

# ENHANCING SCIENCE TEACHING SKILLS OF CLASSROOM TEACHERS BY MEANS OF IMPROVISATION

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## Abstract

The importance of science in the modern world has made it inevitable for human operations- By concept, science is abstract but is physically expressed in systematized human activities by means of demonstration, inquiry, discovery, laboratory exercises and field- trip. This systematized way of expressing science is the practical approach, The paper considers improvisation in the realm of science teaching skills. It highlights means and types of improvisation. It highlights the ways by which improvisation could be used to enhance science teaching. The paper highlights the techniques of enhancing science-teaching skills using improvisation. It then makes some recommendations.

## Introduction

Science is simply described as the study of nature. The inquisitiveness of human organisms to probe nature, explore and exploit their immediate and extended environments has led to drastic and astronomical accumulation of knowledge about the cosmos and the operations, structure and nature of tin.; physical phenomena, Science is then considered as a body of knowledge derived from systematic observation and verification of facts, in its broadest sense, it refers to all human activities involving organized knowledge of natural phenomena (Nnachi, 2000).

By means of science man continues to accumulate extra ordinary knowledge of the universe ?;. well as the events of nature. The urination of this knowledge has been made explicit in a wide range of dimensions involving human activities. These dimensions relate to such areas as transportation, medical .services, telecommunication, engineering, computer technology, agriculture, architectural activities, geological operations (including drilling arid mineralization) and related events ami fields. Science, no doubt, has exposed the secret of nature and has simplified complex costuological forces and subsequent operations. The nature of science calls for empiricism 1o authenticate and validate systematized human observations.

When science was a part of philosophy, investigation into phenomena and natural operations was based on contemplation and mere rationalization. This approach was far from realistic in the authentication of facts and confirmation of a set forward hypothesis. Hence empirical approaches into operations and events of nature fastly and inevitably became the order of science. These approaches require the use of materials or gadgets to demonstrate, illustrate or prove the events of nature. The use of the materials or gadgets to demonstrate, illustrate or prove the events of nature as a means of imparting scientific knowledge constitutes what is referred to as *practical science* teaching.

## Practical Science Teaching

Science has been considered as a vast intellectual adventure that engages the world's most creative minds (Dienye and Gbamanja, 1990). No doubt, science continues to probe circumstances and events to seek and discover the truth. Nature has the truth and science probes nature to search for the truth. Though the evidences appeal to the senses, in the course of scientific probe, the truth becomes apprehensible (Dienye and Gbamanja, 1990). This proves that science is a complex human activity that requires human tools for its efficiency, development and survival.

Science as a concept is abstract and intangible. The concept is physically expressed in systematized human activities by means of demonstration, inquiry and discovery, laboratory exercises and field trip. These constitute the practical approaches of explaining, exploring, investigating and probing nature. The teaching of science has over the years considered these approaches as veritable for reliable science venture and inculcating the spirit of science into the learner. Practical science teaching could be carried outside and within the laboratory, using observational means and assisted by science teaching aid materials or gadgets such as weighing balance, pendulum, hand lens, microscope, telescope,

slides, films, charts, models, thermometer, hygrometer and so on.

A good science teacher does not depend on the traditional lecture (Chalk and talk) method but goes an extra mile to involve in his/her teaching those approaches that could make science more realistic than fable. He/she then uses the practical science teaching approaches to deliver information to portray the reality of science. He/she sets apparatus within or outside laboratory environment and can use them mobilize learners to activities involving inquiry and discovery. He/she can set some apparatus for demonstration which goes along with teaching.

A good science teacher sees the laboratory as a science workshop devoted for practical science work. Such a workshop is considered necessary and indispensable for every science learner. A good science teacher mobilizes the learners to attend the science workshop and uses the venue for demonstration of the nature and operations of phenomena.

A good science teacher realizes that laboratory equipment are very important and should be safely kept and be maintained. Also, a good science teacher realizes that laboratory materials and equipment are scarce and could be costly. It is not all the time that materials for practical science teaching could be available either in the laboratory or outside the laboratory. But since science is phenomenal, it continues to demand empiricism. This calls for improvisation in situations where the actual practical science teaching materials and equipment are lacking. Improvisation calls for the use of what is available to create what is not available.

### **Meaning of Improvisation**

The term - *improvisation* is a technical teaching term used to describe the production of local items as a prototype or representative of complex industrial types. Improvisation relates to the production and use of local materials to substitute the industrial materials for instructions or any other activity. Teachers use locally made or produced materials because sophisticated industrial materials are limited and are not always available either to the teachers or to the learners. Not all instructional materials are obtained locally but facilities are often available to extend the range of what already exist (Urnoren, 2005).

The government seems not to be unaware of the importance of the use of local resources in teaching for the facilitation of the understanding of the learners and has thus prescribed curricula for (the primary schools to include the study of sciences, social norms and values of the local community (Ilegbo, 2005). Local environment and resources give first hand information to the learners. They make the learners understand more about what they constantly observe in their daily lives and relate them to what they do not actually observe but are being told about. For instance, the study of carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>) can be done more effectively in the environment through the burning of local firewood. Also, the study of organic minerals can be done through extractions from fruits and plant parts.

The ability of the teacher to harness the local environment for the clarity of the explanation of the environmental phenomena gives the teacher more ego and substantiates his quality as a teacher. By this means, the teacher carries the learners along and creates the atmosphere of reliance and confidence for the learners. Thus improvisation is considered as the harnessing of the environmental resources and the local fabrication and use of (local resources as substitutes to the needed materials that are not readily available.

This is done by experienced and well-trained teacher to make teaching and learning move forward. The resources of the environment are significant factors in the enhancement of the learners' intellectual horizons.

### **Types of Teaching Improvisation**

Improvisation is necessary for the efficiency of teaching and learning. There are different types of improvisation for the facilitation of educational programmes. These types include:

- (i) Environmental raw materials e.g. fruits, seeds, plants, animals, minerals, water and rocks.
- (ii) Locally fabricated items e.g. materials not manufactured or produced by standard factories; such items include the ones produced by local artisans - carpenters, welders, block molders, etc,
- (iii) Teacher-made items e.g. charts and other materials produced by the teacher to facilitate learning,

i) **Environmental Raw Materials**

Environmental raw materials are those materials that are got from the environment and are not transformed by industrial or human processing. The materials are used as got from the environment. the materials are raw as provided by nature. The examples of such materials include fruits, seeds, plants, animals, minerals, water and rocks.

The teacher collects the materials from the environment and uses them for teaching instead of waiting for imported ones. The teacher uses the materials as they are and teaches the students with them. The teaching of students with these materials is Accessory for the widening of the learners intellectual horizon of the environment and nature.

(ii) **Locally Fabricated Materials**

Industrial materials for teaching and learning are not always enough for constant supply. Locally fabricated materials are produced to supplement the industrially produced ones. Many at times, some materials are produced locally by the artisans to supplement industrially manufactured or imported ones.

The local carpenters or welders could be informed of the type of materials to produce. The materials are the prototypes of the industrially manufactured ones. They may include flannel boards, Bunsen burner, local lamps, frying pans, buckets, cups, pots, etc. These items are used by the teacher ;is improvised materials to teach the learners.

iii) **Teacher Made Items**

The teacher does not need to wait for government to import all the teaching aids before he starts to teach the students with some aids. There are some simple teaching aids thaj he can prepare. Such aids include charts, diagrammatic illustrations of phenomena on pieces of paper, cones using tick papers and so on.

The teacher's intension is to ensure that the learners understand better through the aid of (he items he provides. The teacher ensures that the learners get themselves acquainted with those items for the proper understanding of the lessons he delivers.

**Ways of Improvising**

The competent approach for improvisation the teacher adopts is to explore the environment, sun out and use the materials within the environment that would make his teaching effective (Umoren, 2005). The environment is naturally rich in items that could be beneficial to teaching and learning. The major work of the teacher is to carefully select those ones that could be of use to his teaching tasks.

The teacher should bear in mind the sources of materials for improvisation. The sources, according to Umoren (2005), include markets, homes, timber shops, mechanic workshops, electrical workshops, and pharmaceutical stores. Other sources include the nearby bush for plant materials, the school compound for rock particles, the school garden for flowers, zoological gardens for animals. The teacher improvises by:

- (i) Identifying the most appropriate place to get his material for teaching and goes to the place for the collection of the materials to teach as and when due.
- ii) Collection of the materials and locally fabricating them as much as he should to teach for better understanding,
- (iii) Collection of materials from the source and sending them to the artisans for fabrication based on his prescription,
- (iv) Asking the artisans to go to the identified places for the materials, collect the materials and fabricate them according to specification and prescription.
- (v) Taking the learners to the identified place of the materials for observation.  
This takes place in form of field trip or excursion.

The teacher ensures that efforts are made for the collection of the local materials for presentation to the learners or the materials could be fabricated as substitute to the industrially manufactured ones and presented to the learners as the case might be. The teacher considers a lot;of factors in respect of what he/she presents and how he/she presents the materials.

**Using Improvisation to Enhance Science Teaching**

Improvisation is necessary and required for science teaching because science apparatus are scarce and limited and in many cases science teachers do not get them for teaching the learners. If every science teacher depends on the availability of science apparatus and equipment for teaching, there may constantly be hitches in teaching endeavour as it pertains to science courses or subjects. This calls for improvisation.

The empirical nature of science continues to demand for demonstrations and illustrations that portray the reality of nature. In line with this, science should be continually supported by experiments with local and environmental examples (Nnachi, 2005). Since certain specimens are imported and certain equipment and apparatus imported are scarce, the science teacher does not need to be waiting for the availability of the items before efficiently carrying out his/her teaching activity. To ensure great efficiency in science teaching, the science teacher resorts to improvisation where the imported and more quality or required materials are not available. The science teacher uses the improvised materials to enhance the quality of his/her teaching.

Improvised materials are used by the teacher for the following methods or approaches of teaching:

- (i) Discovery method,
- (ii) Enquiry approach
- (iii) Demonstration method
- (iv) Laboratory method
- (\ ) Field trip approach

### **Improvisation for Discovery method To Enhance Teaching**

In the absence of certain materials formally used for laboratory experiments such as glass beaker, metal stand or any other materials, the teacher could decide to use empty can or local pot in the place of beaker, stool or table in the place of stand for setting up an experiment. An experiment of this nature can be set up for osmosis using paw-paw from the school compound or bought from the market. The teacher could ask the learners to mark the initial volume of available strong or hypertonic solution and observe whether when put in the paw-paw and dipped in the weak solution or water in this pot could rise or could not rise. The teacher could tell the learners what to do and watch them do that and discover the facts by themselves.

The teacher could always make his/her teaching interesting by setting the improvised apparatus and making the learners discover facts of the matter. The learners become more inquisitive and more serious to work and discover the facts through their own efforts.

### **Improvisation for Enquiry Approach**

Enquiry approach is similar to the discovery method. It involves unstructured exploration by which tin<sup>1</sup> learner employs his mental processes to draw general conclusions from the data made from the exploration. The learner is asked by the teacher to make enquiries to discover facts. This approach; helps the student to establish the facts (Dienye and Gbamanja, 1990).

In this approach the teacher might ask the learners to boil water and observe the vapour rising into the atmosphere. The learners can, at this point, enquire and watch with rapt attention. The teaching of gases could be carried out using this approach without the teacher waiting for the arrival of more complicated equipment for the same teaching. The teacher can give the learners assignments; that involve enquiries which he could require the learners to carry out and make their reports. Such assignments may include the investigation on the photosynthetic activities of plants; formation of water and the ways erosion could be- caused by rain. The "teacher delivers his instruction in consideration of the learners reports.

### **Improvisation for Demonstration Method**

Demonstration is a means of showing how things work and can be used in the finding of facts, in the display of materials or in the identification of problems (Dienye and Gbamanja, 1990). By means of demonstration the operations of the natural phenomena and the general workings of nature are illustrated. Also by means of demonstration, the teacher shows the learners the correct ways of using

science apparatus.

One peculiar thing with demonstration is that it provides concrete illustration of objects or events which makes it an indispensable approach in science teaching. The teacher uses experimental means to demonstrate events. For instance, if the teacher, intends to teach on the reaction of acids on metals he may pour one liter of hydrogen chloride acid into a coated basin and then drops some pieces of copper metal. The students may be asked to stay some distance away and watch. 
$$\text{Cu} + 2\text{HCl} \rightarrow \text{CuCl}_2 + \text{H}_2^{\uparrow}$$

The students can watch the attack of the acid on the metal. The students might observe the release of hydrogen gas in the course of the demonstration by the teacher.

In the absence of acid and metal for experimental illustrations, the teacher can demonstrate the phenomenon by drawing the event on a chart. The teacher can also make drawing on the chalkboard for illustration of the reaction of acids on metals.

Demonstrations of phenomena can also be carried out using locally sourced materials instead of waiting for the arrival of more sophisticated or industrial materials. For instance, the teacher can use common salt for the demonstration of crystalloid solution in aqueous disperse system.

### **Improvisation for Laboratory Method**

Scientifically, a laboratory is a workshop where science materials are kept and science practical exercises carried out. Laboratory teaching is one of the science teaching methods. In this case, teaching is carried out in the laboratory and it may, involve discovery approach, enquiry approach or demonstration method. The main purpose of the use of laboratory method is to ensure that there is practicalization in science.

Laboratory method calls for careful observations and data interpretation. It also calls for the use of simple and complicated materials and equipment. It is not everyone that gets in touch with laboratory items. This situation calls for improvisation. Improvisation for laboratory method of teaching demands that any venue can be used for demonstration, discovery or enquiry of facts provided it is safe to do that. In line with this, it could be borne in mind that the study of some chemicals such as sodium chloride could be carried out outside the school laboratory. Such a study could be carried out even in kitchens. In other words, laboratory is not the only place for the study of materials. Improvisation of laboratory facilities can be done using our home facilities.

### **Field trip As A Means of Improvisation**

[or] The fact that resources are always in short supplies, there is the need to take learners to the venues where they would have the opportunities of coming into contact with the materials in abundance. Field trips are carried out by taking the learners to the venues where the resources are in larger supplies.

Field trips are a very good way of improvising. For instance, the study of lions may not be practically carried out unless the teacher takes the learners to a zoological garden where the animals could be seen. Again the study of some machines or equipment can only be practically carried out by taking the learners to the sites where they could be found.

### **(enhancing Science Teaching Skills Using Improvisation)**

Skill refers to the mastery of activities in a particular vocation. This event is achieved through the repetition of activities in the vocation. Skill is acquired in a training and is consolidated by constant practice. Accordingly, a skilled worker is a tradesman that has achieved a high degree of proficiency and recognition in his vocation (Ifegbo, 2005).

Since improvisation is a means of finding alternatives for scarce commodities to ensure that certain activities (for eg teaching) go on, the teacher that constantly employs improvisation continues to acquire mastery of teaching arts. For the facts that science-teaching materials are scarce and limited it becomes the work of the teacher to ensure that local materials are harnessed for the teaching of science. The teacher's uninterrupted capacity to do this brings about mastery of his/her job.

The more the teacher of science improvises, the more his/her work goes on uninterrupted. Umoren (2005), suggests that this can be achieved through the use of everyday local materials. According to her, the philosophy is built on the following:

- (i) The teacher's willingness to try out new things by the utilization of resources around.
- (ii) The teachers ability to explore the fascinating world
- (iii) The teacher's willingness to seek answers to perceived problems.

The teacher's willingness to continue to utilize the resources around him will create the avenue for him to try new ideas that would help the learners to develop creativity in them. The learners would imitate him through Bandura's imitational learning process to try new ideas and develop their science abilities.

The teacher's ability to explore the environment creates the avenue of exploration for the learners. The teacher explores and mobilizes the learners to explore and utilize the materials of the environment. The teacher does this by taking the learners to places outside the laboratory and outside the school to enkindle their interests in the material world and develop in them the spirit of science. By this means the learners' intellectual horizon is expanded and their science zeal is created.

The teacher's willingness to seek answers to perceived problems creates the room for investigation and discovery. The teacher carries the learners along in investigation and discovery of facts. The learners brought up by such a teacher are always eager and willing to enquire on the operations of phenomena using available resources. Such learners usually develop the spirit of enquiry and discovery.

Without controversy, the teacher is the intellectual architect. His plan and construction of ideas go a long way to determining the way the learner builds. His ability to improvise increases his mastery of his work to influence the learning and behaviour of the learners. Thus the science teacher's leaching skill is enhanced as he makes more efforts to improvise.

### **Recommendations**

It is by means of empiricism that science probes nature. As science is abstract in nature, its-manifestation for human applications takes place by means of practical exercise. This is done by either demonstration, inquiry, discovery, laboratory exercises or field trip. These activities are mostly carried out through the use of equipment which are not always available to the teacher.

This means that teachers should be encouraged to make improvisations. It is, therefore, recommended that:

1. Science teachers should constantly receive in service training.
2. They should always attend workshops to equip them with some intellectual **skills**.
3. They should be always sponsored to make provisions of local substitutes.
4. They should always be encouraged through better pay packages.

### **Conclusion**

Science is an abstract concept that manifests itself through human activities. This has improved the welfare of human kind in the areas of agriculture, communication, computer technology, engineering works and so on. The study of science for productivity is associated with empirical venture. Science studies that have no empirical background is like a house without foundation.

This is why the classroom science teacher is expected to teach in such a way that the leaching would appeal to the senses of the learners. This is what the empiricism is all about. For the fact that the materials for science teaching is in short supplies, the classroom science teacher owes the duty of improvisation to ensure that his work of Leaching is uninterrupted. The more the classroom science teacher improvises the more he increases his skill of influencing the intellectual behaviour of the learners. The classroom science teachers, therefore, need to utilize the means of improvisation for the enhancement of their science teaching skills.

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