PROBLEMS OF EXPERIMENTAL METHOD OF TEACHING PRIMARY
SCIENCE IN NIGERIAN SCHOOLS: THE WAY FORWARD

Godwin Awori Ochuema (Ph.D)
Federal College of Education, Obudu,
Cross River State

Agnes Agbede Ochuema
Federal College of Education, Obudu,
Cross River State

Abstract
There is no gainsaying that technological advancement occupies the nerve centre of the present day Nigeria’s economic policy. This calls for the promotion and sustained encouragement of science teaching and learning since technology is a bye-product of science. This paper therefore focuses on the problems of experimental method of teaching science at the primary school level where the learners are at their formative years. Such problems were examined from two perspectives: problems encountered by the teacher and problems encountered by the pupils. The paper also provides the way forward as the basis on which the Nigerian primary school teacher should embrace the experimental method of teaching science with open mind. This would enhance effective learning of science as the fulcrum for national development.

Introduction
The issue of how best to help a learner acquire knowledge, skills and values had constituted problems to educationists over the years. In an attempt to find solution to some of these problems, different methods of teaching have been evolved. Okeke (1995) views teaching as the process of making it possible for somebody to learn something that is worthwhile. This implies that the job of learning is done by the learner while the teacher serve as the facilitator by setting up the necessary conditions for learning to take place.

A method is a way of doing something. Consequently a teaching method is a systematic procedure employed by teachers in their attempt to help learning to take place. It describes how a teacher organizes and presents learning materials to learners. There are as many teaching methods as there are different conceptions of the nature of education and how learning take place. Some examples of teaching methods are: the lecture method, discussion method, demonstration method etc. However, for any method of teaching to be effective certain factors such as; the age of the...
learners, their interest, scope of coverage, teacher’s mastery of the subject matter and availability of learning materials, among others, must be taken into consideration.

The paper specifically looks at the problems and prospects of the experimental method of teaching in the primary school. Attention will therefore be focused on the definition of experimental method of teaching, the nature of primary school children, rationale for experimental method, guidelines for experimental method of teaching and, finally, the problems and prospects of experimental method of teaching in the Nigerian primary schools.

**Definition of Experimental Method of Teaching**

Hardly is there any clear-cut distinction between experimental, discovery, field-trip and demonstration methods of teaching since, all are characterized by practical activities. For instance, experimental is a method where concepts have been taught in abstract and require children to carry out an experiment to reaffirm the concepts taught. It is more of doing practical activities. In discovery method the teacher leads the child to discover step-by-step by demonstration and experimentation – implying practical activities. Using the field-trip method, the teacher takes the learners out to see the practical aspects of what have been taught in theory. Experiment can be seen here because the learners have opportunity to ask questions and carry out some practical activities to reaffirm concepts taught in theory.

Okon and Ibanga (1982), settles for experimental as a method of teaching which a pupil is guided to investigate the truth of ideas, facts or assumptions for ultimate confirmation or rejection. It is an activity that an individual or group is involved with the sole purpose of making personal observation of cause-effect relationship. It is a pupil-centered method that provides direct experience resulting from observation and manipulation of materials. Having examined the experimental method of teaching, the next sub-topic on which we shall focus attention is the nature (or characteristics) of primary school children.

**The Nature of Primary School Children**

The primary school child:
- Enjoys dramatic play
- Is often demanding of parents
- Is curious about nature, things and people
- Talks with adults rather than to adults
- Is concerned about the reasons behind things
- Likes to help when in the mood
- Makes collections of all kinds of things
- Seeks new experiences; tries out new behaviours sometimes including challenging rules
- Exhibits a combination of liking and hostile attitudes towards opposite sex.
- Discovers that parents are human and make mistakes
- Is often more polite away from home than at home
- Begins to select friends on basis of personal qualities for a reason, not always positive
- Exhibits keen sense of privacy – “This is my room – keep out”
- May be very self-critical
- May show anger by sulking rather than use harsh words (Collins, 1984).

**Rationale for Experimental Method of Teaching**

Most of the characteristics of the primary school child as outlined above shows clearly that the primary school child who, according to the Piagetian developmental stages, is at its concrete operational stage and as such, learns better by practically manipulating concrete materials. If children are fully involved in activities and challenged to come out with results, they are more likely to learn better than if they were simply told or presented with the outcome of the experiment.

The experimental method of teaching is also capable of helping the teacher to:

- demonstrate knowledge of science concepts and principles appropriate for teaching primary school children.
- demonstrate a set of process skills involved in basic science activities.
- recognize and access children’s capabilities according to Piagetian criteria and plan activities which accommodate and promote these levels of development
- recognize and assess children’s capabilities according to their individual knowledge and skills and plan activities which accommodate and build upon these abilities.
- recognize the value of open enquiry including experimental enquiry and promote enquiry through a variety of teaching-learning strategies.
- gain knowledge of a variety of primary science programmes as well as special topics and materials to aid in curriculum planning.
- develop and evaluate questioning techniques and classroom management strategies while teaching science.
- develop a personal philosophy of science teaching and defend it.
- recognize the potential of various kinds of materials and media, locate various resource materials and ways to procure them for use in the classroom.

**Hints on Effective Utilization of Experimental Method of Teaching**

Experimental work as an integral part of primary science teaching, (Maduabum, 1989), generally involves class activity. This must be well organized and carefully planned if pupils are to achieve the desired outcomes. A fruitful strategy is to execute the experimental method in phases. These include:

(a) The pre-experimental work planning phase
(b) The pre-experimental work discussion phase
(c) The experimental work discussion phase
(d) The experimental phase
(e) The post experimental work discussion phase

The pre-experimental work planning phase allows for advance planning to enable the teacher assemble required apparatus. Last minute collection and assembling of apparatus with its accompanying “dead time” is more likely to generate unrest among the class. Whenever possible, involve pupils in finding and bringing necessary materials. This is in line with the philosophy of primary science programme which calls for active pupil participation and emphasizes the notion that science is about the environment. Advance planning also allows for a rehearsal of the experimental activity to ensure workability.

The pre-experimental work discussion phase can take a day before the experimental period. In this phase the problem to be resolved is stated in simple way and pupils are advised on necessary precautionary measures.

At the experimental stage the teacher remains as a facilitator and a resource person providing the structure (procedure) and the setting necessary for the experiment as well as act in a supervisory capacity. He does that by moving round and giving pupils words of encouragement and helping them solve problems that emanate during the experiment.

During the post experimental phase, pupils present their results individually or in groups. The results are subject to class discussion and explanations are offered when opposing results are obtained. This period offers the teacher an opportunity to answer pupils’ questions and clarify their misconceptions. The teacher lastly provides the pupils with the result of the experiment as a means of comparing his result with pupils’. Teacher evaluation of pupils is also carried out during this phase.

Guidelines for Experimental Method of Teaching

The guidelines for experimental method of teaching will be discussed from two perspectives – teacher’s activities and pupils’ activities.

Teacher’s Activities

a. create a problem situation that arouses the learners’ curiosity
b. state the behavioural objectives to be achieved
c. decide on the type of experiment to be performed to achieve the desired objectives
d. name and explain the materials to be used
e. briefly describe how to use the materials
f. conduct the experiment
g. as for pupils’ comments on the outcome of the experiment, they may support or reject the assumption; they suggest alternative approaches to the experiment.

Pupils’ Activities

a. watch the teacher conduct the experiment
b. ask questions on the process where necessary
c. comment on the result of the experiment
d. conduct their own experiments
e. draw diagrams and make illustrations where necessary
f. write a report of the process and outcome of the experiment.

Problems of Experimental Method of Teaching

The problems of experimental method of teaching will be discussed under problems the teacher encounters and problems the pupils encounter.

Problems Encountered by the Teachers
1. The experimental method costs much money because of its elaborate preparation and needed facilities and equipment
2. In the face of a battered economy where galloping inflation is the order of the day, improvisation of needed materials for experimental method of teaching is imperative. Unfortunately however, the average Nigerian primary school teacher’s attitude towards improvisation is rather poor. Those who are interested have such interest killed at the embryonic stage through prohibitions, by the government, against what is tagged “illegal collections” from the pupils in an effort to improvise materials for experiment.
3. An accurate evaluation of pupils’ laboratory skills may not be easy to obtain
4. The experimental method brings pressure to bear on the already crowded school time-table. An experiment certainly requires more than the conventional 30 to 35 minutes provided on the Nigerian primary school time-table; hence the teacher is often faced with the problem of combining speed with accuracy in a bid to achieve his instructional objectives.

Problems Encountered by the Pupils
1. Some pupils still have problem of identifying variables and controlled experiments.
2. Pupils often have problem dealing with data that seem anomalous and in proposing explanations based on evidence and logic rather than on their prior beliefs about the natural world.
3. If not properly planned and guided, the pupils may be exposed to serious accident such as explosion in the laboratory in the process of experimenting.
4. The general lack of communication skills on the part of pupils poses problem of inaccurate reporting of observations made from the experiment.

Way Forward
The experimental method of teaching has the potency of contributing to the developmental needs of the Nigerian nation where scientific and technological advancement occupies the nerve centre of national planning. Such prospects, among others, are that experimental method:
1. Creates lasting impression because the lesson is student-centered and students’ senses would be stimulated.
2. Assists the students to acquire scientific attitudes of humility, skepticism, curiosity, objectivity, open-mindedness and perseverance.
3. Trains the student to depend on his own method, adopt a particular procedure to follow and arrange his data accurately, adopt various techniques and measurements and evaluate his own results.
4. Enables the students to acquire science process skills.
5. Help students to develop self-confidence and engender problem-solving abilities.
6. Exposes students to a variety of unrelated facts and concepts and offering them opportunity to establish relationship between them.
7. Provides a top-gap between theoretical and empirical science experience (Uche and Umoren, 1998).
8. Sharpen thinking, directs attention to important issues, clarifies problems, encourages debate and the exchange of views, and thereby deepens understanding, prevents ossification of thinking, promotes flexibility and adaptation to changing demands.
9. Increases the capacity of the education system, especially that concerned with science education, to recognize, understand, frame and address problems that deserves attention rather than provide unequivocal answers to questions concerned with such matters as pedagogy, standards or teacher quality.
10. The recent upsurge in computer education holds a bright future for the learning and acquisition of information technology, which will facilitate accurate reporting of observations of experimenting by the pupils.

**Conclusion**

The major focus of this paper is on the problems and prospects of experimental method of teaching. Attempt has therefore been made to define teaching method in general, mentioning some examples in the process. In discussing the topic, the authors have paid particular attention to the definition of experimental method of teaching, the nature of primary school children, the rationale for experimental method, guidelines for experimental method of teaching and the problems and prospects of experimental method of teaching.

Science and technology, to say the least, have been identified as the cornerstone of national development; since the experimental method of teaching is a major tool for science instruction, the Nigerian primary school teacher should embrace it with open mind to ensure a sound educational foundation for the growing child. This would serve as the harbinger of the emergence of a technologically self-reliant Nigeria.

**References**


