

IMPROVISATION IN SCIENCE EDUCATION: A PANACEA FOR EFFECTIVE TEACHING IN A RECESSED ECONOMY

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Abstract

Science is the foundation upon which the bulk of present day technological breakthrough is built. Thus science should be properly taught and learnt. Effective teaching of science cannot be fully accomplished without the use of instructional materials. In a recessed economy like ours in Nigeria and to keep up with changing technological development, improvisation of teaching materials becomes a panacea and indispensable strategy towards sustainable development. The paper discussed the importance of improvisation, relevance of improvisation of instructional materials in a recessed economy, qualities of improvised materials and what a teacher can improvise for effective science teaching. Factors that hinder a teacher from improvising were also discussed. The paper recommended attendance to workshop and seminar to update the skills of the teachers towards improvisation.

Keywords: *Improvisation, Science Education, Effective teaching, Recessed Economy*

Introduction

The primary aim of education is to make learners capable of being responsible, productive and useful member of the society. Nigeria government sees education as an instrument per excellent for individual and national development. It is therefore important to give education a solid foundation through effective teaching and learning. This will ensure that knowledge, skills, attitudes and appreciations are built through classroom interaction pattern of the teacher and the learners. Science is the foundation upon which the bulk of present day technological breakthrough is built. Nations all over the world including Nigeria are striving hard to develop technologically and scientifically, since the world is turning scientific and proper functioning of lives depend greatly on science. According to Owolabi (2004), science is an integral part of human society; its impact is felt in every sphere of human life, so much that it is intricately linked with a nation's development. Through science, man has been able to better understand his environment and this has enabled him to manipulate the conditions of his environment to suit his own benefit. Science has made it possible for man to acquire his desired needs easily. Thus, science

should be properly taught and learnt. Mogbo and Saka (2015) pointed out that effective teaching cannot be fully accomplished without the use of instructional materials. Agina (2005) defined instructional materials as concrete or physical objects which provide sound, visual or both to the sense organs during teaching. Agbulu and Wever (2011) pointed out that instructional materials are important because they help both the teacher and student to overcome physical limitations during lesson presentation among others. Giginna and Nweze (2014) emphasized on the importance of instructional materials are as follows; concretizing abstract concepts, stimulating students attention and interest, arousing students curiosity and promoting students' active participation in the classroom.

In spite of the importance of instructional materials, research reports have shown that teachers teach without instructional materials. The commonest reason they give for this is that already made ones are not available in the school, (Eriba, Ogbaba & Ityo, 2015). The teachers view was supported by the assertion of National Teachers Institute (2011) that most of the instructional materials used for teaching and learning in schools are expensive and not readily available. Obioha (2006) reported that there were inadequate resources for the teaching of science subjects in secondary schools in Nigeria. Obioha (2006) further stated that where there were little resources at all, they are not usually in good conditions, while the few that were in good conditions were not enough to go round those who needed them. Furthermore, the situation has worsened in the present days due to economic recession and high exchange rate of dollar to Naira that makes it impossible for many schools to purchase enough instructional materials, hence the need to produce materials locally. A professional qualified science teacher no matter how well trained would be unable to put his ideas into practice if the school setting lacks the equipment and materials necessary for him or her to translate his competence into reality. Hence there is need for improvisation.

What is Improvisation?

In general, to improvise is to provide or quickly make something useful from the resources available. In education, improvisation means the provision of teaching and learning materials using local resources within the reach of the teacher and the learner. Okela (2011) considered improvisation as a make-shift, quickly in time of need using whatever happens to be available to achieve teaching goals. According to Ugwu & Eze (2005), improvisation is the ability of the teacher to assemble local resources together to obtain an instructional material necessary for teaching and learning process. Improvisation is the act of making your own instructional materials from local materials sometimes found within

the school premises (Abugu, 2009). The importance of improvisation cannot be overemphasized as it stimulates the learners' interest and also help to achieve the objectives of the lesson. There are steps needed to be observed in selecting which teaching material to be improvised. These include:

- (a) Selecting the subject matter.
- (b) Defining your target audience.
- (c) What are the instructional objectives expected at the end of the lesson?
- (d) Specifying the instructional techniques.
- (e) What are the appropriate instructional materials?
- (f) Find out the cost of the original material to see if it worth improvising.
- (g) Find out how you can produce the materials.
- (h) Evaluate the improvised materials.
- (i) Finally determine the implementation of improvised material.

Though improvised material may not adequately replace the well researched and developed equipments but it keeps the system going while the appropriate materials are sought for.

Importance of Improvisation of Instructional Materials

Teachers of sciences should expect a shortfall in the supply of teaching equipments both for classroom demonstrations and in the laboratories. No matter how viable an institution is, it is still difficult to provide all the necessary teaching and learning aids. The readymade imported materials can be used up any time or get spoilt and cannot be repaired. This then calls for improvisation. According to Ugwu & Eze (2005: 163), the following are benefits expected from the use or transformation of a local resource into teaching materials.

- *It develops the hidden talent in both the learners and the teacher.*
- *It makes the learning and teaching real, not abstract.*
- *It provides the teachers the opportunity to research into more simple and better methods of teaching.*
- *The teaching and learning process becomes easier and more concrete when use materials from the environment.*
- *It provides originality in teaching and learning if the materials are improvised by teachers and students.*
- *It offers a better opportunity for student-teacher interactions.*
- *It stimulates both the teacher and students to the process of creativity and manipulation of their environment.*

Goals of Improvisation in Teaching and Learning Processes

Learners generally remember twenty percent (20%) of what they hear, thirty percent (30%) of what they see, fifty percent (50%) of what they see and hear, ninety percent (90%) of what they see and do (Osho, 2011). Education in general can only be successful with reasonable availability and proper selection of equipment, facilities and supplies. The fact remains that it is virtually impossible to purchase or make all the equipment, facilities and supplies required for sound and quality education available, especially in this part of the world. This makes it imperative for teachers to think of how best to make use of their manipulative skills to improvise so as to achieve their lesson objective at least to a reasonable extent. Instructional media ensure that the learners see, hear, feel, recognize and appreciate as they learn, utilizing the five senses modalities at the same time (Lidia & Sara, 2010).

When the real instructional media and equipment are not available, improvisation takes their place. This is to enhance the teaching and learning processes as well as make the expensive nature of scientific equipment, the difficulty experienced in procuring them as well as the excruciating and persistent problem of inadequate funds irrelevant in achieving the instructional objective. It is a fact that non provision of real media and equipment have all combined to worsen the teaching of science education in schools (Kenny & Gellrich, 2002).

But with well packaged and relevant improvisation, the arbitrary and complete abstract of the subject matter in the face of the learner is significantly reduced to lend credence to the importance and essence of improvisation where and when the real instructional media are not on hand. Improvisation can be described as substitute. To make a substitute for an item, out of the material that can easily be sourced for or available at the time. Improvisation can be explained as composing a careful selection and use of media as an alternative means of complementing the existing or otherwise instructional media and equipment in school (Osho, 2011).

Through improvisation, learners' attention are captured and retained for the better part of the lesson. Since they serve as educational media, students' interest in science education is stimulated, meaningful and interesting. Learning is more permanent and there is development of skill in the psychomotor domain. The need for improvisation becomes essential where, as the case is in Nigeria, there is inadequate capital to procure the real

media and equipment. It is also necessary when population outweighs what is available because of the insufficient funding in education (Azzara, 2002).

Due to gross inadequacy of media and equipment meant to enhance the effectiveness of science education in the area of teaching and learning, many teachers develop wrong attitude towards the preparation and use of improvised and fabricated local equipment and materials. The wrong attitude is reflected in the teacher's persistent preference for the chalk and talk method to other forms of contemporary method of teaching. Our environment is richly endowed with materials that can be employed in the school to make teaching real and lively. Efforts should therefore, be stepped up to provide improvisation and fabrication material very abundant in our schools more so that emphasis nowadays is placed on relating what is taught to the worldview of the learners.

The Relevance of Improvisation of Instructional Materials in a Recessed Economy

The part a teacher or an instructor plays in the development of a piece of a-learning apparatus is highly important. A very lively teacher/instructor should continue to explore better ways of making his teachings lively and interesting with instructive experiments. If in any situation, the teacher is not alert and interested in his course; his teachings become dull and uninteresting to his learners.

Moreso, high cost of materials is yet another reason for improvising instructional materials. Looking at the situation of things, one needs not be told that the cost of things is getting off hand. The only way by which schools can survive is by going to the alternatives, thus improvisation. In order to overcome this ever-increasing price level, most schools or some institutions should endeavor to improvise some of the materials needed for affective teaching and learning.

The students can be involved in the improvisation of teaching and learning materials. The students can be asked to collect such materials like rope, stones, bottle tops, duster, pins, old calendars, newspapers, cartons, empty cans etc. As they collect these (depending on the areas of studies) they tend to imagine and initiate useful things. It thus helps the children to be practically involved in learning situation.

Furthermore, in this economy, it helps the nation to conserve her foreign currency. Instead of going to purchase some sophisticated instructional materials they can be improvised locally. Opportunity is also created for the children to appreciate 'made in Nigerian goods.' They are made to discover the available resources in their environment.

Improvisation always provides alternatives to the spare parts for the materials. This is quite unlike the imported materials where there is always the problem of spare parts and repairs when broken down.

Recycling is achieved through improvisation. Discarded and assumed useless materials thrown around can usually be converted into useful items of classroom instruction. Such materials as discarded empty tins and cans, wires, pins, nails, ropes, etc can be picked and made more useful during the improvisation process depending on what is to be contrived. This is achieved when the learners are involved in one way or the other either in the improvisation process.

Improvised piece of equipment is a substitute for the ready-made or factory made type. This we can only improvise these science teaching items for which we can find or construct reasonable substitute (Ezeano, 2001).

Qualities of Improvised Materials

According to Ugwu & Eze (2005), there are certain qualities that are expected of any improvised materials. These include:

- (a) It should be able to do the same work as desirable i.e. as the standard apparatus.
- (b) Suitability: It should be appropriate to the age of the learner for which they are meant.
- (c) The improvised materials should be simple for the learners to appreciate the lesson. The simpler the apparatus provided, the better the learners appreciate the method used and the fact to be illustrated.
- (d) It should be adequate in size for visibility and be relevant to the lesson they are meant to serve.
- (e) Clarity: The material should be as clear as possible. Ambiguous diagrams and materials should be removed.
- (f) It should be interesting to the learners.
- (g) It should be durable.

What Can Be Improvised?

The conventional specimen bottle for storing of specimens can be substituted by using sweet bottles or used chemical bottles.

Aspirator can be effectively replaced by the use of water can such as bucket with tap.

Beaker can be substituted by transparent plastic cups.

Gas Supply: Stove with ordinary wick can effectively substitute the usual laboratory gas fitting. The stove provides soot free flame when properly used.

Board for Mounting Insect: Polystyrene sheet used as package for importing scientific equipment has been used as the best substitute for the imported mounting insect board.

Reagent Bottles: This can be substituted with non-coloured clear soft drink bottles with plastic bottle cap available in the local market, serve as reagent bottles.

Delivery Tube: Class tubes can be used to construct varieties of delivery tube. Work table materials such as test tube stand, test tube holders – A sample of any of this can be taken to the carpenter who now constructs something that can be used in the absence of imported ones. A diagram of such can also be taken to the carpenter.

Dissecting Board: The carpenter can construct dissecting board using white (soft) wood. This can be effectively used as dissecting board for such relatively large animals as rat, guinea pig, rabbit, etc. It may equally be done by constructing a rectangle on a rectangular board, melt candles and pour liquid melted candle on the surface of the board with the constructed rectangle. The liquid candle dries, solidifies and serves a soft surface base for pinning the animals.

Plant Press: This is used for plant preservation. It is very expensive, but you can substitute it by with old newspapers with a heavy support e.g. stone incorporated to provide the desired pressure.

Charts – This can be drawn by the teacher using cardboard sheets.

Imported Animal Skeleton: Animal skeleton like rabbit can be prepared by the teacher.

Factors that Hinder Effective Production of Improvised Instructional Material

According to Ugwu & Eze (2005:164), several factors militate against improvisation of instructional materials by both the teachers and students. Such factors include:

- (a) Teachers complain of large classes they control as well as lack of time to complete all the demands of continuous assessment involving the large classes. In the light of the above, they hardly get time to get well organized to improvise materials.
- (b) Because of poor financial background, it becomes difficult for some teachers to spend from their poor salaries to improvise teaching materials.
- (c) Improvisation of instructional materials demands patience, creativity, resourcefulness and ingeniousness the characteristics of which many teachers are not able to meet up with.
- (d) The improvisation of some teaching materials by classroom teachers is made difficult because of some characteristics of such materials e.g. size, weight etc.
- (e) Inappropriate instruction during the training period. For a teacher to improvise, the teacher must be resourceful, creative and initiative. One of the demands of science

teacher in addition to the above is perseverance. These qualities are obtained through a systematic training.

- (f) Lack of encouragement from the principals/administrators. The principals in most case do not show any interest. Principals are unwilling to spend money on improvisation.
- (g) Lack of exposure of “teachers in training” to education technology. Thus, teachers have shallow knowledge on how to improvise materials.
- (h) Poor motivation of teachers.
- (i) Teachers are scared of the messy and unsafe nature of improvisation of instructional material.
- (j) Improvised material may not be accurate and precise.
- (k) Attitude of students who willingly prefers foreign material to local ones and may lose interest and may not benefit from the lesson or may doubt the result derived from such materials.

Disadvantages of Improvisation

According to Ugwu and Eze (2005:166), the disadvantages that may arise from improvisation process are:

- (a) A lot of time can be wasted on improvisation of a single item that can simply be purchased from the science stall. If learners are involved, it may disrupt the school activities. Most of the time, the teacher does it alone, the class time table suffers.
- (b) Improvisation if not well intended may serve as an end instead of a means to an end where the learners are used. The interest may be mainly on improvisation.
- (c) It exposed both the learner and the teacher to some dangers e.g. using glass rod to construct a delivery tube.
- (d) Continuous improvisation of these instructional materials may make the school authority not to think again of the importance of purchase of essential materials from the market.

Conclusion

In a recessed economy likes ours and to keep up with changing technological development, improvisation of teaching materials becomes a panacea and indispensable strategy towards sustainable development. Since the state of the National Economy has made it almost impossible for the provision of the real science equipments necessary for effective science teaching, massive improvisation of science equipment should be embarked upon making use of local and cheaper materials. In this way many of the basic and necessary science

equipment that will make science teaching lively, interesting and meaningful can be improvised.

Recommendations

The following recommendations were made based on the fore-goings:

- (1) Government should sponsor science teachers to seminars, workshops and conferences in order to improve their knowledge skills in handling the production and utilization of instructional materials.
- (2) Adequate fund should be provided for the procurement of tools and materials needed for production of teacher made instructional materials.
- (3) Government at various levels and school principals should ensure that science teachers are adequately motivated to carry out their professional duties such as improvisation of instructional materials.
- (4) Training of student-teachers should be reviewed to emphasize knowledge and skills related to the production and use of instructional materials.

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