

# African Research Review

---

*An International Multi-Disciplinary Journal, Ethiopia*

*Vol. 4 (1) January, 2010*

ISSN 1994-9057 (Print)

ISSN 2070-0083 (Online)

---

## **Attainment of Self-Reliance through Senior Secondary School Science and Technical Curriculum: An Appraisal**

(Pp 428-438)

**Igboabuchi, A. N.** - Department of Biology, Nwafor Orizu College of Education, Nsugbe, Anambra State, Nigeria

### **Abstract**

*All over the world, the importance of science is never in doubt since the 17<sup>th</sup> century AD. The countries of Europe were the first to acknowledge and develop it for man's use. The developing countries of the third world like Nigeria, depend for their total development today on the already developed countries of Western Europe and America. The attainment of good degree of self-reliance had been, since this age of science and technology, the major focus of developing countries. To this effect, Nigeria changed her education structure since 1976 and reorganized her secondary school curricular with emphasis on science and technical subjects with the intention of cultivating scientific culture in Nigeria and equipping secondary school graduates with skills that would make them self-reliant. This work x-rayed the many –sided advantages of science and its application and analyzed the effects of the journey so far as regards the extent the science and technical schools are impacting on the school graduates and the society. The appraisal revealed a near zero impact leading the author to provide possible solutions as a way out of the woods.*

### **Introduction**

The vital role of science in shaping our individual destiny and our collective destiny as a nation is universally known and widely acclaimed (Ndu, 1996).

Typical Nigeria homes right now experience poor living standard, ignorance, disease, low productivity and illiteracy. These are antithetical to progress. In many parts of this country, there are non-availability of certain amenities like pipe home water, electricity, medical services, regular transportation systems, among others. At the root of all these indices lies science. Modern economy can only be sustained through proper utilization and integration of Science and Technology as a primary driving force. Science is indeed the sign-post to progress and prosperity. Most advanced nations of the world have discovered this sign-post, while developing nation are yet to locate it. Nigeria, like other developing countries, has embraced it on the bases of its many-sided advantages which can be appreciated when the concept when the concept of science is properly perceived.

### **What is Science?**

Science means many things to many people. The Science Teachers Associations of Nigeria undertook a research of what people thought science was, and discovered many misconceptions (STAN, 1984). To a layman, science is more or less everything that has made life comfortable to man (Abdullahi, 1982). The meaning of science takes into account its dual nature. Science is a body of knowledge arranged in an orderly manner, obtained through the method involving asking questions, experimenting, observing, collecting data and making inferences. It is said that science is both a product (Knowledge) and a process (method). Take for instance, if one asks the question: what is the boiling point of clean water? One may probably seek an answer by heating water and using a thermometer to measure the temperature of the water up to the boiling point. Science is both method of finding the boiling point (process) and the boiling point obtained (knowledge or product).

There are two main divisions of science, namely: pure science and applied science. Pure science is concerned mainly with the search for knowledge. Examples of pure science include biology, chemistry, physics, mathematics, biochemistry, biophysics, geology, geophysics. In pure science, the emphasis is on establishing facts, ideas, principles, laws and theories as well as on understanding natural things and phenomena.

Applied Science or Technology is concerned mainly with the application of the knowledge of pure science for the benefit of man. Examples of applied science or technology include medicine, pharmacy, agriculture and engineering.

Pure science and technology are interrelated. Each contributes to the other, and neither can do without the other. For instance, in physics (pure science) one learns the properties of lenses. The properties of lenses are applied in technology in making a microscope. The microscope is used in biology (pure science) in studying microscopic structures. The more advanced the technology of the microscope is, the more the microscope can help in the search for biological knowledge. It is the dimension of these divisions of science that help man to better his world through its use and application (Abah, 1982).

### **The Importance of Science**

Importances of science according to Awokoya (1979) are as follows:

1. **Man's Understanding of Himself:** Scientific knowledge has help to understand himself and how his body works. It has helped man to understand his position in the universe and his environment. For instance, man depends on his environment for air, water, food, warmth, energy and materials for shelter. Man cannot abuse his environment indefinitely without threatening his existence.
2. **Control of Disease and Maintenance of Good Health:** Science and technology have helped man to prevent diseases through measures such as environment sanitation, insecticides, and immunization among other. Medical science enables man to diagnose and treat diseases. Knowledge of science help man to maintain good health through drinking clean water, eating a balance diet, taking exercises and having sufficient sleep and rest.
3. **Food Production and Preservation:** Science has help man to increase food production through the disease –resistant or high yielding varieties, irrigation and water application of fertilizer, through plant and animal breeding, to develop management, control of pests and diseases. Food preservation and storage have been improved through appropriate techniques including drying, salting, chemical protection from pests, refrigeration, canning and pasteurization.
4. **Transportation:** Science and technology have provided man with bicycles, motorcycles, cars, buses and trucks, aeroplanes and ships for transport by land, air and water. Roads have been built with materials made by science and technology. There are bridges across bodies of water. Airports, meteorological observations and radar to guide aeroplanes in flight support air travel.

5. **Communication:** The mass media use radio, television or printed materials among others to reach many people in a short time. A football match which was played in Atlanta, U. S. A. was watched all over the world as it was being played, because of satellite communication. Messages can be sent from one part of the world to another via telephone, telex, fax and radiophone among others.
6. **Entertainment:** Science and technology have a major role in music, drama and various forms of entertainment. Videotapes and audiotapes enable us to reproduce in our sitting rooms, events that have taken place far away from us. Many musical instruments now use electronics devices, and there are reports that computers help some composers to put together their music.
7. **Manufacture of Goods:** Many goods are manufactured through science and technology. Such goods include textile fibers, detergents and soaps, radios, roofing sheets, watches, petrochemicals and so on. Mathematics is applied in relevant computations for almost every industrial process. The manufacture of goods provides employment, improves the economy and satisfies human needs.
8. **Making Work Easier Than With Human Energy:** Many machines make-work easier than with human energy alone lifts and cranes are used to raise or lower loads; tractors are used to cultivate the soil or harvest crops; bulldozers are used to construct roads. In the home alone several gadgets make-work easy such as dishwasher, grinders, cookers, pressing irons, washing machines and ponders.
9. **Making the Environment More Comfortable than It is In Nature:** Houses are built with cement blocks, galvanized roofing sheets, glass louver windows and tiled floors for security and comfort. Mosquitoes are kept off with plastic or metal window netting. The rooms may be air conditioned to provide a comfortable level of coolness, otherwise electric fans may be used. Materials that are poor conductors of heat are used in proper places to keep the house cool.
10. **Crime Detection and Maintenance of Law and Order:** Science and technology are applied in crime detection such as in identifying fingerprints, in diagnosing the cause of death, in tracking suspects. Tear gas and other devices are used in controlling rowdy mobs.

11. Dispelling of Superstition: Scientific knowledge dispels superstitious beliefs. Disease, famine, drought, death of a child, thunder and rainbow, among many phenomena may be attributed to superstitious beliefs such as the anger of the gods. Science provides the right causes and gradually people drop their unfounded beliefs.
12. Prevention of War: Science and technology help to prevent war. War may be prevented through early warning signals of troop or aircraft movement, air surveillance of military installations and positions, and availability of adequate retaliatory capacity. It is these advantages of science and technology that advanced nations of the world enjoy which developing nations are striving to get at. In her aspiration to develop her science and technology like the economies of the developed world, Nigeria had to make necessary adjustments in her school programmes especially at the secondary school level.

### **Science and Technical Programmes of Our Secondary Schools**

The six-year secondary education, which started in September 1976, is an innovation in Nigeria. Its importance lies in the emphasized course content centered on science and technology known to be a common pressure in our contemporary age. The courses covering these areas have to be offered in both tiers of secondary education. In J. S. S. the integrated science took care of sciences while introductory technology took care of technical subjects. In the S. S. S the science and technology subjects, get isolated and taught as single subjects.

The Science Subjects According to N P E (F R N 2004) are:

Biology  
Chemistry and  
Physics

The Technical Subjects include:

Auto-Mechanics	Applied Electricity
Building Construction	Computer Education
Electronics	Food and Nutrition
Metal Work	Technical Drawing
Woodwork	

In general, the goals/objectives of secondary school education include, among others:

- To offer diversified curriculum to cater for differences in talents, opportunities and roles open to students after their secondary school course.
- To equip students to live effectively in our modern age of science and technology.
- To inspire students with a desire for self-improvement and achievement of excellence (FRN, 2004).

In further recognition of the importance of the new programmes in secondary school, the government made provisions for technical education in separate secondary schools having these as its objectives:

- To provide trained manpower in applied science, technology and commerce particularly at sub-professional grades.
- To provide the technical knowledge and vocational skills necessary for agriculture, industrial, commercial and economic development;
- To provide people who can apply scientific knowledge to the improvement and solution of environmental problems for the use and convenience of man;
- To give an introduction to professional studies in engineering and other technologies;
- To give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant.
- To enable our young men and women have an intelligent understanding of the increasing complexity of technology.

Very central to the curricula and aims, is the intention of secondary education, not only to prepare the students for useful living within the society, but also to enable them 'acquire skills and competences' for self-reliance so that they will live effectively in our modern age of science and technology, (FRN, 2004).

### **The Situation on the Ground Appraised**

The adjustment in the school programmes which laid emphasis on science and technology came into effect with the launching of the national universal

free primary education (UFPE) of 1976. As at today, this programme has lasted for well over thirty years. It is supposed that having lasted for this long, the values or objectives attached to the science and technical programmes would have started manifesting in our society by having our secondary school graduates acquire necessary skills and competences which will make them live on their own as self-reliant, and reduce the social problem of unemployment. And also by preparing the secondary school graduates for useful living within the society and cultivating in them the scientific culture and knowledge to enable them pursue science-oriented courses in universities.

Today, the situation on the ground is quite different from what is intended. Graduates of our secondary schools are not prepared for useful living within the society, they do not acquire from the school programmes the necessary skills and competences which will then live on their own and be self-employed and self-reliant; the scientific culture and knowledge is not cultivated in a greater percentage of our school leavers. Admissions into our country's colleges of education and universities skew positively towards arts and social science courses. This is in line with the detailed results of WAEC and NECO where more casualties are recorded in physical sciences than in arts and social sciences.

Igboabuchi (1995) carried out a study on the extent science and technical programmes of our secondary school were catching on in Enugu and Anambra States after two decades of its implementation. He noted, as the situation still holds to date, that though emphasis in all schools is on science subjects, all schools do not offer all the sciences except mathematics because relevant staff are not available. Among all science subjects, only biology is popular because of its presumed low difficulty level. When compared with technical/vocational subjects of the senior secondary school, science subjects appear to have advantage of head-start over the other as they are as old as the inception of the secondary school system in Nigeria. According to Igboabuchi (1995), the technical subjects (as enumerated above) viewed as the crux of technological development are quite new, at least, in Nigerian Secondary School. This explains why all schools still emphasize science with one vocational subject i.e. agriculture; while very few schools offer one technical subject i.e. technical drawing.

The situation observed by Igboabuchi in his study in 1995 has not changed to date. Why are the technical subjects not taught in our secondary schools when these are supposed to prepare the secondary school graduates for useful

living within the society and also equip them with relevant skills that would make them self-reliant? Why are the science subjects not properly and evenly taught in all the schools?

Introductory technology is taught in J.S.S. but the technical subjects which spring up from introductory technology are not taught in the SSS. This implies that the right teachers to teach the specific technical subjects are generally lacking in schools. Even the introductory technology taught at JSS, because it cuts across technical subjects, may be shoddily handled by unqualified teachers. Where teachers for key science subjects are not easily available in our schools and teachers to handle technical subjects mapped out in the secondary school programme are nowhere to be found in our schools, where lies the hope of the nation for scientific and technical breakthroughs in this modern age of science and technology or for the realization of the major objectives of the new school programmes?

From the foregoing, it is clear that the situation on the ground is not promising. The adjusted secondary school programme in Nigeria which came into effect in 1976 was intended to make a big difference in the school products as itemized in the objectives of secondary and technical education (FRN, 2004). Today the school graduates have no jobs because they acquired no skill while in school; interest in science has not been cultivated in school graduates; teachers to teach the relevant subjects are seriously lacking in our schools. Sometimes funds are lacking to equip the schools as required. But there could be a way out.

### **A Way Out**

1. allocation of funds

Government should endeavour to allocate a reasonable percentage of her scarce funds to science and technology.

2. Judicious management of fund

The funds so allocated should be judiciously utilized. We are witnesses to the ugly trend where suppliers of science equipment will collude with authorities to either hike the prices of materials or even supply inferior goods.

3. Effective security of science laboratory and equipment



It is sad to note that laboratories are vandalized. Equipment may be supplied to colleges and universities today, only to be carted away the next day. Science masters should be security conscious with the authority of the institution.

4. Maintenance Culture

There is need, particularly when funds are scarce, to establish equipment and service centres in both post primary and tertiary institutions. These centres should have a pull of experts to service faulty equipment.

5. Fabrication and improvisation of science/laboratory materials using locally available materials.

Science teachers should endeavour to fabricate and improvise scientific materials for teaching and learning of science.

6. Science Books/Journals

Core science books and journals should be centrally procured and kept at the disposal of all students particularly the indigent ones. This is necessary because students rely heavily on shabby lecture notes and handouts.

7. Stable environment

Authorities and students alike should strive to maintain stability and conducive environment within the school system and university campuses. This is very necessary because any equipment or property damaged during any disturbance will be difficult to replace.

8. Training programme

From what we have seen, it is obvious that the technical dimension of our secondary school programmes are not yet catching on. The technical subjects are there in school programmes but the relevant manpower to implement them and turn the school leavers into self-reliant technicians in various fields are not there. There is therefore a serious need to mount practical training programmes attainable in higher institutions like polytechnics and colleges of education (technical) and even universities to prepare special teachers with technical knowledge who would effectively cover the technical programmes in our secondary schools.

9. Supply of enough teachers

Even the science subjects are not well covered in our secondary school programmes. Schools do not have enough supply of teachers in the science subjects. This is more pronounced in key sciences like mathematics, physics and chemistry. If science culture is to be properly rooted in Nigerian secondary subjects in all the schools in Nigeria no matter the location. The teachers in science subjects should be well prepared in our tertiary institutions, recruited in good number and evenly distributed to all schools. Besides, the necessary infrastructure and equipment should be provided in all schools irrespective of location (Azogu, 1988).

**Conclusion**

In our contemporary society, which falls into the age of science, the pursuit of science and technology is commonly the in-thing, the world over. Nigeria is quite active in this race. In her action in this regard, she has changed her education structure since 1976 and adjusted her secondary school programmes in line with the new movement. One would expect that a programme that has lasted for well over three decades must have started making impacts on the people and society by way of cultivating scientific culture among secondary school graduates and drastically reducing the rate of unemployment among school graduates by making them self-employed and self-reliant.

Studies related to the extent of impact made by the adjustment on our secondary school graduates reveal virtually a zero impact. On the basis of this, the paper suggests a fresh direction to make the teaching and learning of science and technology in our secondary schools more impactful and result-oriented.

## **References**

- Abah, C. O. (1982). The nature of science and science education: some current trends. *Journal of Science Teachers Association of Nigeria*, Vol. 20 (No. 2), 108-114.
- Awokoya, S. O. (1979). Popularization of science in developing countries. *Journal of Science Teachers of Nigeria*, Vol. 18 (No. 1), 3-8.
- Azogu, I. (1988). *National policy on science and technology implementation: The role of chemistry*. Paper presented at the Third Annual Conference of Committee of Deans of faculties of science of Nigerian Universities, UNN, April 28-29.
- Bajah, S.T. (1982). How relevant is science education to the school leavers in Africa. *Journal of STAN*, Vol. 20 (No. 2), 179-192.
- FRN (2004). *National Policy on Education*. Lagos: NERDC Press.
- Igboabuchi, B. O. (1995). *The implementation of the six-year secondary school education programme in Enugu and Anambra States of Nigeria*. Unpublished Ph.D thesis, University of Jos.
- Ndu, F. O. C. (1996). *Relevance and application of various scientific disciplines to mankind*. A keynote address in a conference on science, its application and relevance, held at College of Education, Nsugbe, September, 24-26.
- Osiyele, A. O. (1976). The relevance of science teaching in technology. *Journal of STAN*, Vol. 14 (No. 3), 37-39.
- Science Teachers' Association of Nigeria (1984). *What is science?* Position paper No. 1.