria. 2004. National Policy on Education. 4th edition.

Federal Ministry of Education. 1985. National Curriculum for Junior Secondary Schools.

Federal Ministry of Education 1999. Universal Basic Education Scheme Proposed Implementation Blueprint.

Federal Ministry of Education 2000. Implementation guideline for the Universal Basic Education. Abuja

Fitz-Gibbon, C. A. and Monis, L. L. 1978. *How to Design a Programme Evaluation*. Califonia, Sage publications.

Fleischman, H. L. and Williams, L. 1996. An introduction to Program Evaluation for Classroom Teachers. Retrieved 23 March, 2011 from http://teacherpathfinder.org/School/Assess/assess.html

Frazer, B. J. 1977. Evaluating the intrinsic worth of curricular goals. *Journal of Curriculum Study, 9:(125-132).*

Frazer, B. J., Okebukola, P. A. O. and Jegede, O. J. 1992. Assessment of learning environment of Nigerian School laboratory. *Journal of Science Teachers Association of Nigeria.* 22(2):1-17.

Fromson, K. 2001. Special contribution to the Imagine NewsDesk. The Comet Newspaper of Thursday, 3rd January.

Fullan, M. G. 1994. Implementation of Innovation. The International Encyclopedia of Education, 2nd edition. T. Husen, T. N. Postlethwaite, Eds. Permagon, Oxford, 2839-2847.

Fullan, M. G. and Stiegelbauer, S. 1991. *The New Meaning of Educational change*. Cassell, London.

Galabawa, J. 2008. Issues Related to curriculum Evaluation and Effectiveness of External Examination System. Keynote Address Paper at a conference on Quality Assurance through curriculum design – A case study of Higher Education Management in East Africa. Faculty of Education, University of Dares Salaam, Kenya.

Garuba, A. 1996. The Basics of Basic Education. *BEAGLE, Journal of Lagos State College of Primary Education,* 1:1&2.

Garba, M. 2004. The critical role of educational resources on curriculum implementation. *curriculum implementation and professionalizing teaching In Nigeria.* A. O. K. Noah, D. O. Shonibare, A. A. Ojo and T. Olujuwon, Eds. Lagos: Central Educational Services.

Gwany, D. M. 2006. Teacher education: Cognitive neuropsychological and idiosyncratic foundations in the educational psychologist. *A journal of the Nigerian Council of Educational Psychologists***.** Nigeria: NCEP, 2Gwany, 2 (1):86 – 92.

Hall-Rose. 2004. Education Today: Science Education in danger. The Newsletter of UNESCO'S Education Sector. No 11, October-December.

Heylighen, F. and Joslyn, C. 1992. What is Systems Theory? *Principia cybernetica web.* Retrieved 17 September, 2005 from http: //pespmcl.vub.ac.be/SYSTHEOR.html

Ibole, P. M. 2000. Using Students perceptions of science teachers and the teaching of science as an index for enriching science instruction. *Proceedings at the 41st Annual Conference of Science Teachers Association of Nigeria*, 87-92.

Ipaye, B. 2002. Teachers' apathy to teaching in *searchlight on secondary education in Nigeria. A handbook of 21- year educational research paper from, the all*

*Nigeria conference of principals of secondary schools, ANCOPSS***.** Ado-Ekiti: All Nigeria conference of principals of secondary schools.

Ivowi, U. M. O. 2004. Curriculum implementation: Implication for school administration. *curriculum implementation and professionalizing teaching in Nigeria.* A. O. K. Noah, D. O. Shonibare, A. A. Ojo and T. Olujuwon, Eds. Lagos: Central Educational Services.

Ivowi, U. M. O. and Odunusi, T. O. 1982. An evaluation of the Nigerian Junior Secondary School Science Curriculum. Retrieved 17 September, 2005.

Jegede, O. J. 1981. An evaluation of the Nigerian Integrated Science Project (NISP) After A Decade of Use in the classroom. Unpublished Ph.D Thesis, University of Ibadan, Ibadan.

Jegede, O. J. 1983. Integrated Science in Nigeria: A review of the problems and prospects. *Proceedings at the 24th Annual Conference of Science Teachers Association of Nigeria*, Awka. 209-219.

Jegede, O., Okebukola, P. A. and Ajewole, G. 1992. Students' Attitude to the use of the Computer for learning and Achievement in Biological concepts in P.A. Eniayeju Ed. *Journal of Science Teachers Association of Nigeria*, 27 (2):61-65.

Jonathan, O. and Justin, D. 2008. Science Education in Europe: Critical Reflections. A Report to the Nuffield Foundation. King's College London. www.nuffield.com

Kalusi, J. I. 2000. An appraisal of the National Policy on Education and Teacher Education in K. Babarinde Ed. *Education and Challenge of Patriotism in Nigeria*. A publication of the Philosophy of Education Association of Nigeria.

Kanno, T. N. 2004. *Teaching practice, microteaching and methodology of education in Nigeria.* Owerri: Logicgate publishers.

Kathy, C. 2000. How do we assess learning in Integrated Science. In BSCS Ed. Making sense of Integrated Science. A Guide for High Schools. Colorado Springs, CO: Author

Kehinde, C. A. 2000. Computer Technology: How it can Enhance Students' performance in Biology classrooms. *Proceedings at the 41st Annual Conference of Science Teachers Association of Nigeria*, Awka.131-133.

Kerlinger, F.N. 1973. *Foundations of Behavioural Research.* New York, Holt, Rinehart and Winston

Kerlinger, F. N. and Pedhazur, 1973. *Multiple Regression in Behavioural Research*. New York, Holt, Rinehart and Winston.

Lassa, P. N. 2007. The current educational reform on teacher education and its implication on national development. A paper presented at committee of deans of education in Nigerian universities 2007 annual conference at faculty of education, university of Lagos Akoka-Yaba.

Lawton. D. 1980. Research on Science Laboratory activities: In pursuit of better questions and answers to improve learning. *School Science and Mathematics.* 90: 403-418.

Lewy, A. 1977. *Handbook of curriculum evaluation*. Ed. Paris. UNESCO New York, Longman.

Lorenz, E. 1966. "Large-scale motions of the atmosphere: Circulation." In *Advances in Earth Sciences*. P. Hurley, Ed. Cambridge, MA: The M.I.T. Press.

Maduabum, M. A. 1990. Crisis in Integrated Science classroom. Reflection on Integrated Science teacher education in Niger. *Journal of Science Teachers Association of Nigeria 26(6):19-24.*

Maduabum, M. A. 1992. Accountability in senior secondary school science achievement in Nigeria: A join responsibility. *Lagos Journal of Science Education 1(1):50-58.*

Marx G. 1998: Education for an unknown future. Lecture delivered at the British Council Course on teacher training for Science Education. King's College University of London.

Microsoft students 2008 DVD

Mauritz, J. 1976. *Intentionality in Education*. A conceptual Model of Curricular and Instructional Planning and Evaluation

Mc Donald, J. B. 1971. Curriculum Theory. *Journal of Educational Research*, 64(5): 196-200.

Mkpa, M. A. 2005. Challenges of implementing the school curriculum in *Nigeria journal of curriculum studies* 12 (1), 9 – 17.

Mkpa, M. A. 2000. In-school Staff Development Strategies for Effective Universal Basic Education curriculum Delivery: Lessons from the Nigerian Community Education programme. A paper presented at the 15th Annual Academy Congress Publication 2000 of the Nigerian Academy of Education held in UNIBEN.

Mohammed, H. A. 2007. Nigeria: Is Universal Basic Education Realistic by 2015? Daily Trust Opinion, Abuja of 28th November.

Moronkola, O. A., Akinsola, M. K. and Abe, C. V. 2000. *The nature of curriculum*. Ibadan. Royal People (Nig) Ltd.

Mustapha, M. T. 2003. An evaluation scheme for Science curriculum Renewal: The ATO Responsive and Illuminative model. *Standards for Science, Technology and Mathematics Educational Research (NASER book of reading)*. T. D. Baiyelo and 'Temi Busari, Eds. Lagos. Victory Printers Nigeria Limited.

Mustapha, M. T. 2001. An evaluation of the Nigeria Certificate in Education (NCE) double major Integrated Science. Ph.D Thesis, Faculty of Education, University of Ilorin, Nigeria.

Nduanya, M. O. 1986. *Elementary School Methodology*. Ibadan, Heinemann Educational Books.

Ngozi-Olehi, L.C. 2004. Relevance of creative science on Early Childhood Education in Nigeria. *Proceedings at the Science Teachers Association of Nigeria Teacher Education Panel*, 50-57.

Nigeria: Customs and Lifestyle. 1993 – 2001 Microsoft Corporation.

Nigerian Educational Research and Development Council. 2007: 9-Year Basic Education Curriculum. Basic Science for Junior Secondary 1-3.

Nneji, L. M. 2000. Implications of the Emergent Adolescent Reproductive Health issues for the Integrated Science Teachers. *Proceedings at the 41st Annual Conference of Science Teachers Association of Nigeria*, Awka. 220-223.

Nneji, L. M. 2002. Innovation in Integrated Science Curriculum for Sustainable Development in Nigeria: The NERDC effort. *Proceedings at the 43rd Annual Conference of Science Teachers Association of Nigeria*, Port Harcourt. 318-322.

Nneji, L. M. 2003. Innovations in Integrated Science Curriculum for Sustainable Development in Nigeria: The NERDC Effort. *Proceedings at the 43rd Annual Conference of Science Teachers' Association of Nigeria.*

Nwachukwu, G. O. 1984: A survey of the resources for the teaching and learning of Biology in some new secondary schools in Lagos. Unpublished Ph.D Thesis, University of Ibadan, Ibadan.

Nwachuku, V. C. 2005. Issues of standards and sustainability of quality education. A paper delivered to the seminar of the all Nigeria conference of principals of secondary school, Abia State branch at kolping conference Centre, Umuahia on 20th September, 2005.

Nwagwu, C. 2002. From UPE to UBE: Some Basic Planning Considerations for effective implementation of programmes. *Planning and administration of Universal Basic education in Nigeria*. T. Ajayi, J. O. Fadipe, P. K. Ojedele and E. E. Oluchukwu, Eds.

Nwosu, C. 1995. *Essentials of Curriculum And Instruction: A Handbook For Students, Teachers And Researchers In Education*. Lagos, Joralf Books.

Obanya, P. A. I. 2000. Federal republic of Nigeria implementation guidelines for the Universal Basic Education (UBE) Programme. J.A. Aghenta and Awanbor, D., Eds. The Nigerian academy of education-proceedings of the 15th annual congress of the Nigerian academy of education held in the university of Benin, Benin City, 6-9th November, 2000, Benin City: Ambik press Ltd; 1-16

Obanya, P. 2002. *Revitalizing Education in Africa.* Stirling - Holden Publishers (Nigeria) Limited. Gaaf Building. Ibadan.

Obashoro, J. O. 2002. Programme Evaluation in Nigeria: Challenges and Prospects. Retrieved 6th April, 2007 from evaluation.Org./Conference/…/Oluwayemisi Obashoro.

Obinna, I. P. 2007. The role of effective teaching in curriculum implementation in *Nigerian journal of curriculum studies* 14 (2):65 – 71.

Obioma, G. 2004. Sustaining the culture of National reforms in Nigeria: Implications for curriculum change. *23rd distinguished Lecture Series,* Adeniran Ogunsanya College of Education, Otto/Ijanikin, Lagos State.

Obioma, G. 2008. The implementation of Universal Basic Education programme. In Guardian, Thursday May 1.

Obisanya, O. O. 1998. An evaluation of the early childcare development and education project in Nigeria. Unpublished Ph.D Thesis, University of Ibadan, Ibadan.

Odetoyinbo, B. B. 2004. Evaluation of the Nigerian Integrated Science Programme in Junior Secondary Schools in Oyo State. Unpublished Ph.D Thesis. Institute of Education, Faculty of Education, University of Ibadan, Ibadan.

Odubunmi, E. O. 1981. Integrated Science teaching strategies and pupils attitudes to the subject in some Secondary Schools in Oyo State of Nigeria. Unpublished M.Phil Project, University of Ibadan, Ibadan.

Offiong, A. A. 2005. Implementation of agricultural science curriculum in secondary schools for vocational impact in *Nigeria journal of curriculum studies 12* (2):229 – 232.

Ofoegbu, R. I. 2001. Motivational factors and the achievement of classroom effectiveness in Edo State secondary schools in Nigeria. *Current issues in educational management in Nigeria.* N. A. Nwagwu, E. T. Ehiametalor, M. A. Ogunu, and M. Nwadiani, Eds.

Oginni, A. M. 2008. Selected Student Aptitude Indices and School factors as predictors of Senior Secondary School Students' learning outcomes in Chemistry in Lagos State, Nigeria. . Unpublished Ph.D Thesis, University of Ibadan, Ibadan.

Ogunleye, B. O. 2002. Evaluation of the Environmental Aspect of the Senior Secondary School Chemistry Curriculum in Ibadan, Nigeria. . Unpublished Ph.D Thesis, University of Ibadan, Ibadan.

Ogunsola-Bamidele, M. F. 1996. Mathematics in physics which way forward: Attitude to the teaching of physics. Paper presented at the Annual meeting of the National Science Teachers Association of Nigeria.

Ogunsola-Bamidele M. F. 1999.Teaching science courses in and out of Area of certification in single-sec/co educational schools. A paper presented at the NARST Conference. Boston USA.

Ojo, M.O. 1995. Retraining and Retaining Professional Competent and Satisfied Science Teachers. *The Nigeria Teacher Today - A Journal of Teacher Education.* 4(1) 85-91.

Okebukola, P. A. O. 2002. Attitudes and teaching methods of some Integrated Science Teachers relative to the Nigerian Integrated Science Project students Achievement. Unpublished M.Ed Project, University of Ibadan, Ibadan.

Okebukola, P. A. O. 2004. Curriculum implementation in Nigeria, strategies for the 21st century. *curriculum implementation and professionalizing teaching in Nigeria.* A. O. K. Noah, D. O. Shonibare, A. A. Ojo, and T. Olujuwon, Eds. Lagos: Central Educational Services.

Okpala, N. P. and Onocha, C. O. 1988. Perceived Difficult Topics in the Nigerian secondary schools physics syllabus. *Journal of Research in Curriculum, 6(1): 75-85.*

Oladiran, O. S. 1998. Striking Balanced Point between English Language and mathematics as Languages if Instruction in Physics Classroom. *Proceedings at the 39th Annual Conference of Science Teachers Association of Nigeria*, 296-300.

Olanrewaju, A. 1982. Attitudes and Teaching Methods of some Integrated Science Teachers relative to the Nigerian Integrated Science Project Students Achievement. M.Ed Project. Ibadan, Faculty of Education, University of Ibadan.

Olokor, N. 2006. Utilization of instructional facilities for enhancing secondary school students' learning experience in agricultural science in *Nigerian Journal of Educational management.* 5, 153 – 159.

Oloruntegbe, K. O. 1996. The place of evaluation in Integrated Science curriculum. *Journal of Science Teachers Association of Nigeria*. 31(1&2):8-11.

Onocha, C. O. 1985. Patterns of relationship between Home and School Factors and Pupils' learning outcomes in Bendel Primary Science Project. Unpublished Ph.D Thesis, University of Ibadan, Ibadan.

Onwu, G. M. 1992. In service education of Integrated Science teachers in Nigeria. Paper presented at the international workshop on Integrated Science teaching, College of Education, University of Ibadan, Ibadan.

Onwuka U. 1981. *Curriculum development for Africa* Onitsha: Africana – FEP Publishers.

Onyeachu, J. A. E. 2006. Management of primary education in Nigeria in *Nigerian journal of curriculum studies, 13* (3):191 – 201.

Onyeachu, J. A. E. (2007). Integration of ICT(s) in teaching and distance learning in Nigeria. A paper presented at 16^{th} annual national conference of technological writers association of Nigeria (TEWAN) at faculty of education auditorium, Abia State university, Uturu. Wednesday, 5^{th} – 8^{th} December, 2007.

Onyeachu, J. A. E. 2008. Curriculum implementation at the primary education level challenges for the 21^{st} century. *Multidisciplinary Journal of Research Development.* 10 (1):38 – 49.

Onyeachu, J. A. E. 2011. Implementation Issues in Secondary Education curriculum in Nigeria: Problems and Prospects. *International Journal of Research Development*, 565-574. Retrieved 13 November, 2011.

Onyejemezi, D. A. 1991. Resource development in education strategies for the schools. *Contemporary issues in Nigerian education.* Mkpa, M.A., Ed. Awka: Mekslink Publishers Ltd.

Osokoya, I. O. 1995. *History and Policy of Nigeria Education in World Perspective*. AMD publishers. Ibadan.

Ornstein, A. C. and Hunkins, F. P. 2004. *Curriculum – Foundations, Principles, and Issues.* (Fourth Edition). Boston: Pearson.

Parlett, M. and Hamilton, D. 1974. Evaluation: A new approach to the study of innovatory programme. Centre for Research in Educational Sciences. University of Edindugh.

Patton, M.Q. 1997. *Utilization-Focused Evaluation*. Edition 3. Thousand Oaks: Sage Publications, Inc.

Pascal. 1996. BBC Teaching Today, March. Reinstated in ECE 204

Provus, M. C. 1971. *Discrepancy evaluation.* Carlifonia: Berkely McGraw Mill Book Comp.

Rowntree, D. 1981. *Developing courses for students.* London, Mc Graw-Hill.

Ruby, R. 2007. FG launches New School Curriculum. Daily Trust of 16th November

Ruelle, D. 1980. "Strange attractors." *Mathematical Intelligencer* 2:126-137.

Rutherford, F. J. 2000. The teaching of science: 21st century perspectives.

Science Teachers Association of Nigeria Newsletter, 1970: Curriculum Development Newsletter No 1. Integrated Science, Ibadan. Yokee-Pekun Press.

Scriven, M. 1967. The methodology of programme evaluation. AERA Monograph Series on curriculum evaluation. Chicago Rond McNally and Co.

Scriven, M. 1973. *Goal-free evaluation. School evaluation.* The politics and process Ed. Ernest R. Berkely Califonia: Macutchan Pub. Comp.

Silver, H. 2004. Evaluation Research in Education. University of Plymouth. Links reinstated August, 2006.

Sjoberg, S. 2000. *Interesting all children in "Science for all" in improving science education*. Open University Press. Bukingham – Philadephia

Smith, M. K. 2000. Curriculum theory and practice. *The encyclopedia of informal education.* Retrieved on 15th August 2006 from www.infed.org/biblio/b-curric.htm

South Eastern Regional Vision for Education. 1996. A student Impact study on Integrated Science programme of the University of Alabama.

Stake, R. E. 1967. "The Countenance of Educational Evaluation" *Teachers College Record.*

Stake, R. E. 1975. *Evaluating the Arts in Education: A Response Approach.* Columbus. O. H. Charles, E. Merill, Eds.

Stufflebeam, D. L. 1971. *Educational evaluation decision making*. Itasca Ilinois P.E. Peacok Publ.

Stufflebeam, D. L. (2003) *The CIPP Model For Evaluation*. Paper presented at the Annual Conference of the Oregon Program Evaluators Network, Portland, Oregon. Retrieved on 10th March 2004 from http://www.wmich.edu/evalctr/pubs/CIPP-ModelOregon10-03.pdf

Sulaiman, F. R. 2004. Evaluation of Public Primary Education programme in Ogun State: 1985 - 2000. Ph.D Thesis, University of Ibadan, Ibadan.

Taiwo, C. O. 1969. The purpose of secondary education. A philosophy for Nigerian Education. Heineman Educational Books(Nigeria) Ltd., Ibadan

Taiwo, C. O. 1975. Science Curriculum Developments in Nigeria. *Journal of Science Teachers Association of Nigeria*. 14(1):21.

Taylor, P. A. and Maguire, T. O. 1965. A theoretical evaluation model. University of Illinous, Department of Educational Psychology (Mimeographed).

Tyler, R. W. 1949. *Basic Principles of Curriculum and Instruction*, Chicago: University of Chicago Press.

Ughamadu, K. A. 1992. *Curriculum: concept, development and implementation.* Onitsha: Emba printing and publishing company Ltd.

Ugwu, O. I. 2005. Teachers motivation: A challenge for implementing agricultural science curriculum in *Nigerian journal of curriculum studies* 12(1):234 – 238.

Ukoli, F. M. A. 1985. *What Science?: Problem of Teaching in science in Nigerian Universities, Ed*. Lagos: Heinemann Educational Books.

Umeoduagu, J. N. 2000. Resources Utilization for Effective teaching of Science Technology and Mathematics in the new Millennium. *Proceedings at the 41st Annual Conference of Science Teachers Association of Nigeria*, Awka. 38-41.

Unagha, A. O. 2008. Implementing Universal Basic Education (UBE) through the Strategic Provision of School Library Services.

United Nations Secretary General. 2000. UN millennium development goals. Retrieved on 5th July, 2008 from www.org/milleniumgoals

United Nations. 2006. Global Monitoring Report. New York.

United Nations. 2008. Millenium Declaration. A/RES/55/2, New York, September 18th.

Valley, E. A. and Withier, C. A. 2009. Integrated Science Program. Learn Science In months Not Years. Southern Califonia University of Health Sciences.

Wholey, J. S. 1981. Using Evaluation to improve program performance. *Evaluation Studies Review Annual.* 6: 55-69.

Wikipedia, the free encyclopedia. Program Evaluation.

Wisconsin, A., Allen, R. and Helming, M. 1991: *Student/Teacher Achievement Ration.*Tennessee's K-3 class size study. Nashville Tennessee State Department of Education.

World Bank. 1988. Education in sub- Saharan Africa. Washington. D. C.

Worthen, B. R. and Sanders, J. R. 1987. *Educational Evaluation: Alternative Approaches and Practical Guidelines.* Second edition. New York: Longman.

Yara, P. O. 2008. School Environment and Student factors as Predictors of Achievement in Secondary School Mathematics in Southwestern Nigeria. Ph.D Thesis, University of Ibadan, Ibadan.

Zadeh, L. 1969. "Biological application of the theory of fuzzy sets and systems." *The Proceedings of an International Symposium on Biocybernetics of the Central Nervous System* Boston: Little Brown. p. 199-206.

APPENDIX I

UBE BASIC SCIENCE STAKEHOLDERS' QUESTIONNAIRE

Sir/Madam,

This questionnaire has been designed to determine your assessment of Basic Science curriculum component of the Universal Basic Education (UBE) programme. The items require your assessment of Antecedent and Transaction variables with regard to Basic Science offered at Junior Secondary School. Your rating of the objective of science at this level is also required.

Your frank responses to the items of this questionnaire would go a long way in helping to collect adequate data for an ongoing research to evaluate implementation of Basic Science curriculum component at Junior Secondary School level.

Please feel free to express your opinion as your responses would be kept strictly confidential

SCIENCE PROGRAMME OBJECTIVE RATING SCALE (SPORS)

Section A: Stakeholder's Socio-demographic Data

Please tick [√] the correct option

CATEGORY A

1. STATE: Lagos [ ] Ogun [ ] Oyo[ ] Osun [ ] Ondo [ ] Ekiti [ ]
2. STATUS: Ministry Official [ ] Principal [ ] Year tutor/HOD [ ] classroom teacher [ ].
3. AGE: under 18 years [ ] 19 – 25 years [ ] 26 – 40years [ ] 41years and above [ ]
4. GENDER: Male [ ] Female [ ]
5. QUALIFICATIONS: School Cert. holder [ ] OND holder [ ] HND/NCE holder [ ] First degree [ ] Second degree [ ]
6. AREA OF SPECIALIZATION: pure science [ ] applied science [ ] humanities [ ]
7. YEARS OF SERVICE: 0-5 years [ ] 6-10 years [ ] 11-20 years [ ] 21 years and above [ ]

CATEGORY B

1. NAME OF SCHOOL ____

2. LOCAL GOVERNMENT AREA ________________________________

3. GENDER: Male [ ] Female [ ]

4. AGE: under 12 years [ ] 13 – 15 years [ ] 16 years and above [ ]

5. INTENDED CAREER: Science based [ ] Non-science based [ ]

Section B: Science Programme Objective Rating Scale

Please indicate (√) your rating of the objectives of Science at the Junior Secondary educational level.

	STATEMENTS OF OBJECTIVE	**5**	**4**	**3**	**2**	**1**
1	Acquire basic knowledge in science and technology					
2	Acquire basic skills in science and technology					
3	Apply scientific and technological knowledge to meet					
4	Apply scientific and technological skills to meet societal					
5	Apply basic intelligent skills					
6	Endow individuals with tools for learning, problem solving, analytical thinking and rational decision					
7	Take advantage of numerous career opportunities offered by science and technology					
8	Recognize stages of development					
9	Develop interest in science and technology					
10	Become prepared for further studies in science and technology					

APPENDIX II

BASIC SCIENCE COURSE MATERIAL ASSESSMENT QUESTIONNAIRE (BSCMAQ)

Section A: Basic Science Manpower Assessment Questionnaire (BSMAQ)

1. Name of school:____

   Tick (√) as appropriate

2. Sex : Male [ ] Female [ ]

3. Highest Academic qualification:

   HND [ ] NCE [ ] OND [ ]

   B.Ed./B.Sc(Ed) / B.A.(Ed) [ ]

   B.A./B.Sc [ ]

   PGDE [ ]

   M.Ed [ ]

   M.A./M.Sc. [ ]

   Ph.D [ ]

   Others (specify):____

4. Area of Specialization:____

5. Status: Masters Grade I[ ] Masters II[ ] Masters Grade III[ ]

Section B: Basic Science Manpower In-service Training Assessment Questionnaire (BSCMITAQ)

Please indicate (√) your assessment of the extent of In-service training acquired as Basic Science teacher at Junior Secondary School level.

1. Qualification at point of entry:_______________________________________

2. Additional qualifications obtained:_____________________________________

3. Teaching Experience: Below 5years [ ] 6 – 10 years [ ] 11 -I5years [ ]

   16 - 20years [ ] above 20years [ ]

4. Participation at Workshop/Seminar: Often [ ] Once [ ] Never [ ]

5. Computer literacy: Diploma [ ] Certificate [ ] None [ ]

Section C: Basic Science Course Material Assessment Questionnaire (BSCMAQ)

Please indicate (√) your assessment of the extent of availability of Course material for teaching and learning Basic Science at the Junior Secondary School.

Use the key: SA = Strongly agree A = Agree

D = Disagree SD = Strongly disagree

	STATEMENT	SA	A	D	SD
1	Students' textbook and workbook in the Sciences are available				
2	Teacher's manual in Integrated science is available				
3	Science materials are available in the school library				
4	The Science materials in circulation are readily affordable				
5	Basic science materials is in conformity with the National curriculum content				

Section D: Infrastructural Facility

Please indicate (√) your assessment of the extent of availability and adequacy of Instructional facilities for teaching Basic Science at Junior Secondary School level.

Use the key: SA=Strongly Agree; A=Agree;

D = Disagree; SD = Strongly Disagree

	STATEMENT	SA	A	D	SD
1	Science laboratory is provided in the school				
2	Science kits are brought to the classroom to aid teaching and learning				
3	The laboratory is functional at the moment				
4	Equipment and materials are adequately provided in the laboratory				
5	Library is stocked with Science materials				

APPENDIX III

BASIC SCIENCE CLASSROOM OBSERVATION SCHEDULE (BSCOS)

1. Name of School: ____

2. Class: ____

3. Period: ____

4. Topic: ____

KEY: Excellence = 5; Very Good = 4; Good = 3; Fair = 2; Poor =1

	LESSON FEATURES	5	4	3	2	1
	Instructional behavior					
1	Lecture (L)					
2	Explain concept (EC)					
3	Give directive (GD)					
4	Question – low order (QL)					
5	Question – high order (QH)					
6	Treatment of pupils responses (PR)					
7	Ask pupils to comment (PC)					
8	Make reference (charts, model, etc) (REF)					
9	Assess pupils (AP)					
10	Give practical work (PRA)					
	Methodology					
11	Lecture (L)					
12	Discussion (DI)					
13	Enquiry (EN)					
14	Demonstration (DE)					
15	Practical (P)					
	Pupils Engagement					
16	Listen to teacher (LT)					

17	Copy from chalkboard (CC)					
18	Make observation (MO)					
19	Set experiment (SE)					
20	Handle equipment (HE)					
21	Record observation (RO)					
22	Work out example (WO)					
23	Answer teachers question (AQ)					
24	Ask self initiated question (SQ)					
25	Others (OT)					

APPENDIX IV

BASIC SCIENCE ACHIEVEMENT TEST (BSAT)

(1) The fusion of male and female gametes is called ______________________

[A] Reproduction [B] Fertilization [C] Excretion [D] Respiration [E] Future

(2) The instrument used in reading intensity of rainfall is called ______

[A] Rain gauge[B] Wind gauge [C] Anemometer [D] Speedometer [E] Rain measure

(3) A pure substance ____

[A] has an attractive colour [B] is always a solid [C] has a constant melting point [D] cannot be separated into different components by chemical means [E] is always a mixture

(4) When a force moves through a distance, the result is ______________

[A] energy [B] power [C] pressure [D] work [E] weight

(5) Water from a river contaminated by alkali waste will have a p^H of about:

[A] 1 [B] 3 [C] 5 [D] 7 [E] 9

(6) The uses of satellite include all EXCEPT

[A] Communication [B] Photography [C] Mapping [D] Geographic Information System [E] Photometric

(7) The simplest way to test for protein is to use a solution called __________

[A] sudan II reagent [B] millon's reagent [C] million's reagent [D] fehling's reagent [E] benedict's reagent

(8) A catapult which has been pulled to its maximum elasticity is said to possess ______ energy

[A] electrical [B] kinetic [C] mechanical [D] motor [E] potential

(9) A small piece of iron was placed in a measuring cylinder containing $16cm^3$ of kerosene level then rose to $25.2cm^3$ mark. The volume of the iron in cm^3 is __________

[A] 0.92 [B] 0.93 [C] 0.94 [D] 9.10 [E] 9.20

(10) Apart from the inherited traits, one of the following has effect on the life of an individual _____________

[A] characteristics [B] chromosomes [C] environment [D] genes [E] pedigree

(11) The class of food required for body building is ________________

[A] proteins [B] fats & oil [C] roughages [D] carbohydrates [E] water

(12) An elderly woman that stops menstruating is said to have reached ________

stage.

[A] menopause [B] puberty [C] adolescent [D] old age [E] adulthood

(13) One of the following is NOT a component of Information Communication Technology

[A] Sewing machine [B] Computer [C] Fax machine [D] Telephone [E] Internet

(14) The following causes water pollution EXCEPT

[A] Domestic waste [B] Nuisance waste [C] Industrial waste [D] Agricultural waste [E] Oil spillage

(15) The number of oxygen atoms in $3H_2SO_4$ is?

[A] 2 [B] 3 [C] 4 [D] 8 [E] 12

(16) Which one of these air pollutants prevent the blood from transporting oxygen?

[A] Carbonmonoxide [B] Carbondioxide [C] Sulphurdioxide [D] Nitrogendioxide [E] Hydrogensulphide

(17) One major factor that affects the efficiency of a machine is _____________

[A] friction [B] gravity [C] grease [D] motion [E] oil

(18) The burning of piece of wood into ashes is an example of ____ type of change

[A] biological [B] chemical [C] electrical [D] magnetic [E] physical

(19) The care given to pregnant women before delivery is ___________________

[A] ante-natal care [B] Intra-partum care [C] postnatal care [D] pregnancy care [E] permanent care

(20) Heat is transferred through _______________________

[A] conduction only [B] convention only [C] radiation only [D] all of the above [E] none of the above

APPENDIX V

Students' Attitude Questionnaire (SAQ)

Please tick (√) the column that best represent your attitude towards Science.

Use the key: SA = Strongly Agree A = Agree

D = Disagree SD = Strongly Disagree.

	STATEMENT	SA	A	D	SD
1.	Studying science is exciting				
2.	I always enjoy science lesson				
3.	Certain terms used in science made me to like the subject				
4.	I don't have interest in science				
5.	Studying science has helped to develop scientific attitude and skills				
6.	Science lesson is not fascinating to me				
7.	Science has no benefit to me				
8.	1 will love to have science material as a birthday gift				
9.	Science lesson is not a waste of time				
10.	Science has not helped to erase superstitious belief				
11.	Science has not helped to increase power of observation				
12.	Science is not a tool for rational decision making				
13.	1 will like to take more science courses in the future				
14.	I don't like studying science in my spare time				
15.	Knowledge gained in science is useful for daily living				
16.	Science subject as taught in school is not interesting				
17.	I always look forward to science lesson				
18.	Learning Science is fun				
19.	Science lesson is boring				
20	Experimenting in science is not exciting				

APPENDIX VI

S/N	Key to BSAT	Difficulty Index (%)	Discriminating Index
1	B	75	0.50
2	A	75	0.25
3	C	50	0.25
4	D	87.50	0.25
5	E	50	0.50
6	E	50	0.50
7	E	75	0.25
8	E	75	0.25
9	E	75	0.50
10	C	62.50	0.50
11	D	87.50	0.25
12	A	87.50	0.25
13	A	37.50	0.25
14	B	37.50	0.25
15	E	12.50	0.25
16	C	87.50	0.25
17	A	87.50	0.25
18	B	62.50	0.25
19	A	87.50	0.25
20	D	37.50	0.25

APPENDIX VII

Report of Pilot study on "Evaluation of the Implementation of Basic Science Curriculum component of the Universal Basic Education Programme in South western Nigeria"

INTRODUCTION

Following the decision to introduce the 9-year Basic Education programme and the need to attain the Millennium Development Goals (MDGs) by 2015 and the critical target of the National Economic Empowerment and Development Strategies (NEEDS), Basic Science and Technology has been introduced as the science subject to be offered at the Lower Basic and Middle Basic level. Also, Basic Science and Basic Technology are the sciences to be offered at the Upper Basic level. The introduction of the 9-year basic education curriculum only in primary 1 and Junior Secondary 1 will gradually phase out the old curriculum being used in primaries 2 – 6 by June 2013, and Junior Secondary 2&3 by June 2010 (EFA, 2008). It is worthy to note that the success of this programme is very much dependent on the state of the antecedent variables which are manpower requirements, infrastructural requirements, and the programme objective. As well as the transaction variables which are availability of texts, instructional techniques and staff training.

The pilot study is hereby being reported as it answers the eleven research questions below:

1. What is the profile of the following stakeholders as indicated by the following socio-demographic variables?
    a. Ministry officials: age, gender, qualifications, area of specialization and years of service.
    b. School Principals: age, gender, qualifications, area of specialization and years of service.
    c. Year Tutors/Heads of Department: age, gender, qualifications, area of specialization and years of service.
    d. Classroom teachers: age, gender, qualifications, area of specialization and years of service.
2. What are the stakeholders' ratings of the objectives of Basic Science?

3. Are the infrastructural facilities for teaching Basic Science in place?
4. Are teachers of Basic Science professionally qualified to teach the subject?
5. Are the course materials, such as: students' textbooks, workbooks and teachers' guide for Basic Science readily available?
6. What are the ratings of instructional techniques employed by teachers of Basic Science?
7. Do teachers who are teaching Basic Science receive any form of in-service training? If yes, how often?
8. What is the students' level of performance in Basic Science Achievement Test?
9. What is the students' attitude towards Science?
10. What are the relative contributions of the antecedent and transaction variables to students' learning outcomes in Basic Science?
11. What are the composite contributions of both the antecedent and transactional variables to students' learning outcomes in Basic Science?

RESULTS

Research question 1: What is the profile of the stakeholders?

Table 1: Profile of Stakeholders

		MINISTRY OFFICIAL	PRINCIPAL	YEAR TUTOR/ H.O.D.	CLASSROOM TEACHER	TOTAL
CATEGORY A	Age : 26 - 40yrs	_	_	1	4	25
	41yrs +	5	5	4	6	
	Qualification HND/NCE holder	2	_	_	_	25
	First degree holder	1	3	3	5	
	Second degree holder	2	2	2	5	
	Area of specialization: Pure science	2	2	5	9	25
	Applied science	1	_	_	1	
	Humanities	2	3	_	_	
	Years of service : 6 – 10 yrs	_	_	1	_	25
	11 – 20yrs	4	2	2	9	
	21yrs +	1	3	2	1	
CATEGORY B	Gender : Male		15			25
	Female		10			
	Age : Under 12 yrs		02			25
	13yrs		18			
	16yrs +		05			
	Intended career : Science based career		17			25
	Non-science based		08			

The profile of the stakeholders in this study is as shown in table 1 above.

Research Question 2: What are the stakeholders' ratings of the objectives of Basic Science?

Table 2: Frequency count, Percentages and Mean rating of the objective of Basic science

ITEM	EXCELLENT (5)	VERY GOOD (4)	GOOD (3)	FAIR (2)	POOR (1)	MEAN (X)	REMARK
1	12 (48)	10(40)	03(12)	_	_	4.36	VERY GOOD
2	11(44)	11(44)	03(12)	_	_	4.32	
3	09(36)	10(40)	06(24)	_	_	4.12	
4	06(24)	12(48)	06(24)	01(4)	_	3.96	
5	04(16)	11(44)	09(36)	01(4)	_	3.76	
6	06(24)	12(48)	06(24)	01(4)	_	3.96	
7	07(28)	09(36)	08(32)	01(4)	_	3.92	
8	07(28)	15(60)	03(12)	_	_	4.16	
9	05(20)	13(52)	06(24)	01(4)	_	3.88	
10	04(16)	13(52)	08(32)	_	_	3.84	

Table 2 revealed that stakeholders rated the objectives of Basic science to be very good.

Research question 3: Are the infrastructural facilities for teaching Basic science in place?

Table 3: Frequency distribution and Mean score of infrastructural facility for teaching Basic science.

SCORES	FREQUENCY	OBTAINABLE SCORE	MEAN SCORE	PERCENTAGE MEAN SCORE	REMARK
06 – 10	03	20	11	55	Infrastructural facility is averagely available.
11 – 15	07				
16 – 20	_				

Table 3 showed that infrastructural facility for teaching Basic science is relatively available.

Research question 4: Are teachers of Basic science professional qualified to teach the subject?

Table 4: Frequency count and percentage of Area of specialization of Basic Science teachers

Area of specialization	Frequency count	Percentage (%)
Pure science	09	90
Applied science	01	10
Humanities	_	_

Table 4 showed that 90% of the classroom teachers teaching Basic science in schools presently specialise in pure science courses.

Research Question 5: Are the course materials, such as student's textbooks, workbooks and teachers' guide for basic science readily available?

Table 5: Frequency distribution and Mean score of course material for teaching basic science in schools.

Score obtained	Frequency	Obtainable score	Mean score	Percentage mean score	Remark
06 – 10	_	20	14.1	70.5	Course material is well available
11 – 15	09				
16 - 20	01				

Table 5 showed that course material for Basic science is well available.

Research Question 6: What are the ratings of instructional techniques employed by teachers of Basic science?

Table 6a: Classroom observation: Instructional behaviour

Category	A	B	C	D	E	F	G	H	I	J	TOTAL
Lecture	3	2	3	2	2	3	4	3	4	_	26(7.02)
Explain concept	4	5	5	4	4	4	4	5	5	5	45(12.16)
Give directive	5	4	3	4	5	4	2	4	4	5	40(10.81)
Question low order	4	4	4	3	4	4	4	3	3	4	37(10.0)
Question high order	3	5	5	4	5	4	3	4	3	_	36(9.73)
Treatment of pupils response	4	5	5	3	4	4	4	4	4	5	42(11.35)
Ask pupils to comment	4	5	4	3	4	3	4	3	4	5	39(10.54)
Make reference	1	5	4	3	4	3	3	5	1	5	34(9.19)
Assess pupils	5	3	4	4	4	4	3	4	3	5	39(10.54)
Give practical work	4	5	5	4	4	4	2	4	_	_	32(8.65)
											370

Key: Figures in parentheses are in percentage.

Table 6a revealed that classroom teachers explain concepts 45(12.16), give directive 40(10.81) and treat pupils response 42(11.35) more than any other behaviour during lessons.

Table 6b: Classroom observation: Methodology

Methodology	A	B	C	D	E	F	G	H	I	J	TOTAL
Chalk and talk	_	5	5	3	2	5	5	5	4	4	38(19.59)
Discussion	4	4	4	3	2	3	4	4	4	4	36(18.56)
Enquiry	5	4	4	4	3	4	4	5	4	4	41(21.13)
Demonstration	3	4	3	4	5	4	4	4	4	4	39(20.10)
Practical	4	5	5	5	5	3	4	5	4	_	40(20.62)
											194

Key: Figures in parentheses are in percentage.

Table 6b showed that teachers use combination of methods in teaching Basic science

Table 6c: Classroom observation: Pupils' engagement

Pupils engagement	A	B	C	D	E	F	G	H	I	J	TOTAL
Listen to teacher	5	4	5	4	4	5	5	4	4	4	44(14.33)
Copy from chalkboard	3	4	4	4	4	5	4	4	2	_	34(11.07)
Make observation	4	4	3	4	5	4	3	4	4	_	35(11.40)
Set experiment	2	5	4	4	5	_	3	_	_	_	23(7.49)
Handle equipment	2	4	4	5	5	_	2		-	-	22(7.17)
Take observation	3	4	4	5	4	-	3	-	-	-	22(7.17)
Record observation	3	4	3	5	5	-	3	-	-	-	23(7.49)
Work out example	4	4	3	4	5	-	4	4	4	-	32(10.42)
Answer teachers question	4	4	4	4	5	4	4	5	4	5	43(14.01)
Ask self initiated question	4	4	4	4	4	2	3	-	3	1	29(9.45)
											307

Key: Figures in parentheses are in percentage.

Table 6c showed that students engage more in listening to teachers and answering teacher's question

Research Question 7: Do teachers who are teaching Basic science receive any form of in- services training? If yes , how often.

Table 7: Frequency distribution of in services training acquired by Basic science teachers.

	Frequency	Percentage (%)	Total
Additional qualification: Yes	09	90	10
No	01	10	
Participation at workshop: Often	09	90	10
Once	01	10	
Never	-	-	
Computer literacy: Diploma	04	40	10
Certificate	05	50	
None	01	10	

Table 7 showed that teachers possess additional qualification and participate often in workshop.

Research Question 8: What is the students' level of performance in basic science achievement test?

Table 8: Mean and Standard deviation of male and female students' achievement scores.

Gender	Mean	N	Students deviation
Male	9.5333	15	4.10342
Female	10.5000	10	3.65908
Total	9.9200	25	3.88287

Table 8 showed average performance in achievement by students.

Research question 9: What is the student's attitude towards science?

Table 9: Mean and Standard deviation of male and female students' attitude scores.

Gender	Mean	N	Students deviation
Male	56.6667	15	7.89816
Female	52.1000	10	10.91838
Total	54.8400	25	9.29014

Table 9 showed good attitude towards science by students.

Research question 10: What are the relative contributions of the antecedent and transaction variables to students' learning outcomes in Basic Science?

Table 10a: Relative contribution of antecedent and transaction variables on students' achievement in Basic science

Model	Unstandardized coefficients		Standardized coefficients	t	Sig
	B	Std. Error	Beta		
(Constant)	95.958	83.548		1.149	.334
Objective	-.740	.390	-.879	-1.900	.154
Infrastructure	-1.203	1.648	-.690	-.730	.518
Available text	-.937	2.065	-.341	-.454	.681
Manpower requirement	-2.204	3.137	-1.005	-.703	.533
Staff training	1.024	1.319	.577	.777	.494
Instructional technique	-.230	.234	-.950	-.982	.398

Table 10b: Relative contribution of antecedent and transaction variables on students' attitude towards Science

Model	Unstandardized coefficients		Standardized coefficients	t	Sig
	B	Students error	Beta		
(constant)	175.349	132.068		1.328	.276
Objective	-.341	.616	-.266	-.554	.618
Infrastructure	-2.020	2.605	-.761	-.775	.495
Available text	-1.656	3.264	-.396	-.507	.647
Manpower requirement	-6.237	4.959	-1.866	-1.258	.297
Staff training	2.329	2.084	.862	1.117	.345
Instructional technique	-.307	.370	-.833	-.829	.468

Research question 11: What are the composite contributions of both the antecedent and transactional variables to students' learning outcomes in Basic Science?

Table 11a: Regression analysis of antecedent and transaction variables on students' achievement in Basic science.

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.755	.570	-.289	4.27432

Table 11b: Analysis of variance

Model	Sum of squares	Df	Mean square	F	Sig
Regression Residual Total	72.791 54.809 127.600	6 3 9	12.132 18.270	.664	.694

Table 11c: Regression analysis of antecedent and transaction variables on students' attitude towards Science.

Model	R	R square	Adjusted R square	Students error of the estimate
1	.733 a	.537	-.388	6.75660

Table 11d: Analysis of variance

Model	Sum of square	Df	Mean square	F	Sig
Regression Residual Total	159.045 136.955 296.000	6 3 9	26.508 45.652	.581	.739

Table 10 & 11 showed that both relative and composite contributions of antecedents and transaction variables to students' learning outcome in Basic science are not significant (P > .05 in all cases). The adjusted R square in the two cases is negative.

SUMMARY OF PILOT STUDY REPORT

The instruments were given out to a handful of category A respondents which include ministry officials, principals, Head of department/Year tutors, classroom teachers and category B respondents which are upper basic III students. The result showed that most of category A respondents fall under age 41years and above, specialises in pure sciences and has put in more than 10years in service. Most of category B respondents fall in the age 13years and above, and intend to study science-related course in the nearest future. The findings also showed that:

(i) stakeholders rated the objectives of Basic science to be very good.

(ii) infrastructural facility for teaching Basic science was relatively available.

(iii) 90% of the classroom teachers teaching Basic science in schools presently specialise in pure science courses.

(iv) course material for Basic science was available.

(v) classroom teachers explained concepts, give directive and treat pupils response more than any other behaviour during classroom lessons.

(vi) teachers used combination of methods in teaching Basic science.

(vii) students engaged more in listening to teachers and answering teacher's question.

(viii) teachers possessed additional qualification and participate often in workshop.

(ix) average performance in Basic Science achievement test by students.

(x) showed good attitude towards Basic Science science by students.

However, the result equally showed that both relative and composite contributions of antecedents and transaction variables to students' learning outcome in Basic science are not significant ($P > .05$ in all cases). The adjusted R square in the two cases is negative.