



## THE POVERTY OF LECTURE AS AN INSTRUCTIONAL STRATEGY IN THE TEACHING OF SCIENCE AT THE SECONDARY SCHOOL LEVEL

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### ABSTRACT

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The issue of concern in this discourse is the poverty of lecture method of teaching in the teaching and learning of science subjects in the secondary school. Often times, science teachers cast aspersions on the prevalence of lecture in science classrooms given the popular belief that science, by its nature, dictates that activity-oriented methods should be used rather than a rather passive method like lecture method. It has however been argued in this paper that when lecture is enriched, it serves a vital role in delivering science lessons profitably. Based on this position, it was recommended that lectures should be suffused with other methods, science teachers are advised to use visual aids as they teach and emphasis should be placed on hand-on-activities and experiences so as to maximally realize the benefits of lecture as an instructional process so as to improve field practice.

**Contribution/Originality:** The study contributes to the on-going debate on the limitations of lecture in science teaching and learning. Its uniqueness and primary contribution is the appeal to suffuse lecture with activity-based methods to improve students' engagement, academic achievement, morale, and career prospects of learners, hence the advocacy for enriched lecture.

### 1. INTRODUCTION

Without controversy, science teachers are unanimous in their outright condemnation of lecture as a teaching strategy in science classes. This situation is borne out of the need to teach science as dictated by the nature of science, which is a body of knowledge governing natural phenomena and more importantly, a process. Of all the teaching strategies available, lecture makes less demand on the user than the modern or innovative methods of teaching like concept mapping, inquiry/discovery or demonstration approach, cooperative learning, hands-on-science, hands-on-minds-on, to mention a few. Many of the apprehensions people express about lecture as a teaching strategy, even though over exaggerated in some of the cases, emanate from the fact that the teacher, not the student, is at the centre of the transaction in the classroom where lecturing is the rule rather than the exception.

In Nigeria, most of the secondary school students are at the concrete operational level of cognitive development; this being the case, lecture method of instruction could be damaging to them. Lecture makes more meaning to students who can undertake abstract reasoning; however, if science teachers can sufficiently enrich lecture, it can benefit senior secondary school students. The characteristic of this group is that concrete materials

are required for them to derive maximal benefits from their learning. For this reason, the science class must be lively, rich in resources and science teacher should allow the students freedom to interact with learning materials and the students themselves. But for reasons that we do not always have enough material resources, infrastructure and funding required to teach science effectively, creates the imperative for the use of lecture in secondary school science teaching and learning.

Psychologists, from their knowledge of children, including their characteristics and dispositions affirm that sound pedagogy must be situated in the lived realities of children, only then will science teaching and learning be meaningful to them. [Mankilik and Macmillan \(2013\)](#) reported that traditional pattern of teaching, which is lecture, is ineffective and sadly, it is the method being employed in the teaching of physics (a science subject) instead of the ICT-based methods which is learner friendly. They equally noted that the pervasive poor performance of students in physics in Senior Secondary Certificate Examination (SSCE) is blamable on this development. [Akinmade and Chollom \(2013\)](#) averred that what exists in science classrooms from primary school to post-graduate level is the predominant use of unidirectional lecture method with minimal use of activities and questioning. Said that lecture method is an instructional procedure with the help of which teacher seeks to create interest among the students towards the subject and also influence and encourage them to ask critical questions on various aspects of the subject being taught. He further said that in science education, lecture entails the science teacher providing information of various scientific concepts and principles whereas students remain passive listeners or at best take down some notes. The consequence of this is that the classroom environment is dull and creativity nosedives.

[Okebukola \(2002\)](#) blamed science teacher factor for the pervasive poor performance of students in science in particular and Nigeria in general. He noted that the science teacher constitutes, in a number of ways, a barrier to the meaningful learning of science. The hindrances to meaningful learning are manifested in the poor preparation of science teachers, low level of motivation and high level of stress in the work environment, all adding up to poor instructional delivery. [Oyetunde \(2010\)](#) blamed the poor performance of Nigeria candidates in the West African Senior Certificate Examination (SSCE), compared to those from Ghana, Gambia and Liberia, on poor standard of teaching and learning process prevalent in Nigerian schools, hence an indictment of teacher education in Nigeria. He lent strong support to [Ukeje \(2000\)](#) whose conclusion is that the social ills plaguing the Nigerian society have drastically and damagingly eroded the schools. He further observed that the educational system has suffered untold neglect and has virtually collapsed. Structures and facilities have suffered unbelievable decay and the teaching-learning process and environment have lost their aura, he lamented. [Aliyu et al. \(2010\)](#) stressed a relationship between the quality of science education at the primary level and the development of science and technology. From their investigation of the effects of instructional strategies on the academic achievement of students at various levels of education by various scholars, they agreed that academic success can only be achieved through the interplay of variables which include active student participation and commensurate language proficiency. They further emphasized that teaching methods that are teacher-centered and thus neglecting active participation of students compound the problem. The pervasive use of lecture as a teaching strategy in science classroom unmindful of its effect on learning outcomes is a major worry of the paper. This style of teaching is the domain which lecture method belongs and does not represent or conform to the nature of science.

[Bajak \(2014\)](#) asked; are your lectures droning on? Change it up every 10 minutes with more active teaching techniques and more students will succeed, researchers say. The author also reported a study among over 2000 undergraduates where it was concluded that students in classes with traditional stand-and-deliver lectures are 1.5 times more likely to fail than students in classes that use more stimulating so-called active learning methods. The “sage on a stage” method in Science, Technology, Engineering and Mathematics (STEM) has long been challenged; rather, engaging students with questions or group activities is more effective. Reports from meta-analysis shows that teaching approaches that turned students into active participants in their own learning rather than passive listeners reduced failure rates and boosted exam scores by almost one-half a standard deviation.

Sciencedaily (2018) reports that conventional lecture still dominates up to 55% of STEM classroom interactions in much of American schools even though previous research has classified it among the least effective at teaching and engaging students.

Covill (2011) reported a study where 51 students were surveyed on their perceptions of traditional lecture method of instruction in a 200-level psychology course. Results showed that students' perceptions differed greatly from those of educators. While the students claimed that they learn a great deal, being involved in the learning process, and engaging in independent thinking and problem-solving, educators believe that traditional-style of learning is ineffective, compared to active learning. He concluded that learning by lecture is relatively transient and superficial.

Jaschik (2018) in agreement with Bajak (2014) reported that new study of undergraduate STEM courses finds that lectures remain dominant despite repeated findings questioning their effectiveness. The author further observed that professors are retooling their courses to focus on active learning. While 55% of classroom time is spent on conventional lecturing, 27% lecturing and interactivity such as answering multiple choice questions via clickers was found. Only 18% emphasized student-centered style heavy on group work and discussion.

Innovative science teaching and learning strategies discussed by Edsys (2018) lend strong support to these radical approach-student centeredness in STEM education.

What then is lecture method of teaching, what is the nature of science, what are the merits and demerits of lecture method of teaching, how can we enrich lecture method to deliver the goals of science teaching, and what are the assurances of breakthrough expected from these endeavours? These concerns will drive the subsequent discourse.

## 2. RESEARCH METHODOLOGY

The paper being a review article, utilized relevant literature on the subject to resolve the problems identified.

## 3. WHAT IS LECTURE METHOD OF TEACHING?

Lecture method, said is an instructional procedure with the help of which teacher seeks to create interest among the students towards the subject and also influence and encourage them to ask critical questions on various aspects of the subject being taught. Lecture, originally called '*lectus*' (Latin) according to Igonoh (2015) means "to read" or that which is read. Later on, it took on the meaning of an oral instruction given by a teacher in front of an audience of learners who may be few or many. Nacono-Brown *et al.* (1990) see lecture as a process of delivering verbally a body of knowledge according to a pre-planned scheme and that in the strictest sense it is characterized by one-way communication. They however admitted that when lectures are carefully planned and skillfully delivered, students find pleasure and the desired teaching aims are achieved. These authors gave the following tips on the use of lecture in the secondary school:

- i. When introducing a new topic.
- ii. When presenting important materials not easily obtainable.
- iii. When supplementing textbook materials.
- iv. When developing interest and appreciation.
- v. When summarizing important points after a unit of study.
- vi. When attempting a lot of materials in a short time.

## 4. WHAT IS THE NATURE OF SCIENCE?

What is science or what is the nature of science? What makes science unique from other school subjects and hence deserving of special methods of teaching? These concerns are addressed in this segment of the discourse. Science is generally regarded as an intellectual and practical activity encompassing the systematic study of the

structure and behaviour of the physical and natural world through observation and experimentation. Okwori (2002) defined science as a systematized and dynamic body of knowledge obtained through the processes of scientific investigation, or simply put, it can be defined as a systematic and demonstrable knowledge. The implication of this definition is that basic scientific knowledge is required by scientists to undertake scientific investigations using the processes of science namely observing, measuring, experimenting, recording, hypothesizing, and so on; findings from these activities constitute the body of knowledge in form of concepts, laws, theories, and principles etc governing natural phenomena. The concepts-whether empirical or theoretical, laws, theories, principles are unifying terms used to explain nature. Science also comes in the form of conceptual or applied or technological science, while the former is concerned with a body of knowledge and the process of acquiring and refining the knowledge, the latter is about using the knowledge of science to finding solutions to practical problems of man. The nature of science in general refers to key principles and ideas which provide vivid description of science as a way of knowing as well as characteristics of scientific knowledge. Generally, the nature of science shows that scientific knowledge is tentative, this being the case; all that we know today become obsolete when superior findings are published. The nature of science also requires that experimentation is an on-going process, a relentless effort; otherwise scientific knowledge will not be relevant especially as the needs, values and challenges of today are different from those of yesterday. So, what works today may not work tomorrow, this requires a constant revision of scientific processes. So, the beauty of science is not necessarily the accumulation of facts but rather in the revision of its knowledge based on new discoveries.

## 5. MERITS AND DEMERITS OF LECTURE METHOD

Lecture method, though very popularly in use in many climes, has its merits and demerits. According to Chiappetta and Koballa (2002) the strengths or merits of lecture method are as follows:

- i. A large amount of material can be covered in a short time.
- ii. It is an effective means of introducing a unit, clarifying understandings, and defining science terms.
- iii. It is an efficient way to convey information to students who have difficulty reading textbooks or have difficulty reading assigned materials.
- iv. It is an inexpensive method of instruction, since a lecturer using few materials and resources can teach many students.

The demerits of lecture method are obvious, they are as Nacono-Brown *et al.* (1990) noted the fact that:

- i. It is characterized by teacher-dominated talk;
- ii. The chalk board is sparingly used while the pupils remain passive listeners.
- iii. Students' questions are often not normally encouraged and where they arise, they are merely intended for clarification of facts and information, not necessarily for higher level discussion.

## 6. HOW CAN WE ENRICH LECTURE METHOD FOR MAXIMUM BENEFITS?

Enriched lecture, according to Chiappetta and Koballa (2002) is lecture skillfully suffused with or interjected with demonstrations, its benefit is that it promotes thinking and enhances subject matter coverage. Akpan (1992) gave three gainful uses of lecture in science teaching as follows:

- i. For demonstrations on special, expensive, limited equipment;
- ii. For giving an introduction and overview of course or giving periodic summaries;
- iii. In deriving mathematical relations, in demonstrating a method of a problem, or in explaining a theory.

Chiappetta and Koballa (2002) believe that lecture method can be as effective as other instructional methods, particularly when the aim is for immediate cognitive gains. The following are some of the suggested conditions for using lecture method:

- i. The basic purpose is to disseminate information.
- ii. The material is not available somewhere.
- iii. The material must be organized and presented in a particular way for a specific group.
- iv. It is necessary to arouse interest in the subject.
- v. Students need to remember the information for only a short time.
- vi. It is necessary to provide an introduction to an area or directions to a learning task that is going to be taught via some other teaching methods.

Overall, Akpan (1992) noted that for lecture method to prove its mettle in delivering useful learning outcomes in science, the teacher must be able to skillfully blend subject matter mastery, fluency of speech, effective demonstration of concepts, with the use of visual aids.

## 7. CHALLENGES AND PROSPECTS OF LECTURE METHOD IN SCIENCE TEACHING AND LEARNING

It is often said that tradition dies hard, this being the case; it is a daunting task to ask science teachers who benefit from the use of lecture method to adopt other apparently more viable options in their teaching endeavour. However, considering the fact that we have to teach science with the process emphasis; we may not be morally justified to advocate the use of lecture in the teaching and learning of science. This position therefore creates a dilemma, hence a big challenge. Ihejirika (2016) blamed poor teaching as one of the challenges confronting the promotion of quality science education in Nigeria. She is of the view that science, being an empirical subject should be taught through hands-on, minds-on activities but not rote memorization. By implication, the mention of rote memorization makes one to suspect the use of lecture method of teaching. She added that when children learn science as scientists, that is, do science in the laboratories as scientists, their understanding is better. She lamented that in Nigerian schools, hands-on activities are rare due to non-availability of materials, lack of funds for procurement of teaching materials and poor preparation of teachers. Cognitive gains, which result from lecture method of teaching, are not sufficient in the learning of science; rather skill development holds better prospects for students.

The prospects of lecture method in the teaching and learning of science is dependent on such factors as the competence of the handler, student's level of retention and perhaps the performance of students so exposed in examinations whether internal or external. As discussed earlier, when lecture is enriched and suffused with other methods; students gain a lot from their learning experiences. Chances are that above-average students will benefit immensely from this form of teaching, below-average students however may be disadvantaged in both content and skill. Meaningful learning is the hall mark of all science experiences, to attain this goal, teaching must be able to sufficiently address students' interest, needs, aspirations and relevance of what is taught to their daily lived experiences. In a sense, learners should be capable of translating what they learn in school to solving problems encountered at home; hence the utilitarian aspect of science.

## 8. CONCLUSION AND RECOMMENDATIONS

The concept of poverty with particular reference to the use of lecture in the teaching and learning of science has been discussed. Even though it is popularly believed to contradict the way science should be taught, it has its own merits in the teaching and learning of science if it is well handled. This position is anchored on the fact that science is both a 'knowing' and a 'doing' subject. It is recommended that lecture should be suffused with other methods like demonstration, discussion and the use of visual aids. It should not be rushed because the vital element of creating students' interest and covering a large mass of topics within a limited time will not be meaningful if students do not benefit maximally from the process. It has been suggested that science teachers should be resourceful and creative enough to maximize the benefits of lecture while not being unmindful of its limitations in

the teaching and learning of science for the simple fact that science lays emphasis on the process dimension. At tertiary education level, however, lecture is not out of place because it is expected that the participants in tertiary level of education are more intellectually mature and experienced for the demands imposed by lecture.

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**FOOT NOTE**

- I. Results, is as discussed in the contribution of the study in section 2.0
- II. Structure of paper, see last paragraph of introduction

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