SCIENCE EDUCATION IN GHANA

G.K. Tuani,
BSc DASE MPhil
Department of Chemistry,
University of Science & Technology, Kumasi, Ghana

ABSTRACT

Fundamentally, science involves knowledge about elements, forces and processes of nature. This paper seeks to establish that our environment is very rich in these elements, forces and processes of nature. Some of these have been recognized and interpreted in many areas of our society and some are of valuable service to us. Even though the present state of scientific knowledge within our context may be intuitive or rudimentary and may be sometimes contrary to modern scientific knowledge, nevertheless, the infrastructure is there and the Ghanaian child must be made aware of the scientific and learning potential of his rich environment - this is Education through science.

Keywords: Science Education, Culture, Rural Science and Technology

INTRODUCTION

Education and its aims have passed through a series of shifts in perspective. One finds it hard to make sense of all the literature about education and its aims. People tend to differ very much in what they regard as most important. New positions about the aims of education have emerged only to be challenged and given way to alternatives. For example, whilst developing countries are providing more schools and working on new ways of making formal education or schooling more relevant to their societies, there are proponents of the "deschooling philosophy", in the industrial countries of the world who hold that "effective" education would be achieved without schools. Though the vocabulary of education is international in nature, its practice should be opened to local interpretation. Education should be the process of preparing the individual for life in his immediate environment, the society and the world at large.

Ghana's educational system takes away a very large percentage of total national budget every year but the very elitist nature of this system tends to serve only a very small minority, who: are intellectually strong. Most of our elitists: "...have come to regard education as meaning a man is too precious for the rough and hard life which the masses of our people live..." [1] This educational system simply teaches people to despise knowledge other than that which comes from books; it does not encourage a open critical mind which can appeciae that sometime the accepted wisdom of the tribe or society is correct and the wisdom of books incorrect.

SCIENCE EDUCATION

The word "Science", when used without qualification, can be misleading. This is because "science" changes its nature at the level at which it is prosecuted.

Science, or scientific pursuit, refers to the activity in which research scientists are engaged in. Science students in secondary schools learn about the body of opinion which has been generally accepted by the scientific community. They are learning selected scientific facts. While involved in this process, they will also learn something of the tools and techniques of scientific research and something of the fundamental nature of scientific theories. However, they remain apprentices and not craftsmen, so that the present function of science teaching is the imparting of "basic craft skills."Such skills are to be regarded as intellectual as well as physical. For example, the abilities to use correctly a pipette or apply the principle of conservation of energy, both represent craft skills. Science education in our schools, both at "O" and "A" levels, largely involves and continue to involve, the imparting of "basic craft skills" considered to be of value in the training of a future research scientist.

There is no doubt that the West African Examination Council's science syllabuses are largely subject-centred and science education in our schools remains education in science.

NEED FOR CHANGE

Pressure for change is more often made on broad "educational" grounds, namely:

a. that the vast majority of students taking "A" level science subjects including the few who may enter the universities, are certainly not going to be research scientists,

b. that the present syllabuses are not attracting pupils to study science,

c. that through science education, pupils should be made aware of the effects of science and technology.

These represent pressures for science education to be more pupil and society-centred. That is, the aim is for education *through* science, and a move away from

the subject-centred approach.Our secondary schools' science courses should demonstrate the relevance of the subject to modern life.

The courses must include applications of the basic sciences with technology and deal to some extent with the social consequences of scientific developments. For, as expressed by the developers of the Project for Science Integration [2], if scientific knowledge or concepts would be "...acquired without the skills and attitudes which one needed for its successful application, that knowledge is empty..."

RELEVANT SCIENCE TEACHER EDUCATION

"...Teacher Education...is a service industry,"[3]. This service should be to respond to the changing priorities set by society for educational development.

In the past (and even at present) teacher education curriculum in Ghana existed just:

"...to provide a supply of teachers who will fit smoothly into and maintain the school as it is. The usual method courses were parallel to the curriculum areas that were customary in the school. For the prospective elementary school teacher, they are offered in reading, arithmetic... For the secondary school teacher, they are offered in the specialities for which he is preparing himself. Hence, the pattern of method offerings correspond to the offerings of the existing schools, rather than to any of the possible revisionary concepts."[4] Our teachers are acquainted only with the content, materials and teaching tactics that were preferred by the educational leaders of some times past. To them, scientific thinking involves just observations, explanation of observation and possibly testing the explanation. Our science teachers have been trained to "think scientifically" that way and this is all that they impart to the pupil. Is this all that scientific thinking involves and can offer? There is a need for a new science teacher educational programme which will: "...prepare teachers who will not only be able to perform tasks (that could be envisaged) , but who will also be able to create future educational reforms and develop systems that give teachers the power to create as well as perform."[5] This new type of teachers would be expected to have a very deep understanding of our development problems in terms of Ghana's predominantly rural population and the relevance of science education to this rural development. This teacher should be able to organise science lessons centred around locally available resources; thereby encouraging the students to be self-reliant in the community to foster traditional skills and culture. The teacher should also be able to develop in the student an awarenes in the community of rich local resources that can be utilized for development.

NON-SCIENTIFIC CULTURE

The foreign cultural impact on Africa has produced some positive and desirable results but it has definitely produced some adverse effects as well. Dzobo [6] has summarised the adverse effects in the following words: "It has undermined the African's belief in the worth of his cultural heritage and in some cases has led to the destruction of his self-respect and the formation of diffused and negative image of himself and of his culture. On the other hand, it has led to uncritical and simple-minded admiration and acceptance of the Western way of life in all its various forms. Many Africans have therefore become mental slaves of Western cultural tradition and have lost their identity and the power to participate meaningfully in shaping the world by letting what is indigenously African be rehearsed as the constitutent of human history..." During the course of Ghana's contact with the West, (and the East) Dzobo continues:" ...Africans and their culture have been treated as object and not as subsject of history. They have been forced to play a passive role in the making of the history of our world and so it is always to them that something is being done and they are the ones being 'acted upon' " [6].

In the field of science, it is generally believed by non-Africans (and many Africans) that the African is unscientific in his ways and superstitious in his attitudes. His environment is also regarded as lacking in those forces that would stimulate scientific and intelligent behaviours. Such prejudices towards the African environment tend to support the belief that the African would and should always depend on imported technologies and ideas to develop into modern technological societies.

While it would be accepted that certain sophisticated scientific tools may be necessary to enhance studies in the sciences at higher educational levels, there has always been a rich collection of cultural objects and beliefs with scientific bases in all African societies. The scientific bases may be elementary, but could serve as valuable links between what is familiar and new knowledge and understanding that is to be required. A few of the African's cultural items and technologies with their related scientific principles or concepts are listed in Table 1.

TABLE 1 BASIC TECHNOLOGIES

MATERIALS OR ACTIVITIES	SCIENTIFIC PRINCIPLES APPLIED
1.Local soap production from plantain peels' ash and oils	Alkali hydrolysis of esters or glycerides saponification.
2.Production of local spirits from palm wine and sugar juice.	Bacterial fermentation
3.Manufacture of local alcoholic drinks.	Distillation
4.Charcoal making	Destructive distillation of wood
5.Canoe building	Mass-volume relationship
6.Clay uses	Texture of materials
7.Common salt from sea water	Evaporation and crystallization
8.Dyes	Extraction of natural products
9.Herbal medicine	Organic natural products and chemotherapy
10.Iron smelting	Reduction of iron oxide using carbon(charcoal)
11.Preservation of food products by salting, drying, smoking and steaming.	Metabolism control
12.Palm oil from palm fruit	Extraction
13.Roofing of houses	Non-absorbent property of materials, heat insulators.
14.Use of clay pots as coolers	Refrigeration, evaporation causing cooling
15.Birds and animal traps	Elastic properties of materials. levers
16.Bow and arrow	Elastic properties, direction and force
17.Catapault	Elasticity, direction and force.

CONCLUSION

The goals of Science Education should be curiosity, compassion and competence: Curiosity concerning the world in which we live, compassion for those in need, and competence to do something about it [7], We do not have a non-scientific culture. Our science teachers should explore and expose to the pupil, the rich and abundant resources in his environment and to instil in him an awareness and appreciation of the knowledge, skills and expertise of the "ordinary" people in our supposedly non-scientific culture. This calls for education through science and not education in science.

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