The Effect of Video CD and Audiocassette-Based Instructions on Secondary School Students' Practices on Disease Control in Selected Environmental Topics in Biology

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Abstract

This study examined the effect of Video-CD and Audiocassette-based instructions on secondary school students' environmental practices on Disease control in selected environmental topics in Biology. The study adopted a pretest, post-test, control group, quasi experimental design using a sample of 352 S.S.1 Biology students from six secondary schools, randomly selected from 4 Local government areas of Ibadan in Oyo State. Five instruments were used and three hypotheses were tested. The data analysis revealed a significant difference between (a) students exposed to Video-CD and control group (b) students exposed to Audiocassette and control group (c) Gender and parents' level of education in their environmental practices. However, there was no significant main effect of gender on students' environmental practices. Appropriate recommendations were advanced for the use of ICT-based instructions.

Introduction

Information Communication Technology (ICT) in education plays an important role especially in the process of empowering the technology into the educational activities. Information and Communication Technologies (ICTs) - which include radio and television, as well as newer digital technologies such as computers and the Internet - have been touted as potentially powerful enabling tools for educational change and reform. When used appropriately, different ICTs are said to help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching and learning into an engaging, active process connected to real life (Tinio, 2010). Angeli and Valanides (2005) posited that ICT- based instructional strategies have positive impacts on students learning when teachers know how to use it to promote students' knowledge construction thinking, attitude and even behaviours. Common examples of ICT-based instructional strategies include the following:

- Audio presentation.
- VCD presentation
- Power point presentation and
- Educational games (Digital gaming)

Audio presentation involves use of sound media for classroom presentation of instruction.

ICT has a significant work to play in our life especially in the educational activities. Influence of ICT cannot be ignored in the lives of students at the secondary school level and beyond.

Environmental awareness and sensitivity can be promoted through environmental education. The use of ICT products in form of Video CD and audiocassette can be used to bring desirable changes in learning towards the environments. Since environmental issues are issues that are experienced by learners on a day to day basis, the modeling of environmentally responsible behaviours or practices can then be achieved. Fien (1996) maintained that environmental education

would teach citizen the cause of environmental problem and how the problems could be solved so that the environment will continue to support future citizens. Positive environmental practices among students can be achieved when students are aware and sensitized about the environment. In environmental education skills, values and knowledge are taught to students. When students acquire knowledge and skills about environmental problems, they in turn will bring desirable changes to the society. It is accepted that beliefs and misconceptions which people acquire when they are young, tend to stick to them for a long period later in life.

Biological knowledge enables us to understand clearly the factors affecting our existence such as drugs, sanitation, health, food requirement and various products for our shelter and comforts. Biology plays a vital role in the technological advancement of a nation. Biology as a subject seeks to address the problems of health, sex, reproduction and disease for the benefit of the society at large. The subject prepares students to acquire the ability to apply scientific knowledge to everyday life especially in matters of personal and community health and health of the nation in general (Ojo, 1995). The subject helps people, especially the professionals like doctors and microbiologists in cure, diagnosis and prevention of diseases.

But health cannot be attained in isolation of the environment, which is one of the major determinants of health. Moreover, health does not come automatically, it is learned and the learning must be acted upon (Akpan, 1995). Educational system has been looked upon as the variable channel for influencing the behaviour of future generations. If people (including school pupils and students) are knowledgeable about their environment, the associated problems, subsequent solutions and motivated or inspired for actions, the situation would eventually change for the benefit of both present and future generations (Olagunju, 2002). It is assumed that emphasis on the knowledge of the effects of microbes, diseases, spread of diseases and developing positive habits and practices through environmental concepts in Biology will bring about effective utilization of the environment and hence improved quality of living.

Research studies have revealed positive relationship between environmental knowledge, environmental attitude and environmental practices (Mansaray and Ajiboye, 1997) and those environmental practices depend largely on acquisition and manipulation of environmental skills. In order to effect a change in attitude and in behaviour of students towards the environment and health issues, proper and adequate exposition about the environment is needed, since health, environment and education interact in a reciprocal fashion.

It is also assumed that students bad practices and attitudes to understanding some diseases common among them could be moulded and corrected when they are still young and in school.

The design and development of these learning packages used the Berlo's SMCR Model, where S stands for SOURCE, M for MESSAGE, C for CHANNEL, and R for RECEIVER of the message. Berlo's SMCR model, according to Akude and Ofoefuna (1990) recognizes the sense organs (eyes, ears, skin, nose and tongue) as the channel of communication. As far as the receiver is concerned, his/her communication skill (e g., ability to read, write, and speak), attitudes, knowledge level and the socio-cultural context or environment in which he/she is operating are emphasized. Berlo's model of communication in contrast to Shannon-Weaver's model strongly considered the human touch in the communication process and this is very important in teaching and learning.

Statement of the Problem

The Biology teacher who is usually faced with the problem of handling large classes has persistently embraced lecture method. Various researches have revealed that the use of lecture method has led to lack of interest and underachievement in the sciences. Several research findings have shown that students would learn best when they are engaged with the course materials

and they actively participate in the learning process. The need to employ ICT based instructional delivery system in biology then arises.

This study, therefore, investigated the effect of Video-CD and Audiocassettes-based Instructions on secondary school students' environmental practices.
It also examined the influence of students' gender and parents' level of education on students' learning outcomes in selected Environmental topics in Biology.

Hypotheses
Three null hypotheses were tested at 0.05 level of significance.
HO_1: There is no significant main effect of treatment on students' environmental practices on disease control.
$H0_2$: There is no significant main effect of gender on students' environmental practices on disease control.
$H0_3$: There is no significant main effect of parents' level of education on students' environmental practices on disease control.

Methodology
This study adopted a Pretest, Post-test, Control Group, Quasi-experimental Design using a 3 x 3 x 2 factorial matrix.

Three hundred and fifty-two senior secondary 1 (SS 1) biology students (175 boys and 177 girls) were involved in this study from four local governments areas in Ibadan, Oyo State. Part of the selection was based on purposive sampling technique which involved two schools. Four schools were randomly selected. Two experimental schools were randomly assigned to treatment (Audiocassette), two other experimental schools were purposively assigned (Video CD).

Instrumentation
Five main instruments were prepared, validated and used for collecting data.

- Operational Guide for Video CD-Based Instruction (OGVBI)
- Operational Guide for Audiocassette-Based Instruction (OGABI)
- Operational Guide for Conventional-Based Instruction (OGCBI)
- Assessment Sheets for Evaluation of Trained Teachers' Performance (ASETP)
- Students' Environmental Practices Scale (SEPS) was validated using Cronbach alpha and 0.84 was obtained.

The teachers of the experimental school trained on the use of OGVBI and OGABI to assess their conformity. The teachers in the control group were also trained on the use of OGCBI. OGVBI AND OGABI are operational guides that were used by the researcher in the experimental groups to ensure uniformity, to score the trained teachers and students on the role played in the course of the lesson. These operational guides consist of two aspects, Teachers Active/Passive role and Students Active/Passive responses.

The Video CD-Based Instruction (VCDBI) was developed by the researcher. It is mode of instruction on microorganisms, an aspect of SS1 topics in Biology. It is a self-learning package or could also be used with the assistance of the teacher where and when necessary using the linear model. It is also backed up with test yourself exercises.

The Audiocassette-Based Instruction (ACBI) was also developed by the researcher. This was prepared for the second experimental group. It has the same content and is of the same model as the Video CD-based Instruction. The ACBI is different from the VCDBI in presentation format of its course content because it is backed up with diagrams and workbooks and test- yourself exercises. For the purpose of validation, experts' comments were solicited to ascertain the appropriateness of the concepts, the usability and methods to the target

population. The observation and comments of the experts were taken into consideration while preparing it.

The Video CD and Audiocassette-Based Instructions were programmed in such a way that the concepts were presented in frames or chunks for easier and better mastery by students. Students were in groups. Discussion which is one of the common strategies promoting active learning was allowed after each lesson. For the VCDBI groups, questions were asked by the VCD instructor which was answered by students. Each group was awarded marks based on correct response made by the students. The numbers of attempt made in getting the correct answers determine the marks awarded. This has already been programmed into the package. The computer appraises the answer and then gives two or more clues. This is in line with the principles behind Operant Conditioning. Reinforcement is the key element in Skinner's S-R Theory. A reinforcer is anything that strengthens the desired response.

Students' Environmental Practices Scale (SEPS) is divided into two sections A and B. Section A consisted of the personal data of the subject containing the gender, name, school and parents' level of education. Section B consisted of thirty (30) items or statements having 4 options.

Procedure for Data Collection

The actual procedure followed the steps below:

- Two weeks of training involving the researcher, as the resource person, the research assistants, the participating biology teachers and the computer teachers as applicable.
- The participating teachers were trained using the OGVBI and OGABI, on the use of the Instructions, the instruments and how to create the right type of environment needed for the experimental.
- Third week was used for conducting pretest. The researcher with the help of the research assistants, and the biology teachers administered the pretest on the subjects in SEPS
- The treatment period lasted eight weeks in all the six schools. This involved the use of Video CD-Based Instruction (VCDBI) in two schools (Experimental group 1), the use of Audiocassette-Based Instruction (ACBI) in two schools (experimental group 2) and the use of the Conventional-Based Instruction (CBI) in the remaining two schools (control group).

Data Analysis

The data obtained were analyzed using a 3 x 3 x 2 Analysis of Covariance (ANCOVA) with the pretest scores as covariate. The Multiple Classification Analysis (MCA) was used to show the magnitude of the post-test mean scores. In addition, the Scheffe post-hoc analysis was carried out for possible explanation of the direction of the observed significant main effects.

Results

Table 1: Summary of Descriptive Statistics Associated with Treatment, Parents' Level of Education and Gender on Students' Environmental Practices

Variable	Statistics	Treatment			Parents' Level of Education			Gender	
		Video	Audio	Conventional	Low	Medium	High	Male	Female
	N	126	103	123	42	114	196	175	177
Practices	Pretest								
	X	74.04	75.21	71.93	75.31	74.25	76.09	70.05	71.15
	(σ)	(3.96)	(3.51)	(3.36)	(3.51)	(4.17)	(4.41)	(4.85)	(3.71)
	Posttest								
	X	86.68	85.09	78.87	82.38	82.89	84.06	83.71	83.26
	(σ)	(2.51)	(3.19)	(2.85)	(2.83)	(3.65)	(2.61)	(3.21)	(2.51)
	Mean gain	12.64	9.88	6.94	7.07	8.64	7.97	13.66	12.11

Keys: Video = Video CD-based instruction; Audio = Audiocassette-based Instruction; Conventional = Conventional-based Instruction, σ = Standard Deviation, X = Mean.

Table 1 showed that on environmental practices the mean gains for the Video CD, Audiocassette and Conventional Based Instructions were 12.64, 9.88 and 6.94 respectively. However, students with high parents' level of education had a mean gain of 7.97; Students with medium Parents' level of education had a mean gain of 8.64 while students with low parents' level of education had a mean gain of 7.07, Male Students had a mean gain of 13.66 while females had a mean gain of 12.11.

Ho_1: There is no significant main effect of treatment on students' environment practices on disease control.

Table 2: Summary of 3 x 3 x 2 Analysis of Covariance (ANCOVA) on Students' Environmental Practices

Source		Sum of squares	df	Mean square	F	Sign (p)
MAIN EFFECTS	(Covariates)	950.040	1	950.040	8.62	.004
	(Combined)	3509.686	5	701.937	6.37	.000
	Treatment	3397.634	2	1698.817	15.42	.000
	Gender	27.244	1	27.244	.247	.619
	PLE	2.803	2	1.402	.013	.000
2-way Interactions (Combined)		2063.239	8	257.905	2.342	.018
Treatment * Gender		1563.037	2	781.519	7.09	.001
Treatment * PLE		298.483	4	74.621	.67	.608
Gender * PLE		102.473	2	51.236	.46	.628
3 – Way Interaction						
Treatment * Gender * PLE		469.448	4	117.362	1.00	0.373
Model		6992.413	18	388.467		
Residual		36667.485	333	110.113	3.52	.000
Total		43659.898	351	124.387		

Table 2 revealed that there was a significant difference among the groups in the post practices observations ($F_{(2,333)}$ 15.42: $p<.05$).

Table 3 Multiple Classification Analysis on Environmental Practices Grand Mean = 83.483

Source		N	Unadjusted Deviation	Eta	Deviation	Beta
TREATMENT:	Video group	126	3.19		2.996	
	Audio group	103	1.60	.309	1.549	.292
	Control group	123	-4.61		-4.366	
GENDER	Male	173	.228		.285	
	Female	179	-.220	.020	-.275	.025
PARENT' LEVEL OF EDUC.						
	Low	42	-1,10		.24	
	Medium	113	-.58	0.60	-5.1	.008
	High	197	.57		-2.2	

R = .320

R_2= .102

Table 3 revealed that students exposed to video treatment had the highest post practices mean score (83.48+2.99) X = 86.47 followed by those exposed to Audio treatment (83.48+1.54) X= 85.03, while those exposed to Conventional strategy had the least post practices mean score. (83.48-4.36) X =79.11. The table above showed that the total effect of the treatment (given by the beta value) to be 0.292.

All these showed that the treatment had a significant effect on students' practices on disease control. Therefore, HO_1 was rejected. Table 4 revealed the sources of significant difference through pair-wise comparison.

Table 4: Scheffe's Post Test on Practices

Treatment	Mean	Control Grp	Video Grp	Audio Grp
Control Grp	79.117		*	*
Video Grp	86.479	*		
Audio Grp	85.032	*		

* The mean difference is significant at the 0.05 level of significance.

Table 4 showed that there was a significant mean difference (i) Video group and Control and (ii) Audio group and Control group, but difference between Video group and Audio group was not significant.

These showed that both Video and Audio-Based Instruction were better than Conventional-Based instruction in developing good practices of disease control in the students.

$H0_2$: There is no significant main effect of gender on students' environmental practices on disease control.

Table 3 showed that there was no significant difference between male and female students in their post environmental practices ($F_{(1.333)}$ = 0.24; p<.05). Therefore, $H0_2$ was rejected.

$H0_3$: There is no significant main effect of Parents' level of education on students' environmental practices on disease control.

Table 2 revealed that parents' level of education had no significant main effect on students' environmental practices ($F_{(2.335)}$ = 0.013; p > .05). Therefore $H0_3$ was not rejected. However, there was no significant main effect of gender on student's environmental practices.

Discussion, Implication and Recommendations

Treatments affect practices. Students exposed to Video treatment had the highest post practices means score followed by the Audio treatment while those in the conventional group had the least post practices mean score. This result should be expected since attitudes positively correlate with practices. This corroborates the submission of Mansaray and Ajiboye (1997) that positive relationships exist among environmental knowledge, environmental attitude and environmental practices. Use of treatment in form of Video CD can also achieve transfer of learning in the three domains of learning because there was avenue for students to participate actively which of course never happened in rote learning (Aremu, 1992).

The data analysis revealed that the interaction effect of parents' level of education on students' environmental practices was low ($F_{(2.333)} = 0.013$; $p > .05$) and therefore not significant. This finding runs contrary to the submissions of Bosker (1999), Bali (1997) and Awosolu (1997) that parents' levels of education significantly affect the children academic performance. The data analysis showed that parents' level of education had no effect on the knowledge acquisition, attitudes and practices of the students. Whether in the use of Video CD, Audiocassette or Conventional-based instructions, there was no significant difference in the performance of students from Parents' with low, medium or high level of education. This could be as a result of students' personal exposure to the environment and environmental health hazards and diseases. The results indicated that there was a significant interaction effect of treatment and gender on students' environmental practices ($F_{(2,.333)}=7.09$; $p<.05$).

The focus of this study was to develop ICT-based instructions (in form of Video CD and Audiocassette) and to expose average Nigerian students to electronic learning. The study also investigated the effects of gender and parents' level of education on students' environmental practices to disease control. The study is learner-centred and embraced active participation by the students as advocated by the Cognitivist learner-centred theory. The students were enthusiastic at the innovation. The study emphasized the active intellectual involvement of learners by providing opportunities for students to meaningfully talk and listen, write, read and reflect on the contents, ideas, issues and concerns of environmental topics in Biology. Teachers are to be acquainted with the skills of developing instructional packages that are ICT based. This would further enable students to be actively engaged in the learning process. Curriculum planners and designers should provide instructional designs that are ICT-based; this would enhance valid achievement of educational objectives. Instructional designs that are learner-centred should be provided so as to foster motivation, participation and creativity among students.

It is recommended that the government at state and local levels should provide ICT in form of computer systems, projectors and tape recorders to schools. Government should also ensure and enforce the use of ICT in both private and public schools. Students were enthusiastic and excited at' the innovation, an average Nigerian' student should therefore be exposed, encouraged and motivated to learn through electronic means. The implication of the findings in this study is that Video-CD and Audiocassette should not only be seen for social pleasure such as in listening to music or watching home video by students alone, but should also be seen and used for academic purpose. The knowledge and sensitivity of youths and adolescents in these days of disease rampage and HIV epidermis can be enhanced and enlightened. Positive attitudes and practices can also be encouraged and developed by students towards disease control.

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