

CHALLENGES OF INNOVATION IN SCIENCE TECHNOLOGY MATHEMATICS (STM) EDUCATION IN NIGERIA

By

R. E. AYOGU

*Department of Integrated Science,
Federal College of Education,
Eha-Amufu.*

Abstract

In Nigeria the new science curriculum projects the importance of acquisition of science process skills and the development of appropriate scientific attitude in addition to the understanding of science concepts and principles. The success or failure of any good education programme is dependent on how effective it is implemented or embrace new innovation. This paper discusses the challenges facing innovation in STM education and recommends approaches to encourage innovation in STM education.

Science Technology and Mathematics (STM) education was put in place in Nigeria by the government with the aim of making education more functional and assisting in socio-economic and technological growth of the nation. In recent years STM in Nigeria has undergone some remarkable changes in the number of curriculum projects and innovations. Science and technology and mathematics education has been so exalted in the educational programmes of many nations of the world simply because of its dominant influence in the socio-economic development of these nations. On this note it is obvious that science technology and mathematics (STM) education is the bedrock of national industrialization.

In spite of this awareness performance of students in the STM in Nigeria is decline. The recent science programme lay emphasis on students in depth understanding of smaller number of important concepts rather than on mere superficial knowledge of facts and definitions. Invariably there has been a shift in STM outcomes worldwide from operative discoveries of the past to science for all. Importance is also a deliberate effort on the part of science educators, science curriculum developers to make every favourably disposed to the study and practice of science. These are changes in STM education as they are informed. A number of achievements have been made by science educators in the area of innovation in STM.

Innovation is defined as the introduction of something new at any point in time and that to be innovative is to break new grounds. In curriculum development projects, published ideas principles and practices which tend to break new ground or open new avenue makes up what is innovation. According to Parlett (1979) innovation in teaching as evolutionary changes, experiment and applications of educational technology and that

Pristine

it may result to entirely new curricula, or radically changed course structure. For innovation to emerge, there must be a feeling of dissatisfaction with the present state of affairs and the more frustrating the present situation, the more chance there is for innovations or change.

Innovations and of course changes are necessary and common human creation and occurrence since human values and aspiration do change. This evident from the shift in science outcomes described above old ideas and practices one discarded giving was to new and better ones. It has been observed that innovations changes in education are means of survival in a rapidly changing environment unless we sustain an evolutionary growth in education. Despite the effort to encourage positive innovations in STM many set backs are experienced in STM innovation which includes, lack of trained persons, lack of fund, equipment and facilities. This paper attempts to discuss the challenges facing innovation in science technology and mathematics education.

Innovations in Science Technology and Mathematics

Many policies and programmes are all innovations in STM which are aimed at producing scientific literate citizens and potential manpower and leaders in scientific and technological fields of research and development NAEP (1992). A number of innovations has been recorded according to Anchor (1997) among which are;

1. Curriculum development in STM – change.
2. Hand on activities – practical and activity based teaching and learning, popularization of science, technology and mathematics.
3. Mathematics through JETS.
4. The 60:40 admission policy ratio in favour of science disciplines.
5. Introduction of universities of Agriculture and Technology.
6. Writing of indigenous textbooks in local language.
7. Establishment of special science secondary schools.
8. Establishment of mathematics centres at Abuja etc.

With these innovations and many more one tune or the other the question now is to what extent have they been achieved? Actually what significant impact have they made to the attainment of the scientific and technological height we have been expecting?

Since the scientific and industrial revolution that started in Europe hundred of years ago, advances in science and technology had led the world through, various ages one at a period of time. There had been an atomic age, space age, the age of electronics and informatics, the age of new biology, the age of new materials, the age of understanding the organization of the universe Okebukola (2002), and now the information age. Due to advances in science technology and mathematics, each of these ages is identified and recognized with peculiar features and events that characterized the period. It is the school curriculum implementation that usually strengthens and projects the features of the age.

Challenges in Innovation in Science Technology and Mathematics Education

Many challenges are facing innovation in science technology and mathematics education today. Among such challenges are discussed below:

- (1) **Over Crowded Classrooms:** With the population explosion in the schools today, classrooms become overcrowded which place more workload on the teachers. Instructions based on ICT innovation require that teachers should quickly respond to students learning difficulties individually and in groups becomes a problem. The small sized classrooms relative to student's population as obtained in science technology and mathematic classrooms today produce serious challenges for the teachers to cope with and this would affect teacher effectiveness in innovation.
- (2) **Students Teacher Ratio:** With the latest innovation in science, computer based instruction require not more than 20 students per teacher ratio so that the teacher could effectively supervise students class works and pay adequate attention to their learning needs. This situation challenges innovation in STM.
- (3) **Maintenance of Equipments and Energy Supply:** Scientific equipment like computer and the accessories are relatively fragile especially when manipulated by incompetent hands like students and computer illiterate teachers. Under such, use there is no doubt many of the computers will many a times develop fault.
Computers cannot work without energy supply. The issue of epileptic power supply in our country is a big challenge to innovation in STM. This also causes computers to break down and affect effective scientific instructions.
- (4) **Lack of Qualified and Competent Teachers:** There is no doubt that the teacher is a facilitator and a key factor in ensuring effective teaching and learning in our schools. Ikegbuna (1999) observed that the teacher's factors to be considered are those of qualifications, experience, perception of professional role, interest, commitment, responsibility etc. science teachers who posses these qualities to a reasonable degree are still lacking in our educational system particularly in STM. The incompetent teacher cannot be sensitive to innovation in STM. Ikeobi (1987) in Achor (1997) observed that sometime teachers are confused over the nature of innovations which may result in a muddle between means and end. In line with this Ukeje (1996) in Ikegbuna (1999) states that the role of education is to know, what to teach and to whom, why it should be taught and who it should be taught. This implies that the teachers-learner-society should be considered in STM education planning and implementation. Absence of this link has been part of the problem in this country which lead to our dependence on outside world for expert ideas, skills machineries and even personnel.

- (5) **Lack of In-service Training for the Teachers:** Teachers need training to be abreast with the development in the new innovations. Many teachers in the service are not conversant with the latest development in innovation in STM such as ICT, such group of teachers need training and re-training intermittently to be on the known of the innovations. This imposed challenge in innovation and growth of science and technology.
- (6) **Attitude of Students to Science Technology and Mathematics:** Students attitude to STM is an important factor in achieving the objective of science instruction. Scientific activities when properly directed during teaching are usually interesting to the child but this is only so when the student manifests positive attitude towards such activity. Pupils/students still have the impression and fear that STM is difficult. Students in secondary school do not show readiness to take up the challenge in learning science technology and mathematics no matter the effort of the teacher. Many students would still remain non achievers in STM especially the males who boldly tell their teachers that they are in secondary school to merit the name WAEC attempted, after which they go into business. Woodward (1998) said that the low enrollment in science among secondary school students has bearing on their negative attitude towards science formed as early as in primary school age.
- (7) **Lack of Motivation of Teachers:** Teachers are not motivated to put in their best in STM education. Salaries are not paid regularly which dampens the zeal to improvise materials for the STM education. The dedication to pursue an innovation for a significant change is no longer the interest of STM teachers' goal. According to Ahimugu (2000), the non-payment of teachers salaries hampered the system and made it unworkable. He further said that government's poor management of inflation and economy made nonsense of the pay package of an average teacher.

Teachers are also neglected in terms of general conditions of service such as free medical services, staff housing loans, vehicle and vehicle refurbishing loan etc. All these conditions are encouragement that will make teacher highly initiative in innovations in STM. Many teachers leave the schools for business trying to make ends meet. Some teachers opt out to establish private schools and promoting examination malpractice in quest to make money.

- (8) **Lack of Provision of New Equipments and Facilities in Innovations:** Provision of moderately equipped laboratories and libraries, provision of facilities instructional materials are yet to be felt in our school systems. When we have the highest trained teachers without the availability of working equipments the highly qualified person cannot do anything. Provision of such facilities required for new innovation in STM is considered paramount to any

other factor challenging the STM. Computers/information communication technology (ICT) is the new innovation on the stage. There are no ICT facilities in our schools at this information age. This situation imposes a big challenge to innovation in STM. Hardly can one see computer in secondary schools. Many laboratories in schools where they are available are filled with obsolete materials.

- (9) **Lack of Funding:** It is generally known that science technology and mathematic education are very expensive to run. A lot of financial resources are required for the purchase of equipments, maintaining and replacing them when they are bad or obsolete. The feature of our school laboratories is filled with obsolete equipments that need to be replaced and money is required for such replacement. Governments appear to be insensitive to these situations in schools.

The provision of scientific materials as a means of enhancing enlightened science instruction correlates very well with convenient in science beside qualified staff. Ikegbuna (1999) observed that inadequate supply of fund have been observed to affect acquisition of laboratory equipment and other facilities.

- (10) **Societal Value:** The societal values, views, ideas and priorities have permeated deep into the minds of teachers and students. The 'get rich quick' episode in the society has left our academic institutions for women mainly. Even many women do not see the need for studying especially STM that is activity oriented and requires patience. For this reason the crazy rush for material possession make many students to do all sort of things such as buying certificate either in kind or cash, but mostly in cash these days. This thought a big challenge to innovation in STM.

- (11) **Lack of Indigenous Science STM:** Science and technology are yet to be written and taught in any of the Nigerian languages. In technologically developed nations science is taught in their mother tongue. In such places teaching and learning is easier because both the teacher and the learner are at home with the language of communication. Sometimes instruction on how scientific materials and equipment should be used is also written in foreign language like German or Italian or French. Teachers are expected to interpret and apply them in our own situation and environment.

The importation of culture and language including curriculum are part of the set back that are facing science technology and mathematics education in Nigeria today.

Conclusion

Society is never static but dynamic. Science Technology and Mathematics education is a continuous process and the concept of change demand that we must constantly seek for new and better approach to be scientifically literate and well informed. The paper enlisted several innovative attempts in the science technology and

Pristine

mathematics education. It also examined the challenges encountered by innovation in STM education such as crowded classrooms. Lack of maintenance of equipment and energy supply, student teacher ratio etc. But despite such challenges/obstacles facing innovation, there are many ways forward recommended like encouragement of STM teachers through incentives, provision of gadgets and learning equipments like computers in schools etc in the paper. All hands should be on deck to join this innovation crusade to achieve the fundamental objectives of STM education.

Recommendations

Change or innovation in science and technology is a normal and continuous process and has come to stay. Having observed the challenges militating against innovation in STM the following recommendations are made to be in tune with the dynamic of world social order.

- (1) Opportunities should be provided/ given for professional growth of STM teachers through workshop, seminar and conferences.
- (2) Incentives should be given to STM teacher that perform creditably to encourage him and enforce commitment and dedication.
- (3) Government should be made to know the financial involvement in any innovation in STM and should be further committed to enter into agreement on modalities for full implementation.
- (4) Provision of facilities and infrastructures that are required for the implementation of innovations by the government is what will ensure reality of these things.
- (5) Provision of computers and internet services in schools in this information age for effective implementation of innovations.
- (6) Provision of textbooks and teaching of science in local language to domesticate science should be pursued with seriousness to encourage pupils' interest especially in primary and junior secondary.
- (7) Regular supervision of any innovative programmes to ensure progress and discourage laziness because lack of supervision encourages premature death of any programme.
- (8) Mathematics of the equipments is paramount to ensure productivity and success in STM innovations.

References

- Achor, E. E. (1995). Improvisation and local production of science education materials and its implications for Nigeria as a developing nation; *Teacher Education Journal*, 1 (2), 47 – 53.
- Achor, E. E. (1997). *Promoting innovations in science technology and mathematics in Nigeria*. Past, Present and Future. STAN Proceeding.
- Federal Ministry of Education (2004). *National policy on education*. Lagos: Federal Government Press.

R. E. Ayogu

- Ikegbuna, N. (1999). Science and technological education for nation building: A review of the Nigerian Situation. *Journal of Science and Technology* 1(1).
- NAEP's (1992). *The 1990 Science Report and NAEP's Assessment of 4th – 8th and 12th Grades* National Centre for Education Statistics: US, Department of Education.
- Parlett, M. (1979). *Evaluation innovation in teaching, in teaching curriculum design*: Golby Et al (ED), 414 – 424.
- Okebukola, P. (2006). *Beyond stereotype to new trajectory in science teaching text of special lecture* presented to the 13th STAN and Common Wealth Association of Science Technology and Mathematics Education (XSTME) August, 19th – 23rd.