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INTEGRATING FORMAL AND INFORMAL SCIENCE FOR DEVELOPMENT: IMPLICATION FOR EDUCATION AND TRAINING

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INTEGRATING FORMAL AND INFORMAL SCIENCE FOR
DEVELOPMENT: IMPLICATION FOR EDUCATION AND
TRAINING

By

Dr. (Mrs.) B. T. Danmole

Abstract
Every society of the world possessed one form of technology or the other which was used to satisfy basic needs (Olaoye, 1989). Science and Technology has the same meaning all over the world. It is often an index of development. Development can be described as a level of growth and advancement. It could also mean the stage of industrialization or economic advancement of a country. The orientation of science and technology in any nation depends on the national goals, values and aspirations of that society. An attempt is made in this paper to examine the national policy on education with respect to formal and informal science. It suggests methods that would ensure the integration of both formal and informal science. Furthermore, the paper discusses the implications of such integration for education and training. Recommendations are made.

Introduction
Science is the state or fact of knowledge, the systematic knowledge derived from observation and experimentation in order to determine the nature or principles of what is being studied (Webster’s Dictionary & thesaurus, 1998). Science is also the systematized knowledge of nature and the physical world, as in any branch of the natural sciences.

Science may be viewed from two perspectives namely: Basic and Applied Sciences. The former deals with the fundamental principles or facts, while the latter is concerned with practical application of the principles and facts. While basic science is pure science, applied science is associated with technology and constitute skills and techniques whether modern or traditional. Such skills and techniques are utilized to provide goods and services for better quality of life and development.
Every society of the world possessed one form of technology or the other which was used to satisfy basic needs. (Olaoye, 1989). The Nigeria communities had developed their own technology based on their ecological conditions and ingenuity to satisfy their needs. The traditional industries, arts and crafts grew from domestic occupation to very extensive industries some of which still exist today.

A number of these indigenous such as that of soap making (black soap) and Cassava processing to produce Garri (a staple African food) utilize the principles and processes of science in spite of their non-confinement to academic institutions. This could be referred to as informal science. There are other apprenticeship training programmes embarked upon by several communities. Informal science is unofficial and not according to prescribed of fixed regulations.

Formal science is that which is studied within the confines of an established academic institutions. It is based on official course of study content of a specified duration and certain stipulated entry requirements (Webster’s Dictionary & Thesaurus, 1978)

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**National Policy on Education**

Education is the most crucial factor for development; consequently, it should be used to transmit the values and know-how of society as determined by the national policy. Formal science is an integral part of basic education as reflected in the policy at all levels of the educational system. For instance, at the primary school level, one of the goals is to “lay a sound basis for scientific and reflective thinking”. Similarly, at the secondary school level, the goal is to “provide trained manpower in applied science, technology and commerce at sub-professional grade”. Also, one of the goals of the policy is the provision of technical know-how
and vocational skills much needed for the streaming of students at junior secondary school level in the following manner.

<table>
<thead>
<tr>
<th>Senior Secondary School</th>
<th>60%</th>
</tr>
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<tbody>
<tr>
<td>Technical College</td>
<td>20%</td>
</tr>
<tr>
<td>Vocational Training Center</td>
<td>10%</td>
</tr>
<tr>
<td>The Apprenticeship Scheme</td>
<td>10%</td>
</tr>
</tbody>
</table>

In the same vein, policy pronouncements for vocational education are to provide trained manpower in the applied sciences, technology and business, particularly crafts.

At the tertiary level, that is, universities and polytechnics, students in technically based professional courses are to be exposed to relevant working environment before the completion of their course (NPE, 1978).

It is noteworthy that a section of the policy highlights mass literacy, adult and non-formal education. However, in spite of the provisions in the policy, most institutions especially at the secondary and tertiary levels have little or no interaction with many community based indigenous informal science training centers which are scattered all over the country. Many problems have been identified to be responsible for this gap. The problems range from inadequate funding, shortage of workshops and indeed, or technical manpower. Others are lack of facilities and equipments in the institutions. As for informal training in science, the problems include lack of specified syllabus, and lack of periodic examination to determine the extent of competence of the apprentice. Also, there in no uniform entry requirement and no specified duration of training.

**Methods of Integrating Formal and Informal Science**

There are several ways of integrating formal and informal sciences. One important method is to constitute a body that would evaluate and review the present 6-3-3-4 educational system. Such a committee must have a teacher as a member.

Another way is that there should be information gathering with particular reference to education. This collection of data must include how information can be integrated from the informal sector (i.e number location and profile of those excluded from the formal system, the salient features of their programmes and sources of their finances). This is to ensure that they registered with the Ministry of Education and monitored.
Another method is to organize the educational sector with the aim of creating links between formal and informal systems by sharing education resources to support projects which have been found effective in catering for those not in the formal system. Furthermore, it is necessary to maintain cooperation and partnership for the educational sector by identifying forces outside the school system that can be invited to provide a demand for education (Poisson, 1999). For example, a skilled carpenter in the informal sector can be invited to an Intro-Technology class to demonstrate his techniques to junior secondary school students. Another example could be to invite an expert from the informal sector on Tie-Dye technique to show some practical demonstrations and effect of chemicals on fabrics to chemistry students in the senior secondary school who have earlier been thought the principles of the reaction. Another example, science students may be taken to cassava processing centers accompanied by their teacher linking the scientific knowledge of the fermentation process with their observations of the traditional procedure of cassava processing in the making of Garri.

If information and modern instructional techniques are provided to the informal sector with the necessary information and tools, the standard of apprenticeship would be enhanced, which in turn, would help to restore confidence in the informal sector. Indeed, students from formal institutions and informal training centers could benefit from joint practical training programmes which should be organized by Government.

Periodic inspection of formal institutions and informal centers using similar criteria and guidelines is another way of integrating the two sectors.

**Implications for Education Training**

From the methods highlighted above the following major implications can be identified as follows:

**Policy**

It is imperative to review policies that organize the merits of informal science and are aimed at consolidating and promoting it. There is need for existing provisions for science and technology education at all levels and all setting to be reviewed. There is the need to give appropriate attention to development and maintenance of learning programmes responsive to the needs for individual and communities (Project 2000). The 3-3 tiers of the secondary school education in the 6-3-3-4 system must be implemented.
Curricula

The need to develop competence-based school science curricula becomes imperative in order to be in close collaboration with the informal sector. There should be the development of appropriate in school and out-of-school opportunities and programmes, with the aim of reducing the distinction between the formal and informal sector. The provision of easy transition from formal to informal science training and preparation for lifelong learning becomes imperative. It is important to review science syllabuses that are too theoretical. For instance, Nwosu (1994) observed that the present Introductory Technology syllabus does not pay sufficient attention to the value and importance of technologies already existing in the students immediate environment. Topics on traditional technologies associated with building, food processing, weaving, dyeing, food preservation and storage, pottery and several others are lacking in junior and senior school science syllabuses.

Curriculum for each informal training programme must be developed to bring about uniformity in content and duration of training. For instance, duration of training in the informal sector often depends on such factors as, patronage of clients, disposition of the boss and number of apprentices.

The need for strengthening of ties between formal institutions and informal sector through apprenticeship programme must receive adequate attention. Indeed, the improvement of basic education such as universal Basic Education (UBE) is a preliminary to the integration of formal and informal science. The need to introduce technological training and/or production components into the curriculum cannot be ignored. Technical and vocational educations as organized in the countries of the sub-region, is a poor preparation for integration because of many defects. Some of these are under-equipped workshops and low examination success rate to mention a few. Training programme through workshop for instructors of the informal sector must be mounted periodically to equip them with new scientific procedures and techniques.

Examination Assessment

This aspect deserves attention more than ever before. More time should be spent on practical work and the need to device alternative assessment procedures other than paper and pencil testing which only assess the cognitive domain of knowledge. Practical skills should be assessed thoroughly. Besides, competence of apprentices in informal science must be determined through examination in addition to practical
skills before being considered to have completed their training. There has
to be a laid down standard for assessing practical work in both the formal
and informal sectors.

Certification

A present, certificate which trainees obtain from informal training
programmes are not often recognized by employers of labour.
Government should endeavour to harmonize certification procedures of
formal and informal training in Nigeria. Several elements of the training
can be the responsibility of Ministry of Education, Ministry of Labour and
Productivity, the Private sector and the Industry. These agencies must
work in unison (Atchoarena & Cailloids, 1999). This is inevitable in order
to bring about the desired uniformity in certification.

Personnel

The training of teachers and instructors towards the reforms has
become necessary. The promotion of in-service education for formal
science teachers is implied. Informal science instructors must not possess
less than a primary school leaving certificate and must be conversant with
basic processes of education. The shortage of manpower especially
teachers and instructors must become history for the proposed reform to
make appreciable impact in development.

Conclusions and Recommendation

Science and Technology is an integral part of today’s world.
Therefore, it is crucial to combine science education programmes in
schools with informal training schemes. For a leap forward in science and
technological development, formal and informal science should be
integrated in a way that Nigeria indigenous technology, arts and crafts,
such as, soap making, food processing and storage, cloth weaving, pottery
and black-smithing which are largely informal are also taught by qualified
personnel in the formal school system as envisioned in the National Policy
on Education.

In order to achieve these objectives the following
recommendations are made:

1. Government is to ensure the availability of basic education to all
citizens. Therefore, the Federal Government Universal Basic
Education programme should be well implemented to ensure
education for all Nigerians.
Integration of formal and informal science requires substantial amount of funds. Government must have the political will and commitment to fund science education at both formal and informal levels.

3. Government must find new ways of financing education. Each government, at the Federal, State and Local levels must have its role clearly defined with respect to funding education.

4. Government should evaluate the present 6-3-3-4 education system especially as it relates to science and technology education. Establishment of workshops must be given special attention.

Reference


