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Teaching Basic Science Through Indigenous Practices for Millennium Development Goals

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Abstract

Millennium Development Goals(MDG'S)are targets for making measurable improvements in the lives of the world's poorest citizens. Participating countries were expected to articulate policies; strategies and plans which will facilitate the realization of the eight MDG'S. In meeting this need, the Nigerian government in 1999 developed a new 9-year basic education programme consequent upon which NERDC developed a new 9-year basic education curriculum in which basic science is a major component. This study lays emphasis on achieving goal 2of the MDGs which is achieving universal primary education with special interest in basic science curriculum delivery. The use of methodologies which draw on the cultural practices of pupils to enhance optimum performance was advocated.

Keywords: Home practices; Basic education; Curriculum and Millennium development goals

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1. Introduction

Education has been identified as the fulcrum on which development revolves and that societies that are undeveloped are those which do not invest nor see education as their overriding priority as stated by the authors in [5]. Consequently the authors in [8] in its National Policy on Education categorically stated that "Nigeria has adopted education as an instrument par excellence for effecting national development".

It is curriculum through which the general aims of a school education receives concrete expression. Accordingly, the authors in [2] opined that national curriculum provides a significant means of attempting to fulfill national objectives and of attempting to provide coherence and progression in the learning of pupils.

Primary education basically is the education given in all institutions for children aged 6 to 11. According to the policy document [8] the rest of the of three education system is built upon it. The authors in [12] cited in [2] review of the world have for primary education showed a considerable emphasis on basic knowledge and skills, intellectual, social and moral development providing a foundation for subsequent education. The relative priorities given to such aims reflect the circumstances of each country. Whatever the priorities, the specification of national curriculum is commonly seen as an important means of development. In Nigeria, the general objectives of primary education are;

- The inculcation of permanent literacy and numeracy and the ability to communicate effectively,
- The laying of a sound basis for scientific and reflective thinking,
- Citizenship education as a basis for effective participation in and contribution to the life of the society,
- Character and moral training and the development of sound attitudes,
- Developing in the child the ability to adapt to his/her changing environment,
- Giving the child opportunities for developing manipulative skills that will enable him/her to function effectively in the society within the limits of his capacity, and
- Providing basic tools for further educational advancement including preparation for trade and craft.

In achieving the stated objectives, the Universal Basic Education (UBE) was launched in 1999 by the Federal Government under the administration of the former President of Nigeria, Olusegun Obasanjo. UBE was to remedy the pitfalls observed in our educational system by aiming to provide quantitative, qualitative and functional education in Nigeria according to [6]. The author in [4] opined that it is in line with the programme that the Nigerian Educational Research and Development Council (NERDC), has developed a new 9 year basic education curriculum of the UBE. The basic science/ technology curriculum component assumes a prominent position in the overall curriculum because topics in science and technology constitute core or compulsory content of the curriculum from lower basic through the middle to upper basic levels. This is premised upon the fact that it is principally by means of science and technology that people can achieve national development.

It is in this connection that the Federal Government in collaboration with UNESCO embarked on the provision of mathematics and micro science kits to primary and secondary schools, the provision of technical support,

building the capacities of teachers/inspectors and designing and implementing advocacy programmes and others.

The Millennium Development Goals (MDG's) were set up as benchmark for development in countries world over. According to [5]; following the United Nations Millennium Declaration adopted at the Millennium Summit held 6th through8thSeptember 2000 in New York, Nigeria has been committed to the realization of MDG's by 2015.

The new curriculum was in response to meeting the MDGs but these are not without challenges.

This paper focuses on goal 2 of the MDGs which is achieving universal primary education with special emphasis on basic science curriculum delivery.

2. Millennium development goals

The Millennium Development Goals were drawn up by the United Nations. These goals were targets for making measurable improvements in the world's poorest citizens. According [13]''these goals were geared towards the reduction of poverty and encouragement of rapid progress in the improvement of the world''. The eight MDGs are to:

- Eradicate extreme poverty and hunger;
- Achieve universal primary education;
- Promote gender equality and empower women;
- Combat HIV/AIDS and malaria and other diseases;
- Improve maternal health;
- Ensure environmental sustainability and
- Develop a global partnership for development.

These goals are to be attained by the countries of the world before 2015. Education as stated earlier is the vehicle for attaining development, it is thus not an overstatement that the success of all the MDGs hinge on the realization of goal number 2 which is to achieve universal primary education because it is only an enlightened citizenry which has its root in primary education that will be well informed on issues relating to MDGs. Incidentally, the Dakar Framework reaffirmed the basic learning needs of all by means of Education For All (EFA) in which Nigeria participated actively and included in its goals that by 2015, that all children with emphasis on girls, children in different circumstances and from ethnic minorities shall have access to 9 years of schooling and complete free and compulsory education of good quality.

3. Improving the quality of science delivery in the primary schools

The 9 years basic science and technology curriculum is a restructuring and realignment of the revised core curriculum for primary science and integrated scienceof the junior secondary school. According to [4]; in the

selection of content, globalization, and information and communication technology (ICT) and entrepreneurship were three major issues considered to be crucial in the development of the child, important to nation building and influencing the contemporary world of knowledge. It is in line with this that the Federal Government of Nigeria (FGN) with support from the World Bank is implementing a science and technology post basic(STEP-B) projects whose objective is to improve the quality, equitable access to and relevance of science and technology education so as to increase the country's competitiveness in a globalizing world.

Specifically the objectives of the new basic education curriculum in science and technology are enabling the learner to;

- Develop interest in science education
- Apply their basic knowledge and skills in science and technology to meet societal needs
- Take advantage of the numerous career opportunity offered by the study of science and technology and
- Become prepared for further studies in science and technology

The teaching of topics in the new UBE scheme requires a students' full participation and therefore a child-centered approach.

Literature is replete with the abysmal performance of our pupils in the sciences and often more than not have been blamed largely on faulty procedures and methods adopted by teachers in content delivery. To substantiate this point, [7] had stated that:"many students lose any feelings of enthusiasm they once had for science that too often they studied science because they have to, but neither enjoy or engage with the subject and they develop a negative image of science which may last for life''

Perhaps a placebo to this scenario is to look inwards in our homes to seeif the home experience of students can be applied to teach the subject meaningfully. According to [16] the current best practices in science are activity-based. Activity – based approaches provide opportunities for children to be involved in experiences where they learn how to investigate and discover scientific concepts and principles. He argued further that school science is neither magic nor a bundle of abstract facts unrelated to out of school experience. Basic science teachers should therefore embrace the current trend where science is taught as an activity and never be as the conservatives of the saber tooth curriculum of the stone aged people in Britain reported in [18] from an address by the author in [9]. Perhaps an illustration is necessary here. The first educational curriculum consisted of

- *Catching fish with bare hands*
- *Clubbing tiny horses to death and*
- *Frightening saber-toothed tiger with torches*

By studying these three subjects in their school, the Stone Age people got along fairly well until there came a changed condition caused by the movement of ice from the north and forerunner of the ice age. The stream beamed multiplied and fish could not be seen to catch with the bare hands, so someone invented the net made of vines.

The tiny horses fled and the antelopes replaced them. The Stone Agers invented antelope snares. The saber tooth tigers died of pneumonia but the big ice bear replaced them and the Stone Age men dug pits to trap them, so, net making twisting antelope snares and digging bear pits became the three essentials of life. But the school continued to teach fish catching with the hands, horse clubbing and tiger scaring because they have taught them for years. Some liberals wanted to teach net making, snare making and pit digging but they were met with opposition. Some even wanted to do away entirely with the old subjects but they aroused a storm and were called radicals.

The old subjects must be retained for their cultural value the school people contended. *The proposed new subjects had no place in the curriculum. The conservative said training to catch nonexistent fish with bare hands is the best way to achieve muscular coordination and agility, training in clubbing horses that do not exist is an education in stealth and ingenuity, predicting to frighten tigers that do not exists develops courage. Some things are fundamental and sacred in education and must not be changed* [18:347].

Contemporary literature has showed that recognizing the school context of learning as well as the learner's socio-cultural background in teaching and learning of science is of primary importance if a strong foundation is to be established for successful pupil achievement and effective outcomes.

Below are some ways of improving students' performance in science drawing on their cultural experience. For pupils' culture can itself produce an excellent motivational hook into school work as opined by [2]:

1. Explanation relevance
2. Use of analogy
3. Transferring home activities to the school science laboratory/classroom.
4. Use of examples and non-examples

3.1 Explanation relevance

To explain is to relate an object, event, action or state of affairs to some other objects, events, action or state of affairs as advanced by the authors in [1,10] For explanation to be successful, the explainer must consider the knowledge and characteristics of the learner. Perhaps the best explanation the teacher could make is to relate what is practiced at home to the school science concept with the psychology that learning should relate to the child's experience for it to be meaningful.

3.2 Use of analogy

The author in [14]; viewed analogy as a link between two points, the known and the knowledge. According to [10] analogy is the use of very familiar and concrete examples and others which have some resemblance in some aspect or aspects which the imagination finds in two or more things that are essentially different to achieve understanding during explaining and describing. He maintained that the use of analogy plays a significant role in

achieving effectiveness in science teaching. Analogy helps reduce the length of explanation and to make abstract information more imaginable and concrete.

Below are examples of some analogies provided by [17]:

- Bacterial Chromosomes are like Spaghetti:
- Blood vessels are like highways
- The cell is like a factory
- DNA is like a spiral staircase
- Electricity is like flowing water
- The immune system is like the police force
- Building a protein is like building a house.

A detailed analogy comparing the features of water circuit to an electric circuit by the author in [15] is shown below.

Table 1: Features of water circuit compared to features of an electric circuit.

Circuit	
Water Circuit	Electric Circuit
Flowing water	Electric current
Pipes	Wire
Pump	Battery
Pressure	Voltage
Filter	Poor conductor
Reduce flow	Resistance

Home science activities may serve as better analogies for concretizing school science conceptsin the learners. The author in [17] earlier asserted that new content is meaningful only when it is connected to students' existing relevant knowledge.

The use of analogy is very important in science classrooms. However [15] had cautioned that analogy should be modified and targeted at the specific background knowledge of the students they teach. This is important only

when it is connected to students' existing and relevant knowledge. That by tailoring analogies to the particular background of the students, the science teacher can maximizes the explanatory power of analogies.

3.3 *Transferring of home activities to the school science classroom/laboratory*

Nigerian homes provide a rich source of activities for the development of science process skills. A deliberate attempt to foster scientific practices in pupils is to repeat these home activities in the school especially for topics considered to be difficult by pupils. Some examples may suffice to elaborate this point. In teaching the digestive system or alimentary canal, the actual slaughtering of chicken which takes place in the kitchen can be transferred to the school laboratory where the pupils will be fully engaged. Other activities abound in our homes that are applicable to school science. Ironing of clothes in the sitting room can be used to teach energy transfer and conversion from electric to heat energy. Conductors and insulators can be illustrated at meal times on the types of spoon and plates used, also at meal times, the concepts of food components, balanced diet and deficiency diseases could be incorporated most especially for children who are highly selective or who may prefer sweetened foods to vegetables and fruits. The use of radio, fans, television, refrigerators, computer, pressing irons, batteries in torch and lamps depict the concepts of electricity. The concepts of conduction, radiation and convections could be illustrated during cooking, boiling of water and staying at the fire place or being exposed to the direct rays of the sun respectively. The concepts of condensation which appears difficult to most pupils could be simplified with cooking activities.

Permit me here to share my experience with my daughter on the topic condensation. She said, mummy, you are in science, what is condensation? My aunty said condensation is when hot water meets a cool surface, I don't understand. I started defining it, but she interrupted, mummy, what is condensation? Then I remember my dissertation topic which was on a home science and students' performance in basic science. Then we quickly rushed to the kitchen where I was already cooking. I told her to watch, I opened the lid that was already accumulated with water vapour, immediately water drops started dripping down from the lid and she screamed with joy, yes! I know, I know and ran out of the kitchen. These will serve as stimulating experiences which is a kind of reward that enhances learning. Other learning principles which corroborate this view as outlined by the author in [17] are that learning is transferred to the extent that learners see possibilities for transfer as opportunity to apply this knowledge, meaningful material is easily learned and well retained, and learning is enhanced by a wide variety of experiences which are organized around purposes accepted by the students.

3.4 Use of examples and non-examples

Examples are used to clarify, illustrate or substantiate an idea. Examples can often make murkiest point clear and understandable for the student. The author in [20] had suggested several ways of using examples to clarify concepts as follows.

- Make them accurate. The examples should fit the concept to be taught and the purpose of the lesson.
- Make them clear. The examples should be simple and concrete using vocabulary and ideas familiar to the students.

- Make them interesting. The examples should relate to the experience and interest of the students.
- Make them transferable. When several examples are used, they should range from easy todifficult and should cover a variety of possible experiences.

It is up to the science teacher to harness these possibilities in his or her daily engagement with students for optimum performance. For instance, the authors in [3,11] have reiterated the efficacy of teaching basic science concepts using home related science activities.

4. Conclusion

Education is a key factor in addressing issues relating to development. As a result, countries the world over considered education critical to achieving the Millennium Development Goals (MDG's). The curriculum remains the instrument through which educational goals are implemented. In Nigeria, meeting the MDG's of achieving universal primary education through the basic science curriculum is not without challenges.

It has been argued that curriculum implementation lies squarely on the shoulders of the classroom teachers, for teachers' actions in the classroom influence learning. It is the view of the writers that if basic science teachers adopt strategies that are learner centered, activity oriented and providing students with concrete examples to illustrate ideas tapping from their home experiences, there will be meaningful learning of science.

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