21st Inaugural Lecture
Science and Technology Education in Nigeria: The Euphoria, The Frustrations and the Hopes.

by

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Ladies and Gentlemen of the Press

Distinguished guests, ladies and gentlemen

I give thanks to the Almighty God for sparing my life till today to give this Inaugural Lecture "when the Lord turned again the captivity of Zion, we were like them that dream". I also appreciate the honour given me by the Vice Chancellor to deliver this 21st Inaugural Lecture. The Lord, God Almighty will continue to guide your footsteps.

PREAMBLE: This Inaugural Lecture is the 4th in the Faculty of Education and the second from the Science Education Unit. The first one from this unit and from the faculty was delivered in 1992, by an eminent scholar Professor P.A.O. Okebukola titled, "And the Barriers to the Learning of Science Came Tumbling Down".

Mr. Vice-Chancellor, Sir, about two years ago I stumbled on my English composition exercise book when I was in St. Andrews College, Oyo. Our Tutor then, Mr. Olatona, had asked us to write on where we would be and what we would be doing in ten years to that year. The essay was written in 1967, and I wrote my address as follows:

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I never even remembered that I wrote anything like this. However, in 1977 I was in the Department of Teacher Education, Science Education Unit, University of Ibadan, as an undergraduate student and today by the grace of God I am a Professor of Science Education. Thus, the essay indicates that my being in science education is not by accident.

From my college days, I have taken interest in science education and this was because I realized that for a nation to develop we could not pay lip-service to the teaching of science and its twin brother technology. When in 1957, the Russians launched the "Sputnik", the Americans were taken aback and through a Congress resolution, it was advanced that the answer to Russia's challenge must be found in the science classroom. Even now, nations are grouped into developed or underdeveloped, industrialized or agrarian, as a result of their level of development in science and technology. For instance countries like

Japan, China, Korea and even India that were not all that known in terms of science and technology twenty years ago or even less are now being reckoned with in the world of science and technology.

Another aspect of science and technology that is worth mentioning is in the area of improving the quality of life. Thus, such areas as food production, health, transportation, communication, shelter and many more are intricately interwoven with the knowledge acquired in science and technology and used for the benefit of man. Even now, if one reflects on what is being worn, what to eat, the means of transport to take back home and so on, then science and technology educators, scientists and technologists must be perceived as very essential for the progress of any nation.

Improvements in the quality of life and level of production should be accompanied by investment in science and technology education I cannot but agree with Awokoya (1955) when he said, "Educational development is imperative and urgent. It must be treated as a national emergency second only to war…" The implication of this is that the highest investment in education should be in science and technology education. The question therefore is how has Nigeria fared in terms of science and technology education over the years? During the course of my study in science education in Nigeria I have identified two periods - periods of euphoria and frustrations. However, I still believe we have hope to overcome our frustrations, hence "The Hope".

Pre- Euphoria Periods

There are four events that led in an evolutionary manner to the euphoria of science and technology in Nigeria:

(a) Christian Missions Activities,

(b) Memorandum on Education for British Colonial Territory,

(c) Constitutions of 1945, 1951 and 1954,

(d) Establishment of the Nigeria College of Arts, Science and Technology.

Christian Missions' Activities

The Christian missions never included science in the curriculum at the inception of schooling in Nigeria. At the primary school level, the science related subjects taught up till early fifties were nature study, hygiene and gardening. However, in 1856 and thereafter, the missions established some industrial institutions in Abeokuta, Lokoja, Calabar and Onitsha, where such subjects as brickmaking, carpentry, dyeing, printing, agriculture and masonry were taught. These are vocational subjects related to technology.

Questions that can be raised are:

(a) What were the purposes of vocational schools at this time?

(b) How many students benefited from the programme in terms of the needs of the society?

It seemed that the missions intended the programme mainly for the building of churches, schools, dispensaries training schools for catechists/pastors, mission houses and so on; and only few adherents benefitted. This programme no matter how inadequate marked the beginning of vocational education in Nigeria.

At the secondary school level, some efforts were made by the missions to include science subjects within the curriculum. Thus, between 1889 and 1906, botany, chemistry, physics, mathematics and physiology were taught. This was expanded in 1913 and beyond when

missions' influenced schools-Ibadan Grammar School, Ijebu-Ode Grammar School, Barewa College Kaduna, Dennis Memorial Grammar School, Onitsha, and so on, were established. Thenceforth, the teaching of science has been gaining ground.

Memorandum on Education for British Colonial Territory

This 1925 memorandum was an offshoot of the report of Phelps-Stoke Commission. It emphasized that technical and vocational subjects should be taught in government departments such as Railways, Port Authority, United African Company and Public Works Department and so on. Though the teaching of both science and technical subjects was not emphasized within the school system, at least the memorandum made the colonial Government think of mounting training in vocational/technical subjects.

Hussey, having been influenced by Phelps-Stokes Commission report, proposed the following three levels of education with science and technical education in mind:

(a) Six-year primary education with the following science-related subjects as part of the curriculum agriculture, hygiene and interest in the environment.

(b) Intermediate level of six years: many could be employed in various fields after completion

(c) Vocational higher education.

Since the first two levels were already in place, attention was focused on the third level which led to the establishment of Yaba Higher College with the following disciplines: teaching, medicine, agriculture, engineering, pharmacy veterinary science and so on. The

establishment of this college boosted the learning and teaching of science at the secondary school level in two ways namely:

(i) Students were encouraged to study physics, chemistry and biology at the secondary school level, knowing fully well that they could end up becoming pharmacists, medical doctors, engineers and so on.

(ii) Science teachers were produced for the secondary school to boost the teaching and learning of science.

According to Taiwo (1980),

> In 1939, eight former students, now science masters who were sponsored by the missions, returned in their pairs to the C.M.S Grammar School, Lagos, the Hope Waddell Institute Calabar, the Dennis Memorial Grammar School Onitsha and the Methodist Teacher Training College, Uzoakoli to lay the foundation of a Science Curriculum in those Institutions.

The curriculum of science masters consisted of botany, zoology, chemistry, physics and mathematics.

Good as the establishment of this institution (Yaba Higher College), was the admission policy was very strict. The following table indicates the situations about admission and graduation of students of the college:

Table 1

Situations of Admission and Graduation at Yaba Higher College

Year	No of Admitted students	No of Students that Graduated	Remarks
1937	38	-	All withdrew or were withdrawn at the end of the year
1938	24	14	10 withdrew
1939	36	13	23 withdrew

In 1937, there were 3,851 students in all Nigerian secondary schools. At least 10% (386) of this must have been science oriented. However, it must be stressed that the establishment of Yaba Higher College was not only a motivating factor to learn science in our secondary schools but it also enhanced the study of science and technology in Nigeria.

Constitutions of 1945, 1951 and 1954

Three constitutions-Richards constitution of 1945, Macpherson constitution of 1951 and Lyttleton constitution of 1954 that made Nigeria to have three federating units made the advancement of science and technology possible. Within the constitutions, there were three legislative lists-exclusive, concurrent, and residual. Primary and secondary education were on the residual list. In other words, the regions could exclusively legislate on primary and secondary education.

Thus, in 1955, the free six-year primary education launched in the Western Region was not only revolutionary in the country but also "the boldest and perhaps the most unprecedented scheme in Africa South of the Sahara" (Fafunwa, 1974) with the introduction of free primary education, the following decisions that expanded the teaching and learning of science and technology were made:

(a) More secondary schools must be established. In fact the secondary school enrolment which was 10,935 in 1955 in the West and 27,347 in the whole country jumped to 144,734 in the West and 195,499 in the whole country respectively, when the products of free primary education entered the secondary school.

(b) Science must be taught in all secondary schools.

(c) Eight technical colleges (trade centres) were to be built in each province.

Other regions also expanded their primary and technical education.

In order to make meaningful impact at the tertiary level, the Federal Government in 1952 established the Nigeria College of Arts, Science and Technology with branches in Enugu, Ibadan and Zaria to advance the learning of science and technology in Nigeria. The admission policy of the college was better than that of Yaba Higher College as shown below:

Table 2

Students Enrolment in All Branches of Nigeria College of Arts, Science and Technology: 1952/53-1959/60

Year	Enugu Branch	Ibadan Branch	Zaria Branch	Total
1952/53	-	8	31	39
1953/54	-	113	29	142
1954/55	-	162	92	254
1955/56	32	190	191	413
1956/57	99	232	220	551
1957/58	148	291	273	712
1958/59	204	336	335	875
1959/60	241	424	423	1,088

Source: Fafunwa, 1974

Meanwhile, in 1948, through the report of the Elliot Commission the University of Ibadan was established. It took over the properties of the Yaba Higher College, and started with the faculties of arts, science and education; and schools of medicine, dentistry, agriculture, forestry and veterinary science. The only set-back here was the non-establishment of a faculty of engineering. However, the establishment of the university and Yaba College of Arts, Science and Technology further increased the learning of science and technical subjects in our schools.

According to Stone (1960), by June 1958, the following numbers of secondary school students in Nigeria were being taught science generally or being taught up to the school certificate level:

Table 3

Number of Pupils Receiving and not Receiving Science Education in Nigerian Secondary Schools

Region	Pupils Receiving Education in the Sciences	Pupils Not Receiving Education in the Sciences
Lagos	4,077 (90%)	468 (10%)
West	12,880 (73%)	4,781 (27%)
East	12,115 (92%)	1,064 (8%)
North	2,642 (74%)	3,203 (26%)

Table 4

Percentage of Pupils Being offered Science Classes at School Certificate Level in Nigeria

REGION	3 SCIENCE SUBJECTS	GEN. SCIENCE	2 SCIENCE SUBJECTS	1 SCIENCE SUBJECT	NO SCIENCE SUBJECT	GENDER
Lagos	86%	-	-	-	14%	Boys
	13%	6%	-	70%	11%	Girls
WEST	49%	9%	5%	12%	25%	Boys
	11%	13%	31%	11%	34%	Girls
EAST	55%	27%	27%	9%	7%	Boys

	8%	19%	1%	55%	17%	Girls
NORTH	45% -	15% 60%	11% 40%	- -	29% 0%	Boys Girls

Thus, before independence, the establishment of the University College, Ibadan, with courses in science, agriculture and medicine, the regionalisation of the country, the establishment of the Nigeria College of Arts, Science and Technology, free primary education programmes, the expansion of secondary school education and regional governments' determination to give science and technology education a priority, marked the beginning of euphoria for science and technology education in Nigeria.

THE EUPHORIA

As at 1958, according to Stone (See Tables 3 and 4) more students at the secondary school level were taking science subjects. Thus, at independence the intensity of euphoria for science and technology education became obvious. Apart from the fact that the three regional governments intensified their efforts in education, the Federal Government of independent Nigeria also took keen interest in the educational enterprise.

The following reports shaped the educational enterprise at this period (1960-1970).

(a) The Banjo Commission Report of 1960 submitted to the Western Nigeria Government .

(b) The Oldman Commission Report of 1961 submitted to the Northern Nigeria Government

(c) The Dike Commission Report of 1962 submitted to the Eastern Nigeria Government.

(d) Ashby Commission Report of 1960 submitted to the Federal Government.

Some of the commissions' reports in the regions included the recommendation that science and agriculture should be taught at the primary school level. On secondary school science, Dike Commission in its report stressed that-science teaching should be overhauled in such a way that qualified teachers should be employed and that laboratories should be adequately equipped.

In its own report to the Western Region Government, Banjo Commission submitted that all modern schools should be converted to junior high schools with such curriculum offerings as science, pre-vocational and pre-technical subjects, and that the Grammar schools should be converted to senior secondary schools. In fact, the establishment of the Aiyetoro Comprehensive High School was a result of the Banjo Commission's report. The school, like its counterpart in Port-Harcourt, was established to advance the teaching of science and technical subjects. The subjects being offered included among others, general science, physics, chemistry, biology, woodwork, metal work, auto mechanics and electronics. Within the first three years, general subjects like Mathematics , General Science , pre vocational and pre-technical subjects were taught. Those who could not continue with the second stage could go to trade or vocational centres or seek employment. The second stage was the

senior secondary of two years after which the candidate could sit for the West African School Certificate examinations. The third stage was the sixth form of two years leading to Higher School Certificate.

If there is any commission that shaped the Nigerian educational system more than any other in the 1960s, it was the report of Ashby Commission. It made recommendations for primary, secondary and tertiary education. In response to the Ashby Commission report, the Western Nigeria Government directed that no grammar school should be established without the provision for science laboratories-in most cases physics, chemistry, and biology-while the Eastern Region Government ensured that some Grammar schools had technical streams. There was also expansion of vocational/technical education.

Thus, craft schools, trade centres, technical and vocational institutions were established throughout the country. The following table shows the position of technical /vocational education in the country between 1962 and 1970:

Table 5

Technical/Vocational Education in Nigeria, 1962-1970

Year	No of Schools	Total Enrolment
1962	32	7,241
1963	31	7,355
1964	39	10,085
1965	63	12,756

1966	66	15,050
1970	65	13,421

Fafunwa (1974)

Apart from the above, the departmental training in the United Africa Company, the Railways, Post and Telegraphs and so on continued.

The apex of the Ashby Commission recommendations was the establishment of four more universities with science based-professional courses. The University College, Ibadan, only had such-science related faculties as agriculture, science and medical school when it was established. The following were the universities established and the courses offered in the 1960s:

Table 6: Nigerian New Universities and Courses offered in the 60s.

University	**Year**	**Science related courses**
1. University of Nigeria, Nsukka	1960	Agriculture, Agricultural Engineering, Engineering, Science, Architecture, Veterinary Science, Medicine, Pharmacy
2. University of Ife (now, Obafemi Awolowo University Ile-Ife)	1962	Agriculture, Science, Medical Sciences, Agricultural Engineering
3. Ahmadu Bello University, Zaria	1962	Agriculture, Science, Veterinary Science, Engineering, Architecture
4. University of Lagos	1962	Medical School , Faculty of Science, Faculty of Engineering

The establishment of these universities led to the expansion of science teaching at the secondary school level. In fact, sixth form science became very popular. Even then, according to Stone (1960), Wood Robinson (1966) and Engels (1967), there were inadequate staffing for science-teaching and inadequate science equipment. However, Fasemore (1970) reported that established schools in Lagos and Western states were better equipped.

The apex of the euphoria for science education was reached in 1969, when the National Curriculum Conference was held. The effect of the conference, through the introduction of the 6-3-3-4 system of education is still being felt till now (National Policy on Education, 2004). The conference examined "the role of science and technology in development and recommended, among others, as follows:

1. Science should be taught at all levels of education.
2. More science teachers and scientists should be trained.
3. More science laboratories should be provided.
4. Technologists and technicians should be trained in sufficient quantity and quality.
5. Science teaching in schools should be improved.
6. Science and technology should be introduced into all training curricula.
7. Science curriculum development centres should be established all over the country.

8. Science and technology curricula should be diversified to permit the teaching of pure and applied sciences in our secondary schools and teachers training colleges.
9. Financial assistance should be provided to interested groups in science and technical education .
10. The importance of the understanding and application of science rather than the mere passing of examinations should be emphasized.

(NERC, 1972)

Immediately after the conference, a seminar was held in 1973 and this led to the publication of the first edition of the National Policy on Education (NPE)in 1977. It has since been revised in 1981, 1998 and 2004. Still based on the conference, another seminar supervised by the Nigeria Educational Research Council (NERC) was held in Bagauda in 1980. The report of the seminar came up with the philosophy of **developmentalism**, whereby science and technology formed the nucleus of the curriculum offerings. In terms of science and technology, the following were proposed for the primary, junior secondary and senior secondary levels of education.

Primary Level

The curriculum should be designed, among others, around integrated science and technology, agriculture and home economics, and mathematics.

Figure1: Junior Secondary School Level

Seven areas of the curriculum are suggested here with the agriculture, technology and home economics category as the nucleus of the curriculum

Probable combinations in line with NPE (2004) could be:

English Language, Social Studies, Yoruba Language, Hausa/ Igbo Language, French, Mathematics, Integrated Science, Introductory Technology/Building and Woodwork/Automobile and Metal Work, Physical and Health Education, Agriculture , Business Studies, Religious Knowledge.

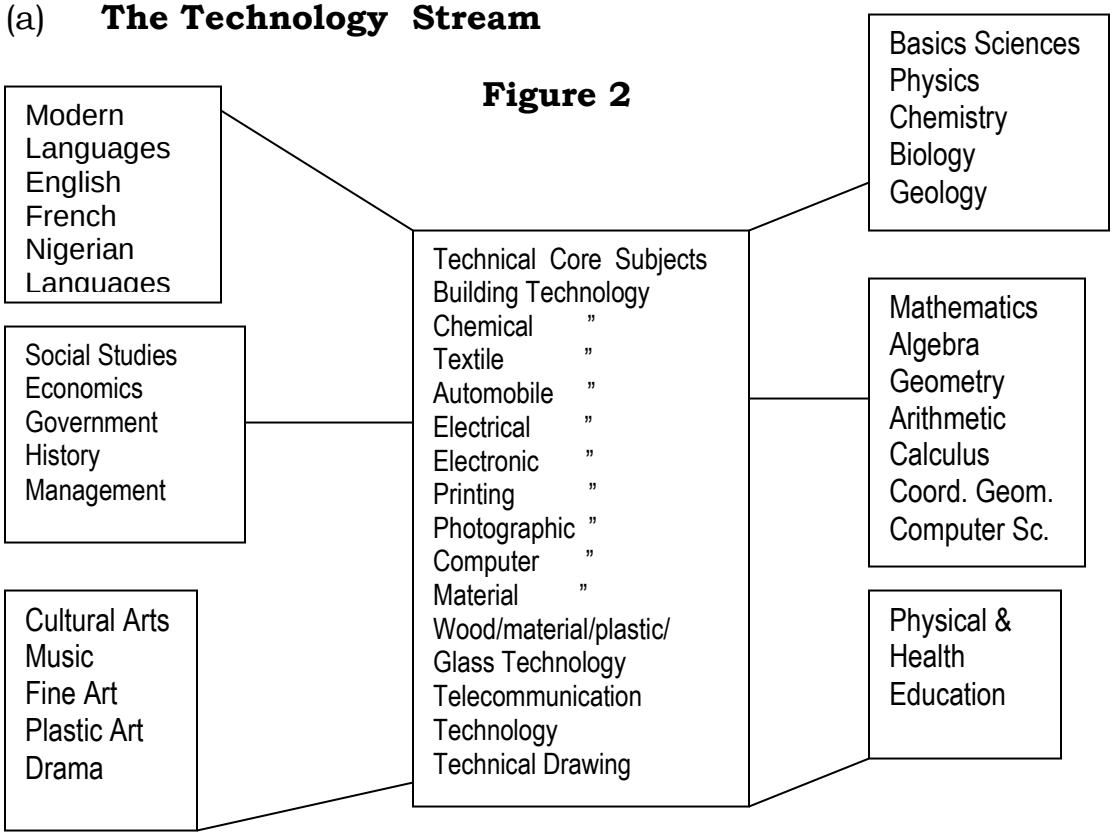
Each student should take a minimum of 10 and a maximum of 13 subjects. Computer education can be added to the core subjects.

Senior Secondary School Level

Four streams related to science and technology were proposed.

(a) **The Technology Stream**

Figure 2

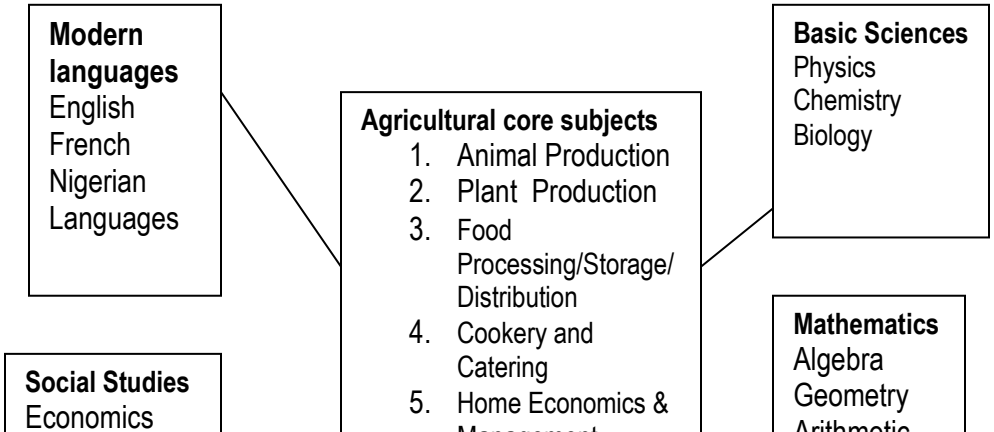


Probable subjects that could be taken by students are, Physics, Mathematics, Chemistry, Building Technology, Technical Drawing, English Language, French Language , a Nigerian Language, Fine Art, Economics.

Subjects taken should not be more than ten.

(b) **Agricultural stream**

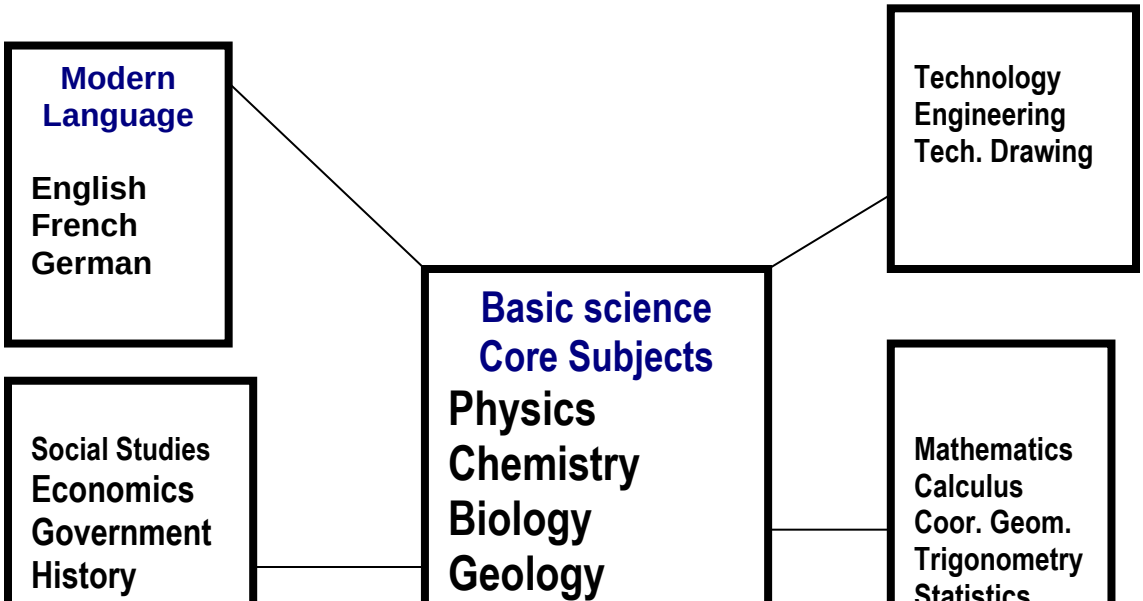
Figure 3



Probable subject offerings: English Language, French, a Nigerian Language, Animal Production, Animal Food Processing Rural Technology, Mathematics, Biology, Chemistry, Physics, Management.

(c) **The Basic Science Stream**

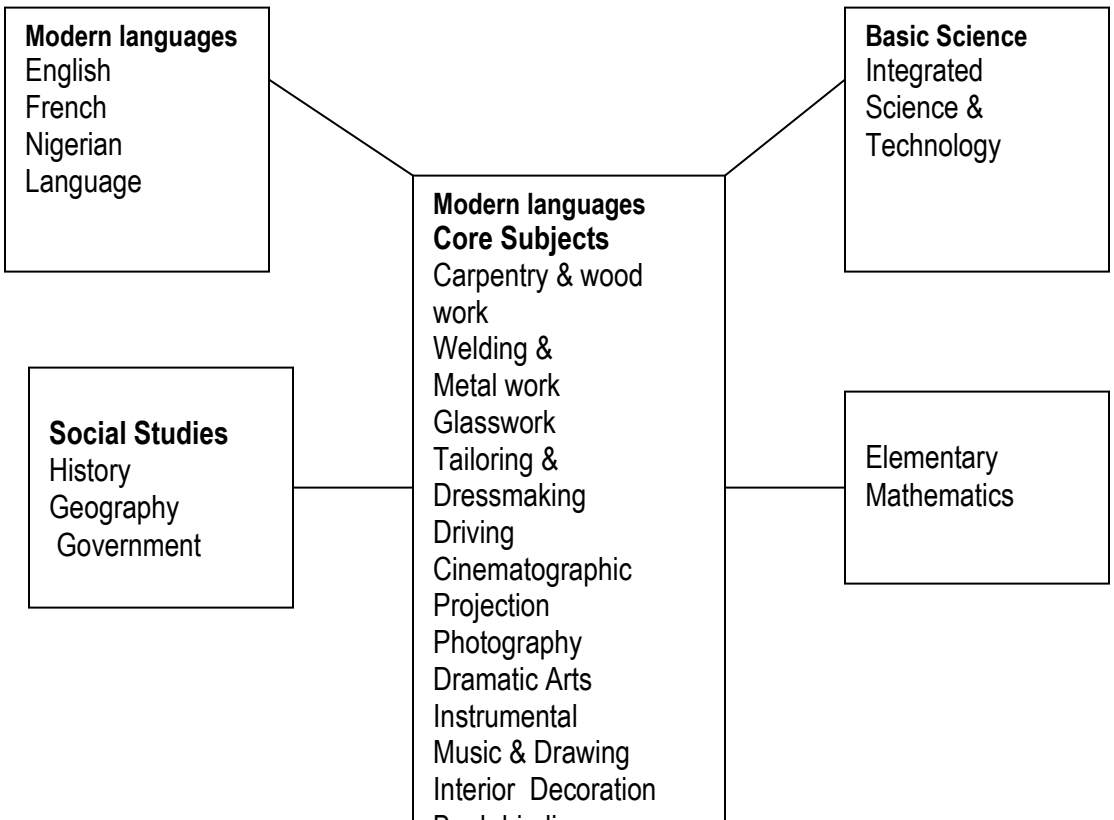
Figure 4



We are all conversant with this.

(d) **The Arts and Crafts Stream**

Figure 5



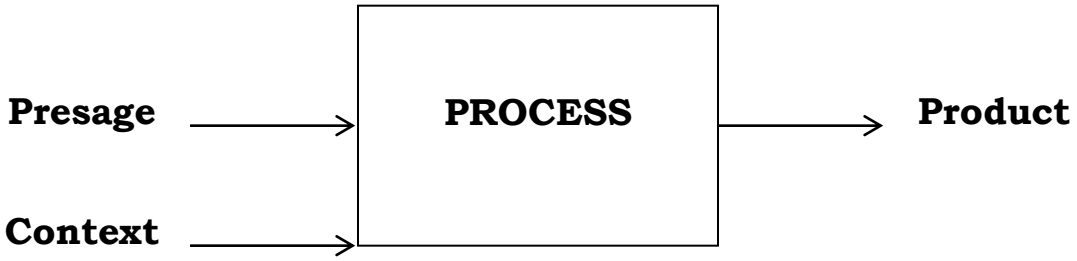
Possible combinations : Photography, Cinematographic Projection, Interior Decoration, Driving, Dramatic Arts, Government, English, a Nigerian Language, Integrated Science and Mathematics.

Apart from designing these curricula in line with the philosophy of developmentalism between 1960 and 1976 the euphoria was so high that more university, polytechnic and college of education students were encouraged to study science, science-related courses, and technology through bursaries and scholarships from federal and state governments, voluntary agencies and communities.

However, the inadequate implementation of science and technology programmes at the primary, junior secondary and senior secondary school levels marked the beginning of frustrations in science and technology education in Nigeria.

THE FRUSTRATIONS

This is treated using the following model:



The presage and the context variables are the inputs into the system to facilitate teaching and learning. The presage variables deal with the characteristics of the teacher - qualification, experience and so on while context variables are the classroom/laboratory characteristics - availability of furniture, apparatus and materials. The process variables include the following:

Teacher ⟶ Student interaction

Teacher ⟶ Material interaction

Student ⟶ Student interaction

Teacher ⟶ Student ⟶ Material interaction

The product variables are the intended learning outcomes in terms of cognitive, affective and psychomotor achievements.

For the implementation of science and technology education to be successful the following inputs should be made:

(a) Well designed curricula in science and technology for various levels

(b) Teacher training programmes for effective handling of different curricula

(c) Building programmes for the implementation of different subjects of the curricula

(d) Equipment programme to facilitate classroom teaching

(e) Placement programme to take care of those graduating at every level of the system.

It can now be examined how frustrations set in in terms of science and technology education at every level of the educational system.

Primary School System

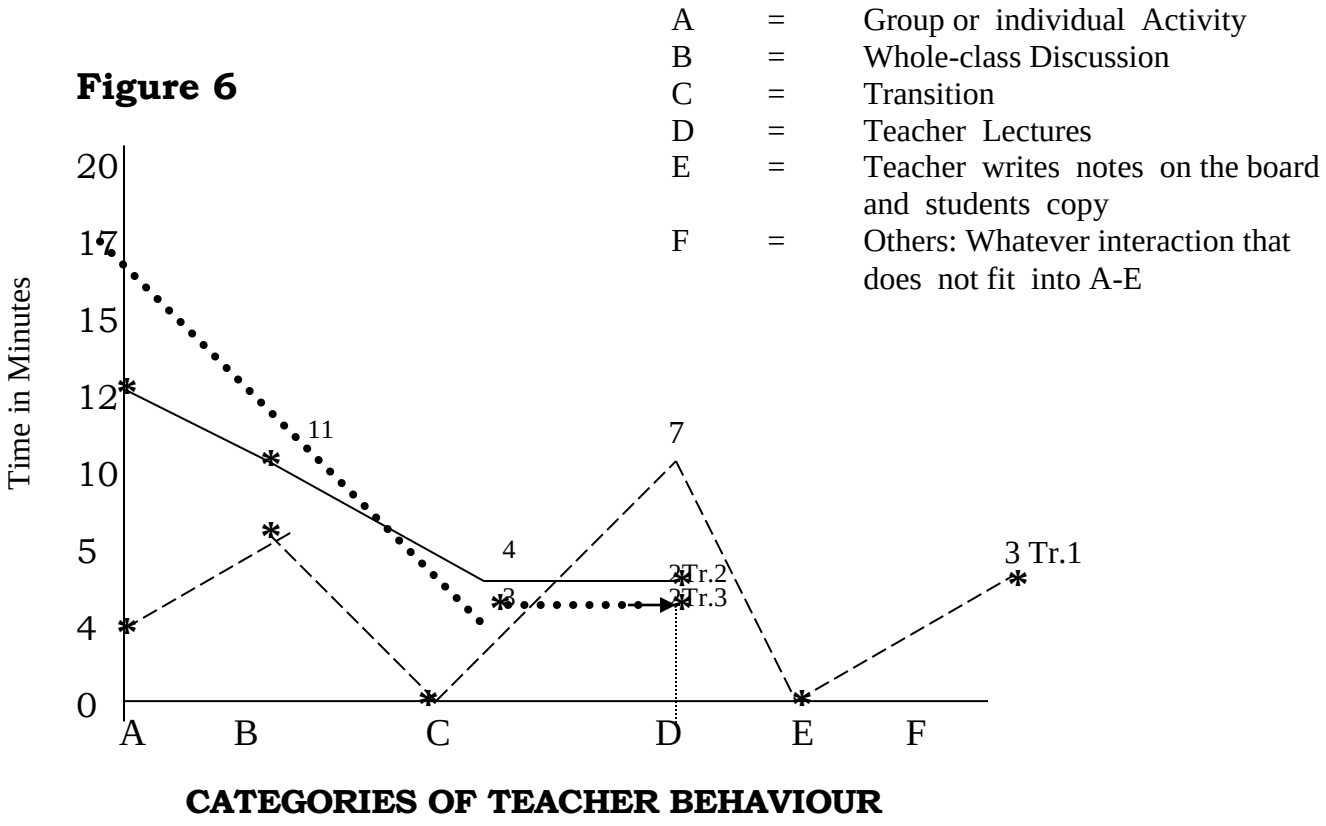
The frustrations here were as a result of ill preparation for the programme. For instance, the National Policy on Education was published after the programme had started - 1977. Thus, curricula for primary science, agriculture and home economics had not been constructed. The mass training of teachers started with the introduction of the programme. New buildings, science kits and laboratories were not in place. If this is compared with the 1955 take-off of the free primary education of the Western Region, one would agree with me that the Federal Government started the frustration right from the beginning of the programme. The inputs in terms of well-trained teachers, provision of infrastructural facilities and equipment were not there. In the case of the Western Region, the regional government spent three years on preparation (1952-1954). Primary school curricular offerings were restructured for six years, more teacher training colleges were built, more classroom buildings were erected and preparation were made to pay the teachers as and when due.

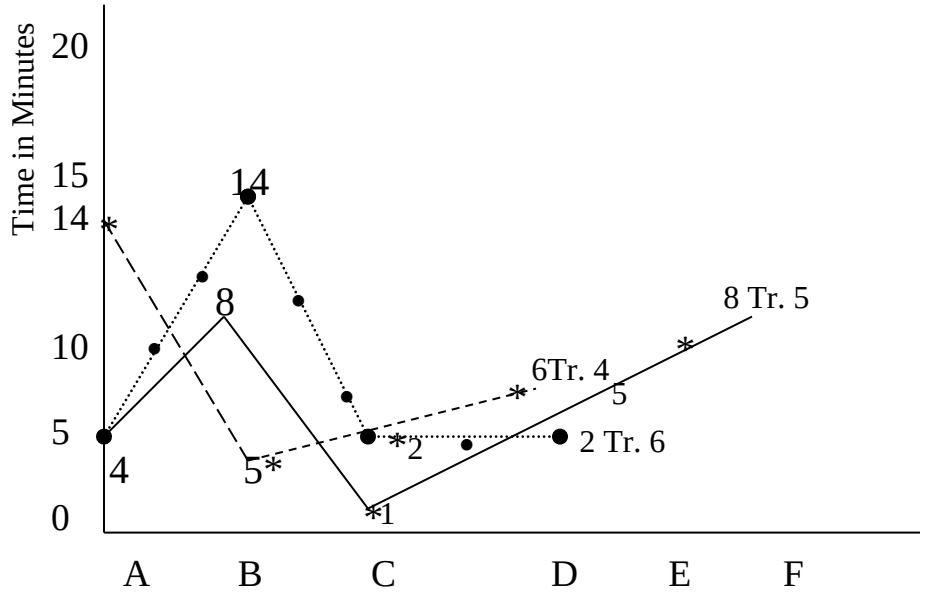
For instance, for the 1976 UPE the science kits were not imported until the early 1980s, most of the primary school teachers could not make use of them and, of course, many experts questioned the rationale for the importation of the kits, when our local industries could produce them.

However, in order to make sure that the science and mathematics curricula are well implemented in our primary schools, Nigerian

Educational Research Council (NERC), now Nigerian Educational Research and Development Council (NERDC), embarked on real Curriculum Development Project in these subjects. Thus, materials for primary science were developed and pilot teachers were given in-service training in each state with the hope that it would spread to the Local Government Areas. I participated in the Project in Minna in 1988. The pilot teachers were trained for six weeks. I used some instruments to evaluate their teaching patterns and the attitude developed towards primary science teaching. Apart from the fact that the teachers developed favourable attitude towards primary science teaching, they also exhibited the following teaching patterns:

Figure 6





Source Odubunmi, 1991

There was no pilot teacher that never spent some minutes on category A. If this project had continued, many primary science teachers should have improved on their science teaching. However, this project could not continue for reasons best known to the Federal Government. Thus, the yearning of science educators, teachers and NERDC to expand the programme into the local government areas of the whole country was frustrated. How is science teaching faring in our primary schools presently?

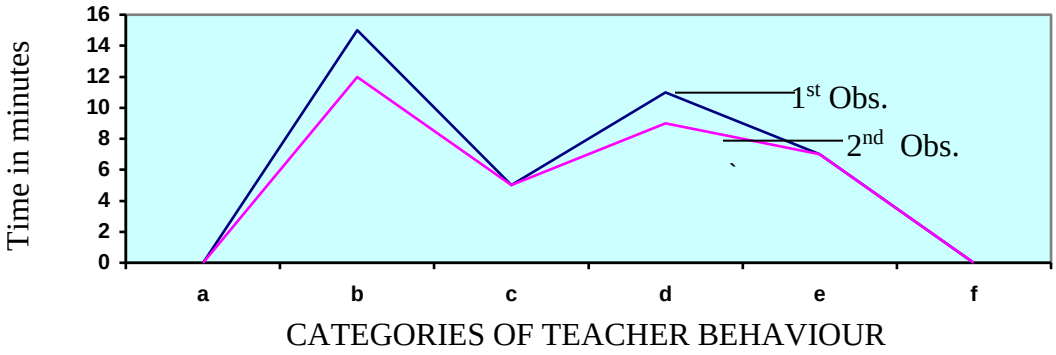
To answer this question, an M. Ed. student of mine surveyed some private and public primary schools for science teaching. Aregbede (2005) found the following.

(a) 50% of the private schools surveyed had no apparatus.

(b) Only 10% of the public schools had apparatus.

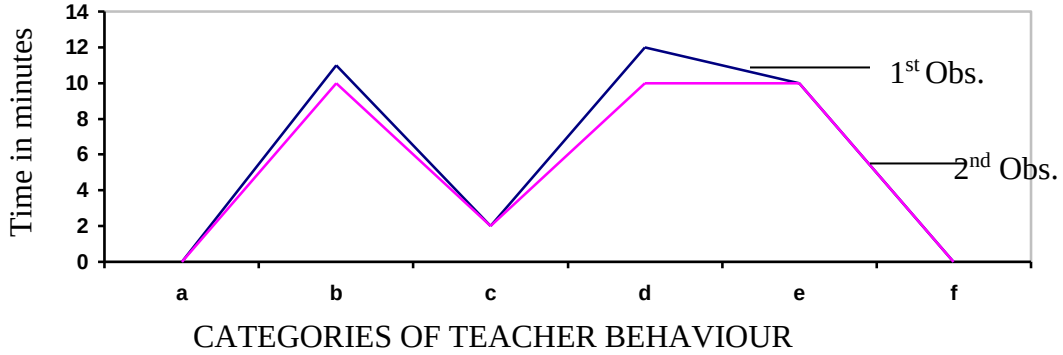
(c) All were using their normal classrooms for science teaching.

Figure 7: Private school Teacher 1 teaching strategies
Sex: Female; Topic: Inclined plane



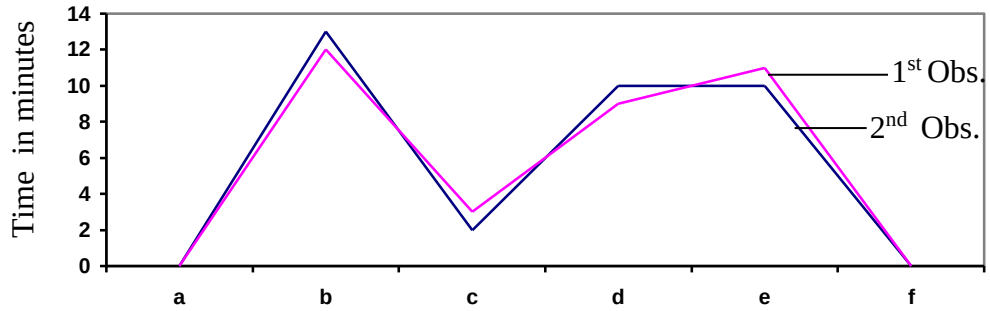
Private school teacher 2 teaching strategies

Sex: Female; Topic: Friction



Private school teacher 2 teaching strategies

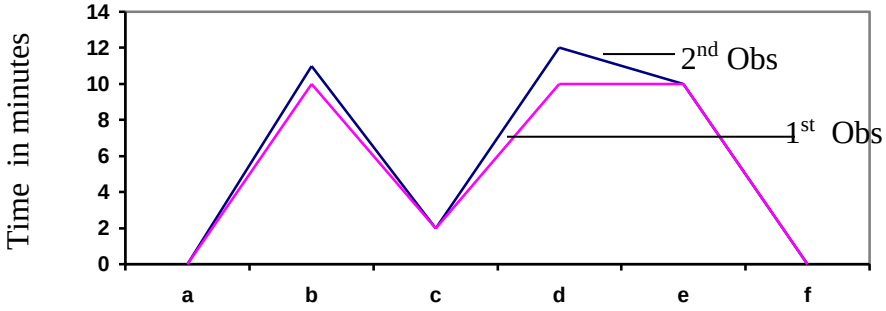
Sex: Female; Topic: Simple machine



CATEGORIES OF TEACHER BEHAVIOUR

Public school teacher 1 teaching strategies

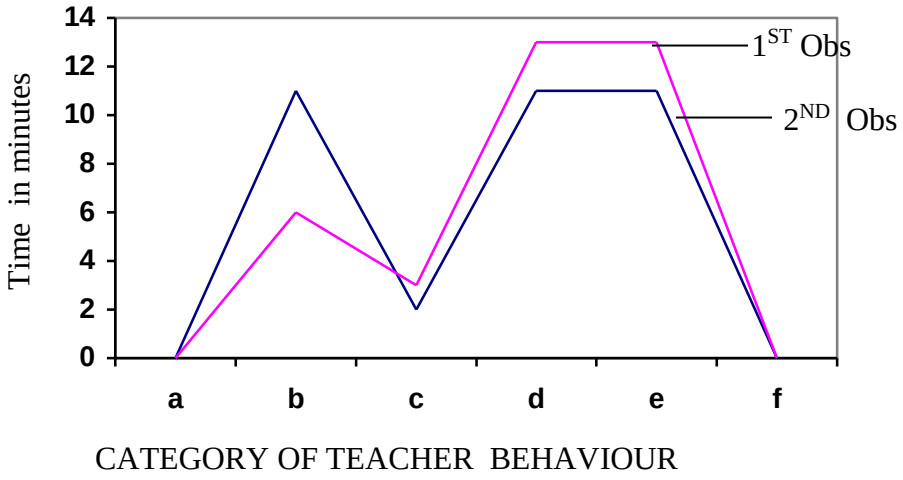
Sex: Female; Topic: Classes of Lever



CATEGORY OF TEACHER BEHAVIOUR

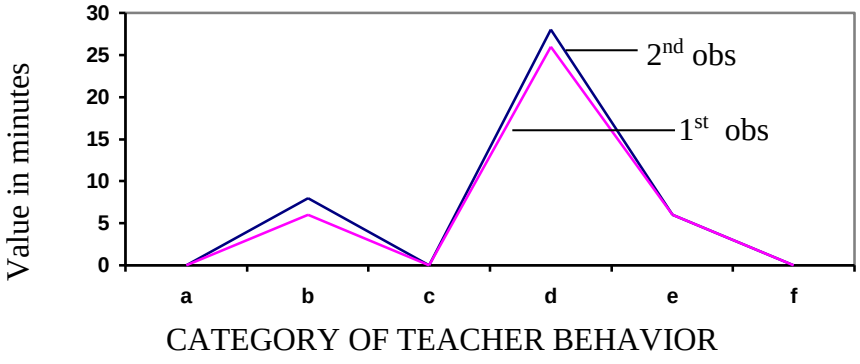
Public school teacher 2 teaching strategies

Sex: Female; Topic: Classes of Food



Public school teacher 3 teaching strategies

Sex: Female; Topic: Inclined plane



The Junior Secondary School Level

The integrated science and introductory technology curricula are well designed. Integrated science is a course devised to make pupils

(a) gain the concept of the fundamental unity of science

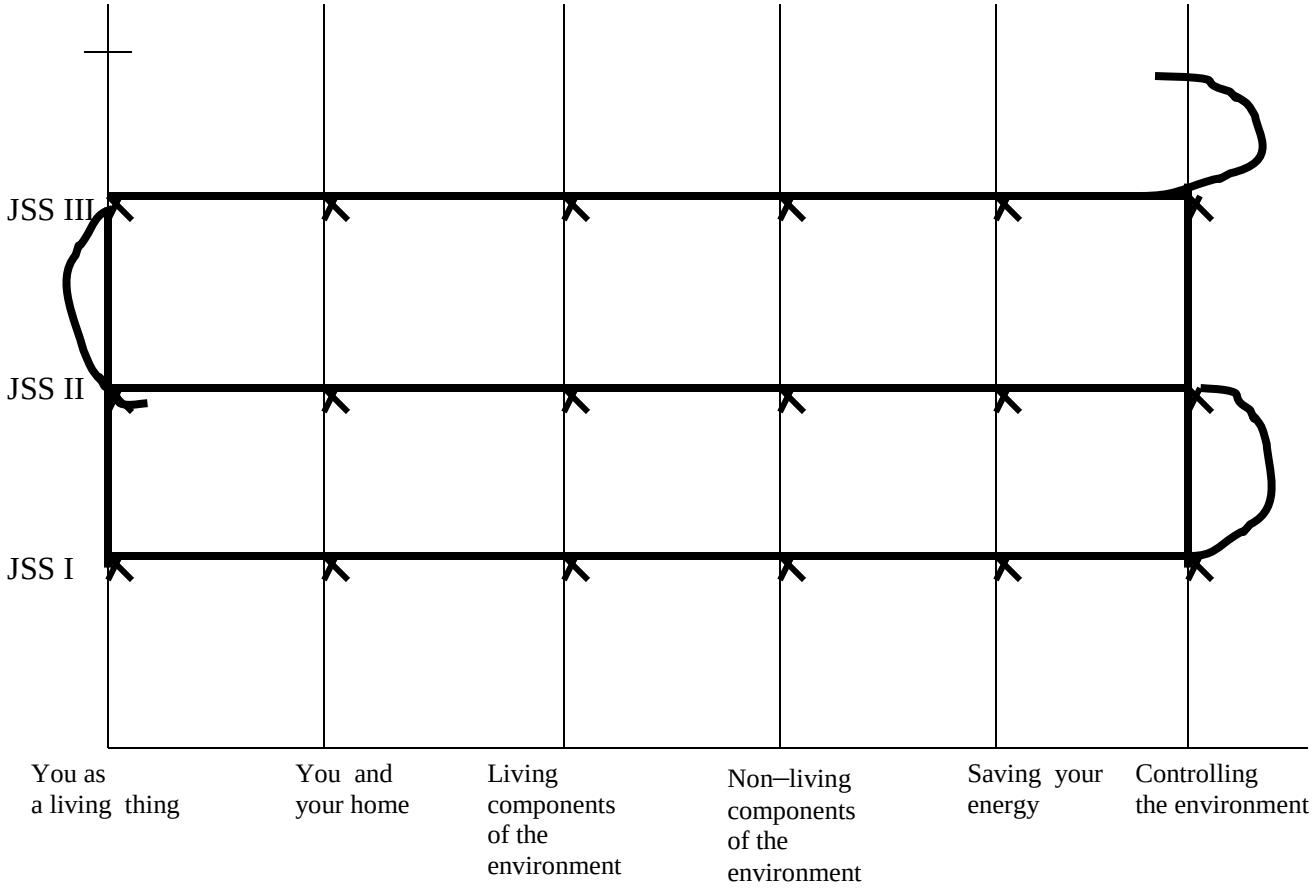
(b) gain the commonality of approach to problems of a scientific nature

(c) be helped to gain an understanding of the role and function of science in everyday life and the world in which they live. (FGN,1981)

The integrated science curriculum is based on the thematic approach. The curriculum was not trial–tested before its introduction into schools. Thus, teachers were not familiar with the programme before total installation. In fact, teachers, since 1970 when the curriculum newsletter was published by STAN, were not trained specifically for the teaching of the subject until in the late 1980s and early 1990s. Till now, many universities, including Lagos State University have not introduced the curriculum within the regular programme.

One of the problems facing integrated science and introductory technology teaching is the non-understanding of the structure of the curricula by the teacher. Odubunmi (1988) explained the structure of the integrated science curriculum thus:

Figure 8: Organization of Integrated Science Curriculum

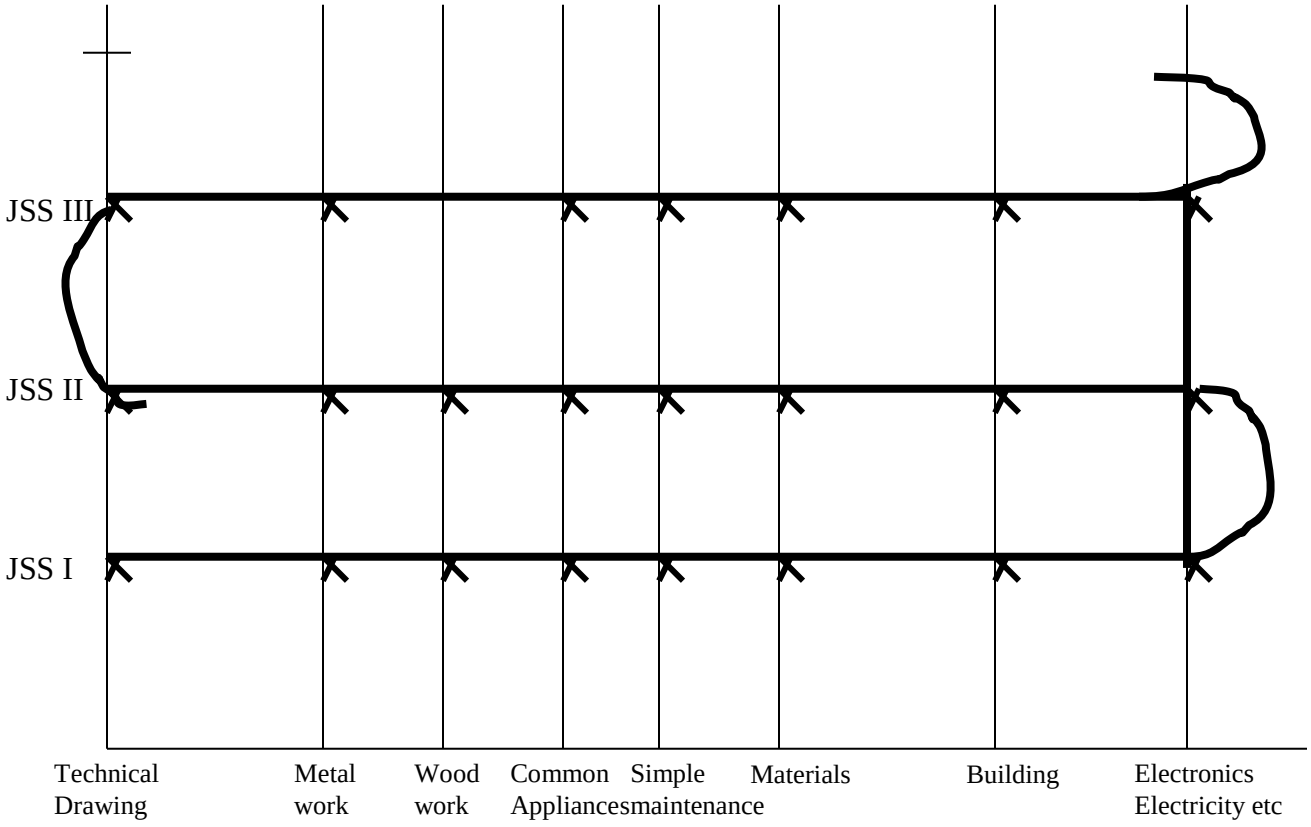


Integrated Science Themes

According to this organization which is "spiral" in nature, the vertical dimension indicates sequential arrangement of each theme from simple concepts to complex ones while the horizontal dimension deals with the coverage of the programme and the relationship between the themes. However, for integrated science to lay adequate foundation for subsequent learning in biology, chemistry and physics each year's work should be adequately completed, using guided discovery method. This has not been so in most of our public schools. The result is that the last three themes non–living components of the environment, saving your energy and controlling the environment, might not be taught at all or hurridly taught. Thus, the foundation for subsequent learning in chemistry and physics is poorly laid. Another problem is that where there is no special teacher for integrated science teaching, a teacher of chemistry, physics or biology may only teach chemistry, physics or biology topics:

For introductory technology, the following is the structure.

Figure 9: Organization of Introductory Technology Curriculum

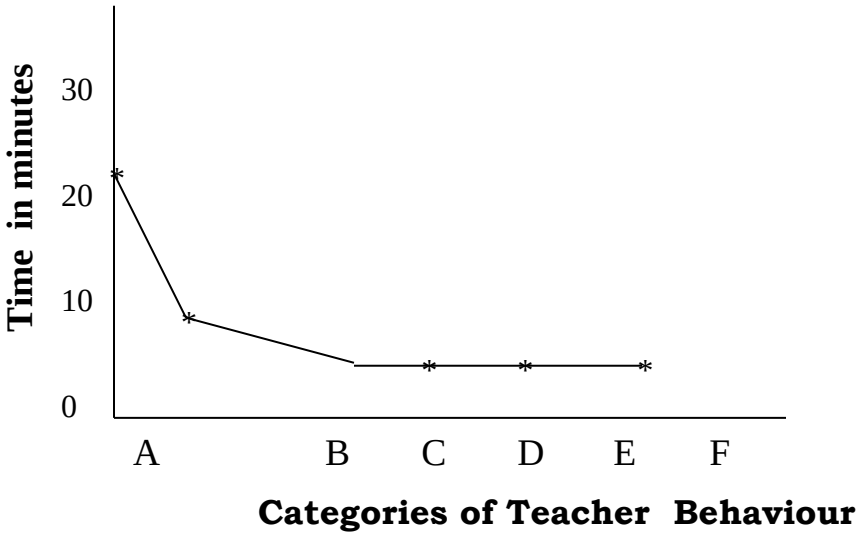


Introductory Technology Areas.

The students are to be exposed using activity based method.

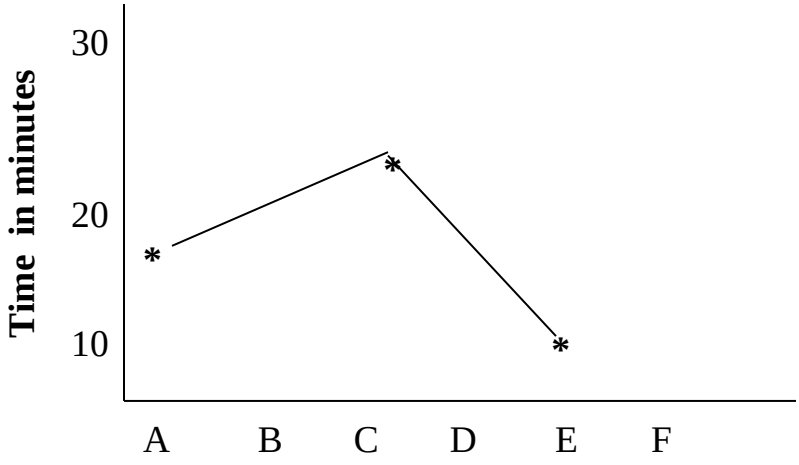
Mr. Vice–Chancellor, Sir, I started my research work in integrated science (1980 and 1981); I have since followed it up especially to determine how classroom teachers are handling the subject. For a teacher to teach integrated science according to its philosophy and objectives with the observational instruments I used, his/her teaching should depict the following:

Figure 10



The following are some of my findings concerning integrated science teaching (Odubunmi, 1980):

Figure 11



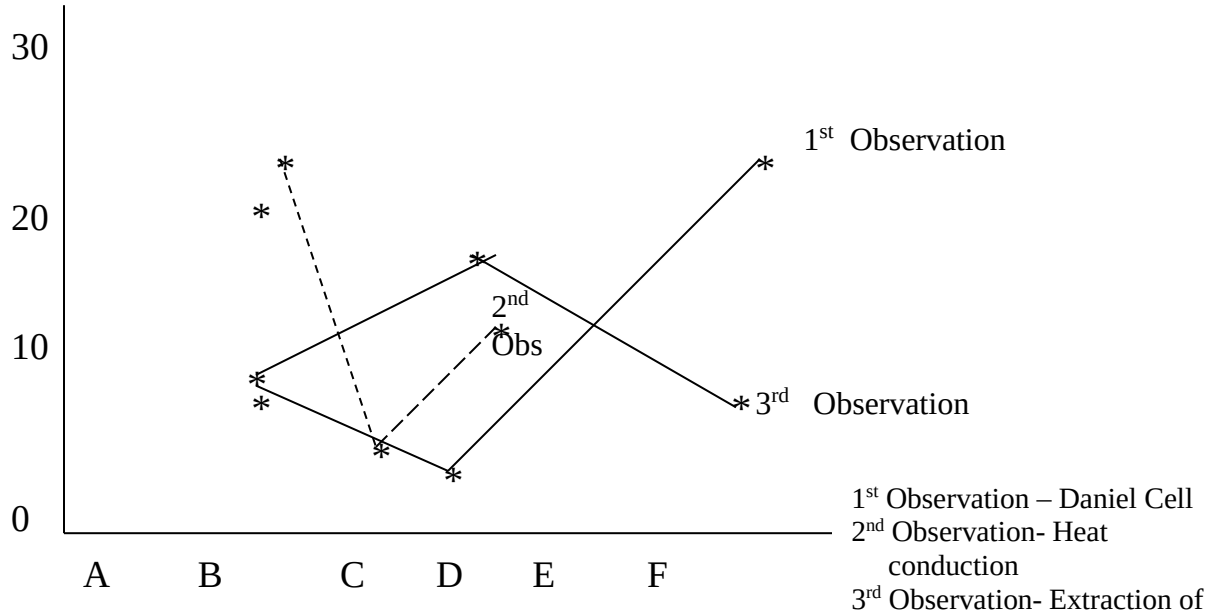
Categories of Teacher Behaviour

Here the teacher spent twelve minutes on whole class discussion, twenty minutes on lecturing and eight minutes on writing notes on the board. When there is whole class discussion without the students interacting with materials, then the discussion is in the abstract.

In 1981, I put eight teachers on three observations while teaching integrated science, only one of them followed the teaching pattern according to the philosophy and objectives of integrated science for one lesson. Below are the patterns of teaching of the two of the teachers.

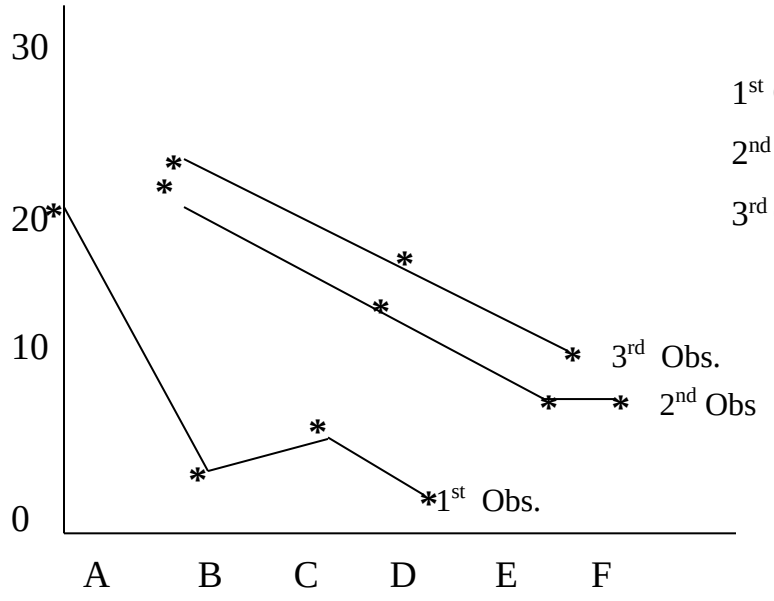
Figure 12

MIXED SCHOOL



Categories of Teacher Behaviour

UNISEX FEMALE SCHOOL



1st Obs = External Features of house fly

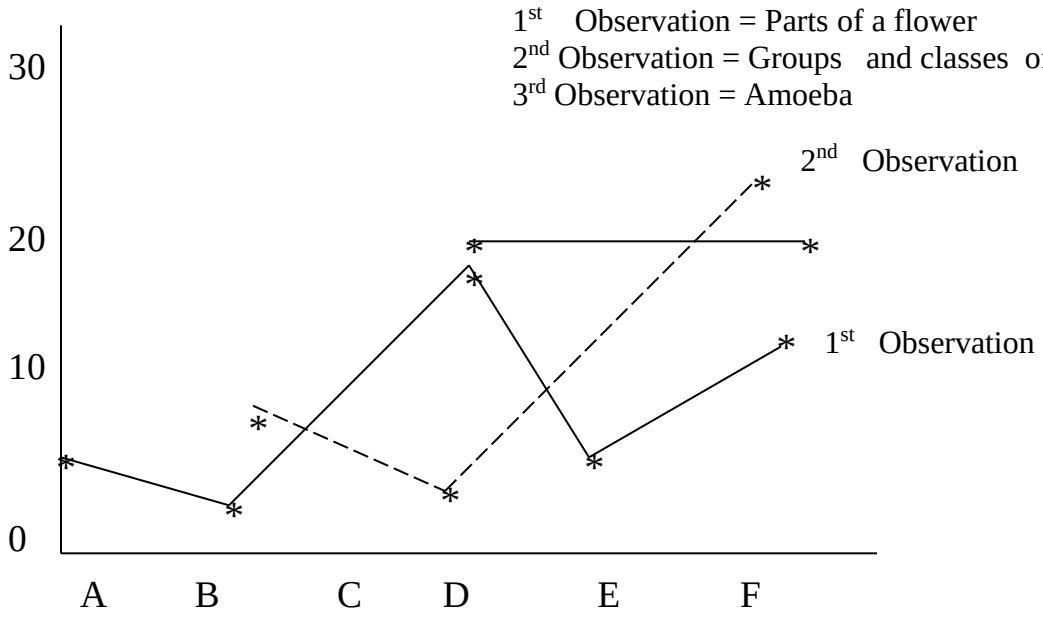
2nd Obs = Photosynthesis

3rd Obs = How energy is transferred

CATEGORIES OF TEACHER BEHAVIOUR

(Odubunmi, 1986)

Figure 13



CATEGORIES OF TEACHER BEHAVIOUR

In 1986, similar teaching patterns were exhibited by pre-service science and technical teachers. The non-teaching of integrated science by most of the junior secondary school teachers in line with its philosophy and objectives is in itself frustrating because adequate foundation is not being laid for the majority of our junior secondary school students to study physics, chemistry and biology at the senior secondary school level. The majority of our students, when they do, out of sheer interest, perform poorly at the end.

Benjamin (2003), having observed some integrated science teachers (for his Ph.D thesis) from some local education districts of Lagos State, asserted:

> Although majority of the teachers (52%) indicated their beliefs in the importance of student engagement in class activities, this view was never reflected in their description of the roles played by the students during their last integrated science lessons. The students in the case study classes played mostly passive roles of listening, answering questions observing the teacher and copying notes in most of the lessons.

Having found that teachers were not employing the right method of teaching science, it was then decided to determine whether students, when exposed to the right type of teaching strategy – sandwiching theory with practicals – would perform better. In the experiments performed (Odubunmi, 1983, 1986; Odubunmi and Balogun; 1991; Odubunmi 2003), it was found that when guided – discovery method which is inquiry based is employed, students'

cognitive, affective and skills and processes achievements are enhanced. Four findings, apart from the ones mentioned above, stood out clearly:

(a) That a student with high IQ will achieve well, knowledge wise, even under chalk and talk method.

(b) No matter how intelligent a student is, if he/she has not been involved in observation, experimentation and so on , he or she will not perform well in process skills.

(c) The use of guided–discovery method, which is activity oriented, will maximally enhance the performance of students with low socio-economic background.

(d) Students with low IQ exposed to guided–discovery method performed better than those exposed to chalk-and-talk method.

In terms of teaching facilities for integrated science, Odubunmi (1981) found that 31% had no laboratory for students' use and those which had, had no separate laboratories for integrated science. In Lagos State schools, it seemed that in many schools (secondary) the senior schools had hijacked the laboratories, hence the junior high school students had no laboratories. Agusiobo (2,000) stated that integrated science teachers' non-use of resource materials might be due to non-availability in the school or that teachers were not conversant with their use. Whatever be the case, it seems that infrastructural facilities and equipment needed to teach integrated science are not adequate.

Another area that is frustrating for science and technically oriented students at the junior secondary school level is the area of

placement after completion. Owing to inadequate arrangement and because the next stage of learning is not adequately provided for, many of the students that can be streamed into technical/ vocational schools, or arts and crafts schools, fall out of the school system to become miscreants. Students, after completing their JSS course, can be placed thus:

(a) Technological stream: Some students can be placed here- Technical Colleges can absorb them

(b) Agricultural stream: There can be senior secondary school for agriculture this will be explained later.

(c) Basic science streams: From their abilities and interests, students are placed here. In some states there are science schools.

(d) Arts and crafts stream: All those that cannot fit into any of the above or even liberal arts/ social science can fit in here, and that is why it has been advanced that for the 6-3-3-4 system of education, if well implemented, there is no failure.

The Senior Secondary School Level

At this level also, the curriculum is well designed and it follows the spiral curriculum pattern. For this level to take care of the students from JS3, six streams are proposed, four of which are science and technology related. If the curriculum is suitable and the streams to which students should be placed are not there, then a gap has been created.

Another serious problem is that where the streams are provided, such as the basic sciences and technical subjects, are teachers adequately prepared to handle the basic sciences and technical subjects? Wasagu (1998) posited that ... our teachers need all the exposure both in breadth and depth to sciences which represent the basis for which they are called science teachers.

Odubunmi (2001) asserted that,

> The reasons for poor performance of science teachers go beyond the non-grasp of the subject matter, it includes inadequate exposure to pedagogical knowledge, pedagogical content knowledge , pedagogical skills and research and evaluation knowledge

He therefore advanced that **"once the science curriculum (or any curriculum for that matter) for which teachers are to be prepared is designed, the next step is to identify what the pre-service Teacher Education Programme should entail".** This has not been the case for the science and technology education, hence the poor implementation at the classroom level. I have since suggested the following five areas for the training of science and technology teachers (1) content knowledge (2) pedagogical knowledge (3) pedagogical content knowledge, (4) pedagogical skills (5) research and evaluation knowledge (Odubunmi, 2001)

Facilities and Equipment for Science and Technology Teaching

If curricula are well–designed and science and technical teachers are well–trained, the inadequacy of facilities and equipment can adversely affect the classroom implementation of the curriculum. For senior secondary school science, many science educators for more

than two decades now have been reporting the inadequacy of science facilities (Odubunmi, 1981; Maman, 1985; Alli, 1986; Okebukola, 1986; Ango, 1986, Nwokocha and Tanko, 1998; Baikie, 2000; Owolabi, 2000; Ajeyalemi, 2002; Salau, Omole and Akinsola, 2002). Comments from two of them are put below:

> Infrastructures such as water, light air conditioning, storage space, preparation space, safety devices… sterile chamber, fume chamber were often insufficient or completely absent in many secondary schools… sometimes some instruments and equipment may be in state of disrepair, may be inadequate or not available at all (Ali, 1986).
>
> **The pressing inadequacy and in some more serious situations, near absence of teaching aids, laboratory equipment, reagents, chemicals, laboratory space etc are well known to most of us, if not all of us. (Baikie, 2000)**

Apart from the above, there are cases where though the facilities are available yet teachers fail to make use of them because of lack of knowledge and skills to do so.

The inadequate facilities for science technology education and lack of knowledge and skills to make use of them by teachers have affected science classroom/laboratory interactions. Odubunmi (1993) found that students perceived their biology, chemistry and physics lessons to be more of note–taking as teacher lectures, use of charts and copying of notes from the chalkboard in some schools in Lagos.

The following are some observations of Adam (2005) of biology classrooms in some public schools in Lagos:

> Teacher D, Topic = Nervous co-ordination Considering the importance of this topic, there are however, factors that deter students from its understanding in this particular class… the teacher was not competent to handle the subject … The

teacher spent 75% of her time talking to student in the name of lecture, 25% for uproar and noise in the class.

Teacher H Topic = Living things

Here the students sitting arrangement was poor, as all the students sat on the floor because of lack of furniture. The teacher tried to make sure that she explains the concept taught to the student referring them to things they see in their environment everyday by spending 70% of her time lecturing, 12.0% for note taking and 20% to advise due to problem of class control.

The question is what intervention have we made to improve the teaching of science and technical subjects in our schools? The Department of Curriculum Studies, unit of science and technical education intervened in the following ways, among others:

(a) Mounting a course on the improvisation of science apparatus and the use of alternative materials for science teaching;

(b) The use meta-cognitive strategies and co-operative learning to handle large classes;

(c) The use of inquiry-discovery method, especially guided–discovery method, to train our students on the use of process skills; However, the department has not got any laboratory to effectively handle this;

(d) Teaching our students on how reading with annotation can be incorporated into the method of teaching science and technical subjects.

Improvisation according to NERC (1987), "is the making of substitutes from available materials when the equipment is not available." In this course, students are made to use local materials

to improvise for science equipment. Also students are led to identify alternatives to materials. Thus, alternatives to starch, indicators, some acids, hydroxides and so on can be sourced for.

Our efforts in the unit include making the results of our research in concept–mapping (Okebukola, 1984, 1992; Olumide et. al, 1987). Co-operative learning (Okebukola and Ogunniyi, 1984; Okebukola, 1985; 1986a) and guided discovery method (Odubunmi, 1986; 1987, 1991, 2003) reflected in our lectures; it has also crystallized in the topic of our first Ph.D product (Oke 2003). This thesis eventually won the first position in Babs Fafunwa Foundation awards in 2004. Our framework on the topic was that guided–discovery method should form the background while concept–mapping and reading with annotation should be compared. Our idea of reading with annotation stems out of our classroom experience that an average Nigerian student does not like reading textbooks of basic science; he/she prefers reading question–and–answer books.

Learning Outcomes in Science and Technical Subjects

With the scenario given in terms of curricula designed without trial testing, poor preparation of science and technical teachers to handle the curricula, poor infrastructural facilities and laboratory equipment, the teaching of most science and technical teachers based on lecturing, note–taking and note–giving, then one will not expect brilliant performance of students in the science subjects, building construction, electronics, woodwork and so on.

Generally, there are three main areas of measuring learning outcomes–attitudes developed, process skills acquired and knowledge gained. In terms of attitudes (Odubunmi and Balogun,

1985, 1991; and Ajewole, 1991) found that students generally have favourable attitudes towards science–especially at the levels of the primary and first year of the junior secondary school levels of the school. This is understandable because science permeates every aspect of our lives–health, transportation, communication and so on. However, it has been found that students at the senior secondary school level generally show negative attitudes towards science (Asokhia and Longe, 2003; Aigbomian, 1987).

Thus, if students develop negative attitude towards a subject it may be that they are finding the subject difficult and this can be as a result of poor teaching, poor facilities, peer group influence or uncaring attitude of parents, or a combination of all these. Odubunmi and Tsepa (2002) found that Basotho students perceived the genetics, evolution and microbiology areas of their biology learning as difficult. The probability is that when students find the learning of some concepts difficult and the subject where the concepts are located they may hate such a subject.

Achievement in process-skills is not all that different either. Odubunmi (1987), and Shuabu and Mari (1999) found that students generally exhibit low understanding of science process skills. This is not surprising because students in most cases are not involved in experimentation in science classes. It has, however, been found that when students are exposed to guided discovery method or any other activity based strategies where they interact with materials, achievement in process–skills is enhanced (Odubunmi and Balogun, 1991; Odubunmi, 1987, Oke; 2003).

In terms of the cognitive performance of our students, the following table indicates the percentage of performance in relationship to the numbers of students' entry in science and technical subjects:

Table 7: Performance of Students in SSCE/WASSCE

YEAR	AGRIC SCIENCE		BIOLOGY		CHEMISTRY		PHYSICS		ENGLISH LANGUAGE		MATHEMATICS	
	TOTAL ENTRY	% CREDIT PASS	TOTAL ENTRY	% CREDIT PASS	TOTAL ENTRY	% CREDIT PASS	TOTAL ENTRY	% CREDIT PASS	TOTAL ENTRY	% CREDIT PASS	TOTAL ENTRY	% CREDIT PASS
1991	220,221	21.9	285,690	25.5	116,526	10.4	967,42	17.6	294,568	10.2	294,.079	11.1
1992	273,040	29.70	358,961	27.90	142,379	18.70	124,351	16.2	369,391	11.2	265,491	21.69
1993	378,607	38.56	481,034	18.70	170,537	23.00	152,275	24.5	496,658	13.3	291,755	10.93
1994	395,278	33.10	508,384	11.40	161,232	23.70	146,000	14.7	524,294	14.1	518,.118	16.50
1995	361,973	41.30	453,353	18.90	133,188	36.70	120,768	18.9	464,270	12.4	262.,273	16.50
1996	401,676	22.90	506,628	15.90	144,990	33.50	132,768	12.8	516,196	11.33	514.,342	10.00
1997	490,108	15.20	609,026	15.80	172,383	23.60	157,700	9.4	618,139	6.5	616.,923	7.60
1998	513,130	23.37	637,021	34.45	185,430	21.40	172,223	11.34	636,777	8.48	756,080	11.15
1999	599,101	31.46	745,162	27.81	223,307	31.08	210,271	36.57	757,233	9.71	756,080	18.25
2000	508,369	19.30	639,020	19.31	201,369	31.89	193,052	30.06	636,064	10.82	643,371	32.81
2001	792,986	36.44	995,345	23.25	301,740	36.25	287,993	34.46	104,0101	26.07		36.55
2002	832,949	33.31	1,047,235	31.39	309,12	34.89	298,059	47.66	925,289	24.57	1,07,8961	31.56
2003	738,905	42.59	931,219	43.14	288,324	50.98	280,88	47.56	939,507	29.03	939,.506	36.91
2004	677,497	24.26	838,945	30.83	275,078	38.97	270,028	51.02	844,540	30.27	844,525	34.52

SOURCE: WAEC ANNUAL REPORTS

The table shows that enrolments in physics and chemistry are very low when compared with that of Biology. Except for 2004 physics, no credit level and above had up to 50%. The poor enrolments in physics and chemistry might not be connected with poor teaching, poor facilities and negative attitudes of students towards the subject while the poor performance in biology might be due to all the factors mentioned above with the misconception that it is a soft option. The highest percentage pass in biology since 1991 is 43.14%.

Table 8: Performance of Students in SSCE/WASSCE

Technical Subjects 2000-2004

	B/CONSTRUCTION		ELECTRONICS		WOODWORK	
	TOTAL ENTRY	% CREDIT PASS	TOTAL ENTRY	% CREDIT PASS	TOTAL ENTRY	% CREDIT PASS
2000	198	27.21	227	56.47	408	8.29
2001	489	32.60	238	42.93	595	6.62
2002	215	25.38	183	35.29	621	10.18
2003	288	27.53	336	40.47	542	8.34
2004	216	25.50	290	35.91	519	14.22

Performance of Students in SSCE/WASSCE

Technical Subjects 1991-1995

In a survey conducted by NERDC (2000) SSCE results were obtained from some elite and public schools from the six geo-

political zones. The table below shows the performance of students between 1991 and 1995:

Table 9: Performance of Students in Public and Elite Schools.

Subject	Public Schools			Elite Schools		
	N	A1-C6	F9	N	A1-C6	F9
English Language	145371	8.08	68.03	13146	56.46	17.09
Mathematics	151498	8.90	59.77	12142	40.28	26.90
Biology	126534	16.30	61.97	13495	54.34	13.96
Chemistry	48180	20.68	55.67	6407	49.80	22.01
Physics	44483	18.90	56.52	6407	49.80	22.01
Agricultural Science	99249	30.60	46.18	5113	58.50	15.65
Literature in English	35796	30.98	48.77	4407	65.96	17.04
History	32117	17.21	62.82	2653	53.11	22.43
Religious Studies	75940	41.43	26.07	4031	68.52	9.77
Nigerian Language	90673	53.88	27.45	5922	73.66	13.83
Economics	110629	21.23	49.92	0337	60.25	12.13
Government	45617	20.26	49.31	4168	54.22	17.15
Geography	85436	27.22	55.08	8385	75.28	11.34
Technical Drawing	2897	8.60	54.44	533	34.71	31.33
Food & Nutrition	6741	46.02	24.98	1768	89.31	2.04
Book-keeping	12205	16.80	62.50	993	43.51	26.10
Home Management	9338	66.88	18.73	2339	99.02	0.47
Auto-Mechanics	30	3.33	13.33	-	-	-
Wood Work	1464	7.38	80.67	5	40.0	40.00
Metal Work	169	5.33	52.07	2	0.0	100.00
Applied Electricity	39	30.80	46.15	127	40.94	29.13
Building Construction	175	4.57	72.0	9	33.33	44.44

Generally the enrolments for technical subjects between 1991 and 1995 were very poor. This is a reflection of what happens even in our technical colleges. Also, students from elite schools performed better than their counterparts from public schools in all the science subjects. These elite schools have better infrastructural

facilities, better–equipped laboratories and workshops, and better quality staff strength when compared with the public schools.

Science and Technology Education within the University System

Mr. Vice–Chancellor, Sir, perhaps the scenario for science and technology education in our universities might not even be better.

Salau, Omole and Akinsola (2002) pointed out that, "Some of the more established Federal Government Colleges are better endowed building and laboratory wise than what has come to be called fourth generation universities in Nigeria (those universities established post 1983)". Most universities established after 1983 are state ones, I want to stress that there are some federal universities that lack laboratory equipment and staff, just like state universities.

In terms of curriculum and courses, from my observation of state and federal universities of science and technology, the NUC benchmark has been followed. The main problem is funding which is reflected in the availability laboratories, workshops, lecture halls and so on.

The following statements from both students and lecturers in an on-going study will convince one of the situation not only in our universities of science and technology but also in our faculties of science, engineering and so on.

Student A

> We have shed laboratories and workshops, they are mere houses. We observe practicals.

Student B

> At 100 L I did not see any equipment not to talk of touching. At 200L I did only one practical-Readings taken seven years ago were given to us as practicals.

Apart from the above the staffing situation in some of our faculties of science and science-based professional courses is appalling. (see the table below)

Table 10: Staff–strength in Faculties of a University of Science and Technology as at Nov. 2005

Faculty of Environmental Science

Departments	**No of professors**	**Senior Lecturers**	**Lecturers**
Architecture	_	2 –1 with Ph.D and is on part–time	5 – full time
Dept. of Geog.	1 – Visiting	3 – All with Ph.D but are on part-time	4 –3– with M.Sc 1- GA

Faculty of Engineering

Departments	No of professors	Senior Lecturers	Lecturers
Civil Engineering	–	3 - All Visiting	8 – Part Time & visiting 3 - Regular
Electrical Engineering	Associate Prof - Visiting	3 - All visiting	8 - Part–time & visiting 4 - Permanent staff
Mechanical	1 - Full -time	2 - Visiting 2 - Part- time	3 are regular 2 - Visiting with Ph.D 3 - Visiting with Ph.D

Faculty of Science and Science Education

Departments	**No of professors**	**Senior Lecturers**	**Lecturers**
Mathematical sciences	1 Prof - Visiting	5 4 visiting 1 regular	13 5 with PhD - 4 visiting 8 with M.Sc
Biological Sciences	–	3 - All visiting	6 in all 5 with Masters 1 with B.Sc
Chemistry	1 - Full time	3 - visiting	7 all with Masters
Physics	–	5 - visiting	5 1 on study –leave 1- with masters 3 about to finish masters
Science Education	Yet to take off because the university wants a professor of Science Education		

Faculty of Agriculture and Agric –Technology

Departments	**No of professors**	**Senior Lecturers**	**Lecturers**
Dept. of Agriculture - Animal Science - Soil Science - Crop Science	5 All visiting	10 7 – visiting 3 - permanent All have Ph.D	9 permanent All with masters
Food Science and Technology	1 Associate Prof. visiting	4 3 - visiting 1- Permanent with Ph.D	5 Permanent All with Masters

Even under these constraints, it has been found that some universities of technology and faculties of science, engineering and so on have produced marketable materials but no fund for large productions. Some of these are :

Typhoid vaccine

Threshing–machine

Cassava Pealing machine

Cassava Grating machine.

The frustrations in science and technology education have been highlighted; however, all hope is not lost with the commitment of government, in terms of finding, then science and technology education will move forward.

The HOPES

Mr. Vice–Chancellor, Sir, from what has been discussed so far, one would tend to ask; is there any hope for progress in science and technology education? I will answer in the affirmative that there is hope, if only education, particularly science and technology education, is seen as an investment.

Investment in science and technology education will make the industrial development and economic buoyancy of the nation possible; to realise these hopes, I hereby recommend the following:

1. **Renewed Commitment towards Science and Technology Education**

   From the middle fifties up till middle seventies, various governments in the federation not only funded science and technical education but they also provided Bursaries, scholarships and loans. The present governments should do more. It is a known fact that the federal government, through Universal Basic Education Commission (UBEC) is taking care of primary and junior secondary education. Each state government should fund senior secondary education appropriately. Both federal and state governments should set up commissions or research team to determine the status of science and technology teaching and learning in primary, junior secondary and senior secondary Schools to find out areas that need attention.

2. **Implementing School Programmes**

   The main problem facing our educational set up is that of implementation. Therefore, there should be a section within

UBEC that will be responsible for the implementation of the programmes of the primary and junior secondary schools. Such a body should also be within the states UBEC. Implementation body should be different from the monitoring body. Thus, NERDC should have branches in the states or zones to monitor the implementation up to the senior secondary school level. For implementation and monitoring, special attention should be paid to science and technical subjects.

3. **Diversification of the Senior Secondary School Curriculum**

The curriculum of the senior secondary school should be diversified to include the following science and technical streams:

(a) Basic science stream which can be offered in science schools or normal senior secondary schools

(b) Agriculture stream: Here take the students to a farm settlement, enrich the curriculum as stated earlier and train them in the area of crop production or animal production using modern equipment. Thus, students of crop production should be trained in the use of tractors , planters and so on and should be able to do simple repairs. Since the country is basically agrarian, each state of the federation should do this. States from the old Western Region can revive the farm settlements for this purpose. The

students should take the Senior Secondary School Certificate examination.

(c) Technical/Technological Stream: This is better done at the technical schools now. Most of the technical schools are shadows of Oshogbo, Oyo, Sapele and Ijebu-Ode trade centres of the old Western Region. I do not share the view that technical education is inferior to other forms of senior secondary education. Some of the products of the old trade centres/ technical schools are now lecturers in Polytechnics or even faculties of engineering in our universities. Technical colleges should be established with day and boarding students. It is even possible for a state to establish a school offering science and technical subjects only.

(d) Arts and crafts stream: When a student falls out of the school system, if he/she does not want to be a miscreant he learns a trade. In order for the school system to formalize this arts and crafts school are suggested. It is therefore recommended that each division of a state should establish an arts and crafts school. It may not be necessary to replicate the courses in the schools. These schools should be highly formalized as suggested earlier on, instead of non-formal ones scattered all over Lagos State (Oke, 2002)

4. **Resuscitation of the National Primary Science and Mathematics Projects (NPSMP)**

The Nigerian Educational Research and Development Council should resuscitate the National Primary Science and Mathematics Project through the workshops for the state pilot teachers to the level of local education district of each state. Also curricula in science and technical subjects for the junior and senior secondary schools should be reviewed , developed and tried like the NPSMP. In other words, the curriculum after review, should have the materials tried before total installation.

5. **Provision of Well-equipped Laboratories and Workshops**

There should be laboratories, and workshops in all primary, junior secondary and senior secondary schools. The laboratories and workshops should be well-equipped. In the 1950s and 1960s, it was mandatory for every Grammar school to have laboratory for science-teaching. It is a known fact that integrated science, physics, chemistry and biology cannot be taught effectively without laboratories and hence it is frustrating on the part of the school , the teacher and the student if science or technology is taught without adequately equipped laboratories or workshops.

6. **Science Teacher Education Programme to be Overhauled**

The idea of having departments of primary education in our colleges of education can be cost-effective, but it is not a better option. Thus a college of primary education with boarding

facilities like the one in Lagos State (LACOPED) should be established in every state to effectively train primary school teachers. It should be a generalist/specialist programme. Such pre-service teachers should be exposed to nearly all the subjects for the first two years and specialize in two (i.e, mathematics/primary science) in the last one year of the programme.

The college of education (secondary) should be able to train teachers to handle integrated science, introductory technology, and agriculture at the junior secondary school level.

For senior secondary school physics, chemistry, biology and technical subjects, one would like to suggest an 18 months PGDE programme and a five year degree programme in education. In suggesting eighteen months for the PGDE programme one feels that a prospective teacher should be adequately immersed in pedagogical knowledge and research and evaluation knowledge.

Also laboratories for physics, chemistry, biology and integrated science should be built in the science unit of the faculty for pedagogy and integrated science teaching. Workshops for teaching technical subjects and improvisation should also be provided.

7. **Placement of Pupils/Students after Each Level of Education**

One of the problems facing our educational system is lack of planning for placing our students appropriately at the next level of education. For instance, after primary education, one

expects 100% transition from primary to junior secondary school. Some children may not feel comfortable moving into the next stage (junior secondary school). Such children can be advised to go to an arts and crafts school or a farm settlement where programmes can be mounted for them.

To transit to the senior secondary school level, appropriate planning for placement should be made. Thus, students can be placed into one of the following science and technology related streams after completing the junior secondary school programme:

(a) Basic science stream

(b) Agriculture stream

(c) Technical/technology stream

(d) Arts and crafts stream.

If placement is appropriately planned and executed, then street boys and girls and miscreants will be reduced within the society. Federal and state governments should look into this and set up placement units/departments to work in collaboration with schools.

Most of our students, after completing their senior secondary school programme, focus mainly on entering the university, the polytechnic or the college of education. Students should be advised, while in school, on the opportunities existing in schools of nursing and midwifery, agriculture, forestry, medical laboratory technology and so on. Apart from this, there should be resuscitation of the sixth form and the senior secondary school curriculum should be studied to determine whether it should be a one or two-year programme. Some

of the advantages will include among others (a) having matured students in the university thereby reducing cultism and examination malpractices. (b) It will also give students the time to re-arrange their future in terms of what they want to do.

8. **Decongestion of Large Classes in Public Schools**

As a matter of urgency large classes should be decongested in Nigerian public primary and secondary schools particularly in Lagos State schools where this is very acute.

Mr. Vice-Chancellor, Sir, I cannot but make some recommendations for the university system, having witnessed the good, the bad and the ugly.

Firstly, in the faculties of science, engineering, environmental sciences and the department of science and technology education and also colleges of medicine in our universities, the laboratories and workshops must not only be adequate one will also like to witness, once more, where a student is assigned a microscope, two students to a metre bridge and one student to titrating apparatus. To translate this our hope into reality federal and state governments should give an advance of between Eight hundred million and one billion naira to each university of science and technology, while an advance of between five hundred million and eight hundred million naira can be granted to faculties related to science and technology in our conventional universities .

Secondly, capacity building for science and technology is very crucial for implementation of programmes at the tertiary level; therefore, scholarships should be made available to competent students willing to pursue masters' and Ph.D programmes anywhere in the

world. Such students should be bonded and of course, the university and the federal government should liaise with the foreign universities in such a way that when a student finishes, he/she is flown back to Nigeria. Thirdly, there should be a programme of mass production from the byproducts of science and technology education from our universities. Thus, when a product has been pilot-tested and found marketable, federal or state government can liaise with the Manufactures' Association of Nigeria to provide some funds to make sure that such product is on mass production. Fourthly, I was saddened when I heard that some state governments pay two thousand five hundred Naira as bursary to students. As a student in the 1970s my bursary allowance was four hundred Naira. That was when the exchange rate was about two dollars to the naira. In other words, I was getting about eight hundred dollars. When this is converted using the present rate – N130 to the dollar, the bursary amounts to N104,000,00! I am not saying this amount should be given to each student, but at least each student should be given between sixty and eighty thousand Naira as bursary, knowing fully well that such students would pay tuition fees, feed, and buy books.

Mr. Vice-Chancellor, Sir, my Bible says, "you are going to reap just what you sow " if we invest little in science and technology education we reap little, if we invest much as enunciated in my discourse then the yield will be enormous. Thank you, and remain blessed.

ACKNOWLEDGEMENTS

First and foremost, I have to express my gratitude to God Almighty and my Lord and Saviour, Jesus Christ, Who made it possible for me to weather through life, "Many are the afflictions of the righteous but the LORD delivereth him out of them all." To Him only be the glory Amen.

I have to thank my grandfather Odubunmi Ajadi (eso) Omotekun, a warrior, friend and adviser to Alaafin Oladigbolu III who, following his tradition, enrolled all his grandchildren, especially the first borns into the school system. I have to thank my father and my mother who continued in the same vein after the death of my grandfather.

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Sir, there is somebody here – a woman who has been many things to me - a sister, a companion, a mother, a confidant… for the past 36 years. When sorrow was all over me - sorrow of losing my parents prematurely, sorrow of losing my only younger brother, sorrow of being alone, she came into my life and the sorrows were reduced to the barest minimum. That woman is Deaconess Mariam Oluwakemi Odubunmi (nee Egbinola), the Vice–Principal of Ojo Community Junior Secondary School. She is my wife, my guiding angel, a virtuous woman whose price is far above any jewel.

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SCIENCE AND TECHNOLOGY EDUCATION IN NIGERIA: THE EUPHORIA, THE FRUSTRATIONS AND THE HOPES

21ST INAUGURAL LECTURE

2006

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