ENHANCING COMPUTER SCIENCE STUDENTS' RETENTION THROUGH VIDEO, ANIMATION AND AUDIO VOICE THREAD MODES IN COLLEGES OF EDUCATION IN NORTH-CENTRAL NIGERIA

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A B S T R A C T

Achievement in a subject is more meaningful when a learner is able to retain the knowledge gained for a longer period of time. This study therefore focused on the need to enhance college of education students' retention through video, animation and audio voice thread modes in North-central Nigeria. Three research questions raised were answered and three null hypotheses were also tested at 0.05 level of significance. The study adopted a quazi-experimental design in which intact classes of students in participating schools were used. A multi-stage sampling technique was used and a total of 210 students constituted sample size of the study. Intact classes of students were randomly assigned to experimental group I (voice thread video mode), experimental group II (voice thread animation mode), and the control group (voice thread audio mode). Voice thread modes were used as treatment instrument while computer science achievement test which was administered at posttest and retention test was used for data collection. The instrument was satisfactorily subjected to validation and reliability checks. Data collected were analyzed using mean, standard deviation and Analysis of Covariance statistics. Findings that emanated from the study revealed that the retention ability of both male and female students were enhanced by video and animation voice thread modes better than the audio mode. It was recommended that these two modes should be integrated in teaching and learning in colleges of education for improved retention of students in computer science.

K E Y W O R D S

Computer science, retention, voice thread, video, animation, audio.

INTRODUCTION

In this contemporary time, science and technology have become part and parcel of human culture where every field of study is adopting to enhance adequate man power and productivity for the well-being of mankind (Olugbemi, 2013). In the field of education, the learning environment and culture have uncountable influence on the way people reason, live and do things. Most learning at all levels of education especially in tertiary institutions are mainly passive type where students are being spoon fed with information making the classroom one-way conversation type (Sayan, 2015).

Computer Science is one of the fundamental courses that students are expected to enroll for in Colleges of Education in Nigeria (Sulaiman, 2012). Computer information is used everywhere in the world by everyone to carry out one particular task or the other (Orolade&Oyewusi, 2017). In the school, the knowledge students get about computational thinking and application helps them to carry out academic tasks easily as well as endowed them with the spirit of discovery, creativity and novelty (Sulaiman, 2012). It is a general course offered by students in Colleges of Education and woeful performance of students in the subject has been noticed over the years. The course coded GSE 213 is offered by year two students in Colleges of Education in Nigeria. The introduction of this course content into colleges of education curriculum grew rapidly because of its significance in meeting the need of the present times.

Being a general course with large population of students offering it from various academic departments, the method of teaching used may not really take care of individual differences in the class or even give students the opportunity to access and learn computer science effectively. This abstract way of teaching Computer Science with little or no computers to go round could be regarded as one of the factors why students fail the course (Araoye, 2010). This trend of poor performance among students has been a source of concern to teachers and other stakeholders in Colleges of Education.

Globally, different instructional methods have emerged. Thus, a good teacher should adopt different methods, taking into consideration the best material that will improve learning and aid retention in the class. In view of this, Adoboye (2012) asserted that various technological platforms are trendy and can be adopted for teaching and learning and one area in which this current practice has made substantial difference is online learning. The increase in the use of online learning is connected to the development of open source learning system and cloud base technology. Prominent among the cloud-based platforms is the Voice Thread.

Voice Thread (VT) is a Web 2.0 cloud based technology that can be used to support teaching and learning. It is a multimedia slide show that holds onto images, documents and videos and allow students to turn slides and put down comments via voice, mic or telephone(Brunvand & Bird, 2011).It is also a distribution tool that enables both teachers and students to perform online presentation using video, audio, text, and animation (Archambalt& Carlson, 2001).

The platform enables teachers and students to work as a team and share their ideas on video while watching at the same time (Sun & Gao, 2013). The use of voice thread does not only encourage teachers and students to work collaboratively but encourages co-operative learning activities among students (Mandernach& Taylor, 2011). However, the goal of every educational system is to make sure that effective learning takes place in the class and instructional strategy employ by teachers ascertain

the success of the learning process (Holzberger*et al.,* 2013).In this study, three different modes of Voice Thread (Video Only, Animation and Audio) were adopted to determine their capabilities in enhancing students' retention in computer science.

Retention is defined as the capacity to recollect or hold onto what is learnt and be able to put it down or say it when it is needed (Ajai&Imoke, 2015). It is the ability to recall what has been taught after a period of time. Retention is faster when more senses are involved in the teaching - learning process. Students' retains better when the method and medium of instruction satisfies the educational needs of the learners (Falode*et al.,* 2015). The conventional method of teaching has been blamed for making learners passive receivers of information. Hence, the use of Voice Thread modes was investigated to determine if it could be adopted to enhance the retention of College of Education students in Computer Science in North Central Nigeria.

Aim and Objectives of the Study

The aim of this study was to determine if video, animation and audio voice thread modes would enhance students' retention in computer science in Colleges of Education in North-central Nigeria. It also examined the influence of gender on retention abilities of students.

Research Questions

The following research questions were answered in the study:
1. What is the difference in the mean retention score of students taught Computer Science concept with Voice Thread Modes (Video Only, Animation and Audio)?
2. What is the difference in the mean retention score of male and female students taught Computer Science Concept with Voice Thread Modes (Video Only)?
3. What is the difference in the mean retention score of male and female students taught computer science concepts with Voice Thread Modes (Animation Only)?

Null Hypotheses

HO_1: There is no significant difference in the mean retention score of students taught Computer Science concept with Voice Thread Modes (Video Only, Animation and Audio).

HO_2: There is no significant difference in the mean retention score of male and female students taught Computer Science Concept with Voice Thread Modes (Video Only)

HO_3: There is no significant difference in the mean retention score of male and female students taught computer science concepts with Voice Thread Modes (Animation Only).

Research Method

The study employed Quasi-experimental research design which is pre-test, posttest non- randomized, non- equivalent group design. The population of the study comprises 2,501 Nigeria Certificate in Education (NCE) Computer Science students in the 2020/2021 academic session in North-Central geo-political zone of Nigeria. A total of 210 year two computer science students constituted the target population of the study. Clustering technique was used to cluster the 15 Colleges of Education in the study area into six groups that is group, after which one College of Education each was randomly sampled from each of the cluster making a total of six Colleges of Education. These six Colleges of Education were randomly assigned to three groups. They are Experimental group one (Video Voice

Thread instruction), Experimental group two (Animation Voice Thread instruction)and the control group (Audio Voice thread instruction).Intact classes of year two students consisting both male and female constituted sample size of the study.

The research instruments used for the study were the treatment instrument (Voice Thread instructions -Video Only, Animation only and Audio only modes) and the test instrument (Computer Science Achievement Test -CSAT). The achievement test has two sections. While section A was used to retrieve the bio data of the participants, part B was a 50-item multiple choice questions drawn from the concepts taught (Basic Computer operations, Computer Networks and Application of Computer in Education. The research instruments were validated by Educational Technology and Computer Science experts. The reliability co-efficient of 0.76 using Pearson Product Moment Correlation formula was obtained which shows that the instrument was reliable for data collection. The research questions were analyzed using Mean and Standard Deviation, while the hypotheses were analyzed using Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA) and Sidak PairwisePosthoc analysis at 0.05 alpha level of significance through the aid of Statistical Package for Social Sciences (SPSS) version 23.0.

Results

Research Question One: What is the difference in the mean retention score of students taught Computer Science concept with Voice Thread Modes (Video Only, Animation and Audio)?

Table 1: Mean and standard deviation of posttest and retention scores of students taught computer science concepts with voice thread modes (Video, Animation and Audio)

Groups	N	Post-test		Retention		Mean Difference
		Mean	SD	Mean	SD	
Exp Grp 1 (Video)	73	69.48	6.019	60.48	5.598	9.00
Exp Grp 2 (Animation)	74	69.84	4.877	61.57	4.442	8.27
Ctrl Grp (Audio)	63	66.57	6.278	62.78	5.493	3.79

Table 1 shows the mean and standard deviation of retention scores of experimental groups one (Video Only), experimental group two (Animation Only) and control groups (Audio) at posttest and retention. The table revealed the mean and standard deviation scores at posttest and retention of experimental group one is $\overline{X}$=69.48, SD=6.019and $\overline{X}$= 60.48, SD = 5.598 respectively. This gives a mean difference of 42.80. Similarly, the mean and standard deviation at posttest and retention of experimental group two are$\overline{X}$= 69.84, SD = 4.877 and $\overline{X}$=61.57, SD=4.442 respectively. This gives a mean difference of 8.27. Finally, the mean and standard deviation at posttest retention of the control group are $\overline{X}$= 66.57, SD = 6.278 $\overline{X}$= 62.74, SD = 5.493 respectively. This gives a mean difference of 3.79.

Research Question Two: What is the difference in the mean retention score of male and female students taught Computer Science Concept with Voice Thread Modes (Video Only)?

Table 2: Mean and standard deviation of posttest and retention scores of male and female students taught computer science concept with voice thread modes (Video only)

Groups	N	Posttest		Retention		Mean Difference
		Mean	SD	Mean	SD	
Male	32	68.69	5.975	59.19	4.974	9.50
Female	41	70.10	6.053	61.49	5.904	8.61

Table 2 shows the mean and standard deviation of posttest and retention scores of male and female taught computer science concept with voice thread modes (video only). From the table, mean and standard deviation scores of posttest and retention for male students is $\bar{X}$= 68.69, SD= 5.975 and $\bar{X}$= 59.19, SD= 4.974 respectively. This gives a mean difference of 9.50. Also, the mean and standard deviation scores at posttest and retention for female students is $\bar{X}$= 68.188, SD= 4.522 and $\bar{X}$= 61.37, SD= 4.310 respectively. This gives a mean difference of 8.61. The result also revealed that male students had the highest mean difference of 9.50.

Research Question Three: What is the difference in the mean achievement score of male and female students taught Computer Science concepts with Voice Thread Mode (Animation Only)?

Table 3: Mean and standard deviation of pretest and posttest scores of male and female students taught computer science concepts with voice thread modes (Animation only)

Groups	N	Pretest		Posttest		Mean Gain
		Mean	SD	Mean	SD	
Male	26	28.88	5.256	71.04	5.355	42.16
Female	48	28.48	4.631	69.19	4.523	40.71

Table 3 shows the Mean and Standard Deviation of pre-test and post-test scores of male and female students taught computer science concepts using animation mode. Male students had achievement mean score of 28.88 with a standard deviation of 5.256 at the pre-test while their female counterparts had achievement mean score of 28.48 with a standard deviation of 4.631. Also, male students had achievement mean score of 71.04 with a standard deviation of 5.355 at the post-test while their female counterparts had achievement mean score of 69.19 with a standard deviation of 4.523. This gives a mean gain of 42.16 for male and 40.71 for female. Mean gain of 42.16 for male and 40.71 for the male and female students respectively indicates that male students achieved higher than their female counterparts.

Hypothesis One: There is no significant difference in the mean retention score of students taught Computer Science concepts with Voice Thread Modes (Video Only, Animation and Audio).

Table 4: Summary of Analysis of Covariance (ANCOVA) of retention scores of experimental group I, II and the control group

Source	Type III Sum of Squares	Df	Mean Square	F_{cal}	P_{value}
Corrected Model	1006.884[a]	3	335.628	14.589	.000
Intercept	2027.217	1	2027.217	88.121	.000
Posttest	828.231	1	828.231	36.002	.000
Groups	367.860	2	183.930	7.995*	.000
Error	4739.040	206	23.005		
Total	801372.000	210			
Corrected Total	5745.924	209			

: Significant at 0.05 level

Table 4 shows the ANCOVA result of the comparison of retention scores of students in experimental group I, II and the control group. An examination of the table shows (F $_{(2, 206)}$ = 7.995, p< 0.05). On the basis of this, hypothesis four was rejected. Therefore, there is a significant difference in the retention scores of students taught Computer Science with Voice Thread Modes (Video Only, Animation and Audio). Therefore, a SidakPairwise post-hoc analysis was computed to show where the significant difference exists as presented in table 4. (b).

Table 4 (b): Sidak Pairwise Post-hoc analysis of the retention scores of students in experimental group I, II and control groups

Treatment	Experimental Group I	Experimental Group II	Control Group
Exp Grp 1 (Video)	-	.535	.000*
Exp Grp 2 (Animation)	.535	-	.017*
Ctrl Grp (Audio)	.000*	.017*	-

: Significant at 0.05 level

Table 4(b) shows the Sidak post-hoc analysis of retention scores of students in experimental group I (video), II (Animation) and the control groups (Audio). The table indicates that significant difference exist between the achievement scores of students in experimental group I and control group (0.000). It also shows that a significant difference exist between experimental group II and control group (0.017).

Hypothesis Two: There is no significant difference in the mean retention score of male and female students taught Computer Science concept with Voice Thread Modes (Video Only).
In testing hypothesis five, the summary of analysis of covariance of mean retention scores of male and female students Computer Science concept with Voice Thread Modes (Video Only) is presented in Table 5.

Table 5: Summary of Analysis of Covariance (ANCOVA) of mean retention scores of male and female students taught computer science concept with voice thread modes (Video only)

Source	Type III Sum of Squares	Df	Mean Square	F_{cal}	P_{value}
Corrected Model	944.185[a]	2	472.093	25.187	.000
Intercept	222.219	1	222.219	11.856	.001
Covariate (Posttest)	849.085	1	849.085	45.301	.000
Gender	39.365	1	39.365	2.100*	.152
Error	1312.034	70	18.743		
Total	269273.000	73			
Corrected Total	2256.219	72			

*: Not Significant at 0.05 level

Table 5 shows the ANCOVA result of the comparison of retention scores of male and female students taught Computer Science concepts with Voice Thread Modes (Video Only). An examination of the table shows ($F_{(1, 70)}$ = 2.100, p > 0.05). On the basis of this, hypothesis five was retained. This implies that there is no significant difference in the retention scores of male and female students taught computer science concept with Voice Thread Modes (Video Only).

Hypothesis 3: There is no significant difference in the mean retention score of male and female students taught computer science concept with Voice Thread Modes (Animation Only).

In testing hypothesis six, the summary of analysis of covariance of mean retention scores of male and female students Computer Science concept with Voice Thread Modes (Animation Only) is presented in Table 6.

Table 6: Summary of Analysis of Covariance (ANCOVA) of mean retention scores of male and female students taught computer science concept with voice thread modes (Animation only)

Source	Type III Sum of Squares	Df	Mean Square	F_{cal}	P_{value}
Corrected Model	200.497[a]	2	100.249	5.742	.005
Intercept	483.386	1	483.386	27.685	.000
Covariate (Posttest)	195.431	1	195.431	11.193	.001
Gender	.114	1	.114	.007*	.936
Error	1239.665	71	17.460		
Total	281942.000	74			
Corrected Total	1440.162	73			

*: Not Significant at 0.05 level

Table 6 shows the ANCOVA result of the comparison of retention scores of male and female students taught Computer Science concepts with Voice Thread Modes (Animation). An examination of the table shows ($F_{(1, 70)}$ = 0.007, p > 0.05). On the basis of this, hypothesis six was retained. This implies that there is no significant difference in the retention scores of male and female students taught Computer Science concept with Voice Thread Modes (Animation).

Discussions

Hypothesis one reveals that there is no significant difference in the mean retention score of students taught computer science concepts with Voice Thread Modes (Video Only, Animation and Audio). Students taught computer science using both video and animation voice thread modes were able to retain the concepts taught. Significant difference exists in the retention score of students taught computer science in favour of those exposed to video only voice thread mode followed by those exposed to animation voice thread mode. This finding agrees with Umar (2012) who investigated the role of Computer Assisted Instructions on the interest and retention of secondary school students. The results reveal that in the computer assisted instructions, the students showed more interest and they retained the concepts for a long time as compared to the traditional lecture method.

Hypothesis two reveals that there is no significant difference in the mean retention score of male and female students taught Computer Science concept with Voice Thread Modes (Video Only). The result revealed that both male and female students taught computer science using video only voice thread mode retained concepts taught. This finding is in agreement with Eze*et al.,* (2016) who investigated the effect of gender on students' retention in financial accounting in Technical Colleges in Anambra State. The findings revealed that there was no significant difference in the mean retention scores of male and female students taught financial accounting using PBTM. Also, it agrees with the findings of Egbunu*et al.,* (2017) found that gender difference does not exist in the retention of students when exposed to video-based computer aided instructional package. However, this study disagrees with Isifanus, (2017) who found that significant difference in the male and female students' retention when taught mathematics through computer-based video instruction.

Findings on Hypothesis three reveals that both male and female students taught computer science using animation voice thread mode retained without any significant difference. This finding corroborates the study of Dantani, Kure and Usman (2013) who found that there was no significant difference in the male and female students' retention when taught using animation.

CONCLUSION

From the findings that emanated from this study, it was discovered that the use of voice thread modes (video, animation and audio) in teaching and learning of computer science enhanced the retention of students in the course. This means that both video and animation voice thread modes enabled the students engage in meaningful interactions with the learning contents which enabled them remembered what was learnt even after a period of time. The learning platforms also proved to be gender friendly as both male and female students exposed to the platforms retained much without any noticeable difference in their retention scores.

Recommendations

In light of the findings of this study, it was recommended that:

Voice thread instructional platforms should be employed for teaching and learning of computer science courses in Colleges of Education since it has proven to enhance students' retention in the course. Also, provision of needed information and communication technology facilities as well as media resources that would aid the use of Voice Thread platform by computer science students and lecturers should be made available by relevant school administrators. Finally, trainings should be organized for students and lecturers on how to create, connect and effectively use voice thread in teaching and learning process.

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