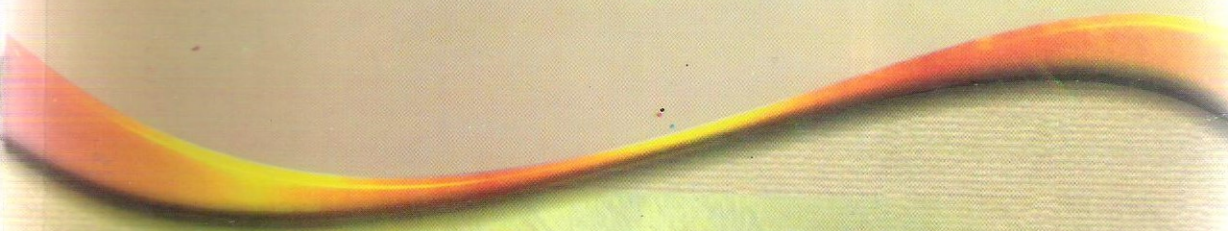


EDUCATION: **A SOCIALIZING AGENT**

**BOOK OF READINGS
IN HONOUR OF**

FESTUS AWOSIKA AKINLAYE (Ph.D)

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Edited by.

**PROFESSOR N. C. NWABOKU
DR. BIODUN AKINPELU
DR. S. O. MAKINDE**

SCIENCE TEACHERS' INSTRUCTIONAL PRACTICES AS ANTIDOTES FOR INCULCATING SCIENTIFIC ATTITUDES AND VALUES EDUCATION

Olugbenga Gabriel Akindoju

Department of Curriculum Studies,

Faculty of Education,

Lagos State University, Ojo.

ABSTRACT

The fundamental of resources in an organization is to add value. "Resources add value by working on the raw materials (input) that enter the factory gate and turning them into finished products (output)". This paper is a follow up on a case study carried out to examine the instructional practices of Biology teachers in a public secondary school in Lagos State. Students' questionnaires, Teachers' observation schedule and checklist were administered to ascertain the appropriateness of teachers' methods, coverage of contents, and availability and use of instructional materials. Based on the findings of the study, it is recommended amongst others that Government should ensure adequate funding of science education at all levels, and provides regular in-service training for teachers; so as to inculcate scientific attitudes and values education.

INTRODUCTION

There is no doubt about the importance of science to life and the fact that it has contributed to, and dominated all aspects of human society.

Science literacy is frequently touted as a key to good citizenship, thus Maslow (1971) admonished that all biologists (Scientists) should put their talents into the services of making the "good person" and the "good society". The scientist's role in the society as well as his moral and ethical responsibility in the discovery and development of new ideas has led to a measurement of his social and scientific value system.

The rate of scientific and technological advancements and how they have revolutionized every facet of life explains why education in its entirety should employ

values of science to ensure maximal achievement of educational goals.

According to Maslow (1971), science itself comes out of human existence and passions and it must be a code of ethics, since if one grants the intrinsic worth of truth then all sorts of consequences are generated by placing ourselves in the service of this one intrinsic value.

The scientific attitudes which need to be, inculcated in learners include critical-mindedness, suspended judgment(restraint), reliance on fact, honesty, objectivity, willingness to change opinions, open-mindedness, while the scientific values and principles (ethics), include truth, freedom, responsibility, integrity, collaboration and professionalism.

Critical-mindedness

This is demonstrated in learners by looking for inconsistencies in statements and conclusions, consulting a number of authorities when seeking information, looking for empirical evidence to support or contradict explanations and challenging the validity of unsupported statements.

Suspended Judgment and Respect for evidence

The science student will demonstrate suspended when he generalizes only to the degree justified by available evidence, collect as much data as possible before drawing conclusions, recognizes conclusions as being tentative and consults several authorities before drawing conclusions.

Honesty

A science student demonstrates honesty when he reports observations even when they contradict his hypotheses. He acknowledges work done by others and considers all available information when forming generalizations and draws conclusions.

Objectivity and Open-mindedness

These are demonstrated when the student considers all available data, reports observations even when they contradict his hypotheses, considers and evaluates ideas presented by others, examines many sides of a problem and considers several possible solutions and considers both pros and cons when evaluating situations.

Willingness to change opinions

The science student must recognize that knowledge is incomplete; conclusions are tentative and alter his hypotheses when necessary to accommodate empirical data.

Truth

The scientist is concerned with the expansion of human knowledge of the world, the deepening of human understanding of its aspects, and the enhancement of human ability to exploit this knowledge for the achievement of goals vital to humanity, or having social merit. He serves these goals, in every branch of science, by acting in accordance with the methods of scientific research in each branch and the rules of conduct in the scientific community in general.

Freedom

The scientist serves the goals of scientific research based on the principle of scientific research freedom, which is one of the most prominent expressions of the democratic system.

Responsibility

The scientist bears full responsibility for every scientific research or experiment he or she conducts, particularly with regard to its direct effect on human lives and on human physical and mental health, welfare, dignity and liberty.

Integrity

The scientist performs every scientific act in accordance with all of the requirements of the scientific method within the framework of which he or she works, and at highest standards.

Collaboration

The scientist acts within a universal framework of scientific collaboration, based on the shared scientific goals, and maintains an atmosphere of openness, mutual assistance and trust among scientists, their assistants and students.

Professionalism

The scientist engages in his or her scientific pursuits in a wholly professional manner, making judicious and continual use of the special knowledge, particular to his or her area of expertise. He or she also draws practical conclusions in the field of ethics of scientific research from the values and principles of scientific research

A major factor in inculcating the above attitudes and values in learners is the teachers' instructional practices. These comprise of the teachers' knowledge base, the method employed and the learning environment.

Several studies have looked at the influence of these factors, singularly and combined, on students' achievement in science (Okebukola, 1988; NRC, 1996; Weld, 1990 and Duyilemi, 1998).

Central among these factors is the teacher who determines how successful any instructional programme will be. According to National Education Standards (1996), the prospective teacher must have a working definition of what it means for a person to be scientifically literate, and must have a well grounded knowledge and understanding of scientific concepts and processes required for personal decision making, participating in civic and cultural affairs, and economic productivity.

The teacher must understand what constitutes effective teaching practices from instructing, informing, and training. He must be able to define the attitudes, values, beliefs and assumptions inherent in the creation of scientific knowledge within the scientific community. These include being able to distinguish science from other ways of knowing; distinguish basic science, applied science and technology; identify the processes and conventions of science as a professional activity; and define acceptable evidence and scientific explanations.

Instructional practices include not only the teacher but also other support systems; including technology and community members hence it becomes imperative to evaluate the science teachers' classroom instructional practice whether it could promote the inculcation of scientific attitudes, values and principles.

Statements of the problem

There has been a growing concern toward the poor performance of biology students in the senior secondary school certificate examination (STAN, 1992). The concern is heightened by the fact that almost every secondary school student offers biology as his/her one science subject or together with physics and chemistry as a science student. Also important is the fact that biology affords learners the opportunity to study the interactions between living organisms and their environment

Therefore, the inability of students to have outstanding performance in science subjects also implies that students' admission to universities will be affected, and perhaps also the attitudes and values that are expected to be transferred into their lives and the society.

It is expected that a good science teacher should be able to demonstrate an understanding of the relationship between science and technology, and the relationship between scientific values and social values as rationale for inculcating the values of scientific knowledge to their students and to society.

In an attempt to address the above situation, it has become necessary to examine critically the teaching and learning of biology in Nigerian secondary schools with a view to identifying indices that could help to remedy the situation.

The study was carried out to investigate how teachers' instructional practices in terms of appropriateness of methods, availability and use of resources, coverage

of contents by teachers influence learning as antidotes for inculcating scientific values education.

Specifically, answers were sought for the following questions:

- i. How appropriate are biology teachers' methods of instruction?
- ii. What is the level of availability of instructional materials for biology instruction in the school?
- iii. What is the coverage level of biology curriculum by teachers in the school?
- iv. What is the extent of utilization of instructional materials by biology teachers in the school?
- v. Is there any significant relationship between teachers' appropriateness of methods employed and their use of instructional materials?

Methodology

As a case study, only one public secondary school was selected in Amuwo Odofin Local Education District of Lagos State by lucky dip.

A total of 180 students were randomly selected from the senior secondary classes, this is made up of sixty students from each of the arm (SS1-SS3) using stratified random sampling technique. All the three biology teachers in the school were involved in the study.

Instruments employed in the study include Students' questionnaire, Teachers' Observation schedule and checklist on availability of resources for teaching biology. Colleagues knowledgeable in evaluation subjected all the instruments to face and content validity.

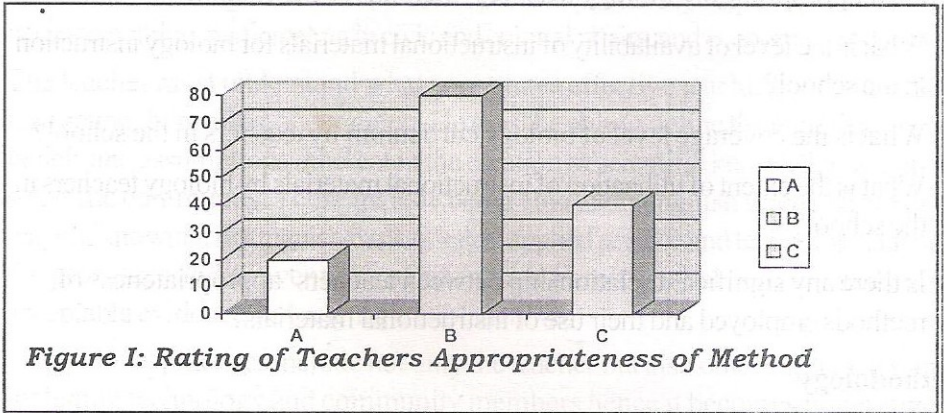
All the instruments have a five point rating scale (0-5) to assess the level of adequacy of methods, materials and coverage of content. The questionnaires were given to students personally for completion and they were all retrieved immediately, while the teachers' observation schedule and checklist on availability of resources for teaching biology were personally administered. Based on the various items on the instruments, Data collected were analyzed using simple percentage and graphs and Pearson product moment correlation coefficient

Presentation of Results

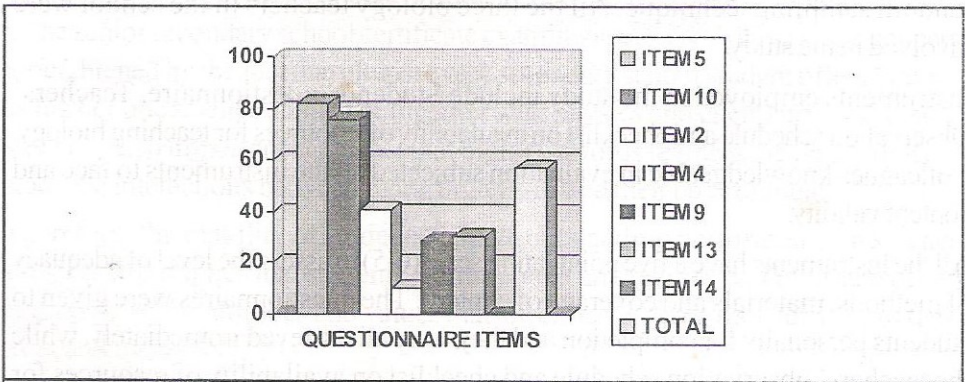
Results obtained from the analyses of data are presented below:

Appropriateness of Teachers' Methods

Data collected from the teachers' observation schedule were analyzed and presented graphically in figure 1 below:



From the result in figure I above all the three teachers employed appropriate method for the topics being taught. Related items on the students' questionnaire were also pooled together and analyzed (fig II).



As shown in figure II above the students rated their teachers above average (57.3%) which implied that they appreciate and enjoy the methods used by their teachers.

Availability of Material Resources for Biology Instruction

The second research questions was answered by analyzing the checklist on availability of material resources for biology instruction in the studied school. The result is presented in figure III below:

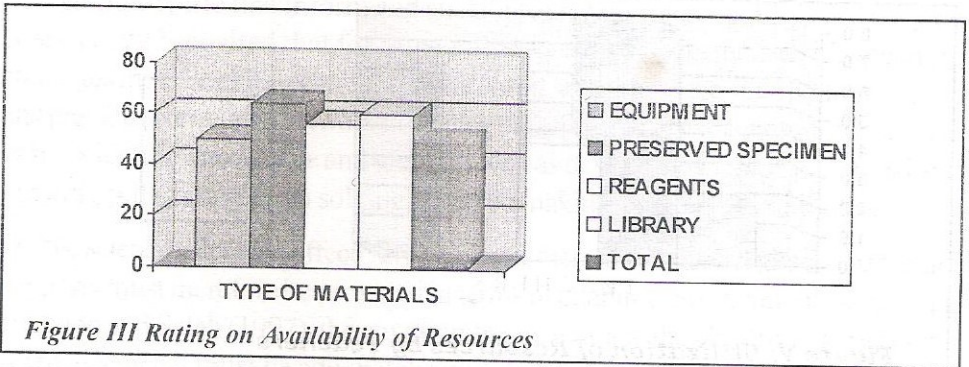


Figure III Rating on Availability of Resources

As shown in figure III above, the availability of resource materials for biology instruction in the school is average. This is shown in the total percentage score of 50%. Similarly related items on the students' questionnaire were analyzed and presented in figure IV below:

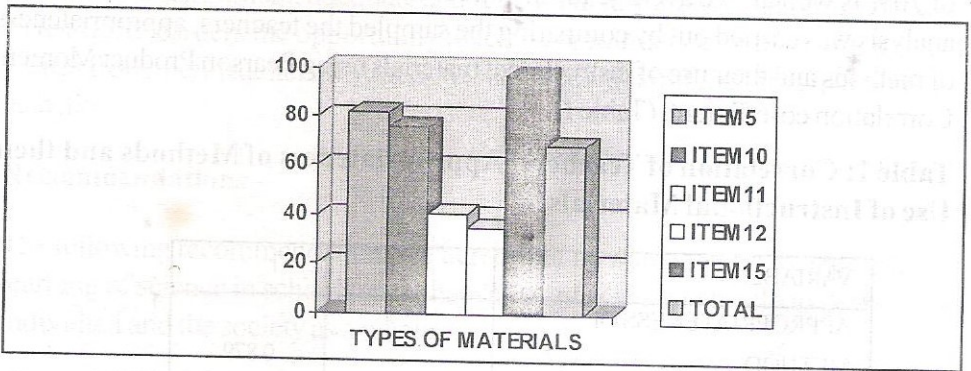


Figure IV: Students Responses on Availability of Material Resources

This result also showed a high rating of availability of material resources (68.4%) for biology instruction in the school by student respondents.

Coverage of Content by Biology Teachers

As part of the observation schedule, the three biology teachers were asked on how much they have covered in their scheme of work. This was compared with their students' biology notes and it was discovered that only two of the teachers have covered their topics as required by the scheme of work.

Utilization of Instructional materials

In order to answer the fourth research question on the effectiveness and efficient use of instructional materials by the biology teachers, relevant results from the classroom observation is presented in figure V below:

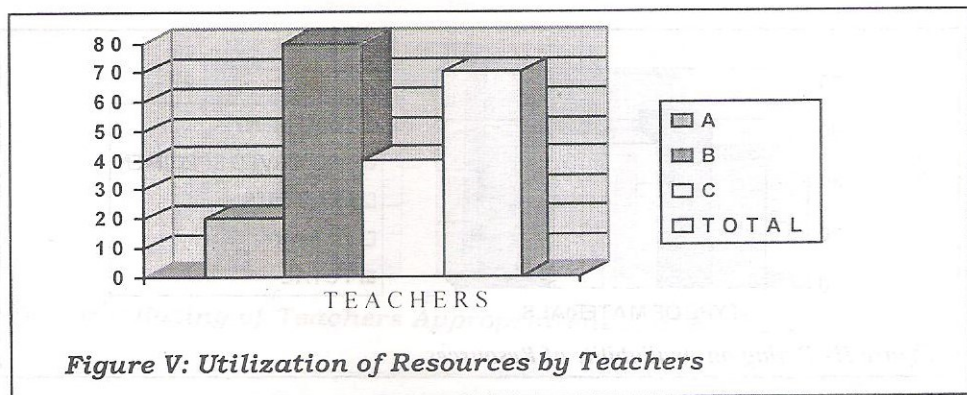


Figure V: Utilization of Resources by Teachers

The above result implied that teacher A's level of utilization of instructional materials is poor while that of teacher C is also below average. However, the total score of 70% is well above average for the three teachers combined together. Further analysis was carried out by comparing the sampled the teachers, appropriateness of methods and their use of instructional materials using Pearson Product Moment Correlation co-efficient. (Table I).

Table 1: Correlation of Teachers' Appropriateness of Methods and their Use of Instructional Materials

VARIABLES	N	r
APPROPRIATENESS OF METHOD	3	0.879
USE OF MATERIALS	3	

The result obtained as presented in table 1 above showed a strong correlation between teachers' appropriateness of method and their use of instructional materials in Biology classes.

As shown in all the results presented above, the biology teachers use appropriate methods and the few materials available in the school are well utilized. The result also showed that students enjoyed their biology classes. This result implies that

students are likely to achieve significantly from the sampled teachers instructional practices: Therefore such practices could serve as avenue for inculcating scientific attitudes, values and principles in the students that will affect their lives and that of the society. According to Okebukola(1988) and Duyilemi, (1998) teaching is said to be effective if the teacher link students learning experiences with those aspects of community life that inform and sustain such experiences. While Nwosu and Nzewi (1997) posited that for the science teacher to be effective, his teaching strategies must be child-centred, activity based, and utilize the child's environment and previous conceptual network in helping or facilitating construction and expansion of his scientific knowledge and views as well as develop desirable operational and thinking skills for problem solving, decision making and scientific attitudes.

For the science teacher to effectively inculcate scientific values in learners, necessary supports must therefore be provided in terms of enabling environment. According to Ladon and Saleh (1997), the environment is central to the objectives for teaching science hence it must be adequately explored in science teaching. The dearth of laboratory equipment and other facilities in schools have been identified by eminent researchers (Bajah, 1986; Bello, 1986 and Iwowi, 1999) as major constraints facing science teaching in Nigeria. Therefore for the teacher to teach effectively conducive environment, adequate and functional resources must be provided so as to afford learners the opportunity to learn appropriate scientific attitudes and values from their teachers instructional practices and imbibe them in their daily activities.

Recommendations

The following recommendations are hereby put forward to improve teaching and learning of science in schools such that values of science can help to develop the individual and the society as a whole

- Sustained, high quality education is the product of high quality teacher, therefore teacher preparation programme must give candidates the knowledge needed to maintain a safe environment for students, and how to develop and maintain an atmosphere conducive for learning of science through investigation and inquiry.
- Adequate laboratory space, facilities and equipment should be provided for the increasing number of students.
- Regular in-service training should be organized for science teachers for them to keep abreast of development in science and pedagogic styles.

- Researches should be encouraged to examine the process of change in teachers' knowledge, beliefs and practices as they participate in professional development.
- Instructional practices need be extended to include not only teachers but also other support systems, including technology and community members.

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