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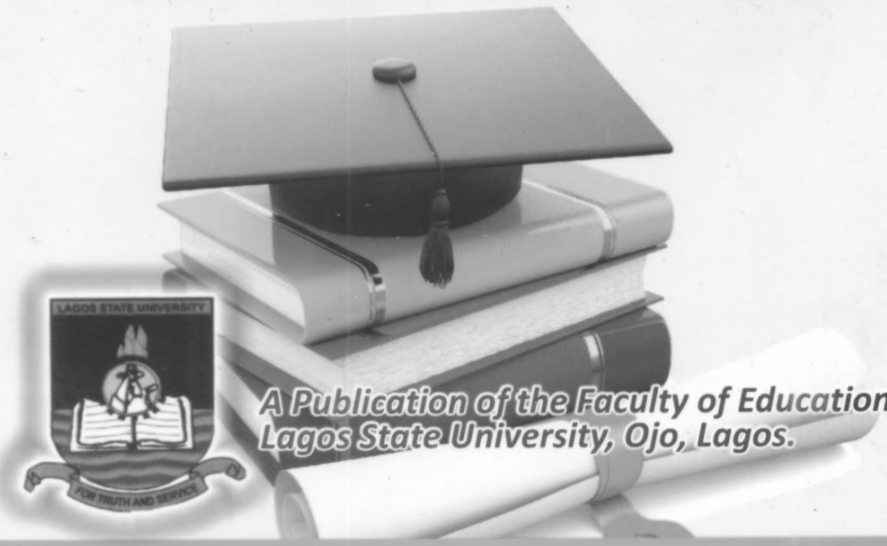

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Chapter25

Science Curriculum Development in Nigeria: A Psychological Perspectives.

Tunde Owolabi (Ph.O)
Olugbenga Akindoju
Bunmi Onafowokan (Ph.O)
Department of Science and Technology Education
Lagos State University

Introduction

In Nigeria, most significant initiatives in science education began in the twentieth century. Educational change was essentially informed by the need to reflect national needs and aspirations in the design of the curriculum. Curriculum design has always been hinged on a theoretical guide which were not explicitly mentioned in the curriculum. Albeit teachers' were exposed to these theories during pre-service training in several of the courses undertaken. It is much in doubt whether teachers decipher these theories and apply then accordingly in science classroom discourse. Knowledge of these theories is not enough without the knowledge of its implications in science classroom.

This chapter examines the evolution of science education in Nigeria. It highlights some emblematic features, elaborates and accentuates the theoretical frame reference with respect to science curriculum development in Nigeria.

EVOLUTION OF SCIENCE CURRICULUM REFORM IN NIGERIA

Prior to 1859, science was never taught in any school in Nigeria (Ivowi, 1990). The establishment of secondary and teacher training institutions between 1859 and 1929 paved way for science teaching in form of astronomy, chemistry, physiology, geology and botany. Science teaching was however fraught with problems. As noted by Omolewa (1977) "Science teaching and learning suffered in the hands of teachers and students, entry and performance at external examinations were very poor".

A watershed in development was recorded with the Phelps-Stokes funded education commission that visited West Africa in 1920 which found that the state of education was deficient. The commission made a strong recommendation for the inclusion of science subjects in the curriculum of all secondary schools. As noted by Omolewa (1977), by that time, very few competent science teachers were available in few schools for a very long time, the provision for, and method of teaching were very unsatisfactory.

Before independence in 1960, Ivowi (1990) noted that at the lower forms of secondary schools, general science was taught and that a few privileged schools (mainly the government and mission schools) taught Biology or Health

Science, Chemistry and Physics in the senior forms. Control and selection of science contents in schools was dictated by external examination boards (Cambridge and London Universities Examinations Syndicates) with little or no regards to peculiarities in Nigeria. This was described by Sampson (1981) thus:

> The attainment of political independence in 1960 however, marked a turning point. Strong emphasis was placed on science teaching and learning especially at the secondary school level and content of these science subjects should be made even more relevant to the needs of the country.

Between 1960 and 1970, debates on science education (in terms of content and teaching) dominated the scene. It became obvious that there was every reason for the Nigerian educational system, with its irrelevant and out-of-date curricula, to be revised. This culminated in curriculum development conferences and workshops. The most remarkable was the curriculum conferences of 1969.

The 1969 conference provided an opportunity for discussing prevalent educational issues and problems, how to ameliorate the situation and come up with desirable and appropriate curricula that will be relevant to the needs of the Nigerian child and society (Adeyemi, 1995). The National Policy on Education was the outcome of the conference.

The National Policy on Education (NPE), first published in 1977, stated Nigeria's philosophical stand in education and indicated how education could be used as an instrument of change in our attempt to develop, both scientifically and technologically. Primary education is to prepare the individual child for secondary education. Secondary education is divided into two stages: the first stage provides for both academic and vocational education. Secondary education therefore prepares the youth for useful living in the society and for higher education.

In order to give a new direction to education in Nigeria, government had at different times taken a number of measures in form of policy statements aimed at boosting and improving science education. Government policies on science education have been clear; these are summarized by Ivowi (1990) thus:

I. Science shall be taught to all children in primary and secondary levels.
Ii. The teaching and learning of science shall be done in such a way as to develop the child in the three domains (cognitive, affective and psychomotor) of educational objectives;
Iii. Equal opportunity, in terms of the provision of curriculum materials, resource persons and laboratory facilities, shall be given to all;
IV. Every child shall take at least one science subject at the end of the secondary school course examination.
V. Local production of science equipment and the practice of improvisation shall be pursued vigorously

The policies on science education are quite laudable. However, realization of these objectives is far from being achieved. Nevertheless, it is evident that government has never neglected science education. Several giant strides have been taken although with little effect on the overall educational attainment.

Curriculum development effort in Nigeria

Curriculum development process refers to the stages undergone in the production of a structural set of learning experiences. The practice of curriculum development is usually guided by theory so that the overall effect of the actions taken can be predicted, evaluated and improved upon in a systematic manner (Ivowi, 1994). Watson (1983) equally defines curriculum development as the selection and organization of content and the elaboration of the teaching methodology inherent in that content so that the desired goals of the curriculum will be effectively achieved.

The efforts in curriculum development in Nigeria follow that of the British system. Two stages are clearly discernible, namely:

i. A period in which subject matter experts dictated what schools must teach in their various subjects, in which the experts solely write the school books and in which they set the examinations and the standards that are to be used to judP,P achievemen+s. (Onw1Jkrl, 199fi).
ii. A period in which teachers and educators seize their legitimate right to decide what to teach, how to teach and where to teach.

Curriculum development follows a rational and logical process, which is translated into specific integrative steps with every step informing what follows and in its turn having implications for the preceding step. Tyler {1969) suggested four basic questions that show the relationship between the parts or stages of curriculum development process and guide curriculum planners. The four basic questions are:

i. What educational purpose should the school choose to attain? (objectives).
ii. What educational experiences can be provided that is likely to attain those objectives? (selection of content i.e learning experiences/ students' activities).
iii. How can these educational experiences be effectively organized? (organization of content).
iv. How can we determine whether these purposes are being attained? (evaluation)

These four concepts (objective, learning experiences/ student activities, content and evaluation) are referred to as the curriculum elements. The inter-relationship of the elements (model) is crucial in any curriculum development process. Since the level of a nation's curriculum development is the hallmark of her educational attainment, efforts in curriculum development need to be taken very seriously. One of the factors in the development of an effective, functional and practical education is the evaluation of an appropriate

curriculum, designed to produce a sound and effective citizenly at appropriate level, who can contribute towards the achievement of the national aims and objectives.

Onwuka (1996) emphasized that a curriculum must be designed in the light of the major trends and development within the society and it must also reflect the major social and cultural needs of the society. An educational system goes astray when it has no relevance to the society. Imarhiagbe (1992) shared this view of the society and its needs with the learner as the provider of the societal needs. The learning experiences should be well structured and organized with the school as the agent of curriculum operation. Odubunmi (2001) opined that whenever a school science curriculum is developed, appropriate science teacher education programme that will aid its implementation should be designed and implemented.

Ivowi (1990) had identified the objectives and process models of curriculum development model of Nigeria Educational Research and Development Council (NERDC), the body, which developed the curriculum (teaching syllabus) in the various teaching subjects used in schools. NERDC also embarks on the development of instructional materials and dissemination of research reports on curriculum development, implementation and renewal {Ivowi, 1993). NERDC model is very much related to the skilbeck five-stage framework, which is a typical example of the process model of curriculum development. The skilbeck five-stage framework is as follows:

Stage 1: Situational analysis; This involves problem identification of formulation of curriculum team.

Stage 2: Goal formulation; This involves stating of objectives.

Stage 3: This involves the determination of curriculum content and development of instructional materials and personnel.

Stage 4: Interpretation and implementation: This involves the Trial testing. Modification and Installation of materials.

Stage 5: Monitoring, assessment and reconstruction feedback; This involves the summative evaluation and revisionary cycle.

According to Adegoke and Ajeyalemi (1998), unlike many developed countries (U.K and U.S.A), there are no school-based curriculum projects for which teachers in a school organize and develop their own curriculum. Curriculum development at present is centrally controlled either at the federal level (Federal Ministry of Education) or at the state levels. National guidelines are prepared for government approval by authorized agencies such as Comparative Educational Study and Adaptation Centre (CESAC, now NERDC) and Nigeria Teachers Institute (NTI). At the state levels, the Educational Research Centres, which are resource centres for teachers, undertake curriculum development work for schools in the state while in some states, the curriculum section in the Ministry of Education undertakes such functions.

Efforts of other curriculum development agencies (STA~ and WAEC) deserve a mention. The primary function of WAEC is as an assessment agency. However, WAEC according to Adeyegbe (1993) organizes symposia, workshops and conferences to attend to contemporary educational issues that have affected the entire educational system in general and curriculum development processes in particular.

Also, STAN has made concerted efforts at improving the quantity, quality and teacher effectiveness in science teaching and learning. The curriculum development efforts of the association cover a wide range of its activities including organizing conferences and workshops, which are aimed at the professional development of members and writing and publishing of journals, textbooks and other instructional materials.

The current goals of science education in Nigeria are geared towards economic emancipation and as remarked by Awokoya (1980) "The curriculum of such a programme must be characterized by relevance to the needs of the community, so that the knowledge and skills acquired must be adequate for the task".

Theoretical framework of science curriculum

The scientific process is a perfect bridge from learning theory to classroom scientific investigation. There are diverse learning theories (behaviourist, cognitive, humanist and social and situational), the teaching and learning processes in science in Nigeria is however guided by a combination of behaviourists (Skinner, Pavlov) and cognitivists (Bruner, Gagne, Pavlov) theories. Science teaching at this stage involves the use of specific identifiable stimuli (Pavlov,1927) to trigger internal cognitive structuring. The internal mental process is prompted by the teacher passing information that enables pupils to use their insight, feel objects, and interact with their environment (Piaget, 1957). Consequently, pupils produce desirable behavioural change and develop capacity and skills to learn better.

School curriculum in science was designed on the strength of these learning theories. In order to achieve a holistic presentation of science and technology content to learners, the thematic approach to content organization was adopted in line with Gagne's (1967) work on instructional theory. Gagne (1967) opined that learning is brought about as a result of instruction that arise from the psychological requirements of learning tasks and hierarchical theory. Gagne (1967) viewed a wide range of instructional problems as variety of learning tasks. The four major propositions in instructional theory of Gagne informed the present structural configuration of science curriculum. These are:

Learning goal- This is represented in the science curriculum by the performance objective which is expressed in action form to depict learning by doing

Learning outcome represented in a predictable prerequisite relationship- Science curriculum is arranged in learning hierarchies. It is a sequence of

content units arranged in such a way that the learning of each unit may be accomplished as a single act, provided that the capabilities described a specified prior units {in the sequence) have already been mastered by the learner.

Acquisition of different outcome requires different internal processes (internal conditions of learning)-

The science curriculum consists of arrays of activities to be performed by the teacher and the students. Relevant instructional materials needed to actualize the activities are listed. It encouraged teachers to provide reinforcement (Skinner, 1938) to increase the frequency of a selected response.

Acquisition of different outcome categories requires identifiably different instructional processes (events of instruction and external conditions of learning)-

The science curriculum explore instructional strategy which recognizes experimental learning tasks. This is achieved by the teacher providing experiences that ensure that the child engages in mental operations appropriate to their development using hands-on experiences that tasks the child on grouping, and categorization. In doing these the teacher ensures the matching of instruction with objectives, classifying objectives as knowledge, skills, physical development, disposition and experiences. Premised on Bruner (1961) theory, this instructional strategy encourages practice in and discovering for oneself and teaches one to acquire information in a way that makes that information more readily viable in problem solving. In this situation, the learner draws on own experience and prior knowledge, interact with the environment (arrays of instructional materials) by exploring and manipulating objects, performing experiments. The teacher acts as facilitator all through the period of learning guiding pupils with the aid of thought provoking and leading questions, discussions and experiments. Guided discovery produced more immediate recall of facts, longer term transfer and problem-solving skills (Kirschner , Sweller and Clark, 2006) and ensures an activity oriented and learner centered classroom environment.

literature is replete with the predominance of lecture method at the instance of guided-discovery method advocated by the curriculum. Concerted efforts had been dissipated to stem the growing tide of lecture method which is largely teacher informed. little improvement had ensued due to teachers' reluctance to embrace change. Teachers' conviction of the necessity for change through convincing explanatory evidence of theoretical basis of curriculum design could provide the needed antidote for attitudinal change. This paper provides invaluable insights and exposed teachers to the psychological underpinning of the science curriculum development.

Conclusions

The present curriculum in science has received laudable commendations of practitioners. It provided the needed guide for teachers in terms of formulation of performance objectives, sequencing of content, sourcing and listing arrays of learning activities, and evaluation guide. An overarching problem is how to ensure proper implementation of the numerous learning activities. The hitherto stereotype nature of practical work where focus of experiments is to establish links with general scientific principles is still largely fixed in the cookbook mold.

Practical work should be subject to change and counter change. First, students should perform experiments with their own hands and these experiments should not be the mere confirmation of previously learnt concepts but means of elucidating previously uncertain phenomena. Emphasis should be on teaching science for understanding rather than rote learning.

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