

POTENCY OF VISUALS ON STUDENTS' ACHIEVEMENT IN BIOLOGY IN AN ICT DEFICIENT ENVIRONMENT

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Abstract

This study was designed to find out, which instructional materials amongst the triols, (chart, diagram and specimen) affect more on biology instruction in senior secondary schools. Adopting three by two factorial design, A total of 200 hundred students from two randomly selected secondary schools in the Ojo Local Government Area made up three experimental and control groups. All students involved in the study were subjected to pre-test, followed by treatment and post-test. Data collected was analysed using SPSS to answer research questions and test hypotheses raised in the study.

Result obtained showed a significant effect of instructional materials on students performance in Biology, among which the real objects standout. The finding also revealed that students taught with instructional materials (experimental groups) were ready to learn and exhibit high level interest towards the subject. While those taught without instructional materials (control group) exhibits low level interest towards biology. Based on the findings of the study, appropriate recommendations were put forward

Keywords: Visuals, Experimental, performance, ecology.

1 INTRODUCTION

In the last decade and half, the greatest input in Nigerian education has been the adoption of the 6-3-3-4 system of education, as a matter of fact; many educationists have claimed that there is really no other alternative to this programme in a world that is becoming increasingly technological.

The national policy on education (NPE) described the senior secondary school as both academic and pre-vocational; this means that all the basics which would enable pupils to acquire further knowledge and develop skills required for developing the society are targeted in the secondary school curriculum.

The importance of the teaching and learning of Science subjects especially biology cannot be over emphasized as it concerns life itself. It is interesting to note that biology as a subject is taken in senior secondary schools by majority of the students. However, there have been several reports of decline in the performance of students in the subject (Ndioho, 2007). The consistent poor performance of students in science subjects has often been dismal, which may be partially blamed on the negative attitude of students towards biology as a discipline. Several other factors are also responsible for students' performance in science including biology. These factors include lack of active participation of students; teaching and learning of science in most schools is predominantly by memorization and regurgitation of facts, lack of sponsorship of science teachers to relevant conference, workshops, seminars and in service training programmes to make them current. In some schools, there were existing rooms being used as laboratory but these rooms were not properly equipped (Adegboye, 1993). Okebukola, (2002) was of the view that adequate training in STM requires well-equipped laboratories as an appropriate environment for active learning. However, poor performance is partly blamed on the increasing school enrolment without a corresponding increase in teachers and other resources.

The introduction of cost sharing in secondary schools has limited the government role to paying teachers' salary. Capital developments and purchase of teaching materials have been left to parents, who have been unable to carry out their roles effectively because of increasing poverty levels in the country.

However, due to increasing number of students offering biology there is need to improve the quality of instruction, to concretize and consolidate effective teaching and learning of biology, and to also improve students' performance in the subjects.

In a communication process, the sensory register of the memory acts as a filter. As stimuli are received, the individuals' sensory register works to sort out the important bits of information from routine or less significant bits. Within seconds, what is perceived as the most important information is posed to the working on short-term memory where it is processed for possible storage in the long-term memory. This complex process is enhanced by the use of appropriate instructional aids that highlight and emphasize the main points or concepts.

The advent of Information and communication technologies has revolutionise all aspects of human endeavour including education, and classroom instruction. Studies have shown that adoption of ICTs could motivate students to learn (Souter, 2001) After in-depth interviews and classroom observations of five middle school teachers from three middle schools in rural Pennsylvania, Kim, Grabowski, and Song (2003) concluded that using internet resources leads to active learning and motivates students to engage in the learning process. Such benefits of technology can only be explored fully when all limiting factors have adequately controlled.

The working on short-term memory functions are limited by time and capacity. Therefore, it is essential that the information be arranged in useful bits or chunks for effective coding rehearsal or recording. The effectiveness of the instructional aid is critical for this process. Carefully selected charts, graphs, pictures, or other well-organised visuals aids are examples of items that help the student understand, as well as regain, essential information.

In this situation the responsibility for learning is shifted to the students. The teacher facilitates the learning by acting as a coach, resources, guide and companion in learning. The use of instructional materials does not only encourage teachers and students to work collaboratively but also resulted in more co-operative learning activities among the students.

Educators and teacher training programmes emphasise the importance of instructional materials and resources in effective instructional delivery of lesson in secondary schools. Considering the instructional process as a communication process, it requires good quality of medium or channel to make it effective and efficient. This requirement place the responsibilities on the teacher to be able to select at any given time the appropriate medium best suited for the situation at hand.

However, achieving these laudable goal of conscientious utilization of instructional materials and resources in teaching and learning has been very challenging in developing countries, such as Nigeria, as noted by Garuba (2003), the Nigeria teacher operates from a deficient environment where particularly in the rural set-up, and even in the urban areas, only few schools are connected to the national grids. While virtually all the rural schools do not enjoy basic facilities like pipe born water and electricity. The purpose of instructional materials is to promote efficiency of education by improving the quality of teaching and learning incorporating these tools and materials present support and reinforce teaching.

Ideally, instructional materials should be designed to cover the key points and concepts. In addition, the coverage should be straight forward and factual so it is easy for student to remember and recall. Generally instructional aids that are relatively simple are best suited for its purpose.

There are different categories of instructional materials the teacher can employ in biology classes, these include the visual, audio and audio-visual aids.

These visual among the three categories have varieties of materials that can be employed for instruction, ranging from the prints, projected and non-projected visuals, graphical materials, displays materials, model specimen real objects etc.

This wide range of materials actually forms the category where every biology teacher can utilize with little or no technical support. This study therefore investigates the effect of visual, audio and audio visuals aid in improving biology instruction and student academic performance in secondary schools

Statement of problem

The decline in performance of students in biology at senior secondary school WAEC certificate examination has promoted a thorough research in the factors responsible for poor performance of students in biology.

The negative attitude of students towards biology instruction and non use of appropriate instructional materials have been identified among others to be responsible for the decline in students' performance. Therefore this study sought to address the problems leading to poor performance of

students, by looking at instructional material used by biology teacher. It specifically investigated the effects of specimen/real objects, diagrams, charts on biology instruction.

Research Questions

The following research questions were formulated:

What is the pattern of students' performance in relation with the use of visual instructional media in biology?

What is the effect of visual instructional media (chart, diagrams and specimen) on students in the learning process?

How resourceful is the teacher at effectively dispensing Biology instruction with the aid of visual instructions and in Biology and how has these visual instructional materials influenced the teachers' teaching process?

Research Hypotheses

To guide this research study the following hypotheses were formulated:

Ho1: There is no significant difference between performance of students taught biology with visual aid and those taught without visual aids

Ho2: There is no significant effect of instructional aid: (diagrams, charts and specimen) on students' academic performance

2 METHODOLOGY

2.1 Research Design

For the purpose of the research study, experimental research design was used. (Factorial design). This is due to the fact that the nature of the study requires basic contacts between the researcher and the subject respondents for data collection, the gathering of information and data is through the achievement test.

The aim is to investigate the possible cause and effects relationship by manipulating one independent variable to influence the other variables(s) in the experimental group and by controlling the other relevant variables and measuring the effects of the manipulation by some statistical means. By manipulating the independent variable, the researcher can see if the treatment makes a difference on the subject

Factorial design - was applied to determine if the effects of the independent variables can be generalized and also the relationship between variables called the "moderator variables"

Table 1: Factorial design (diagram).

Group 1 exp	Group 2 Exp	Group 3 Exp	Group 4 Control
Random assignment	Random assignment	Random assignment	Random assignment
Pre test	Pre test	Pre test	Pre test
Treatment 1	Treatment 2	Treatment 3	Treatment 4
Post test	Post test	Post test	Post test

Subject are randomly selected and placed into four groups.

The first second and third, group are the experimental groups while the fourth group is the control group. The first to the third group are exposed to different treatments while the fourth group are taken as control group.

All four groups are pre tested and post tested

2.2 Population and Sample

The sample used in this study comprised of two (2) senior secondary schools simple randomly selected within Ojo Local Government Area of Lagos State, Nigeria. A total sample of two hundred (200) students was involved in the study.

2.3 Research Instrument

The instrument used for data collection in this study was an achievement test, which seeks information about Biology instruction in senior secondary schools.

The achievement test was prepared in such a way that the necessary information on the required data was obtained easily.

The instrument was designed by the researchers and was subject to reliability test using test-retest reliability method. The co-efficient of reliability was found to be 0.62 which mean the instrument was found to be useful and internally consistent for the purpose for which it was prepared.

2.4 Data Collection Procedure

Permission was obtained from the heads of the two schools for arrangements to be made with the teachers and students involved in the study. A twenty item objective achievement test was administered to the selected students as pre-test, followed by treatments in the various groups as described above. Students in all the groups were later exposed to the post-test.

3 RESULTS

This chapter presents the results obtained from the analysis of data collected during the field work. The results are presented in accordance with the various research questions raised in the study.

3.1 Research Question One

The first research question of the study was on the pattern of students' performance in relation with the use of visual instructional media in Biology. To answer this question, data from the students' achievement tests were subjected to descriptive analysis using SPSS, the results obtained are presented as follows:

Table 2: Pattern of Students' Achievement in Biology.

SEX	GROUP	N	Mean Gain Score
MALE	CONTROL GROUP	21	4.62
	DRAWINGS	25	4.52
	CHARTS	24	4.42
	SPECIMENS	26	5.35
	Total	96	4.74
FEMALE	CONTROL GROUP	29	4.69
	DRAWINGS	25	4.92
	CHARTS	26	5.04
	SPECIMENS	24	6.42
	Total	104	5.23

3.2 Research question 2

What is the effect of visual instructional media (chart, diagrams and specimen) on students in the learning process?

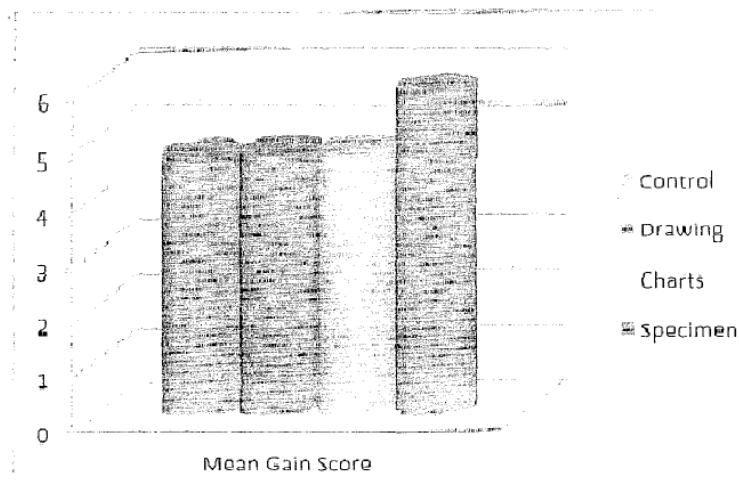


Fig1: Influence of Visuals on Students achievement.

Fig 1 shows the gain scores of students in the achievement test from the control and three experimental groups which reveal the effectiveness of the various media increasing from drawing to specimen which is more real.

3.3 Research Question 3

How resourceful is the teacher at effectively dispensing Biology instruction with the aid of visual instructions and in Biology and how has these visual instructional materials influenced the teachers teaching process?

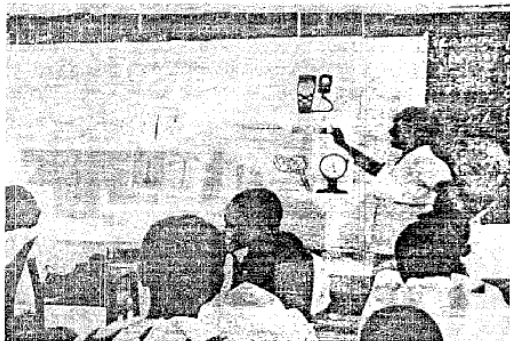


Fig 2: A picture of the Chart Group (school 1)

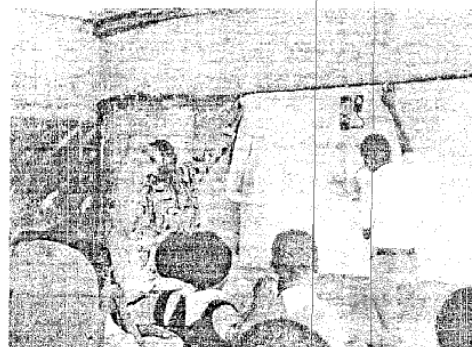


Fig 3: A picture of the Chart Group (school 2)

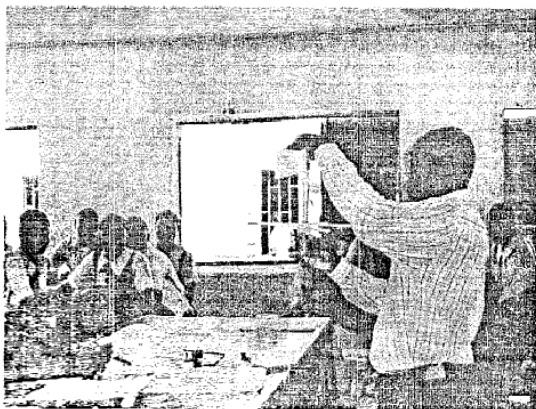


Fig 4: A picture of the real specimen group (school 1)

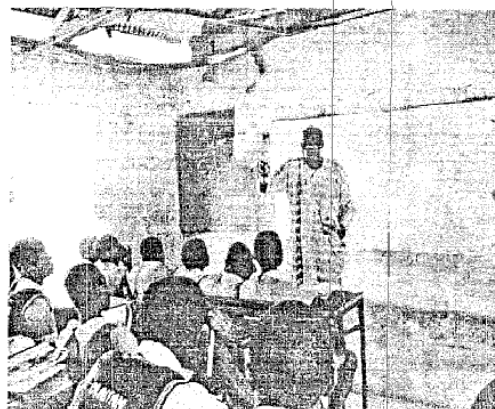


Fig 5: A picture of the real specimen group (school 2)



Fig 6: A picture of drawing book during instruction 1



Fig 7: A picture of drawing book during instruction 2

Photographs in figs 2-7 show the teachers in the various groups using the three types of visuals and that of the control group. The pictures depict the level of excitement and involvement by students in the charts and specimen group which perhaps reflected in their achievement score after the treatment.

4 TESTING OF HYPOTHESES

4.1 Hypothesis One

The first hypothesis of the study states that "there is no significant difference in the academic achievement of students taught biology with visual aids and those taught without visual aids". This hypothesis was tested by comparing the gain score of students in the control group with those students taught with visuals in the three experimental groups put together using t-test inferential statistics for independent samples, the result obtained showed that the control group ($M=4.66, SD=1.67$) achieved significantly lesser than the experimental group ($M=5.11, S.D=1.90$), $t(198) = -1.48; p > 0.05$.

This result implied that students in the experimental groups performed significantly higher than those in the control group, therefore the first null hypothesis of the study should be rejected.

4.2 Hypothesis Two

The second hypothesis states that "there is no significant effect of diagrams, charts and specimen on students' academic achievement in biology. This hypothesis was tested by comparing the gain scores of students in the three experimental groups individually, with the control group using ANOVA. The result showed $F(3,196) = 5.64; p < 0.05$ confirming that a statistically significant difference exist among the gain scores of students in the control group and the three experimental groups. This finding also implies that the second null hypothesis of the study should be rejected.

Table 3: LSD Post hoc Multiple Comparisons of effects of methods on students' Gain Score.

(I) METHOD	(J) METHOD	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
TRADITIONAL	DRAWINGS	-.06	.357	.867	-.76	.64
	CHARTS	-.08	.357	.823	-.78	.62
	SPECIMENS	-1.20*	.357	.001	-1.90	-.50
DRAWINGS	TRADITIONAL	.06	.357	.867	-.64	.76
	CHARTS	-.02	.357	.955	-.72	.68
	SPECIMENS	-1.14*	.357	.002	-1.84	-.44
CHARTS	TRADITIONAL	.08	.357	.823	-.62	.78
	DRAWINGS	.02	.357	.955	-.68	.72
	SPECIMENS	-1.12*	.357	.002	-1.82	-.42
SPECIMENS	TRADITIONAL	1.20*	.357	.001	.50	1.90
	DRAWINGS	1.14*	.357	.002	.44	1.84
	CHARTS	1.12*	.357	.002	.42	1.82

Based on observed means.

The error term is Mean Square (Error) = 3.186.

*. The mean difference is significant at the .05 level.

Post hoc analysis was carried out to ascertain which of the media is responsible for the significant difference reported. Table 3 shows that specimen has the greatest effect on the sampled students' achievement in biology

5 DISCUSSION

The main purpose of this study was to identify the effect of visuals (charts, specimen, and drawing) on students' achievement in biology as a potential make up for ICTs in situations where it is practically impossible for teachers to explore the advantages of teaching biology with ICTs.

It can be deduced from the limited number of literature reviewed that biology can only be taught effectively and efficiently, and successfully through the use of instructional materials of which the real objects or specimen stood out.

Also, it was found out that students tend to retain biological concepts when specimen / charts and other instructional materials are applied. These, then clarify the fact that apart from the students' ability. The use of instructional materials have a therapeutic effects on students as they learn to work together, share their thought and ideas and also reinforce each other to respects each other view and capabilities.

Therefore, application of instructional materials makes teaching and learning in Biology more concrete, more realistic and dynamic and gives teachers ample opportunities to enhance their instructional process while the stakeholders in the school system work on surmounting the challenges of integrating ICTs into their classrooms.

6 CONCLUSION

The effective use of relevant instructional materials (drawings, charts, and specimen) help the teacher to appeal to their students' senses of hearing seeing, testing, touching smelling. Therefore, every

biology teacher need to develop his/her interest towards the use of instructional materials and should not teach without it.

Instructional materials on the other hand should be incorporated into lessons for explaining, illustrating and reinforcing knowledge of concepts.

For the achievement of educational goal therefore, adequate materials should not only be provided but also be utilized by teachers. This is so because, nothing is learnt until it has being taught and the goal of every teacher is for their students to learn.

7 RECOMMENDATIONS

The following recommendations are put forward

- The school authority should encourage mandate the use instructional materials in the teaching of biology.
- Effort should be made by teachers to improvise materials in the absences of the original.
- Teachers should be monitored by the school authority to ensure the effective use of instructional materials while teaching biology.
- Workshops or seminar should be organized for teachers in order to make teachers more creative, skilled and more informed.
- Funds should be made available by government in the form of aids and grants to support schools.
- Criteria for establishing new school should include adequately equipped laboratory.
- Available materials should be evenly distributed to all schools.

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