

# TOWARDS IMPROVING SCIENCE, TECHNOLOGY AND MATHEMATICS (STM) EDUCATION THROUGH INCULCATION OF SCIENTIFIC LITERACY

Onah, E.E

## Abstract

The emphasis on paper qualification in Nigeria has led Science, Technology and Mathematics (STM) teachers to pursue with vigour the teaching of STM course for the purpose of passing examination and gaining admission into higher institutions. This ugly trend has produced secondary school STM grandaunts who can hardly use scientific knowledge to solve personal or social problems they encounter in life. Thus a gap exists between the science taught in schools and the child's experiences at home or in the world of work. The paper tries to address the issue of Science, Technology and Mathematics education through inculcation of scientific literacy for national development. It also discussed the concept of scientific literacy, the need for scientific literacy in our society and made recommendations for a way forward.

## Introduction

The attainment of high level of scientifically literate society including secondary school students is one of the major goals of science teaching. This expectation has gained wide acceptance in both developed and developing countries of the World. Nigeria as a developing nation in response to this global expectation enshrined in her National Policy on Education, "the inculcation of scientific literacy"<sup>1</sup> as one of the major goals of science education (FME, 1998). The science teacher with the support of the Government has an important role to play in educating the citizens to be scientifically literate.

Because scientific literacy in Nigeria is very low (Alt, 1998), science education at all levels, particularly at the childhood level is vital and will become recognized as a necessary tool for exposing to and sustaining Nigerians in science. Scientific literacy implies in practical terms, a familiarity with aspects of one's natural environment and the technology that operates there. The science taught in the schools are learned by rote and as such students are unable to apply the knowledge of what they learned to solve problems that confront them in the society. There is need to strengthen our science base through proper science teaching. Science should not necessarily be taught for the purpose of passing examinations as is the case in our country, but should be taught for meeting personal needs, resolving societal problems, career awareness and for preparation for further studies (Yager, 1989).

Since our country is aspiring to be scientifically and technologically developed, the need to prepare the citizenry for making valid contributions to scientific and technological issues affecting their lives becomes imperative. Such issues as nuclear energy, hazardous wastes, environmental pollution, personal health, global warming, national defence, ozone layer depletion, population growth and others should be properly highlighted through science teaching.

The present system of education, including technical education in Nigeria tends to produce educated people who completely or almost completely take pride in alienating themselves from their culture. This system of education also produces people who in the main, deny themselves of the imperative required for scientific and technological growth and development (Ali, 1998). For instance, one major imperative for a professional is the field practice of his trade. A trained engineer who spends his working life-time completing forms or simply signing them is not a great productive asset in his field and to the community. With this system of education entrenched in our culture, it is reasonable to expect that the future impact of applied science and technology in Nigeria with regard to growth and development is likely going to be as limited as it is now. There is therefore the need to re-orientate the science teachers towards a holistic approach to teaching science which will lead to acquisition of scientific literacy by students. This is necessary to enable those who are unable to make it to higher institution to still live functionally in their communities.

## Concept of Scientific Literacy

Scientific literacy refers to, -that awareness and demonstrable technical skills about science possessed by an individual vis-a-vis the different phenomena of the environment. Scientific literacy

should not be confused with knowledge of science. Awareness as used here means that on any *ism* on science one should have some knowledge, even if it is residual, about the issue. Technical skills means doing something that will help a situation especially preventing its occurrence. For instance instead of killing flies with brooms every lime or spraying insecticide when you know the thing that invites the flies is not taken care of. Cleaning of the rooms or discarding of dirt that invite flies is the technical skill demonstrated. From this explanation, it follows that a -rural farmer who properly integrates his agro industries with nature is scientifically literate. Similarly, a rural dweller who tackles the problem of mosquito bite by clearing the surroundings and disposing of all the things where mosquitoes breed can be considered as scientifically literate. So, scientific literacy has nothing to do with the level of knowledge or qualification in science, although the later enhances the former.

Scientific literacy is the ability to understand the nature of scientific knowledge and application of such knowledge in solving everyday problems, making decisions and appreciating the role of science in the society (Nwagbo, 1999). Scientific literacy also deals with understanding the role of science and modern technology (Gbananja, 1993)..We now live in a world full of the products of technology, and an understanding of the concept of technology is necessary for the literacy of the citizenry. Scientific/ technological literacy is an aspect of cultural literacy which entails a functional understanding of the nature of science and technology. In the conditions of modern life a scientifically, illiterate person is considerably circumscribed in playing his full potential in the soc« economic development of his community. He is forced to live a marginal existence. He is all vulnerable to exploitation by others to the extent that he is not able to achieve his liberation and se f actualization (Kassanu, 1988).

#### Teaching for the Inculcation of Scientific Literacy

According to Nwagbo (1991) teaching for inculcation of scientific literacy demands that the science teacher combines a variety of teaching methods such as guided inquiry, discussion, activity field trips etc . Students can learn a lot from topics that cut across different disciplines if teachers handle them properly. Such topics like environmental pollution, energy transformation, conservation! of natural resources, HIV/AIDS scourge, population growth to mention a few can be explainer beyond curricula demands and to enlighten the students on global issues.

In teaching environmental pollution for instance, issues such as green house effect, global warming and depletion of ozone layer which cause great concern to people should form a good base for scientific discussion in the classroom. This will create room for more inquiry and exploration on the part of the students. Teachers should not feel that such issues are global and as such are above the discussion level of the students. Students should be seen as part of the environment and of the society so that what affect these areas should also affect them. Teachers' should enrich their knowledge through getting information from science journals, magazines, newspapers and by following the trend in electronic news media. This will go a long way to producing informed citizens that will carry on with the developmental programmes of the nation.

Teaching for the inculcation of scientific literacy has the following implications for the teacher (Nwagbo, 1999):

- (a) STM teacher employs varieties of teaching methods in teaching a concept.
- (b) lie monitors scientific trends as reported in science journals, magazines, newspapers, etc and incorporates them into his teaching as the need arises.
- (c) He emphasises the application of science in solving personal and societal problems.
- (d) He creates awareness of scientific problems in the students.
- (e) He teaches for understanding of small number of major scientific ideas, rather than simply stating facts.
- (f) He explores the topic of discussion beyond curricular stipulations.

#### The Need for Scientific Literacy in Our Society

Education has no higher purpose than preparing people to lead personally fulfilling and responsible lives. For its part, science education-meaning education in science, mathematics and technology should help students to develop the understanding and habits of mind they need to become compassionate human beings able to think for themselves and to face life head on. It should equip them also to participate thoughtfully with fellow citizens in building and protecting a society that is open, decent and vital. Nigeria's future-its ability to create a truly just society, to sustain its economic vitality, and to remain secure in a world torn by hostilities-depends more than ever on the character and quality of the education that the nation provides for all of its children.

There is more at stake, however, than individual self-fulfillment and the immediate national interest of Nigeria. The most serious problems that humans now face are global:- unchecked population growth in many parts of the world, acid rain, the shrinking of tropical rain forests, and other great sources of species diversity, the pollution of the environment, disease, social strife, the extreme inequalities in the distribution of the earth's wealth and the ominous shadow of nuclear holocaust etc. What the future holds in store for individual human beings, the nation, and the world depends largely on the wisdom with which humans use science and technology. But that, in turn, depends on the character, distribution, and effectiveness of the education that people receive.

More and more citizens need to be well informed about scientific events affecting their lives e.g. abortion, pollution, poverty, population growth, disease and HIV/AIDS scourge etc. A scientifically literate person should be well informed for him to be able to make well informed decisions and making appropriate demands. For example, if a demand for siting a cement factory or industry is requested one should be in a better position to advise if he is literate in science.

### **Recommendations**

1. All levels of government should embark upon aggressive campaign strategy for the dissemination of scientific literacy. This should be seriously publicized through government agencies like the print and electronic media.
2. There is need to strengthen our science base through proper science teaching. This could be achieved through integrating theory with practical work in science teaching.
3. There is need to re-orientate the science teachers toward a holistic approach to teaching science which will lead to acquisition of scientific literacy by students. This is necessary to enable those who are unable to make it to higher institutions to still live functionally in their communities.
4. Adult educators in the Nigerian frame of reference should be trained to acquire the scientific skills and processes which they need for liberating the rural populace.
5. There should be training of specialist Adult science educators who will do this job of liberation. Once they are scientifically liberated rural areas are developed.

### **Conclusion**

Leaders of most African countries have turned to the West for providing them with the benefits of science and technology. Sometimes these are done through joint projects, recruitment of trained personnel, the assembling of sophisticated machinery etc. In doing any of these, the African countries expect the transfer of technology. Citizens will learn and acquire the necessary skill while working with or understudying the foreign experts. This shows that the quest for growth and development through science and technology is being approached on a wrong footing. The breaking through towards progress must essentially come from within.

If the benefits of the scientific literacy is properly implemented, it will help us realize the objectives of 6-3-3-4 education system in Nigeria. This invariably will help us to solve basic scientific problems as they arise. Hence scientific literacy plays a concomitant role in manpower development.

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