

**SCIENCE EDUCATION FOR EDUCATIONAL LEADERSHIP AND INNOVATIONS:  
IMPLICATION FOR INQUIRY TEACHING MODEL IN NIGERIAN PRIMARY  
SCHOOLS**

**BY**

**I.A. Msheliza, Ph.D: Department of Educational Foundations, Faculty of Education  
Federal University of Kashere, Gombe, Gombe State**

**&**

**Musa AdamuMshelia, Ph.D: Department of Educational Foundations  
Faculty of Education, Federal University of Kashere, Gombe, Gombe State**

**Abstract**

The paper examined inquiry teaching model as one of the teaching models that teacher can use in teaching-learning process at the primary school level for optimal result. The goals of the model as well as the application of the model by the teacher in a given learning situation, was discussed. It further explained the implication of the model for science education and innovations. The merits and demerits of the model were equally discussed. It also covers how the teacher can use the model for effective and efficient teaching-learning process. The study concludes that the importance of teaching model cannot be underestimated; because it gives the learners some basic awareness and creativity which will prepare them for greater scientific ideas, innovation and knowledge which is intrinsic within the framework of effective use of the model. Finally, the study recommends that teachers ensure proper utilization of inquiry teaching model to achieve the goals and objectives of primary education as enshrined in the National Policy on Education.

**Keywords: Science Education, Leadership, Inquiry Teaching Model.**

**Introduction**

Inquiry model represents an activity-oriented, thought provoking creative method in which learners out of curiosity or under the guidance of the teacher, probe, investigate, interpret relevant issues and problem with a view to providing solution through reflective thinking and

rational decision-making which the method develops in the inquirer. The method involves the scientific approach of identifying problems, formulating hypothesis, collecting relevant data to authenticate the data, drawing conclusion even if tentatively and developing generalization (Msheliza, 2015)

Msheliza (2008) sees inquiry model as “the process where a systematic investigation of a problem or issue is carried out. It is usually carried out in order to discover or find answer to an identified problem supported by evidences”. Dubey and Barth in Masheliza (2008:55) defined inquiry as reflective thinking, reflective inquiry, analysis, critical thinking, inductive thinking, problem-solving and others”. While Joyce and Weil (1972), see it as “the pursuit of meaning”. Thus, the words of Dewey in Hadley (1986) on inquiry, is worth mentioning here. He said thinking enables us to direct our activities with foresight and to plan according to ends in view, or purposes of which we are aware. It enables us to act in deliberate and intentional fashion to attain further objects or to come into command of what is now distant lacking. It enables us to know what we are about when act. It converts action that is merely appetitive, blind and impulsive into intelligent action.

Looking at the above explanations/definitions very closely, whichever is used, the emphasis is always on gaining and verifying knowledge. Inquiry teaching model is a teaching style where the learners with minimum guidance of the teacher, seek to discover or provide an answer to a recognized problem through an acceptable procedure such as:

- a. Problem identification
- b. Formulation of hypothesis
- c. Gathering of data
- d. Reporting data/findings
- e. Formulating a conclusion and stating one’s commitment or applying the conclusion.

This has been supported by the primary education objectives, enshrined in the National Policy on education (2009:11) where it was stated that the objectives of the primary education are to lay sound basis for scientific and critical and reflective thinking, develop in the child the ability to

adapt to the child's changing environments, provide opportunities for the child to develop life manipulative skills that will enable the child function effectively in the society within the limits of the child's capacity.

Thus, this demands the child active participation to be able to realize these noble objectives. It is learner centered before the learner could be aware of the basic science concepts and to use or apply critical and reflective thinking as some of the process of learning science.

Using the model, the teacher served as a planner of learning activities. He introduced the lesson with the use of materials such as pictures, graphs, and general orientation to stimulate the learners' interest for learning which at the end of the day the model will help to develop in the learner skills of searching, gathering and data processing which will give them motivation, excitement and new ideas as they are aware of where to go for the facts.

As questioner and sustainer of the inquiry, the teacher encourages the learners to defend their opinions or views over issues. As formative evaluator, he conducts formative tests at the end of the exercise to warrant acceptance of answers. The general procedures developed in the inquiry reflect the elementary science process through which learners go through in order to have a scientific idea of their surrounding or environment. This basic scientific ideas or knowledge could be that which they have known partially or not at all. Thus, the six (6) different steps of inquiry process proposed by Dubey and Barth (1980) are worth-mentioning. They enumerate them as follows:

1. Experience
2. State of uncertainty and doubt
3. Framing of the problem
4. Formulating hypothesis
5. Exploration and evidencing
6. Generalization.

**Experience:** The process of inquiry starts with an experience. An experience is defined as an interaction one has with one's environment. However, some experiences confront you with a

conflict between what you think you know and what you have experienced. An experience that challenges you pre-conceived ideas encourages you to question your knowledge; an experience that makes you feel uneasy gives you a sense of inadequate understanding.

**State of uncertainty and doubt:** The heart of inquiry is not fact but it is uncertainty. It is the irregular, the confusing and the contradictory that generates inquiry. To have an experience is not to have experience inquiry. It is prompted when such experience raises doubts and uncertainties.

**Framing the problem:** It is the frame which becomes the statement of the problem. The statement of the problem prescribed the boundaries within which conflict is seen. From sensing a problem to a framing of the problem, is the very heart of inquiry. The spirit of inquiry lies within problem sensing. The problem acts as a statement about what is known based upon an understanding that leads to an explanation of the unknown.

**Formulating hypothesis:** When you frame a hypothesis you are literally brainstorming the possibilities. The framing of the problem gives you the limits within which you hypothesize. An hypothesis is a proposition assumed for the sake of argument. It is proposed explanation which needs to be verified and justified.

**Exploration and evidencing:** At this stage one gathers and evaluates sources of evidence. This describes what one does to demonstrate the validity of a hypothesis.

**Generalization:** This is the final step or stage in inquiry process. Generalization is a statement of how well the hypothesis has given meaning to the understanding of the problem. What generalization does is to explain the relationship between problems. Joyce and Weil (1972:138) add that: “As the individual encounters a puzzling environment, and as he needs to explore the data, he puts it together in new ways so that he re-organizes his knowledge”.

This process according to them is carried out through there interacting and complementary functions namely:

1. Encountering the environment
2. Processing the data obtained
3. Re-organizing one’s own knowledge

Looking at the above statement, it is obvious that they are talking about gaining knowledge. In using the inquiry teaching model, the teacher needs to know exactly how the inquiry process works. This is supported by Dubey and Barth (1980:38) who posits that “We need to develop common understanding of how teachers are to use curriculum materials to fit that process”. Inquiry teaching gives the children the opportunity to experiment freely on their own. This is to say that the teacher, who is the key in the drive to progress, directs from only where necessary.

From the foregoing, one could deduce that, the process are talking about gaining knowledge through an approved scientific procedures whereby at the end of the exercise build in the learners some basic scientific anxiety which will serve as the basis for their awareness and creativity of those elementary science concepts available in their surroundings/environment they live. The model give the learners the opportunity to experiment freely on their own, at their own pace, while the teacher who is the key in the drive to progress, directs them where necessary.

### **Goals of the Inquiry Teaching Model**

The goals of using the inquiry teaching model are summarized by Schuman in Joyce and Weil (1972) as follows:

1. To develop the cognitive skills of searching and data processing and the concept of logic and casualty.
2. To give the children a new approach to learning by which they could build concepts through the analysis of concrete episodes and the discovery of relationships between variables.
3. To capitalize on two intrinsic sources of motivation, the rewarding experience of discovery of relationships between variables.

Looking at the above goals of inquiry teaching model, it develops in the child skills of searching, gathering and data processing. It equally gives him motivation, excitement and new ideas, which will help to build up his awareness and creative mind about the elementary science of the immediate environment and the society at large, which is the basis for his learning science.

### **Implication of the Model for Science Education**

When one looks at the goals of the inquiry teaching model, one can deduce that, the implication of the model for science education at the primary schools level are enormous. They are as follows among others:

- a. It builds in the learners some basic scientific anxiety which will serve as the basis for their awareness and creativity;
- b. It give the learners the opportunity to experiment freely on their own;
- c. It exposes them to some basic science concepts available in their environment;
- d. It help to develop their cognitive skills;
- e. It help to develop their psychomotor ability;
- f. It creates in them the love for nature etc

### **Advantages of Inquiry Teaching Model**

The advantages of inquiry teaching model to the learners/teachers according to Msheliza (2008) are as follows:

1. It enables the learners to think on their own as well as to work on their own
2. It motivates/stimulates the learners for further investigation or inquiry into other issues.
3. What they have learnt becomes permanent.
4. It strengthens the learners' creative thinking.
5. It helps the learners to improve their strategies of scientific inquiry and theory-building.
6. It makes teaching and learning easier for both teacher ad learners since learners had, had an idea of what they are reporting to the teacher/class or group.

### **Disadvantages of Inquiry Teaching Model**

Despite the advantages one derived from the use of inquiry model, it has some limitations. Msheliza (2008) list them as follows:

1. It is time consuming as it involves moving up and down in search of facts on the statement of problem at hand.
2. It is expensive as it involves traveling from one place to another; the inquirer spends money to collect data.

3. It is energy sapping or pains-taking as this demands physical energy.

### **How the Teacher can use the Model for Effective Teaching-Learning Process**

For effective learning to take place using inquiry model, the teacher should among others consider the following:

1. The teacher should focus on a particular type of problem of the subject.
2. The teacher should make available the materials for the exercise.
3. The teacher should always be around with the learners (pupils) to assist them where necessary especially when they are analyzing/processing their data.
4. He teacher should encourage/motive the learners (pupils) to face problem-solving situation alone.

### **Conclusion**

In conclusion, the inquiry teaching model is most useful to teach children fact finding particularly, to help them to analyze their own inquiry results and to compare the effectiveness of various strategies which is likely to bring about innovations in their early learning of science education in their immediate environment. Like any other models of teaching, it helps the learners to learn and progress on their own even on that information which were not completely taught in the classroom. Thus, the importance of teaching model cannot be underestimated; because it gives the learners some basic awareness and creativity which will prepare them for greater scientific ideas, innovations and knowledge which is intrinsic within the framework of effective use of the model.

### **Recommendations**

The study recommends that teachers should ensure proper utilization of inquiry teaching model to achieve the goals and objectives of primary education as enshrined in the National Policy on Education.

### **References**

Dubey, D. I., & Barth, S. I. (1980). *The inquiry method approach for Social Studies in Nigeria*.

Kenya: Thomas Nelson & Sons Ltd.

Federal Republic of Nigeria (2009). *National Policy on Education* (5<sup>th</sup> edition), Lagos: Government Press.

Hedley, W. E. (1968). *Freedom, Inquiry and Language*. Pennsylvania: International Text Company

Joyce, B. and Weil, M. (1972). *Methods of teaching (First Edition)*. Eaglewood: Prentice Hall Inc.

Msheliza, I. A. (2008). *Inquiry teaching model*. In Lawani, D. O. (Ed). *Issues in Information and Communication Technology Application in Education*. Lagos: T. Richard Publishers.

Msheliza, I. A. (2015). *Evaluation of the implementation of upper basic Social Studies curriculum In Yobe State, Nigeria*. A. Ph.D progress report in the Department of Science and Technology Education, submitted to the Faculty of Education, University of Jos.