PLANNING FOR INQUIRY-BASED SCIENCE EDUCATION IN NIGERIA

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ABSTRACT

This paper examines the inquiry nature of learning in Nigeria. It is made up of six sections. It highlights modern science education, the inquiry learning process, the status of inquiry-based science education in Nigeria. It assesses the problems in implementing the National science and technology education policy and inquiry-based science education in Nigeria. The last section provides some pivotal recommendations.

INTRODUCTION

Inquiry-based learning is primarily a pedagogical method developed during the discovery learning movement of the 1960s as a response to traditional forms of instruction where people were required to memorize information from instructional materials.

Inquiry-based learning gives constructive thoughts where knowledge is built on familiarity and procedure especially socially based experiences. It is in group situations that learning develops best on this basis. Progress and outcomes are assessed by how well people develop experimental and analytical skills, and a lot more on their effectiveness in the groups (Abel-El-Khalid, 1997).

Inquiry-based learning covers a range of approaches to learning and teaching, includingfieldwork, case studies, investigations, and research projects.

Specific learning processes that people engage in during inquiry-learning comprise:

- Generating questions of their own
- Obtaining backup proof to answer the question(s)
- Clarifying the proof gathered
- Relating the clarification to the information obtained from the investigative process
- Generating an argument and defense for the clarification

A recognized philosopher of education, John Dewey earlier in the 20th century, was the first to disprove that science education was not transmitted in a way to cultivate young scientific thinkers. One of Dewey's proposals is that science should be imparted as a procedure and way of thinking and not as a subject with facts to be remembered. While Dewey was the first to draw attention to this issue, much of the modification within science education followed the life-long work and efforts of Joseph Schwab.

Inquiry-based learning entails the provision of questions, methods, and materials, but the relationships between variables are expected to be discovered by the students.

MOVING FORWARD TOWARD MODERN SCIENCE EDUCATION

1. Students should be able to acknowledge that science is more than memorizing and knowing the facts.
2. Students should have the opportunity to develop new knowledge that builds on their prior knowledge and scientific ideas.
3. Students are influenced by the socialenvironment whereby they have an opportunity to learn from each other.
4. Students will take control of their learning.
5. The extent to which students can learn with deep comprehension will grasp how transferable their new knowledge is in real-life contexts.

INQUIRY SCIENCE EDUCATION

Inquiry activities are formulated to give students sufficient chance to explore, apply prior knowledge, evaluate, widen the understanding toward new learning, and to appraise their progress in emerging new understandings. Inquiry education is most operational when students can identify the importance of their learning and how it can be related to their lives (Koh, 2008).

Inquiry education involves generating questions, taking studies, undertaking research to ascertain what information is already recorded, advancing experimenting methods, developing data collection tools, collating, analyzing, and interpreting data, highlighting possible explanations and forming predictions for future study.

There are many diverse descriptions for inquiry teaching and learning and the various levels of inquiry that can exist within those contexts.

The progression observed from level one through four provides an excellent guide for how to scaffold inquiry learning skills for the students.

Level 1: Corroboration Inquiry: The teacher has imparted knowledge on a particular science theme. He or she then initiatequestions and a methodology that directs students through aproceeding where the results are already recognized. This method is to buttress the concepts taught and to pioneer students to read, and to follow processes, amass, collect and record data appropriately and to maintain and expand understandings.

Level 2: Designed Inquiry: The teacher proffers the initial interrogation and a framework of the operation.The formulation of explanations of findings or discovery by measuring and examining the data collected is done by the pupils.

Level 3: Guided Inquiry: The teacher only allowsthe research question for the students, then the designs, procedures to test that question and the expression of the results and findings arecarried by the students.

Level 4: Open Inquiry: The students design their research question(s), design and follow through with a progressed procedure, and transfer their findings and results. This category of inquiry is standard in science fair contexts where students initiate their investigative questions.

Banchi and Bell (2008), asserts that inquiry instructions should be introduced at lower levels and work their way to open inquiry thereby developing their skills. Open inquiry activities are possible if students are equipped and motivated to conduct an independent research study.

STATUS OF INQUIRY-BASED SCIENCE EDUCATION IN NIGERIA

Research-Based Science Education at the elementary and secondary level in school science education is advocated but not enforced.

The main problem in implementing national science and technology education policy and Inquiry-based science education are;

- Lack of practice facility and institutional infrastructure in rural area in the country
- Insufficient funding
- Shortage of qualified and properly trained teachers
- Backdated curriculum
- Low-quality Technical books and Materials
- Lack of monitoring and quality assurance mechanism
- No occupational standards and absence of Assessment instrument
- High drop-out percentage (above- 20%)
- Poor social perception and management issues

The science and technology education in Nigeria is intensifying in the lower basic education class (primary 1 – 3) where basic science and technology is one of the core subjects. In the middle (primary 4 – 6), and upper (junior secondary 1-3) classes, computer studies, and ICT are compulsory.

Bold steps are taken by government and stakeholders in education and in science and technology to improve the quality of science/technology and education regarding delivery and content. There is no contradiction; prominence must be given to students. It is in pursuance of this that government formulated some policies and initiated some programs that will enhance the status of science and technology education which gear towards the achievement of global standards.

Despite the promises of the education reforms, the salient question is, "can the implementation be successful?". Previous educational reforms had been implemented half-heartedly or abandoned at its inception. A few examples will suffice. Although the implementation of the 6-3-3-4 system of education commenced in the early 80s, most institutions could not effectively implement the introduction to technology aspect, due to lack of science teachers, equipment, and lack of leadership. The computer education programme launched for secondary schools in 1988 never succeeded. There is a wide gap between the policy and its implementation. Most secondary school teachers were not competent in basic computer operation and the application of software.

Regrettably, our customary educational system had operated in a way that it discourages the expected process of inquiry. Students ask fewer questions as they move through the grade

levels. In customary schools, students listen and repeat the expected answers and not to ask too many questions (Akinyemi, 2006).

More or less of the opposition of our natural inquiry process is from a poor understanding about the intense nature of inquiry-based learning. The useful inquiry is beyond mere asking questions and seeking for answers. A compound process is involved when a person attempts to transform information and data into useful knowledge. Beneficial usage of inquiry learning involves numerous factors:

- Background for questions
- Structure for questions
- Content for questions
- Classification of questions

Well-designed inquiry learning yields knowledge formation that can be widely applied. Educators must realize that schools need to move beyond data and information accumulation and act toward the propagation of useful and applicable knowledge.The process is buttressed by inquiry learning. Nigeria's success hinged on the supply of natural endowments in the past, but today, the country relies on a workforce that works smarter.

ISSUES AND PROBLEMS IN IMPLEMENTING NATIONAL SCIENCE AND TECHNOLOGY EDUCATION POLICY

Policies are fair and genuine when documented, but the implementation often encounter logjams hence objectives and goals are eventually rarely met. Typically, the problems are associated with science and technology educational policy and planning in Nigeria, which includes power about the planning stage, lack of project evaluation, pitiful preparation, and costs, and implementation challenges abound, these eat into the fabrics of the system, and the entire society is accountable.

The problems connected with the execution of educational policies in Nigeria are;

- Lack of staff training in methods and techniques of instruction
- Inappropriate development of internal awareness and wholeness
- Areas of demand and priority
- Dearth of inter-institutional cooperation
- Apathy on the role of government

Written reports have designated the non-execution of Nigerian National policies which just contributes to stagnation or degeneration. Funds are injected into policy planning and support, but the plans fail to give way through lack of implementation or poor execution. The dilemma associated with the shortage of funds during the implementation of plans on how to decide which project should suffer from cost reduction. Inquiry indicates that education projects are always the victims of fiscal shortfalls in Nigeria.

On November 2, 2006, the Honorable Minister for Education at one of the official ceremonies in Abuja delivered the keynote address titled "science and technology for youth empowerment" specifically states as follows,

"Our training system is malfunctioning creating in particular problems of scientific and technological personnel production. The situation is clear today that the nation is facing scarcity of scientific and technological experts. In essence, we are producing less and less of leaders of tomorrow: the managers, the entrepreneurial class, the teachers, the doctors, the law enforcement makers, and the professionals. The transition through the various levels of education is not in favor of technology and science career" (Odia, 2007).

Employment opportunities for science graduates: This is a crucial factor in the development of science education of any country. A science graduate should get a job in a research laboratory or a teaching & research position in a university or college or a research development job in the appropriate industry. However, in most cases, the science graduates end up in doing a job (if he gets one at all) which is in no way related to his expertise. Because of this, more and more students are avoiding the study of science.

RECOMMENDATIONS

a) Adequate emphasis to simple concepts of scientific discipline and math from the elementary level, and the school curriculum oriented in such a way that problem-working skills of the pupils are enhanced, and the interdisciplinary quality of science is reflected.
b) Introduction of ICT in the curriculum at secondary and higher levels of education.
c) Primary resources for education and training, namely, qualified teachers, physical facilities, equipment, books, journals, teaching aids, etc. Should be secured.
d) Adequate provision and proper placements for higher training and inquiry in the universities, polytechnics, and colleges of education.
e) Higher education in scientific discipline and engineering should be approachable to all based on merit which will be held by a liberal-government scholarship schemes.
f) Scientific and technological libraries should be spread out geographically to bring all cross-sections of the masses under its coverage.

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