Effects of Animated Cartoon Based Instructional Strategy on Senior Secondary School Students' Learning Outcomes in Computer Studies in Ekiti State, Nigeria

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Abstract

The study investigated the effects of animated cartoon based instructional strategy on senior secondary school students' learning outcomes in computer studies in Ekiti State. The purpose of the study was to determine the significant difference between the academic performance and retention of students taught with the use of animated cartoon based instructional strategy and those taught with conventional method of teaching computer studies. The study adopted the pretest-posttest, quasi experimental research design. The population for the study comprised of Senior Secondary School II Students in Ekiti State. The multistage sampling technique was used to select 240 students from four secondary schools. The instruments used for data collection were Computer Achievement Test (CAT) and Computer Retention Test (CRT). The validity of the instruments was ensured using face, content and construct validities. The reliability coefficient of 0.80 and 0.79 were obtained respectively for the study at 0.05 level of significance through test- retest method. Data collected were analyzed using descriptive statistics of mean, standard deviation and inferential statistics such as t-test, Analysis of Covariance (ANCOVA) and Multiple Classification Analysis (MCA). The findings revealed that there was no significant difference between the academic performance and retention of students in the experimental and the control groups before treatment but there was significant difference between the academic performance of students and between the retention of students in the experimental and the control groups after the treatment. Based on the findings, it was concluded that animated cartoon based instructional strategy significantly improved academic performance and retention of students in computer studies. It was therefore, recommended that conscious effort must be made by teachers in Ekiti State to use animated cartoon based instructional strategy to teach difficult concepts in computer studies to improve the students' academic performance, sand learning retention in computer studies. Also government should provide adequate computers, other technological tools and

well equipped computer laboratories for secondary schools for effective and efficient teaching and learning of computer studies.

Keywords: Animation, Cartoon, Strategy, Teaching, Academic Performance, Retention, Computer Studies, Students.

Introduction

Nowadays, a great number of changes occur in the application of educational technology to teaching and learning especially in the area of innovation. Education has witnessed more innovations in the methods, practices, tools and philosophies in the past ten to fifteen years than in the preceding 100years, (Garry, Thomas, Glenda, and Randolph, 2008). Innovation in education has witnessed a continuous shift in the nature of the use of technological means and measures for improving the processes and products of education. This depends upon the type of excellence attained by the members of the society and communities all over the globe in terms of the scientific, philosophical, psychological, and technological progress and advances. Technology is a significant driver behind change, and mostly plays an important role in innovations in educational design and delivery. This means that technology has the power to transform education by ushering in a new model of connected teaching which links teachers to their students to help them improve their own instruction and personalize learning. There are immense possibilities for greater and wider-spread change with the use of present day technology advancements, as well as the implementation of innovative educational programmes.

With the quest for educational innovations, Nigeria as a developing country should attempt to align with the developed countries in the area of instructional computer technology with advanced technological skills to improve the quality of teaching and learning so that learners can be at par with the developed countries. This step should enhance the teaching of Computer Studies which is relatively new in her educational system (Adebayo, 2016).

Some concepts in computer studies which involve a model with particular reference to computer programming, could look abstract and difficult to grasp by learners in developing countries, if there is no proper teaching of the concepts. Conventional methods such as lecture method have been found not suitable enough in the classroom for teaching and learning of these concepts (Abdulkadir,

2016). The conventional methods of teaching often make students at secondary school feel intimidated and anxious thereby, making learning a passive one contrary to learning objectives.

Specifically, studies such as Twaakyondo (2012), Syeda (2016) and Soetan (2016) have shown that students perform better when contents are presented through animations which attract, arouse, improve and sustain students' interest in learning instead of conventional methods of teaching. The researchers agreed that animation in teaching and learning enables students to grasp difficult concepts more easily and depict abstract contents into real life situations thereby providing learners with higher interactive activities. In addition, Garry, Thomas, Glenda, and Randolph (2010), asserted that teaching-learning that incorporates color, sound, motion, and pictures with text has much more appeal than one with text on a plain background. Combining text, audio, video, animation and sound brings life to teaching and learning.

The role of animation in teaching and learning is rapidly becoming one of the most important and widely discussed issues in contemporary pedagogy. Mayer and Moreno (2002), defined animation as a form of pictorial presentation referring to computer generated moving pictures showing association among drawn pictures and simulation corresponding to the motion picture.

If animation is properly used, it provides basis for conceptual thinking, enhances clarity of communication and increases the speed of comprehension. Besides increasing the teachers' efficiency, animations appeal to any age and ability group. The simultaneous use of audio, text, multi-colored images, graphics, motion, light and other special effects provide ample and exceptional opportunities for the learners to develop capacity for high quality learning and increase their ability to be highly innovative in thinking and in practice. With the conventional method of teaching and learning, students are directed on how to learn and what to learn. It is strictly on learning by listening which might not be favorable to students who desire other learning styles.

Computer Studies is a practical subject, where invention and resourcefulness are encouraged. Learners are expected to apply the academic principles they have learned to the understanding of real-world systems, and to the creation of purposeful artifacts. This combination of principles, practices, and invention makes it an extraordinarily useful and intensely creative subject, suffused with excitement. Also, computer studies is a STEM discipline sharing attributes with science subjects (biology,

chemistry and physics), Technology, Engineering and Mathematics in that it has its own theoretical foundations and mathematical underpinnings which involves the application of logic and reasoning.

No nation can rise above the quality of its education. Through education, of which computer education is an integral part, every nation (including Nigeria) shapes its future. Agbaje, Rashidat, Alake and Ese (2014) opined that the development in the area of science and technology is a measure of the development of any nation. Technological growth of a nation leads to its social and economic development. In view of this, computer education should be given utmost priority in educational settings because of its centrality to the nations' economic growth and technological development. Therefore, since the acquisition of the basic knowledge of computer science and technology skills at secondary school level is central and foundational to that of all levels of education, the quality of education and acquisition of science and technology at that level is paramount and may likely determine the future of the nation.

Computer Education in Nigeria secondary schools is bedeviled by many problems such as availability and accessibility of computers, instructional materials and equipment, teachers' quality and teaching method, learning environment and learners' attitudes (Akuoma, 2012). Other problems include erratic power supply, poor maintenance of computers, low computer literacy of teachers and students and high class size. These problems make teaching computer studies in Nigeria secondary schools a very big challenge to majority of teachers which affects the learning outcomes (academic performance and attitudes) of students in the subject. Secondary School students with particular reference to senior classes (SSS1-SSS3) in Nigeria, are the children between the ages of 13-15 years who have completed their education at the junior secondary school and successfully passed the junior Secondary School Certificate Examination (JSSCE).

Teaching science and technology such as computer studies at this level is considered ideal or necessary for the achievements of learning objectives. The appropriateness of the teaching strategy with the application of science knowledge and technological tools in teaching computer studies at this level is probably the most important determinant of cognitive learning outcomes for the students. It has been observed by the researcher that of all the problems facing the teaching of science subjects in secondary schools today, none is as

persistent as the one relating to the conventional method of teaching these subjects. Conventional method of teaching science subjects is a didactic approach commonly used in formal schools in Nigeria which does not make allowance for students to be actively involved in classroom during instructional delivery (Wang, 2001). He and other researchers (Udoh, 2012, Oteyola, Oyeniran and Adesoji, 2016) criticized this strategy of teaching, affirming that it causes boredom and consequently makes students passive learners. The researchers noted that the basic ingredients required for effective teaching and learning is unavoidably missing in the conventional method.

Analysis of WAEC results from year 2014-2017 from Ekiti State Ministry of Education Science and Technology, Planning Research and Statistics Department, Ado-Ekiti also showed that more than 50% of candidate who registered and sat for computer studies/Data processing failed, while more than 63% of the candidates who registered for the subject from 2015 – 2017 decreased.

It could be inferred that poor academic performance of students in most of the internal and external examinations could be attributed to the adoption of the conventional method of teaching science subjects that is widely used for teaching in formal schools in Nigeria without proper attention to the use of computer instructional package which involves step-by-step approach to teaching and learning process.

In addition, the poor academic performance of Nigerian students in West African School Certificate Examination (WASCE) had been continually poor as a result of the continuous use of the conventional method of instruction, (Adewuya, 2003) cited in (Ajetunmobi, 2013). He, therefore, suggested that professional teachers should henceforth experiment with new methods of teaching in order to stem the tide of poor academic performance of students in examination.

Studies have shown that conventional method of teaching science concepts is a didactic approach to efficient and effective teaching and learning. However, studies by Barak, Ashkar and Dori (2010) have shown the positive effect on students' learning outcomes and motivation in teaching science concepts via animated movies. The researchers are, therefore, of the opinion that giving students the opportunity to be actively involved during instructional delivery through proper application and effective use of animated cartoon will facilitate better understanding of computer studies concept at the senior secondary school level.

Animated cartoon based instructional strategy has the potential of boosting students' morale to develop higher motivation to learn science in terms of self-efficacy, interest and enjoyment, connection to daily living, and importance to the student's future, compared to students who studied science in a traditional way.

In view of this, there is need to investigate the effects of animated cartoon based instructional strategy on senior secondary school students' learning outcomes in computer studies in Ekiti State.

Statement of the Problem

Analysis of WAEC Computer Studies/Data Processing results from (2014 - 2017) year according to Ekiti State Ministry of Education, Ado-Ekiti clearly showed that more than 50% of the candidates who registered and sat for the examination failed computer studies/Data processing which involves programming. It could be inferred that students appear not to be able to "hands on" the computer system successfully and lack the knowledge of computer programming which involves logic and reasoning.

The researchers observed that the poor academic performance and retention of students in computer studies/Data processing was as a result of usual conventional method of teaching the subject adopted by Ekiti State Secondary School teachers which makes the students to be passive learners.

The problem of this study therefore is to investigate the effect of animated cartoon based instructional strategy as a way to improve on the teaching and learning of computer studies/Data processing in senior secondary schools in Ekiti State.

Research Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

1. There is no significant difference between the pre-test achievement mean scores of students in the experimental and control groups in computer studies.
2. There is no significant difference in the post-test achievement mean scores of the experimental and control groups in computer studies.
3. There is no significant difference between the retention of students in experimental and control groups in computer studies.

The research design used for the study is the Pretest-Posttest, Quasi Experimental design. There was one experimental group which was exposed to treatment (animated cartoon based

instructional strategy) and one control group without any treatment but conventional method of teaching. The design format for the study is represented below:

Pretest - Posttest Control Group Design

O_1 x O_{2Ort} (Experimental Group)

O_3 __ O_{4Ort} (Control Group)

Where; O_1 =observation (learning outcome) from the pretest which is the prior knowledge of the students in the topic to be taught (Concept of Program Development and program errors) before the treatment.

x = treatment

$rt_{1=}$ students' retention 6 weeks after posttest in the experimental group

O_3 = observation (learning outcome) from the pretest control group which is the prior knowledge of the students in the topic to be taught (Concept of Program Development and program errors) before the use of conventional method.

- =no treatment (control group)

O_4 =observation (learning outcome) from the posttest control group

rt_2 = students' retention 6 weeks after posttest in the control group.

The population for this study consisted of 14,907 Senior Secondary School students in year II comprising 7,417 males and 7,490 females from 187 public secondary schools in Ekiti State according to Ekiti State Ministry of Education Science and Technology, 2017. The schools comprises both single and co-educational from rural and urban areas. The sample for this study consisted of 240 Senior Secondary School Students in year II from four schools whose selection was based on the combination of multistage and proportional stratified random sampling techniques (using sex of students and location of schools) as proportional stratification basis. Two research instruments were used in the study titled: Computer Achievement Test (CAT) and Computer Retention Test (CRT) which were grouped into two sections. Section A consisted of respondents' (students) bio - data such as name of school, school's location and sex. Section B consisted of 30 multiple choice items which was based on the topics taught under the major content areas of the current scheme of work for public senior secondary schools year II in computer studies subject. A self - prepared marking guide by the researcher was used

for marking the answers provided by the respondents on who the instrument was administered. The validity of the instruments (CAT and CRT) were ensured using face and content validities. The instrument were given to experts in Test, Measurement and Evaluation, Guidance and Counseling and those in the field of Computer Science for face and content validities to ensure the instruments measures what it purported to measure while the reliability of the instruments were determined through test - retest method. The instruments were administered twice within an interval of two weeks on 20 senior secondary school students in year II comprising of 10 males and 10 females which were randomly selected from both rural and urban schools outside the sample space. The two sets of results were collated and analyzed using Pearson's Product Moment Correlation Analysis. The reliability coefficient of 0.80 and 0.79 were obtained respectively at 0.05 level of significance. These values were considered appropriate for the consistency of the instruments.

Results

Hypothesis 1

There is no significant difference between the pre-test achievement mean score of students in the experimental and the control groups in Computer Studies.

In order to test the hypothesis, achievement mean scores of students in the experimental and the control groups before treatment were computed and compared for statistical significance using t-test statistics at 0.05 level. The result is presented in Table 1

Table 1: t-test showing achievement of students in experimental and control group before treatment

Group		**N**	**Mean**	**SD**	**df**	**t**	**P**
Experimental		120	10.65	3.480	238	0.285	0.776
Control		120	10.77	2.834			

P > 0.05

Table 5 shows that there is no significant difference between the pre-test achievement mean scores of students in the experimental and the control groups (t = 0.285, p > 0.05). This means that the entry skills of the students are the same in computer studies. Therefore, the null hypothesis is not rejected.

Hypothesis 2

There is no significant difference in the post-test achievement mean scores of the students in experimental and control groups in Computer Studies.

In testing the hypothesis, the post-test achievement mean scores of students exposed to animated cartoon based instructional strategy and the conventional instructional strategy in Computer Studies were computed and compared for statistical significance using Analysis of Covariance (ANCOVA) at 0.05 level. The result is presented in Table 2

Table 2: ANCOVA of students' achievement in Computer Studies by treatment

Source	**SS**	**df**	**MS**	**F**	**P**
Corrected Model	7647.722	2	3823.861	1025.336	.000
Covariate (Pretest)	778.322	1	778.322	208.700	.000
Group	6952.661	1	6952.661	1864.297*	.000
Error	883.862	237	3.729		
Total	74202.000	240			
Corrected Total	8531.583	239			

***p<0.05**

Table 2 reveals that there was a significant difference in the post-test achievement mean score of students using animated cartoon based instructional strategy and the conventional instructional strategy in Computer Studies ($F_{1,237}$=1864.297, p<0.05). The null hypothesis is rejected.

In order to determine the effectiveness of treatment (use of animated cartoon based instructional strategy) in improving students' achievement in Computer Studies, Multiple Classification Analysis (MCA) was used. The result is presented in Table 3.

Table 3: Multiple Classification Analysis (MCA) of students' achievement in Computer Studies by treatment

Grand mean=16.54					
Variable + Category	**N**	**Unadjusted Devn'**	**Eta^2**	**Adjusted For Independent + Covariate**	**Beta**
Experimental	120	5.35	.90	5.29	.29
Control	120	-5/35		-5.47	
Multiple R					0.285
Multiple R^2				0.081	

Table 3 reveals that, with a grand mean of 16.54, students exposed to animated cartoon based instructional strategy had higher adjusted mean score of 21.83 (16.54+ 5.29) on Achievement in Computer Studies than their counterparts in the conventional group with an adjusted mean score of 11.07 (16.54+(-5.47). This implies that the use of animated cartoon based instructional strategy is an effective instructional strategy for improving students' achievement in Computer Studies. The treatment accounted for about 90% (Eta^2=0.90) of the observed variance in students' achievement in Computer Studies.

Hypothesis 3

There is no significant difference between the retention of students in experimental and control groups in computer studies. In testing the hypothesis, retention mean scores of students exposed to animated cartoon based instructional strategy and the conventional instructional strategy in Computer Studies were computed and compared for statistical significance using Analysis of Covariance (ANCOVA) at 0.05 level. The result is presented in Table 4.

Table 4: ANCOVA of students' retention in Computer Studies by treatment

Source	**SS**	**df**	**MS**	**F**	**Sig.**
Corrected Model	12647.945	2	6323.972	1586.262	.000
Covariate (Pretest)	392.840	1	392.840	98.537	.000
Group	12332.040	1	12332.040	3093.284*	.000
Error	944.851	237	3.987		
Total	56073.000	240			
Corrected Total	13592.796	239			

***p < 0.05**

Table 4 reveals that there is significant difference in the retention scores of students using animated cartoon based instructional strategy and the conventional instructional strategy in Computer Studies ($F_{1,237}$= 3093.284, $p < 0.05$). The null hypothesis is rejected.

In order to determine the effectiveness of treatment (use of animated cartoon based instructional strategy) in improving students' retention in Computer Studies, Multiple Classification Analysis (MCA) was used. The result is presented in Table 5.

Table 5: Multiple Classification Analysis (MCA) of students' retention in Computer Studies by treatment

Grand mean=13.30					
Variable + Category	**N**	**Unadjusted Devn'**	**Eta^2**	**Adjusted For Independent + Covariate**	**Beta**
Experimental	120	7.15	.93	7.17	.
Control	120	-7.14		-6.14	
Multiple R					0.0
Multiple R^2				0.0	

Table 5 reveals that, with a grand mean of 13.30, students exposed to animated cartoon based instructional strategy had higher adjusted mean score of 20.47 (13.30+7.17) on retention in Computer Studies than their counterparts in the conventional group with an adjusted mean score of 7.16 (13.30 + (-6.14). This implies that the use of animated cartoon based instructional strategy constitutes an effective instructional strategy for improving students' retention in Computer Studies. The treatment accounted for about 93% (Eta^2 = 0.93) of the observed variance in students' retention in Computer Studies.

Discussion

Findings from the study revealed that there was no significant difference between the achievement mean scores of students in the experimental and control groups before the treatment. This result showed the homogeneity of all the groups indicating that students performed below average in introduction to Computer Programming as a problem- solving skills in Computer Studies. The researcher observed that the below average performance of the students could be attributed to the way they have been taught in their various schools. This findings supported that of Abdulkadir (2016) who

reported that poor academic performance of students in Computer Studies (algorithm) was attributed to conventional method of teaching and learning Computer Studies which lack varieties of instructional materials and good teaching strategy. The result also indicated that there was a significant difference in the achievement mean scores of students in the experimental and control groups. This means that students exposed to animated cartoon based instructional strategy performed better with adjusted mean score of 21.83 than their counterparts taught with the conventional method of teaching with adjusted mean score of 11.07. This corroborated the findings of Unal and Husein (2017) on conceptual knowledge of computer system where majority of students have misconceptions about basic concepts of computer studies before treatment but the use of 3D animation significantly improved their level of conceptions.

The findings revealed that there was a significant difference in the retention of students taught with the use of animated cartoon based instructional strategy and those taught with the use of conventional method. This implies that the use of animated cartoon based instructional strategy constitutes an effective instructional strategy for enhancing students' retention in Computer Studies. This corroborates the findings ofBarak, Ashkar & Dori (2010), Rahmat (2015) who revealed that students in experimental group retained 90% of what they have been taught in computer studies due to the use of animated movies compared to students in control group (use of conventional method of teaching). Unal and Huseyin (2017) added that students in the experimental group were able to retain what they had learnt on the concept of computer systems after the use of 3D animation. The researchers added that no matter how students are forgetful in their studies, once students are exposed to animated movies, there is tendency for improvement in the level at which they forget what they have been taught.

Conclusion

Based on the findings of this study, it could be concluded that the academic performance and learning retention of students in computer studies were low before the treatment. This was discovered in the study as a result of the usual conventional method of teaching and learning used by the teachers in Ekiti State secondary schools which is teacher centered.

There were improvements in the academic performance and learning retention of students after the treatment.

Recommendations

Based on the findings of this study, it was recommended that conscious effort must be made by teachers in Ekiti State to use animated cartoon based instructional strategy to teach difficult concepts such as programming in computer studies to improve the students' academic performance and learning retention in computer studies. Teachers in the secondary schools should make use of animated cartoon based instructional strategy in teaching computer studies in order to concretize abstract learning. Seminars and workshops should be organized by the government to train teachers on the use of new technological tools for effective and efficient teaching and learning.

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