

Effects of Audio-taped and Pictures Supported Instructions on Students' Achievement in Biology

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Abstract: The study investigated the effects of audio-taped and pictures supported instructions on students' achievement, in biology. Two research questions and two hypotheses were formulated for the study. The quasi experimental design was adopted for the study. The population of the study was 1200 senior secondary two (SSII) Biology students, while 240 students constituted the sample. Six intact classes of three experimental and three control groups in three schools were used. Biology Achievement Test (BAT) was used as the instrument for data collection. Using Richard Kuderson 20 (K-R 20) formular, a reliability coefficient of 0.70 was obtained. Data were analyzed using mean and analysis of covariance (ANCOVA). Results showed that the group taught using audio- taped and pictures supported instructions (ATPSI) achieved significantly higher than the group taught conventionally. Also female students taught using audio- taped and pictures supported instructions achieved significantly higher than their male counterparts.

Keywords: effects, audio-taped instructions, pictures, achievement.

INTRODUCTION

Biology is the scientific study of living organisms. It is a basic science subject offered by senior secondary school students in Nigerian schools. Of the three basic science subjects (Physics, Chemistry and Biology), Biology holds the strongest as the major subject prerequisite into careers in science, such as medicine, pharmacy and Agriculture [1]. Considering the importance of Biology, it is disheartening to note the low achievement in the subject in internal and external examinations [2].

Every nation of the world is presently interested in scientific development. Each country strives towards well trained scientists through the adoption of various innovative techniques. This quest for scientific development favours the adoption of discovery based learning which involves the use of instructional materials. Instructional materials are among the assistant materials which teachers use to make instruction more effective and enjoyable. Instructional materials make a topic clearer by making topics that are abstract for students more concrete. Audio media are materials that expedite learning through the sense of hearing. Audio tapes are used as both instructional materials and method [3]. Audio tapes are effective for making students concentrate on, understand and improve positive attitude towards school subjects. Audio-media includes audio recording, audio-tapes, audio-cassettes and audio - recording equipment [3]. The advantages of audio tapes include ease of operation, they are battery generated and self-threading and they are easily adapted to individualized or small group listening. Audio tapes allow an instructor to talk directly to the students while allowing the students to have control over the presentation and

move at their own pace. Students with learning difficulties can revisit classroom presentations using audiotape. They can replay more difficult sections as often as necessary. Students practice listening skills with tapes of recorded instructions Audio-taped instructions can be supported with pictures for instructional delivery.

According to the World Book Encyclopedia [4], a picture is a drawing, painting, portrait, photograph or a print of any of these. All diagrams used in biology are therefore pictures. The instructional purposes served by pictures include arousing interest, illustration of specific steps in a problem and developing appreciation. Pictures are used to gain attention, make abstract information concrete, stimulate inquiry and serve as advance organizers [5]. Pictures increase instructional efficiency by representing in a single form, what may take hundreds, if not thousands of words to explain [6]. Pictures are unlimited in supply, easy to produce and procure and are valuable instructional materials. A good picture when used with other instructional and curricular materials can help make learning an interesting adventure.

Learning is gained by reading in 10%, hearing 20%, seeing 30% and both seeing and hearing 50% [7]. This shows that audio materials supported by visuals are more effective on students learning. Faster and better learning is achieved when more sense organs are involved in learning. For this reason, science lessons that are supported by visual and audio instructional materials should be developed, to draw students' attention, accelerate learning and reflect the nature of science.

There is an acknowledged problem of female underachievement when compared with their male counterparts apparently under equivalent conditions and this problem of female under achievement appears to be more pronounced in science and mathematics [8]. Investigations into the many areas of the sciences related to assessing academic attainment have confirmed the low achievement of female students in science subjects.

Some factors have been identified to account for differences in male and female achievement in science subjects. Prominent among the factors identified by Okeke [9] are sex-role stereotyping, masculine image of science and female socialization process. Sex-role stereotyping seems to be the origin of differences between males and females in science education [9]. Some research works have shown contradictory evidences in students' academic achievement in sciences due to gender. For instance, Olikeze [10] and Ifeakor [11] found out that there is no significant difference in the achievement of males and females in Biology and Chemistry respectively. It is therefore worthwhile to see how audio- taped and pictures supported instructions would bridge the gap in science achievement by gender in Biology.

In view of the foregoing, this study sought to investigate the effects of audio - taped and pictures supported instructions on students' achievement in a selected biology content which is the skeletal system, whose subject matter has intrinsic visual interest.

Purpose of the study

The study investigated the effects of audio-taped and pictures supported instructions on students' achievement in biology. Specifically, the study sought to:

- Determine the mean achievement scores of students taught biology using audio- taped and pictures supported instructions (ATPSI).
- Determine the mean achievement scores of students taught biology using the conventional teaching method.
- Determine the mean achievement scores of male students taught biology using audio- taped and pictures supported instructions.

- Determine the mean achievement scores of female students taught biology using audio- taped and pictures supported instructions.
- Determine the mean achievement scores of male students taught biology using the conventional teaching method.
- Determine the mean achievement scores of female students taught biology using the conventional teaching method.

RESEARCH QUESTIONS

The study was guided by the following research questions:

1. What is the difference in the mean achievement score of students taught using audio-taped and pictures supported instructions and those taught using the conventional teaching method in a Biology Achievement Test?
2. How does the mean achievement score of male students taught using audio - taped and pictures supported instructions differ from that of females taught using the same method in a Biology Achievement Test.?

Hypotheses

The study was guided by two null hypotheses tested at 0.05 level of significance:

H₀₁-There is no significant difference in the mean achievement scores between students taught biology using audio- taped and pictures supported instructions and those taught conventionally.

H₀₂- There is no significant difference in the mean achievement scores of male and female students taught using audio- taped and pictures supported instructions

METHODOLOGY

The design of the study was quasi experimental and specifically, the pretest posttest non equivalent control group research design. The population of the study comprised 1,200 biology students in senior secondary two (SSII) in Mubi Education zone of Adamawa state. 240 SSII biology students in three purposively selected schools from Mubi urban constituted the sample for the study. In each of the three schools, two randomly selected intact classes, each containing 40 students was used. The assignment of classes to treatment condition was by balloting. One of the intact classes in each of the schools was taught using audio taped instructions supported with pictures and the other was with the conventional teaching method (lecture method). The classes taught using the conventional teaching method served as the control.

Audio- cassettes containing recorded instructions on the skeletal system, cassette players and picture books were used in the instructional process.

Pictures of bones that make up the skeletal system were arranged in the order they were to be taught and bound into a book, called the picture book. An instrument for data collection was developed by the researcher. The instrument was a 37-item Biology Achievement Test (BAT). Test items were paper and pencil type, consisting of 30-multiple choice and 7 alternatives to practical questions. The test items and instructional materials were validated by experts in Science Education and Educational Technology. This was done to ensure face and content validity of the test items. The scorer reliability co-efficient of the test was estimated to be 0.68 using Pearson product moment correlation procedure.

Each of the two instructional methods was randomly assigned to each of the intact classes used. The instructional methods were the audio- taped and pictures supported instructions and the conventional teaching method. Students were pretested before treatment commenced.

Students in the audio- taped and pictures supported instructions group received step by step instruction as presented by a tape recorder while they flipped through the pages of the picture book, as they were instructed by the audio recording. The regular biology teachers taught the conventional method group. Before the experiment commenced, the teachers were trained on how to use the lesson notes, to ensure uniformity. At the end of the treatment, posttest was administered to students in both groups under proper supervision.

The student's scripts were collected at the end of the test and scored using a validated marking scheme. The study lasted for 3 weeks. Data collected were analyzed. Mean and Standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses.

RESULTS

The results of the study are shown in table 1-4

Table-1: Comparison of Means Posttest Scores by Teaching Method

	Mean score pretest	Mean score posttest	Mean gain score	Difference in mean gain score	Standard deviation
Experimental group (ATPSI)	14.75	32.62	17.87		8.50
				6.88	
Control group (CTM)	12.63	23.62	10.99		6.63

The result in table 1 revealed that the experimental group (ATPSI) had a higher mean achievement score of 32.62 and standard deviation of 8.50 while the control group had a mean achievement score of 23.63 and standard deviation of 6.63 in the

BAT. This means that the experimental group had a mean gain achievement advantage of 6.88. The standard deviation of the ATPSI group is higher than that of the conventional method group.

Table-2: Comparison of Mean Achievement Gains of Male and Female Students taught Biology using ATPSI in a Biology Achievement Test.

Gender	Count	Mean score pretest	Mean score posttest	Mean gain score	Difference in mean score gain	Standard deviation
Male	143	19.32	27.63	7.31		8.65
					0.80	
Female	97	20.21	28.47	8.20		8.96

Table 2 revealed a higher mean achievement gain of 28.47 for female students with a standard deviation of 8.96, while male students had a mean achievement score of 27.63 and standard deviation of 8.65. Based on the result, it is evident that ATPSI had a

more positive effect on achievement of female students. The difference in mean gain score is 0.89, in favor of the females. However, considering the sample sizes and standard deviation of each group, the difference in achievement is slight.

Table-3: Analysis of Covariance of Posttest Achievement by Teaching Method

Sources of variation	Sum of squares	Df	Mean square	F	Sig value p-value
Covariates	4310.001	1	4310.001	111.968	.00
	4310.001	1	4310.001	111.968	.00
Main effects	4668.196	2	23340.098	60.672	.00
	4657.291	1	4657.291		
Explained	9341	4	2335.481	60.672	.00
Residual	9045.926	235	38.493		
Total	18387.850	239	76.937		

From table 3, the F-calculated of 60.67 exceeded the critical value of F at 0.05 level of significance. There is therefore a significance difference between the mean achievement scores of the two groups at 0.05 level of significance at 4 and 235 degrees of

freedom. The null hypothesis was therefore rejected. The decision then is that significant difference existed between the mean achievement scores of the two groups, in favour of the group taught using ATPSI.

Table-4: Analysis of Covariance (ANCOVA) of the Achievement obtained using ATPSI by Gender of Students in the Biology Achievement Test

Gender	Count	Mean	Standard deviation	Df	f-ratio	f.prob
Male	143	27.6364	8.65	1		
Female	97	28.4742	8.96	238	.5263	.4689
	240	29.9750	8.7714	239		

Table 4 revealed that at 0.05 level of significance and 1 and 238 degrees of freedom, f-prob (f-crit) is .4689. This value is less than the F-ratio (f-cal) value of .5263. This result led to the rejection of the null hypothesis. There is therefore a significant difference in the mean achievement scores of male and female students taught using audio- taped and pictures supported instructions. The significance is in favour of the female gender.

SUMMARY OF FINDINGS

In summary, the findings of this study are as follows

1. Students taught using audio- taped and pictures supported instructions had higher mean achievement score than students taught using the conventional teaching method in the Biology Achievement Test. (Table 1)
2. Female students taught using audio- taped and pictures supported instructions had higher mean achievement score than male students taught using the same method in a Biology Achievement Test. (Table 2).
3. Students taught Biology using audio- taped and pictures supported instructions achieved significantly higher than students taught using the conventional teaching method in BAT. (Table 3)
4. Female students taught Biology using audio- taped and pictures supported instructions achieved significantly higher than male students taught using the same method in BAT (Table 4)

DISCUSSION OF FINDINGS

Results of the study revealed that students taught Biology using audio- taped and pictures supported instructions achieved significantly higher than the students taught conventionally. The significant difference may be as a result of the ability of the audio instructions and picture books to provide more concrete representations of the bones of the skeletal system, a phenomenon not normally assessable in regular Biology classrooms. This may have increased students concentration. The picture book which each student had must have led to a better appreciation of the content of the lesson and increased their motivation to learn. The

picture book displayed every part and piece of bone in the human body, clearly indicating similarities and differences among them, and clearly demarcated the joints from the cartilages, all clearly labeled. It may not be easy to describe these features to the students when using the conventional methods to teach. It is then often difficult for the students to grasp the content. The use of audio- taped and pictures supported instructions is a simple way to drive home the point concerning the skeletal system an area of Biology which students do not easily understand. This result queries the use of the conventional method.

The results of this study support the views of previous researchers like Onyegebu [12] and Mamah [13] indicating that students taught using audio based instruction out performed significantly in achievement than those taught conventionally. Onyegebu [12] pointed out that audio-visuals when properly used in classroom teaching and learning situations can arouse students' interest, curiosity, motivation, imagination and simulations which could lead to higher achievement. The findings of the study are however not in agreement with that of Leonard. The author's results showed no significant difference in the level of achievement scores of students taught by the lecture method and audio-taped instruction.

It is obvious from the results that female students slightly but consistently out performed the male students in gaining knowledge of the skeletal system. There is no substantive explanation to this. It was observed that the female students were excited about the innovative teaching method and the excitement was enduring, till the end of the lessons. Interacting with the Audio -taped instructions also brought the female students out from their 'cocoon'. Considering the area of this study, the Northern Nigeria female student will not speak, ask or answer questions from the teacher in a normal classroom setting, most especially when the class has male students present (co-educational), as in the schools used for this study. These young females get into the classroom with the mentality of 'second class or inferior citizens'. The males do the talking while the females just sit passively and watch.

This attitude may be attributed to the muslim culture which regards the female sex as inferior. This mentality also has a firm grip on the female christian students with whom these muslims co-exist. But by the nature of this study, the teacher was kept away from the classroom in the experimental groups. It is therefore assumed that the female students had the opportunity to really be themselves, interacted with the audio materials and pictures, as well as themselves. This may have enhanced their achievement.

The findings of this study with regards to gender are in disagreement with Onyegegbu [13] and Mamah [12]. These researchers observed that gender has no significant effect on students' achievement when taught using audio approach.

CONCLUSION

From the findings, some conclusions can be drawn. Understanding of the skeletal system and then, achievement in biology would be significantly increased by utilizing audio-tape instructional approach to teaching. The approach is capable of solving various contemporary problems in the field of science education, arising from the shortage of man and material resources. There is a shortage of good textbooks, well planned instructional programmes, suitable instructional devices and aids and even competent teachers. The learner population is increasing and there is the menace of insecurity due to the increasing spate of attacks on schools in Northern Nigeria, leading to destruction of school buildings and disruption of school calendar. It is not possible to provide efficient quality education to learners without the aid of an effective medium like ATPSI, as students can take them home and listen to, in the absence of the teacher.

The effectiveness of the use of ATPSI is also dependent on gender. Therefore the use of ATPSI in teaching the skeletal system is a potent pedagogical strategy for bridging the gender gap in science achievement.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made:

- Biology teachers in secondary schools should use audio- taped and pictures supported instructions as part of their teaching, since this study has shown that desired knowledge can be acquired in this manner.
- Government should sponsor and encourage in-service educational opportunities for interested biology teachers to learn the basic skills of producing instructional audio tapes, pictures and other materials.
- Government should fund and equip Educational Resource Centres in each education zone. This will

ensure that teachers and learners can borrow and buy audio-taped instructions and pictures that are educationally relevant and suitable.

REFERENCES

1. Okoye AC. The effects of Computer Assisted Instruction on students' acquisition of Science Process Skills and interest in Biology. Unpublished Ph. D Dissertation. Nsukka: University of Nigeria. 2012.
2. West African Examinations Council. Chief Examiner's Report. Lagos, 2015.
3. Adjai R. Principles and practice of teaching. London: Allen and Unwin Publishers. 1980.
4. The World Book Encyclopedia. Chicago: Field Enterprises Educational Cooperation. 1977; 15: 404.
5. Haas K.B, Packer HQ. Preparation and use of aids. Englewood Cliffs: N.J Prentic Hall Inc.1965.
6. Newby TJ, Stepich DA, Russell JD, Lehman JD. Educational technology for teaching and learning. Prentice Hall; 2006.
7. Izzet K. The retention effect of computer assisted instruction on students' academic achievement in Physics Journal of Instructional Psychology. 2004; 35(4).
8. Nworgu LN. Effects of gender sensitization of science teachers on gender gap in science achievement and interests among students. Unpublished Ph. D. dissertation, Nsukka, university of Nigeria. 2004.
9. Okeke EA. Gender, Science and Technology in Africa: A Challenge for Education. 1990.
10. Olikeze FC. Effects of Computer Assisted Instruction on Secondary School Students Cognitive Achievement and Interest in Biology. Unpublished Ph. D Thesis. 1999.
11. Ifeakor AC. Effect of commercially produced computer assisted instruction package on students' achievement and interest in secondary school chemistry. Unpublished Ph. D, Nsukka University of Nigeria. 2005.
12. Onyegegbu N. Effect of video and audio rolliograph on students' achievement and retention in the understanding of schistosomiasis. Unpulished Ph.D. Thesis, Nsukka: University of Nigeria. 1999.
13. Mamah M. Effect of audio- picture instructional system on students' achievement in biology. Unpublished M .Ed thesis. Nsukka: university of Nigeria.1998.