

EFFECTIVE SECONDARY EDUCATION FOR SUSTAINABLE FUTURE IN SCIENCE AND TECHNOLOGY

Kingdom C. Eke

**Department of Curriculum Studies,
Federal College of Education (Technical),
Omoku,
Rivers State.**

And

David Olugbade Ojedapo

**Department of Curriculum Studies,
Federal College of Education (Technical),
Omoku,
Rivers State.**

Abstract

Secondary education is a very vital to development. This is the form of education children receive after primary education and before the tertiary stage of education. For this form of education to perform its roles that lead to technological growth and scientific advancement, it must be effective. The authors of this paper examined the place of effective secondary education in technological growth and scientific advancement in our country. Issues like secondary education in Nigeria, the concept of effective education/school, factors militating against secondary education in Nigeria, effective secondary education, a sine quanon for technological growth and scientific advancement were considered in this paper. Recommendations that will lead the country to effective secondary education for technological growth and scientific advancement were made by the authors.

It is no longer contentious that we live in a technological world. What is in doubt and for which we must attempt to address is how many Nigerians are willing to join the trend and at what point in their lives. We also need to establish the pace at which we are excelling.

Oriaifo (1985) submitted that:

In contemporary world context, any nation that must maintain her independence, sovereignty and ensure favourable economic and social well-being of her citizens must be...technologically developed and scientifically advanced.

Unfortunately, her expressed concern that Nigeria is still at the bottom rungs of the ladder of advanced science and technology. The question then is, has there been any observed change whether positive or negative in the acknowledged trend? Ezeife and Levin (1996) in a related development observed that people are advocating for education that is much more technological in conformity to the prevalence of global information technology, thus, buttressing the obvious importance of technological advancement in our educational system. No wonder Oriaifo (1985) as a follow up recognized that secondary schools are important and the appropriate level of education to kick-start this technological emancipation, thus, upholding the timeliness of the present topic – Effective secondary education: For sustainable future in science and technology. However, the concern in this paper is to bring to the fore the place of effective secondary education as a pivotal or foundation for technological growth and scientific advancement in the country. In order to elucidate the elements of the topic, a cursory look at secondary education in Nigeria, the concept of effective education, factors militating against secondary education in Nigeria, effective secondary education, a sine qua non for technological growth and scientific advancement and recommendations are considered in this paper.

Secondary Education in Nigeria

The National Policy on Education (2004), described secondary education in Nigeria as the form of education children receive after primary education and before the tertiary stage. Its recipients are automatically graduates of primary education. This statement implies that all secondary education candidates have acquired basic functional primary education. Specifically, the broad goals and objectives of this level of education as stated by the policy are;

- (a) Preparation for useful living within the society and
- (b) Preparation for higher education

These goals were based on the five main philosophy of Nigeria education. In order to achieve these goals, secondary schools are guided by some specific objectives amongst which are to “equip students to live effectively in our modern age of science and technology”.

The new system of education in Nigeria popularly known as 9:3:4 broke secondary education into two segments – the first three years of junior secondary

education which is attached to 6 years in primary and three years of senior secondary education. The junior secondary level is meant to prepare students in both academic and pre-vocational areas. The junior secondary students are at this level exposed to the same subjects covering the academic core subjects while the pre-vocational subject consists of introductory technology, Home Economics, Business Studies and Local Crafts.

The last years of senior secondary education exposes the students to core subject areas covering English Language, Nigerian Languages, Mathematics, Physics, Chemistry, Biology and other Arts subjects. Sofolahan (1987) observed that it is at this stage that students can choose to study subjects related to technological and scientific education.

In practical terms therefore, secondary education is recognized and designed to provide technical skills to its recipients in science and technology. No doubt, we are all constrained to ask the question - are our secondary education effective in terms of service delivery, management, funding and well equipped to cater for those desiring to advance in the technological and scientific era? If no, what challenges does this phenomenon pose for the nation and how can we ameliorate the situation?

To capture the importance of the six years of secondary education to its recipients and the society at large, the composition and make-up of its membership become imminent. Secondary schools, whether private or public, harbor adolescent children between the ages of 11 years to 18 years. This is a period recognized by psychologists as characterized by physiological, social and intellectual transition. Psychologists see it as a period of identity crisis i.e. the period of finding out one's potential, self-discovery and or self-definition. Social psychologists described it as a period of storm and stress leading to personal conflict. Whatever happens at this stage of one's life determines to a large extent future achievements or failures.

The Concept of Effective Education

Experience supported by literature that schools are changing, dynamic and relatively unstable organizations. (Koko 2005). Just as schools are perceived as change agents to its membership so the members attempt to change the culture of the school. These phenomenons most often affect the performance of the members and that of the school.

Hoy and Miskel (1991) in describing the school as an organization asserted that the concept of school effectiveness is a puzzle with its meaning and measurement very ambiguous and confusing. This assertion however, prompts the question. What makes one school effective while another is perceived ineffective?

Organizational effectiveness according to Okeke (2002) refers to the extent an organization realizes its goals or objectives. According to him, effectiveness encompasses quality and quantity of output as well as the corresponding felt needs. School effectiveness is dependent on the human beings within the organization. The extent to which they achieve individual needs and aspirations as well as the extent to which the organization is able to achieve its goals through the activities of the human elements within it ultimately determines outcome.

There are major determinants of school effectiveness identified by several researchers which are useful for this discussion. For example, Mortimore *etal* cited by Koko (2005) outlined these characteristics as:

1. **Purposeful Leadership of the Staff by the Head**
Effective heads are sufficiently involved in and have knowledge about what goes on in classrooms and about student progress. The leader does not exert total control by constant interference but he/she is not afraid to assert his/her leadership.
2. **Involvement of the Vice Principal**
A certain amount of power and responsibility is delegated to the vice(s) in policy decision making. It was noted that sharing of responsibilities promotes student progress and school effectiveness.
3. **Involvement of Teacher**
Teachers who are involved in decisions concerning their work are ultimately satisfied and effective teachers. Involvement of teachers in curriculum planning and implementation breeds' spirit de corp.
4. **Consistency Among Teacher**
Continuity of staffing had positive effect on students' performance as well as consistent teaching approaches.
5. **Structural Academic Session**
Children perform better when their school day is structured. Teachers organize students work and encourage a degree of freedom to achieve set goals.
6. **Intellectually Challenging Teaching**
Students perform better under the supervision of a stimulating and enthusiastic teacher. The use of higher order question and statements encourage student's creative imagination and strong problem solving power.

7. **Work-Centered Environment**
Exhibits a high level of pupil industry, with the students enjoying their work and very eager to learn new tasks. Never a dull moment and reduces students movement within the class.
8. **Limited Focus Within Lessons**
Teachers devoted their energies to one particular subject area at a time.
9. **Maximum Communication Between Teachers and Students**
The adoption of flexible communication approach in which teachers interact with the student's as an individual, a class and as a group through the use of discussion or brainstorming.
10. **Effective Record Keeping**
Both the principal and the teachers are involved in monitoring student's progress through adequate planning and assessment.
11. **Parental Involvement**
Schools with an informal open-door policy, which encourages parents to assist students in reading at home, in the class and on educational visits, needs to be more effective.
12. **Positive Climate**
An effective school has a positive ethos. It lays more emphasis on praise and reward than punishment and control. It breeds teacher enthusiasm and involves workers and students alike in wide range of activities within and outside the classrooms.

Having highlighted the twelve key factors of school effectiveness critics of this study argue that too narrow an interpretation of the school effectiveness criteria leads to an increase in standardization. In the case of Nigerian secondary education these factors are not all applicable with high enrolment environment, maximum communication between teachers and pupils and even parental involvement are unattainable. On the other hand, Reynolds (1985) posit that effective schools are schools that are led by heads with the capacity to simulate others and who have a breadth of vision about education together with practical ability to translate this into classroom practice for students. In support, Koko (2002) notes that effective schools are characterized by;

- (a) Effective leaders with acceptable leadership traits particularly the democratic leader.
- (b) Specific goals and objectives which are based on the decision of all.

- (c) Effective communication network system between management, teachers, and students.
- (d) Effective teacher/students relationship which encourages students to aspire and attain highest academic standards.
- (e) Conducive classroom learning environment which exudes friendship and cooperation.
- (f) Qualified and experienced personnel.
- (g) Focused attempts to emphasize and build students personal and social development.

Different researches have different definitions of the concept of school effectiveness. However they all agree on one point, i.e. that effective schools are characterized by strong administrative leadership; students positive outcomes, open school climate and a culture of collaboration leading to a shared consensus (Fullan 1991; Reynolds, Creemers and Peter (1989) and Kobo 2002).

A close look at what is outlined in this section gives everyone a clear picture of what an effective school is and should be. So it is easy for us to assess our readiness or not to lay the foundation of technological growth and advancement based on the indices of effectiveness in school operations. Are our schools effective enough to withstand the foundation of science and technology?

Factors Militating Against Secondary Education in Nigeria

1. The Nigerian Political System:

The greatest challenge in secondary education in Nigeria is the political system. Aloysius (2009) states some elements of Nigeria Political system as:

- a. The system is unstable, turbulent, selfish, corrupt, infested with chronic and deeply rooted tribalism, nepotism, unpatriotism and sectionalism. And, now cultism is seriously attacking the system.
- b. The system seems to seek the welfare of the players more than that of the citizens. The political interest overrides any other interest no matter the intensity and importance. This is why the system considered N5m a year as adequate for a university professor, whereas a senator, a minister or a commissioner may use N10m to furnish his or her house. His or her salary is another matter that needs not be mentioned here.
- c. The political system is immature, weak and loose. The players are unstable and terribly political. The system, by the action of the players does not allow adequate fund to be provided for skill development. Funds may be placed in the system but only a small amount may be devoted for equipping people with the right skills for living.

- d. Misplaced priority of the players of the systems is obvious. The political party determines priority not the citizen's needs. A state governor may have good projects for his people, but the political party or other interested parties may stop him from reaching through the intended project. Priorities sometimes, policies, decision and implementation are not people-oriented but on very parochial and selfish interests.

2. Teacher Factor

The poor preparations of science and technology teachers at the College of Education, faculties of education and in some polytechnics, have resulted in the production of poor quality teachers. Many science and technology teachers cannot organize laboratory practicals that will create opportunities for learners to acquire requisite skills. This may possibly be due to insufficient exposure to science content and processes during the training period. It is important to note that teachers cannot promote learning beyond their knowledge, because nobody can give what he or she does not have. Research results also indicate that the quality of teaching makes a difference in students learning, (Ball and Bass 2000).

3. The Dearth of Facilities and Infrastructures in Schools

Infrastructural facilities for science and technology education in the country are grossly inadequate. Laboratories, libraries, workshops are in short supply and generally ill-equipped. Apart from federal unity colleges and some private secondary schools, most secondary schools have inadequate science laboratories. (Ivowi 1997).

The colleges and universities do not even boast of adequately equipped laboratories. Lack of funds to purchase consumables, overcrowded classroom/laboratories, and high student- teacher ratio are re-occurring features in the schools. The dearth of technical staff to man the existing laboratories put more strain on science teacher and reduces his output and effectiveness. (Warra, Utono, Gunu & Babayemi 2009).

4. Curriculum Related Issues

These include pressure to cover the syllabus of external certificates examination bodies. Inflexibility of the time table, which hinders the teachers in adjusting time table for more practical/field trips with student. Lack of adequate text books and over whelming number of activities demanded by the new curriculum.

5. Insufficient Time to Complete Prepared Learning Modules

The Nigerian educational system has experienced a lot of strike actions by both staff and students. This normally disrupts the school calendar resulting in

insufficient time to complete the learning modules prepared by the teacher. Most often the semester examination is usually scheduled two or three weeks after resumption from a protracted strike leaving most of the contents untaught. This is a great challenge.

Other factor includes

1. Examination malpractice
2. population explosion
3. cultism
4. Inadequate incentives to teachers etc.

Effective Secondary Education: A Sine Quanon for Technological Growth and Scientific Advancement

Koko (2002) is of the view that school effectiveness is dependent on the leadership and that once the leader is weak the school will automatically conform to the weakness of the leader. Specifically the school head is expected to play a leading role in improving the quality teaching and learning, ensure the attainment of school goals and objectives, and effectively communicate with staff and student while enlisting their commitment (Okeke 2002).

Obviously, effectiveness in school has far reaching implications on technological growth and scientific advancement. For instance, an effective secondary school allows for innovations and change. Member are willing to support the leadership to plan new areas of study, effectively and efficiently implement it in such an environment, there is always co operations and commitment from both student and staff.

An effective secondary school is indeed a good place to lay the foundation of technology, such as if a school has qualified and experienced teachers who are always willing to experiment new methods of teaching using technological gadgets such as the computer. This is why Ubong (2013), says that teacher quality should be improved constantly through long and short courses in an institutional organization. It is acknowledged that no nation can buy or transfer technology wholesale expect you borrow it. Therefore, it becomes important for every nation to prepare virile grounds to accommodate the borrowed technology in order to sustain it. This is possible when there is a strong foundation on which to continue the process of continuity and an effective secondary education is a sure answer.

The relationship between effective secondary education and technological growth and scientific advancement in Nigeria cannot be over-emphasized. It should be remembered that secondary education years are years of exploration and experimentation for the students (adolescent years) so these are useful periods to

introduce technology and science education and expect that the students will be enthusiastic to participate. This opinion is supported by the saying, “catch them young and will get best from them“.

Secondary education prepares its candidates for higher education. Thus, the choice of students at this level is a major instrument of career choice at the tertiary level. And if Nigeria and her citizens are to develop scientifically and technologically, it must start at the lower level of the educational ladder to encourage consolidation at the apex.

Most secondary schools (Unity school and private) particularly in the urban areas have already caught the vision of technology by including in their syllabi, computer studies. This is a good omen for Nigeria and which must be commended and supported. All she needs is expansion of existing structures in all secondary schools and improved facilities to accommodate the new curriculum innovations- technology education.

Technology as all know has come to stay. All that is required is for all and sundry to catch up with its vision. In essence, both old and young should imbibe the technology culture and communicate it to the government and the governed. This can be achieved through awareness and sensitization campaigns at different for a such as community meetings, By so doing, the need for building a strong foundation for technological growth and advancement at different levels of education can be brought to the fore.

Conclusion

The authors attempted to examine the role of effective secondary education in laying the foundation for technological growth and scientific advancement in Nigeria. Having highlighted the determinate factors on effectiveness in schools it became obvious that we may need to embark on self- examination in order to establish our strengths and weakness and possibly reorder our processes towards the elimination of our weakness. Research findings uphold the fact that ineffective schools can be turned around to be quality schools.

Technology is with us and we must catch the vision by first of all establishing or re- engineering our schools to the effective secondary school culture. Effective schools are characterized by a culture of collaboration leading to shared consensus (Fullan 1991). With this in mind, we can consider laying a virile foundation for technological growth and scientific advancement.

Recommendations

The authors of this paper recommend the following actions to be taken for effective secondary education that will lead to technological growth and scientific advancement in the country.

1. Recruitment of science and technology teachers by the government and adequate incentives given to them.
2. Provision of adequate physical and infrastructural facilities by government at all levels.
3. Effective monitoring and evaluation of program performance by the government at all levels.
4. The school managers and teachers of science and technology should be mandated to attend training workshops conferences to improve their managerial skills and teaching abilities. These conferences and workshops should be sponsored by the government.
5. Scholarship should be given to students who are interested and have aptitude for science and technology by government and all stakeholders in education.
6. Examination mal-practice should be fought by all means by all stakeholders in education.

References

- Aloysius, E.U. (2009). *Skill Development in Vocational and Technology Education*. A Lead Paper Presented at 9th National Conference of Federal College of Education (Technical), Umuze.
- Ball, D. & Bass, H. (2000). Interweaving Content and Pedagogy in Teaching and learning to Teach. Knowing and Using Mathematics in J. Boaler (ed). *Multiplier perspective on the Teaching and Learning of Mathematics*. West Port, C.T. Ablex publishers.
- Eneile A. N. & Levin, B. (1996). School Coping with a changing world. *Journal of quality Education* Vol. 3, 1- 16.
- Federal Republic of Nigeria (2004) *National Policy on Education*. Lagos: NERDC.
- Fullant M. (1991) *The Meaning of Educational Change*. Cassell, London

- Hoy, W.K & C.G. Mskel (1991) *Educational Administration Theory Research and Practice*. (4th Ed) New York: McGraw – Hill Inc.
- Koko, M.N (2002) monitoring schools effective in M.I Akpana (ed) *Effectiveness School Management Instrument for Academic Excellence*. Port Harcourt: Convince Concept.
- Koko, M.N (2005) *Effective Secondary Education: Foundation for Technological Growth and Advancement*. A Presented at the OML 58 Operational Zone of Elf Petroleum Limited Workshop for Principals and Teachers in Ogba/Egbema/Ndoni Local Government Area held on the 3rd – 4th, 2005.
- Mortimore, P., Sammons, P. & Ecob, R. (1988). *School Matters: The Junior Years* Salisbury: Open Books.
- Okeke, B.S. (2002), Efficiency and Effectiveness in Education Management. The Implications for Academic Excellence in M.I. Akpana (Ed) *Effective School Management: Instrument for Academic Excellence* Port Harcourt: Convince Concept.
- Oriaifo, S.O. (1985). Effectiveness of an Individualize Instructional Package in Secondary School Chemistry. *Benin Journal of Education Studies*. Vol. 1, 5 – 14
- Reynolds, D. (1985). *Studying school effectiveness*. Lewis: Flamer Press.
- Reynolds, D, Creemers, B & Peters, F (1989). Effectiveness and improvement. *Proceeding of the First International Congress*. London, 1988. Gronigen: University of Groningen, Rion.
- Sofolahan, J.A.O. (1987). The Philosophy of National Policy on Educational and its Implementation. *Proceedings of the Tenth Annual Seminar of the Committee of Vice – Chancellors of Nigerian Universities*: Owerri, 12 – 13 March.
- Ubong, B. (2013). *National Development: Can Entrepreneurship be the Beautiful Bride?* 1st Inaugural Lecture of Federal College of Education (Technical), Omoku.